Central
Coast
Watershed
Studies

CCoWS

Monitoring Chlorpyrifos and Diazinon in Impaired Surface Waters of the Lower Salinas Region

Don Kozlowski[1]
Dr Fred Watson[1,2]
Mark Angelo[3]
Joy Larson[1]

[1]Watershed Institute, California State University Monterey Bay
[2]Project leader fred_watson@csumb.edu
3Central Coast Regional Water Quality Control Board

Funded by:

California Dept. of Pesticide Regulation
Agreement 01-0183C

Central Coast Regional Water Quality Control Board
Agreement 9-168-130-0

Report No. WI-2004-03
31 March 2004

The Watershed Institute

Earth Systems Science and Policy
California State University
Monterey Bay
http://watershed.csumb.edu

100 Campus Center, Seaside, CA,
93955-8001
831 582 4452 / 4431.

Disclaimer

Acknowledgements

Funding for this project was provided by:

- California Department of Pesticide Regulation
  Agreement #01-0183C

- Central Coast Regional Water Quality Control Board
  Grant #9-168-130-0

Thanks to student assistants Jessica Wikoff, Suzanne Gilmore and Morgan Wilkinson for their lab and field support; research technicians Joel Casagrande and Julie Hager and research associates Wendi Newman and Thor Anderson for technical support; Revital Katznelson with the State Water Resources Control Board; and Bryn Phillips of the Marine Pollution Studies Laboratory of the University of California, Davis at Granite Canyon.

Table of Contents

Lists of Figures, Maps and Tables

Figures

Maps

Tables

Executive Summary

A number of waterbodies in the lower Salinas Valley are listed under the Clean Water Act Section 303(d) as being impaired due to pesticides. Nine sites in seven of these listed waterbodies were sampled for the pesticides chlorpyrifos and diazinon in both dry and wet seasons. The sites drain watersheds that are impacted primarily by agricultural and urban land uses. Dry-season sampling occurred five times during the summer of 2002 from July through October and seven times during the summer of 2003 from April through October. The same sites were monitored during 3 winter storms occurring in November 2002, February and March 2003. On each sampling visit, three types of sample were obtained: a filtered water sample, a sample of the suspended material retained by a filter, and a sample of the bottom sediments. The samples were analyzed using ELISA technology.

Findings:

- Pesticide concentrations are too high relative to objectives for aquatic health and toxicity set by the California Department of Fish and Game
    - Concentrations are high enough to be toxic to aquatic organisms at all sites, and at most times
    - Concentrations are lower in larger watersheds, for two suggested reasons:
        - Dilution. The larger watersheds sampled have a higher proportion of non-intense land uses (such as shrubland, forest, and grassland)
        - Molecular degradation over time. Material sampled from larger watersheds has been resident in the environment (and thus subject to degradation processes) for a longer period of time since being applied for agricultural or suburban uses. Thus, in-stream management practices such as wetlands that slow down the flow should be encouraged.
- Pesticide loads are too high
    - Loads quantify the movement of pesticides through watersheds
    - A high load indicates adverse impacts to downstream areas, such as freshwater sloughs, tidal sloughs, and the Monterey Bay National Marine Sanctuary
    - Bottom-sediment pesticide concentrations at downstream sites change frequently over time, particularly following the storm season, indicating frequent pesticide loads arriving from upstream sites, as well as frequent removal or degradation of material.
- Pesticide accumulation in ditch/canal/slough sediments during the dry-season, prior to later re-mobilization during the storm season is an important process in the study area.
- The half lives of pesticides are long enough that pesticides applied in the dry season are still present in the system in the wet season, and thus contribute to storm loads
- In terms of total loads delivered to downstream areas in the long term, storm runoff may be the dominant pesticide transport mechanism at many sites. In the Salinas

Reclamation Canal, storm runoff is estimated to have transported 98% of chlorpyrifos loads and 91% of diazinon loads in the 2002-3 water year.

  - Thus, significant reduction of storm runoff should be a priority.
  - Storm runoff should be reduced both from source areas themselves (such as farms), and also in the tailwater ditches that accumulate pesticides during the dry season

- Aqueous transport was the dominant transport mechanism (as opposed to sediment-adsorbed transport)
  - Despite observations that storms transported most of the pesticides, and the general understanding that most sediment transport occurs during storms in the region, sediment-adsorbed transport was usually less than 50% of the total pesticide load.
  - Therefore, sediment retention basins that allow water outflow may not be completely effective at removing pesticides from runoff
  - Sediment-adsorbed transport was more important for chlorpyrifos than diazinon
- In most sites, dry-season pesticide loads are a very small fraction (0.01%) of pesticide applications by growers, but are still high enough to lead to toxic concentrations in listed waterbodies.
  - Therefore, it may be impossible to remove pesticides from runoff down to levels low enough such that the runoff was not toxic. Instead, in order to meet water quality objectives, the suggestion is made that water quality management by farmers using pesticides should be directed toward zero runoff in both dry and wet seasons to the greatest extent practicable.
- In a particular small watershed dominated by greenhouse land use, a very large fractions of grower applications were subsequently measured as loads in the stream (approximately estimated at 6% of chlorpyrifos applications and 41% of diazinon applications). This suggests at least one example of very poor on-site pesticide management techniques. It is unknown whether this is indicative of current greenhouse practices in general.

1 Introduction

1.1 Background

A number of water bodies in the region that surrounds Monterey Bay are listed as impaired due to 'pesticides' under Section 303(d) of the Clean Water Act. Total maximum daily load (TMDL) plans must be developed for these water bodies. As explained below, the proposed work focuses on two currently applied organophosphate pesticides: chlorpyrifos and diazinon.

Regional data are available on the timing and location of pesticide application (California Department of Pesticide Regulation (DPR), 2002; Monterey County Agriculture Commissioner, 2002-2003), on concentrations observed downstream in water, sediment, and tissue (detailed in Section 1.4); and on the toxicity of aquatic organisms due to pesticides (Hunt et al., 1999). But a thorough analysis of the linkage between application data and later occurrence of pesticides in waterways is lacking. In particular, the spatial and temporal dynamics of pesticide transport in the region are poorly understood.

Of the currently used pesticides, chlorpyrifos and diazinon have been identified as being responsible for toxicity of crustaceans in a number of stream water samples (Siepmann and Finlayson, 2000; Hunt et al., 2003) and are present in biologically effective quantities in sediments and tissues (Section 1.4). Their concentration in streams exceeds levels that are known to impact the life cycles of higher organisms such as the federally threatened South Central Coast Evolutionary Significant Unit (ESU) steelhead trout. 59,742 kg of diazinon and 42,408 kg of chlorpyrifos were applied in hydrologic unit 309 (lower Salinas Valley) in 1999, and concentrations of above 1 μg/L (in water) and 1 μg/kg (sediment) have been measured in waterways. The transport processes that move pesticides from application areas to stream sampling sites are poorly understood.

1.2 Chlorpyrifos and Diazinon

Chlorpyrifos is relatively insoluble in water (0.733 mg/L @ 20°C), adsorbs strongly to soil organic matter (soil absorption coefficient (K_{oc}) 5300 to 14800), and is moderately volatile (vapor pressure 2.3 millipascals (mPa) @ 20°C) (Azimi-Gaylon et. al., 2001). Its environmental fate is dominated by hydrolysis and microbial degradation. Half-lives range from 7 to 56 days for soil and surface applications to 12 to 52 days in sediment/water systems (Montgomery, 1997). The lethal concentration that kills 50% of individuals tested (LC_{50}) for rainbow trout is 3 parts per billion (ppb) (Montgomery, 1997); and for water fleas (*Ceriodaphnia dubia*) the LC_{50} is 53 parts per trillion (ppt) (Bailey, et al., 1997).

Diazinon is moderately soluble in water (60 mg/L @ 20°C), does not readily adsorb to soil organic matter (K_{oc} 1007 to 1842), and is moderately volatile (0.64 mPA @ 20°C) (Azimi-Gaylon et. al., 2001). Its environmental fate is also dominated by hydrolysis and microbial degradation. Half-lives range from 14 to 194 days for soil and surface applications to 8 to 10 days in estuarine water (Montgomery, 1997). (Note: the half-life of many pesticides is difficult to determine due to the numerous factors that affect it. Published half-lives are given with respect to the methods used to determine them; therefore, stated half-lives often differ from source to source.) The LC_{50} for rainbow trout is 16 parts per million (ppm) (Montgomery, 1997); *C. dubia* is 320 ppt (Bailey, et al., 1997).

The criterion maximum concentration (CMC) and criterion continuous concentration (CCC) are guidelines most commonly used by the California Department of Fish and Game (DFG) to relate short-term and long-term environmental exposure of these pesticides. The CMC for chlorpyrifos is 20 ppt; CCC is 14 ppt. The CMC for diazinon is 80 ppt; CCC 50 ppt (Siepmann and Finlayson, 2000).

1.3 Notes on half-lives

Half-lives vary according to the several factors:

- Formulation of the product
- medium it's on/in (soil, water, vegetation)
- type of medium (loamy soils, clay soils or fresh water, brackish water, etc)
- acidity of the medium
- temperature of the medium
- amount of sunlight available

The following information was obtained from EXTOXNET:

In soil, chlorpyrifos is moderately persistent, with a half-life anywhere from 2 weeks to one year, depending upon conditions. This would make applications to agricultural lands available to waterways for a considerable amount of time. Once in the water, breakdown is largely dependant upon the formulation used, the alkalinity (higher alkaline, greater degradation) and temperature of the water (higher temperature, greater degradation). At a water pH of 7.0 and 25°C, chlorpyrifos' half-life is 35-78 days. The average pH of the study area waters is about 7.9, but the average temperature of the water is about 19°C. Temperature is a key factor in degradation, as hydrolysis decreases 2.5 to 3 fold for every 10°C drop in temperature. Cooler water temperatures might lead to a greater half-life in the study area's waters. Data on water pH and temperature are available in Table 7.4.

Diazinon, on the other hand, has low persistence in soils, with a half-life of 2-4 weeks. Once in the water, breakdown is partially dependant upon acidity (greater acidity, more rapid degradation). In neutral solutions, diazinon can have a half-life of 6 months, while again the average pH of the study waters is 7.9. Both diazinon and chlorpyrifos are to some degree degraded by photolysis (sunlight). Diazinon has a shorter half-life on land than chlorpyrifos, and is applied with greater frequency within the study area.

1.4 Aims & general methodology

This study aimed to clarify the links between application of chlorpyrifos and diazinon and their appearance in 303(d)-listed water bodies by monitoring the movement of these chemicals in listed water bodies, and the mechanisms by which they are moved.

The following questions were answered:

- Are concentrations of chlorpyrifos and diazinon above levels that limit aquatic ecosystem health?
- What is the variability of *in situ* sediment chlorpyrifos and diazinon concentration and load during ambient non-winter conditions?
- Is it possible to measure loads of chlorpyrifos and diazinon that explain this variability?
- Are loads significant during ambient non-winter conditions?
- Are loads significant during winter events?
- Is there evidence that urban loads are significant?
- Is there evidence that agricultural loads are significant?
- Are the data consistent with published half-lives?
- Is aqueous transport of chlorpyrifos and diazinon significant?
- Is adsorbed transport of chlorpyrifos and diazinon significant?
- Is there a relationship between suspended solids concentration and transport of chlorpyrifos and diazinon?

Samples were taken both within listed water bodies, their sediments, and the flows into these water bodies. Sampling was conducted both during the dry-season, when most agricultural activity occurs, and during storms, when streamflow is highest.

At the outset, it was anticipated that there would be significant spatial, temporal, and matrix variation in chlorpyrifos and diazinon concentrations and loads. Spatial variation was expected due to different application, transport regimes, and degradation regimes in the seven quite-different listed water bodies. Temporal variation was expected for the same reasons, and also because of the differing flow regimes of in-growing-season (summer) and out-of-growing-season (winter) flows. We expected to find a relationship between storm hydrograph peaks and pesticide levels in situations when storms overlap, or almost overlap with the growing season. Finally, we expected different pesticide concentrations within different matrices (water, suspended sediment, and bottom sediment) In particular we expected a correlation between pesticide concentrations and fine sediment concentration. If this were the case, there would be significant implications for the expectation of pollutants adsorbed to any loads of fine sediment observed in the region.

1.5 Previous Work

Previous studies, monitoring and/or data of pesticides in the 303(d) listed water bodies in the lower Salinas region include:

- Ecotoxicologic Impacts of Agricultural Drain Water in the Salinas River, California, USA (Anderson et al., 2003a).
- Integrated Assessment of the Impacts of Agricultural Drainwater in the Salinas River (California, USA) (Anderson et al., 2003b).
- Ambient Toxicity Due to Chlorpyrifos and Diazinon in a Central California Coastal Watershed (Hunt et al., 2002).
- Study 219: Monitoring Surface Waters and Sediments of the Salinas and San Joaquin River Basins for Synthetic Pyrethroid Pesticides (DPR, 2003). http://www.cdpr.ca.gov/docs/empm/pubs/protocol/prot219.pdf
- State Mussel Watch Program (SMW): www.swrcb.ca.gov/programs/smw
  - 3 reports: State Water Resources Control Board (SWRCB), 1994, 1996, 2000
- Toxic Substances Monitoring Program (TSM): www.swrcb.ca.gov/programs/smw
  - 3 reports: SWRCB, 1993, 1995a, 1995b
- Chemical and Biological Measures of Sediment Quality in the Central Coast Region (SWRCB et al., 1998): a.k.a. Bay Protection and Toxic Cleanup Program (BPTC)
- Central Coast Ambient Monitoring Program (CCAMP): http://www.ccamp.org/
- Temporal Distribution of Insecticide Residues in Four California Rivers (DPR, 1997): http://www.cdpr.ca.gov/
- United States Geological Survey (USGS) water quality data: http://waterdata.usgs.gov/nwis/qwdata&introduction

The data from SMP, TSM and CCAMP are available online from CCAMP. Databases for SMP and TSM are also available at: www.swrcb.ca.gov/programs/smw. Department of Pesticide Regulation data are available at the above CDPR website.

Much of the past, current and on-going toxicological research pertaining to pesticides, including chlorpyrifos and diazinon, is being conducted by the Marine Pollution Studies Laboratory of the University of California, Davis at Granite Canyon. That group uses enzyme-linked immunosorbent assay methods (ELISA) to measure environmental contamination, as this study does. Aquatic toxicity research performed in and near the study area in the recent past have indicated that chlorpyrifos and diazinon were the main causes of toxicity to *Ceriodaphnia dubia* and *Hyalella azteca* (Hunt et al., 2001), and this combined with other factors may be impacting macroinvertebrate communities in the Salinas River system (Anderson et al., 2003).

The DPR (Kelley, 2003) conducted a monitoring project during the summer of 2003 looking at the presence of pyrethroid and organophosphate pesticides in the San Joaquin and Salinas valleys. Particular sites monitored in the Salinas Valley include the Alisal Slough/Reclamation Ditch, Blanco Drain at Cooper Rd., Chualar Creek and Quail Creek. All of these sites are near or within the study area of this project. These sites were monitored once per week from May to late September. The final report for that project is due in June 2004.

Previous data on sediment and water concentrations of chlorpyrifos and diazinon found to date at regional sites are summarized in Table 7.1. Limited information on chlorpyrifos and diazinon emerged from these studies. For instance, data from the SMW and TSM were primarily the result of tissue sampling and are not reported in Appendix 1. CCAMP and BPTC examined chlorpyrifos and diazinon in sediments at a few locations in the region, but the data were very limited as sampling was not conducted on a regular basis. Although general water quality data (including pesticide) collected by federal sources such as the USGS exist for multiple Salinas River sites, none are available for sampling sites of this study. No studies have been found to date that address the spatial and temporal variation of chlorpyrifos and diazinon loads for this study area. Table 7.1 shows that chlorpyrifos was examined for (in water and sediment) 119 times for all data combined and was detected 9 times; once in water (110 ppt) and 8 times in sediment (average = 6873 ppt, coefficient of variance (CV) = 95%). Diazinon was examined for (in water and sediment) 203 times for all data combined and was detected 17 times; 16 in water (average=33 ppt, CV=150%) and 1 time in sediment (400 ppt, CV= 32%). This is not an exhaustive review, but it covers the bulk of known data. Other data are known to exist (e.g. Hunt, et al.) but were not obtained by this study.

2 Study Area

2.1 Study Area Description

The study area for this project is located in the lower Salinas Valley of Monterey County, California (Fig 2.1). A total of nine study sites (Table 2.1) are located within a system of interconnected rivers, creeks, ditches, sloughs, and lagoons draining into the Monterey Bay National Marine Sanctuary via the Old Salinas River through Moss Landing Harbor and the Salinas River flowing directly to the Pacific Ocean.

Table 2.1 Pesticide Monitoring Sites

Site #	Waterway	Location	Site Code	Waterbody type	303(d) listed?
1	Salinas River	Davis Rd.	SAL-DAV	Large river	Yes
2	Salinas Lagoon	Del Monte Rd.	SAL-MON	Seasonal lagoon	Yes
3	Blanco Drain	Cooper Rd.	BLA-COO	Large ag. ditch	Yes
4	Blanco Drain	Pump-out station	BLA-PUM	Slough	Yes
5	Reclamation Ditch	San Jon Rd.	REC-JON	Large ag./urban canal	Yes
6	Old Salinas River	Potrero Rd.	OLS-POT	Back-beach swale	Yes
7	Moss Landing Harbor	Sandholdt Rd.	MOS-SAN	Artificial harbor	Yes
8	Espinosa Slough tributary	Rogers Rd.	EP1-ROG	Ag. ditch	No
9	Espinosa Slough	NE end of lake	EPL-EPL	Perennial lake	Yes

North Salinas Valley Pesticide Monitoring Sites

Including

Salinas River, Salinas Lagoon, Blanco Drain, Reclamation Ditch, Espinosa Slough, Old Salinas River Channel, and Moss Landing Harbor

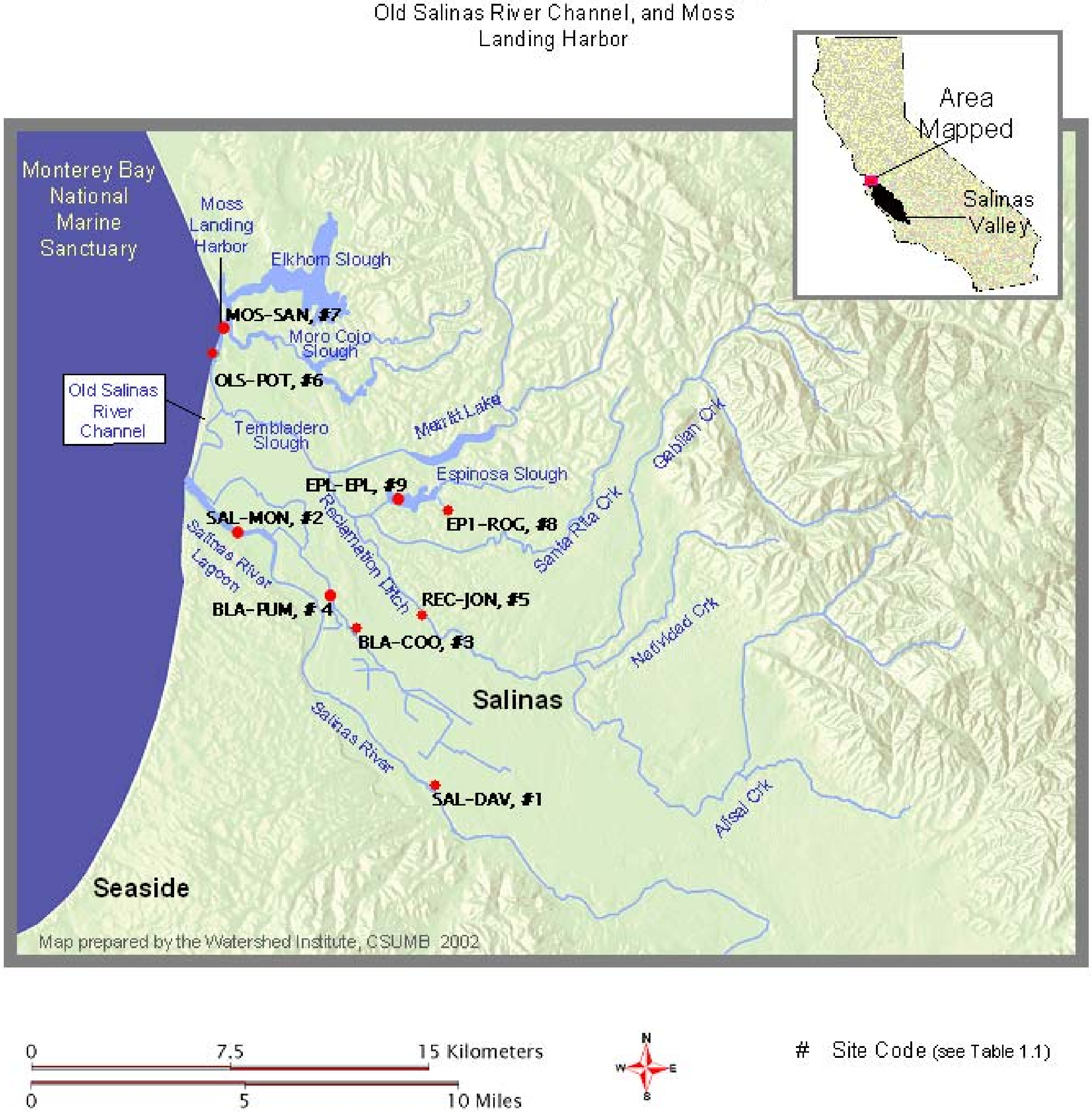


Figure 2.1 Map of North Salinas Valley showing study area and pesticide monitoring sites.

2.2 Site Descriptions

2.2.1 Site #1, SAL-DAV

Site 1(Fig 2.2) is located at a (perennial) deepening of the (non-perennial) Salinas River at the Davis Road crossing, approximately 14 km upstream from Site #2. Site 1 is an ideal location to measure the majority of loads delivered by the Salinas River to receiving waters such as the Salinas Lagoon and the Pacific Ocean. This location could potentially exhibit significant pollutant transport under certain conditions. It also provides *in situ*

Figure 2.2 Site #1-Salinas River looking upstream from Davis Rd. (Photo: Don Kozlowski, June 2002)

habitat for species such as the federally threatened steelhead, other native fish of the Salinas River, waterfowl, and other aquatic organisms. The low flow channel is approximately 5 m wide with sand as the dominant substrate. The main channel ranges from approximately 100 to 200 m wide. Riparian vegetation is abundant and the surrounding land use is primarily row-crop agriculture.

2.2.2 Site #2, SAL-MON

Site 2 (Fig 2.3) is located on the Salinas Lagoon at Del Monte Road, less than 3 km upstream from the seasonal bar at the entrance to the Pacific Ocean. This location receives all the flow and loads of pollutants from the Salinas River as well as some from Site #4 (Blanco Drain). The Salinas Lagoon supports several unique threatened and endangered species including: Menzies Wallflower, Slender-Flowered Gilia, Smith's Blue Butterfly and its host-Coastal Buckwheat, snowy plover, black legless lizard, dune beetle, and is a migratory corridor for the south-central coast Steelhead.

The channel is much wider than at Site 1, and the substrate has a higher percentage of silt and clay. Riparian vegetation is less abundant than at Site 1, and the adjacent land use is predominantly row-crop agriculture with some residential and recreational land use.

During winter storm events, flow from the Salinas River will fill this lagoon until it breaches or is breached by the Monterey County Water Resources Agency, sending flows directly to the ocean. Otherwise, flow is directed from the lagoon down the Old Salinas River Channel to Moss Landing Harbor via the Potrero tide gates.

Figure 2.3 Site #2-Salinas Lagoon looking upstream from Del Monte Rd. (Photo:Don Kozlowski, June 2002)

2.2.3 Site #3, BLA-COO

Site 3 (Fig 2.4) is found on the agricultural ditch system known as Blanco Drain, one of the more polluted areas according to data from the State Mussel Watch Program. It is located at the Cooper Road crossing, approximately 1.5 km upstream of the receiving area of the Blanco Drain pump station (Site #4). It is an ideal site to examine agricultural pesticide loads, since it has no other upstream land uses. Historically a freshwater wetland, the system was channelized so as to improve drainage and make the area more accessible to farming. Sub-surface tile drains are used extensively in the Blanco watershed. The drainage originates just south of the city of Salinas and flows north approximately parallel to the Salinas River. Blanco Drain lacks riparian vegetation and is comprised of a predominantly silt/clay substrate.

Figure 2.4 Site #3-Blanco Drain looking upstream from Cooper Rd. (Photo: Don Kozlowski, June 2002)

2.2.4 Site #4, BLA-PUM

Site 4 (Fig 2.5) is located on the Blanco Drain, approximately 1.5 km downstream of Site 3, and immediately upstream from the pump-out station. Waters from Blanco Drain become a ponded, sluggish slough at the pump-out station where water is impounded (left side of Fig. 2.5) and then pumped into the Salinas River (less than 0.5 km to the west) via a connecting channel (right side of Fig. 2.5). This monitoring location serves as an area of low water flow where sediments settle. The adjacent land use is row-crop agriculture.

Figure 2.5 Site #4-Blanco Drain looking upstream (left) from pump-out station and downstream (right) to the Salinas River. (Photo: Don Kozlowski, June 2002)

2.2.5 Site #5, REC-JON

Site 5 (Fig 2.6) is located on the Salinas Reclamation Canal at San Jon Road (usually known as the Reclamation Ditch). It is approximately 12 km upstream from the confluence of Tembladero Slough and the Old Salinas River channel and approximately 5 km downstream from the city of Salinas. The Reclamation Ditch originates in former Smith and Heinz Lakes which drain the upper Alisal watershed south and east of the City of Salinas. The Ditch flows through Carr Lake in the center of Salinas, where it picks up flows from the Gabilan and Natividad watersheds. The Reclamation Ditch was constructed in 1917 to improve drainage and allow 'reclamation' of the wetlands and other low-lying areas in the the Salinas area for both urban and agricultural uses. The Ditch flows into Tembladero Slough and finally into Moss Landing Harbor through the Potrero tide gates. Site 5 is located on a relatively steep reach, with perennial flow, and a USGS gauging station. The site is thus an excellent place to measure pesticide loads from a large part of the study area. The Ditch is channelized, lacks riparian vegetation, and the primary substrate is silt/clay. Adjacent land use at Site 5 is row-crop agriculture.

Figure 2.6 Site #5-Reclamation Ditch looking upstream from San Jon Rd. (Photo: Don Kozlowski, June 2002)

2.2.6 Site #6, OLS-POT

Site 6 (Fig 2.7) is located on the Old Salinas River channel at the Potrero Road, approximately 14 km downstream of Site 5. The site is the lowest point in the greater Gabilan / Salinas watershed system. It normally appears as a sluggish slough, heavily influenced by tidal pressure from Moss Landing Harbor, but appreciable flows occur during larger storms. The channel has a predominantly silt/clay substrate and lacks significant riparian vegetation other than coastal succulents such as pickleweed. The adjacent land use is mainly row-crop agriculture with some recreational land use.

Figure 2.7 Site #6-Old Salinas River looking upstream from Potrero Rd. (Photo: Don Kozlowski, June 2002)

2.2.7 Site #7, MOS-SAN

Site 7 (Fig 2.8) is located in Moss Landing Harbor at the Sandholdt Road crossing, approximately 1 km downstream of Site 6. This site receives loads from the Old Salinas River channel and Tembladero Slough, as well as Elkhorn Slough and its tributaries. Being connected to the ocean, it is significantly influenced by the tide. On an incoming tide, pesticde loads from the Old Salinas River channel maybe transported through Moss Landing Harbor into Elkhorn Slough. At Sandholdt road, the harbor is broad and lacks riparian vegetation, but has abundant tidal marsh vegetation. The primary substrate is silt/clay with some riprap.

Figure 2.8 Site #7-Moss Landing Harbor looking upstream from Sandholdt Rd bridge. (Photo: Don Kozlowski, February 2003)

2.2.8 Site #8, EP1-ROG

Site 8 (Fig 2.9) is located on an upstream tributary to Espinosa Lake at the Rodgers Road crossing. The drainage originates northeast of the city of Salinas, flows into Espinosa Lake, and if necessary is pumped into the Reclamation Ditch for flood control. This channelized arm of Espinosa Slough is an agricultural ditch, approximately 1 to 2 m wide, and a major contributor of Espinosa Lake's water. The channel lacks riparian vegetation and the dominant substrate is silt/clay. Adjacent land use is row-crop agriculture. There appears to be significant contribution of water flow from upstream greenhouses.

Figure 2.9 Site #8-Espinosa Slough looking upstream from Rodgers Rd. (Photo: Don Kozlowski, June 2002)

2.2.9 Site #9, EPL-EPL

Site 9 (Fig 2.10) is located in the middle of Espinosa Slough, now a lake approximately 2 km west of Site 8. The lake receives flows from Site 8 and was accessed via kayak during the present study. It has some healthy riparian vegetation on its eastern shores, as well us some emergent rushes. Adjacent land uses are row-crop agriculture, grazing, and residential. In the event of flooding, Espinosa Lake is drained by a pump sending water into the Reclamation Ditch.

Figure 2.10 Site #9-Espinosa Lake looking east. (Photo: Don Kozlowski, June 2002)

3 Methods

3.1 Sample Collection

The nine sites were sampled according to the schedule in Appendix 1, Table 7.2 for summers 2002 and 2003 ambient level monitoring and winter 2002-2003 storm monitoring. A total of approximately 207 water samples, 176 suspended solids (SS) samples, and 189 bottom sediment samples were collected and analyzed. Each site was visited within a 24 hr period for each of the twelve ambient sampling events or 'runs'. One SS sample (BLA-COO) was not obtained during the July 2002 sampling run, and three bottom sediment duplicates for ELISA analysis (SAL-MON, SAL-DAV and EP1-ROG) were not obtained. Monitored storm events were labeled sequentially as "Storm 1" (November 6-11, 2002), "Storm 2" (February 14-20, 2003), and "Storm 3" (March 13-18, 2003). Each storm event had pre-storm and post-storm sampling runs that collected the same type and number of samples as an ambient run. A peak-storm sampling run during each event collected water and SS samples, but only at the sites indicated in Appendix 1, Table 7.2. Sites not sampled during peaks were either too difficult to access during a storm or were not expected to experience storm flow conditions. The pre-, peak- and post- sampling runs were collectively considered a single "run" for the purpose of collecting QA/QC samples during each particular storm.

All samples were collected and analyzed according to CCoWS protocols (Watson et. al., 2002), with the exception of samples sent to an external laboratory. One water and one bottom sediment sample from a particular site during each sampling run was sent to Agricultural & Priority Pollutants Laboratories (APPL), Inc., for comparative analysis. CCoWS sample collection and laboratory methods are detailed in the CCoWS protocols document, Sections 4.7 and 5.6. General protocols are addressed below.

At each site, sample water was pumped *in situ* through a 0.7 micron glass-fiber filter and collected into an amber glass bottle (Fig 3.1). Duplicate water samples (1 per sampling run, 15 total) as well as those collected for external laboratory analysis (1 per sampling run, 15 total) were obtained in the same manner and collected sequentially. The filter with particulate (SS sample) was then pressed to remove excess water and placed into an amber glass jar. Bottom sediment samples were obtained using a sediment sampling dredge (Fig 3.2) or a Teflon sampling scoop and were then placed into a stainless steel bowl and mixed with a stainless steel spoon. An aliquot of this mixture was placed into an amber glass jar, with duplicates (1 per sampling run, 12 total) and outside laboratory samples (1 per sampling run, 15 total) obtained from the same mixture. Suspended solids concentration (SSC) samples were obtained using a DH-48 integrated sediment sampler.

Figure 3.1 Filter holder and pump set-up. Photos: Joy Larson, Summer 2003.

Figure 3.2 Bottom sediment sampler. Photos: Joy Larson, Summer 2003.

All samples were immediately placed in a cooler and transported to the CCoWS laboratory where they were refrigerated at 4°C until analysis. Water velocity was measured with an impellor-type current meter or by timing a surface float over a measured distance. Multiple velocity measurements at six-tenths depth were combined to form discharge measurements. During the July and October 2002 and the May-October 2003 ambient runs, as well as the storm 3 run, several additional water quality parameters were measured at each site using a YSI 556 Multi-Probe System.

3.2 Laboratory Methods

3.2.1 CCoWS

Water samples were processed in the CCoWS laboratory using Enzyme Linked Immuno-Sorbent Assay (ELISA) technology (Fig 3.3) according to manufacturer and State Water Resource Control Board (SWRCB) instructions (Katznelson and Feng, 1998).

Standard curves based upon the calibrator pairs used for these analysis give an estimated detection limit (EDL) of 63 ng/L (parts per trillion or ppt) for chlorpyrifos and 25 ng/L (ppt) for diazinon. The chlorpyrifos curve was adjusted during the second storm event to obtain a lower EDL of 50 ppt (within the parameters of the manufactures recommendations). This lower EDL was used for the duration of the study.
Particulate matter captured on the field filter was wet-weighed, dehydrated, dry-weighed and then extracted with methanol (Fig 3.4).

Figure 3.3 CCoWS ELISA laboratory set-up. Photos: Joy Larson, Summer 2003.

Figure 3.4 The adsorbed to suspended solids extraction process: 1) dehydration, 2) methanol addition, 3&4) collecting the extract (notice the bright green color), 5) syringe-filtered to a vial, and 6) the final sample ready for ELISA. Photos: Don Kozlowski and Joy Larson, Summer 2003.

The methanol extract was then analyzed using ELISA techniques. The EDL for this procedure varies with the amount of sample obtained and the amount of methanol used for extraction and is highly variable. On average, the EDLs for chlorpyrifos were approximately 16,000 ng/kg (ppt) for the July run (CV=93%), 23,000 ppt for the August run (CV=52%), and 47,000 ppt for all other runs (CV=72%). The EDLs for diazinon were 6,400, 9,200, and 18,800 ppt for the same respective runs with the same CVs. The progressively larger EDLs for the runs result from using increased amounts of methanol in the extraction process.

Bottom sediment pesticide concentrations are reported as amounts of pesticide for a given weight of sediment (ng/kg). Bottom sediment samples were split into two portions. A smaller portion was wet-weighed, oven dried, then re-weighed to determine wet-to-dry weight ratio. For the October 2002 and March 2003 run samples, this portion was also used to characterize the % silt/clay component of the bottom sediment samples. This was accomplished by wet sieving the sample through a 63-micron sieve, drying, and reweighing the remaining sand component. The remaining portion of the bottom sediment sample had overlying water decanted, was extracted with methanol and analyzed with ELISA. The EDLs for bottom sediment samples are also variable and dependent upon sample mass and methanol volume. However, methanol volumes for bottom sediment extractions were not modified throughout the runs. The average EDL for chlorpyrifos bottom sediment samples was approximately 3,600 ppt (CV=42%); diazinon, 1,500 ppt (CV=42%).

Suspended solids concentration (SSC) samples were vacuum filtered through a 63-micron sieve (Fig 3.5). The portion greater than 63 microns was transferred to a glass fiber filter, dried and weighed to determine the sand-sized component. The remaining sample was filtered through a 1.5-micron glass fiber filter, dried and weighed to determine the silt/clay-sized component. Sample volume was determined by dividing the weight of the water in the sample by the density of water. Results were reported as mg/L.

3.2.2 APPL, Inc.

APPL used EPA 8141A analysis for the detection of organophosphate (OP) pesticides in water and soil samples sent by CCoWS. This gas chromatography (GC) method detects 30 different OP pesticides at various practical quantitative limits (PQLs) as reported by APPL. For diazinon and chlorpyrifos, these PQLs are 50 ppt (similar to CCoWS 25 ppt and 63 ppt for diazinon and chlorpyrifos, respectively) for water samples and 50 ppb (much higher than CCoWS approximate 1.5 and 3.6 ppb) for soil samples.

Figure 3.5 Vacuum filtration of suspended solids sample. Photo: Fred Watson.

3.3 Data Analysis/Calculations

Reported chlorpyrifos and diazinon concentrations for any sample may have been obtained by an average value of the following:

- Laboratory replicates
- Values obtained though serial dilution
- Sample values combined with the values of duplicates
- Replicates of duplicates
- Any combination of these.

Values acquired from APPL are for comparative purposes only and were not incorporated into the final value reported. The QA/QC section addresses variation in these values.

The following nomenclature is introduced to describe the different types of pesticide concentration data reported:

- SPC: Concentration by volume of pesticides in the water column extractable from filtered solids (ng/L)
  - Obtained as the product of suspended sediment concentration (SSC, mg/L) and the suspended pesticide concentration by mass (SPCM, ng/kg), divided by 10^6
- APC: Aqueous pesticide concentration – concentration by volume of pesticides in filtered water from the water column (ng/L)
- TPC: Total water-column Pesticide Concentration (mg/L)
  - Note that TPC = SPC + APC
- BPC: Bottom-sediment pesticide concentration (ng/kg-dry weight)
- FSPC: The fraction of pesticides transported by adsorption = SPC divided by TPC

TPC is thus a combination of two components, SPC and APC. The determination of SPC is not straightforward. The concentration by mass (ng/kg) of pesticides in filtered solids is an over-estimate of true adsorbed concentrations due to a certain amount of water remaining on the filter even after field pressing. Therefore, a correction was applied. Firstly, the volume of excess water (L) was determined from the mass-loss (kg) of the filtered material during drying (Section 3.2.1) (divided by the density of water, kg/L). Secondly, the mass (ng) of pesticide in this water was estimated by multiplying the volume (L) by the concentration (ng/L) of pesticide in the normal filtered water sample. Finally, this mass (ng) was subtracted from the concentration of pesticides by mass (ng/kg) by first multiplying by the dry weight of filtered material (kg), then applying the subtraction in mass units (ng), and then dividing again by the dry weight of filtered material (kg) so as to return to units of concentration by mass (ng/kg). This concentration by mass was then multiplied by the SSC concentration (mg/L) and divided by 10^6 to give the final SPC value (ng/L).

Note that standard GCMS analyses, such as done by our QC lab (APPL Labs Inc.), perform a methyl chloride extraction (which dissolves any adsorbed material) so as to yield total pesticide concentrations. Therefore, our TPC data are most comparable to the work of other labs (as opposed to APC or SPC), and to numeric objectives (such as the CCC and CMC) set using standard analytical procedures.

Instantaneous pesticide loads (denoted SIPL, AIPL, and TIPL respectively) were calculated by multiplying the concentration (ng/L) by the discharge (L/sec) and conversion factor to obtain grams per day (g/day). Total loads over a period of time (kg) were estimated as the integral over time of instantaneous loads. Thus, SPL = SIPL × time, APL = AIPL × time, and TPL = TIPL × time. Total loads for ambient (dry season) periods (kg) were estimated by multiplying the average of the instantaneous loads of a site with the approximate number of days represented by the sampling season. Note that the Storm 1 pre-storm sample was included in the computation of the 2002 ambient means and totals, and the Storm 3 post-storm sample was included in the computation of 2003 ambient means and totals. A crude estimate of the total load for each storm was obtained by assuming that each storm lasted from the time half way between the pre- and peak samples, to the time half way between the peak and post- samples. The IPLs for the peak sample were assumed to be representative of the mean IPLs during this period, and thus the total load was estimated as the product of IPLs and storm duration.

3.4 Drainage Area Delineations and Application Data

Agricultural pesticide application data from the Monterey County Agricultural Commissioner's Office were received in the form of pounds of product applied to Sections (square miles, approximately) of the Townships (13, 14, and 15) and Ranges (02, 03, and 04) of the study area. Data on pounds of product applied were converted into pounds active ingredient (lbs a.i.) by the DPR and CCRWQCB. For the purpose of comparing these applications to pesticide loading rates in the waterways, applications were then converted to kg. At the time of this publication, full application data were available for 2002; however, application data for 2003 were incomplete and only available through approximately May 2003.

The watershed of each sampling site was delineated based on a DEM (modified by field reconnaissance of low-lying areas) using Tarsier software (Watson and Rahman, 2003). To determine chlorpyrifos and diazinon applications within each watershed, a matrix was computed of the area of each Section falling within each watershed. Applications within each Section were then assigned to watersheds in proportion to these areas – thus involving an assumption that applications within each section were homogeneous throughout the Section. This assumption is of course incorrect, but is the simplest assumption given the lack of more precise spatial data. Estimation errors will thus occur at the boundaries of small watersheds.

4 Results

4.1 Hydrology

Streamflow during the ambient monitoring runs was dominated by agricultural and urban runoff. The last significant rainfall in the area prior to the start of the study had occurred in May 2002 (see Fig 4.1). There is no significant natural perennial water feeding these water bodies. Winter precipitation was higher than average in November 2002 and about twice the average in December 2002, while January, February and March 2003 were each under the annual average by over half.

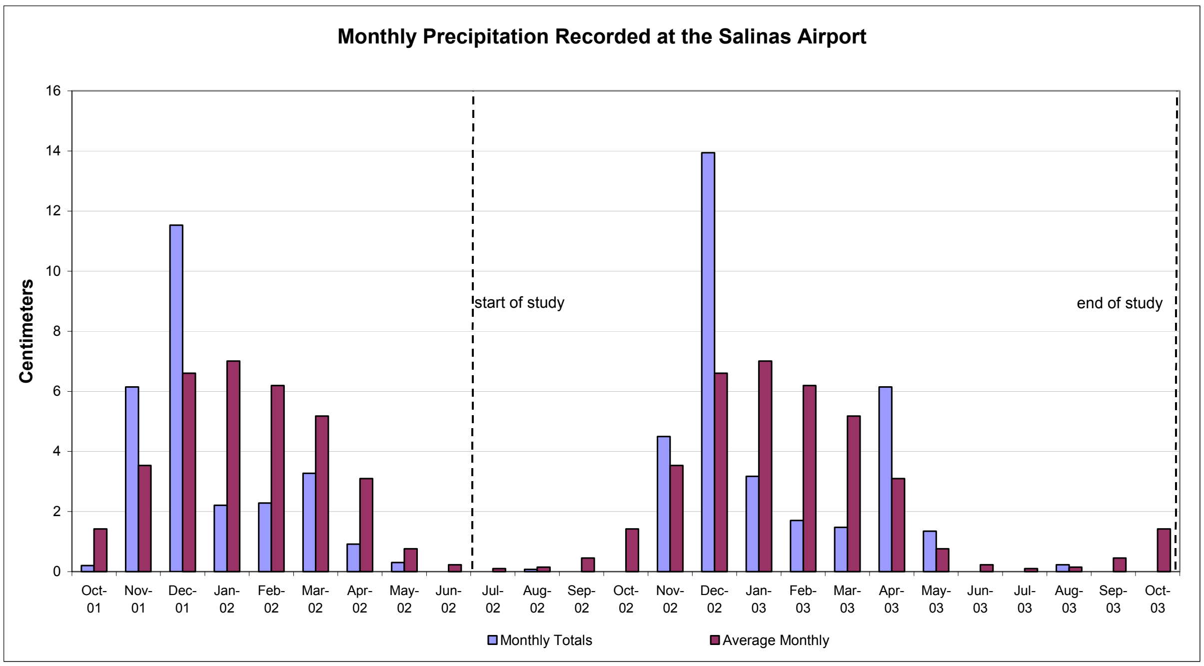


Figure 4.1 Average annual and monthly total precipitation recorded at the Salinas airport.

The Salinas River hydrology during the dry season (May to November) is largely determined by water releases from the Nacimiento and San Antonio reservoirs. These flows are used for groundwater recharge and managed so that flow reaches the lower Salinas River and percolates without being lost to the ocean. Published stream flow data from the USGS station at Spreckels (approx. 3.8 km upstream of SAL-DAV) indicates that minimal surface flow made it past this point to affect the system downstream during the ambient monitoring periods, with the exception of some flow in May 2003 (Fig 4.2). The middle reaches of the Salinas River are therefore somewhat disconnected from the lower reaches during the time periods of ambient monitoring for this study, with the possible exception of sub-surface flow.

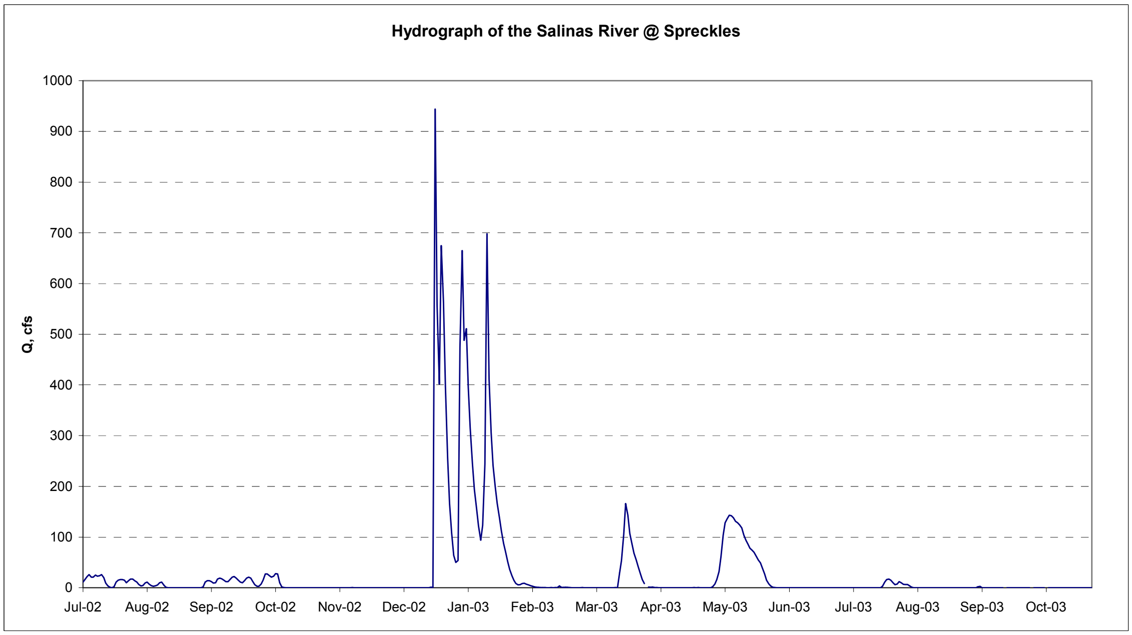


Figure 4.2 Hydrograph of the Salinas River @ Spreckels. Data provided by the USGS http://waterdata.usgs.gov/ca/nwis/dv

The primary source of surface water feeding the lower reaches of the Salinas River, the Reclamation Ditch and the Blanco Drain systems during ambient sampling runs was agricultural return water from adjacent farms. Urban runoff from the city of Salinas also contributed to the system via the Reclamation Ditch and a storm drain on the Salinas River just upstream from SAL-DAV. No water from the Espinosa Lake system is believed to have entered the Reclamation Ditch during the first five ambient sampling runs. However, a local resident noticed pumping of the lake to the Reclamation Ditch during periods of heavy rain. Exact pumping times and amounts have not been established.

Precipitation in November did not connect the Salinas system at Spreckels, indicating that most of the rain percolated to groundwater rather than running off. This is expected given the long period of dry weather prior to the single storm event that delivered 98% of the month's total precipitation. This study monitored that storm, but any runoff that influenced the Salinas River system was localized and therefore any pesticides from the majority of the Salinas watershed would not have been delivered to the study area.

November's rain most likely saturated the ground to a point that allowed December's above average precipitation to connect the Salinas system. This is evidenced by the 3-4 peaks of the Spreckels hydrograph in December and the beginning of January as seen in Fig 4.2. Unfortunately, this study did not monitor any December storm events – larger storms were expected to develop as the season progressed. Only one other storm event in March connected the Salinas River system, and then to a much smaller degree.

A second storm event in February was monitored as well as a third in March that connected the Salinas system (see Fig 4.3 for precipitation graphs coinciding with sampling runs). In anticipation of a non-connecting event, sampling for the March storm was timed to coincide near the peak of the precipitation and not of the hydrograph. The lack of a number of significant storm events reflected in the low precipitation values for the mid to later part of the rainy season (depicted in Fig 4.1) resulted in a deficiency of data representing the majority of the watershed south of Spreckels. Samples taken during the February and March events may be expected to have residual pesticide concentrations due to delivery from the December event.

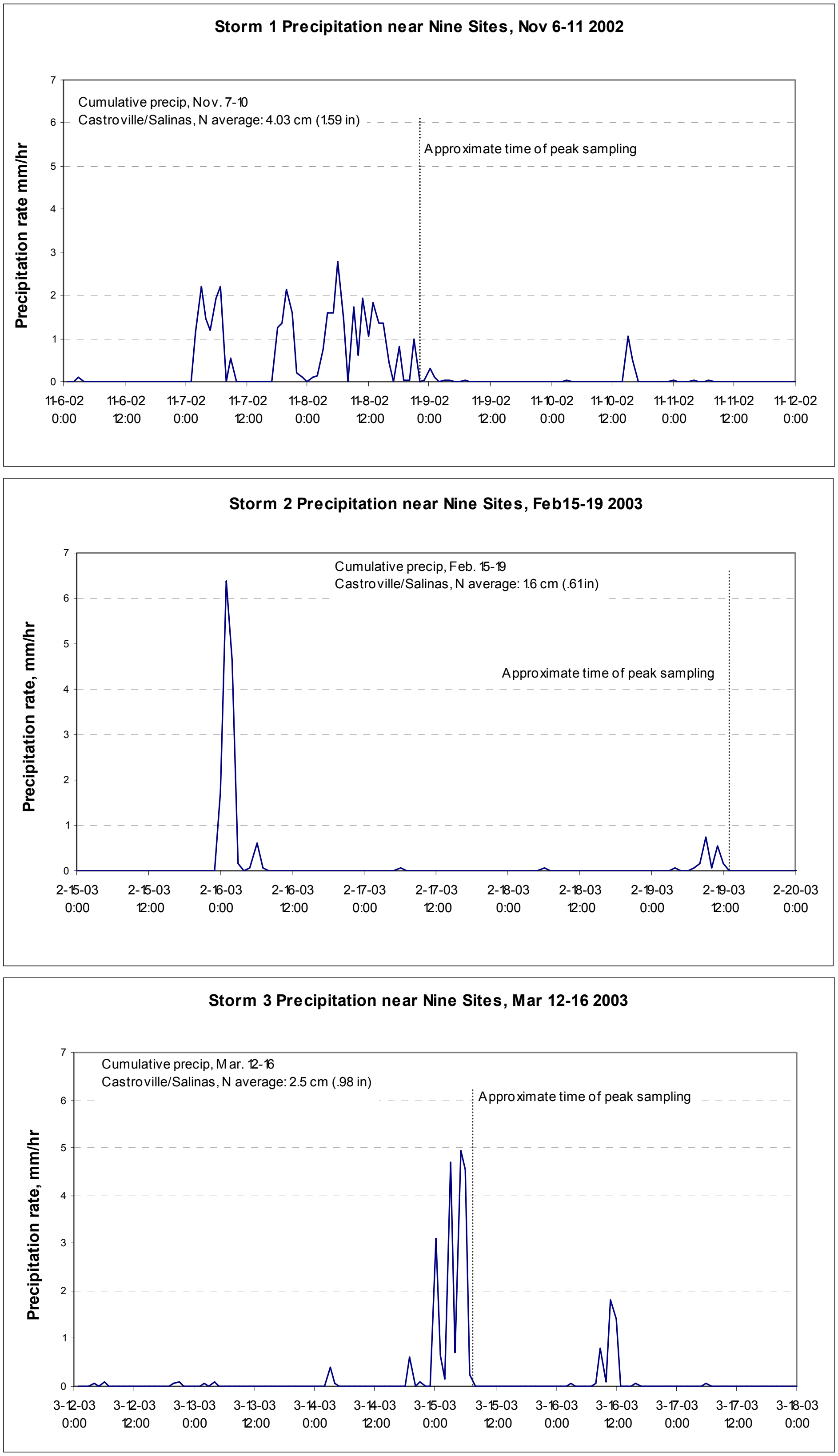


Figure 4.3 Precipitation graphs for storms monitored during the 2002-2003 winter season.

4.2 Drainage Area Delineations

Watershed area, study sites and township-range sections derived through GIS analysis are displayed in Fig 4.4.

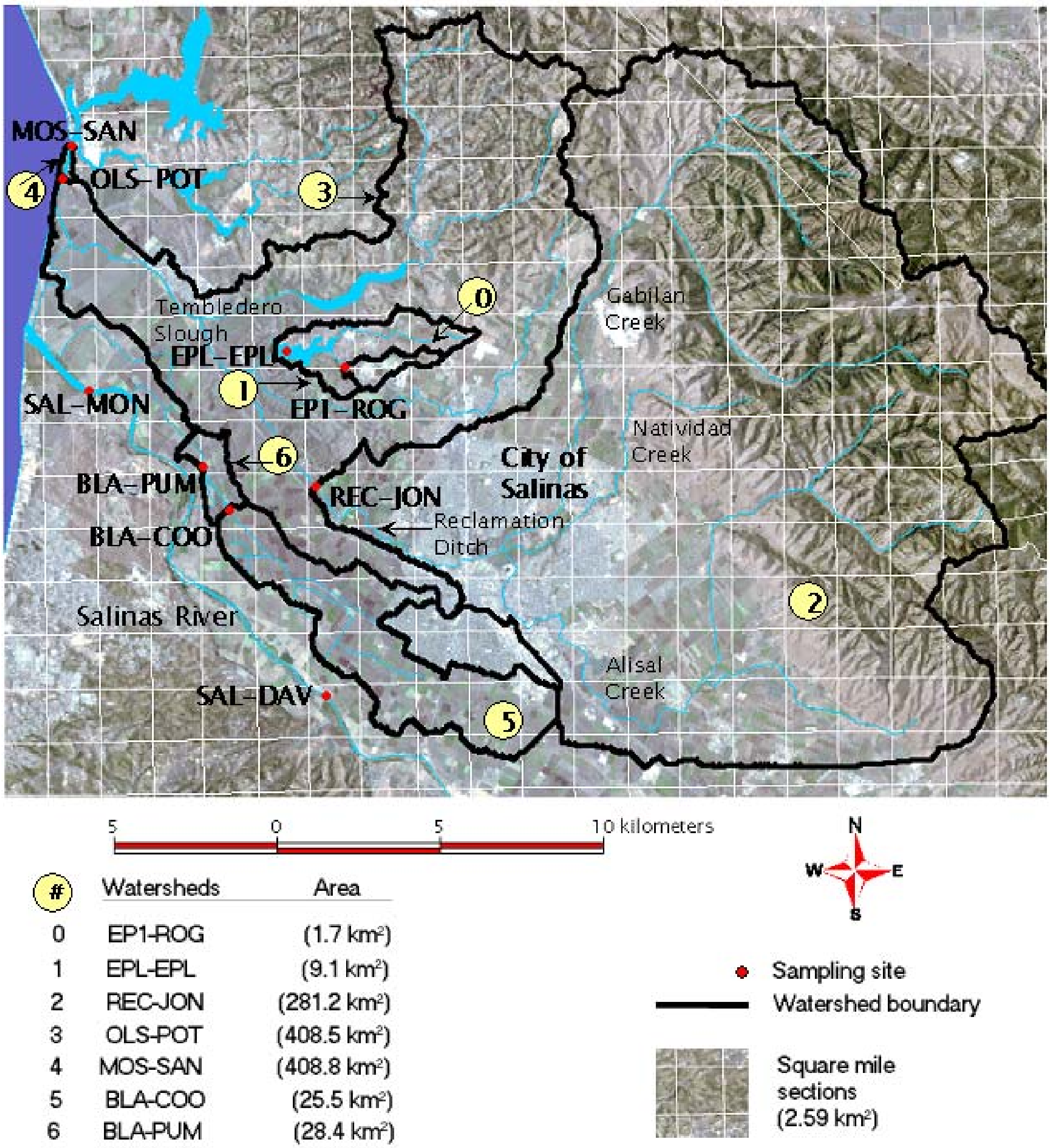


Figure 4.4 Watersheds and 1square-mile township sections. Note: watersheds are nested.

Note that several of the watersheds are nested within each other. MOS-SAN contains OLS-POT, which contains EPL-EPL, REC-JON, and some of the flow past SAL-MON. EPL-

EPL contains EP1-ROG. SAL-MON contains SAL-DAV. Finally BLA-PUM contains BLA-COO.

The Salinas River/Lagoon watershed was not delineated. The actual watershed that would represent delivery to this water body is most of the Salinas Valley proper. However, while this is the applicable watershed area for the larger storms, the contributing area to most of the Salinas runoff sampled during this study was much smaller.

4.3 Commercial Application of Chlorpyrifos and Diazinon

In Monterey County for the year 2002, 3,869,042 kg (8,529,785 lbs) of pesticide active ingredients were applied (DPR website, 2004). Nearly half of this was sulfur (used on vineyards, 27% of total) and methyl bromide (used on strawberry farms, 17% of total). Of the 451 different active ingredients applied, diazinon ranked 9th (24,053 kg, 0.6% of total) and chlorpyrifos ranked 16th (64,895 kg, 1.7% of total). Table 4.1 summarizes the applications by watershed (excluding the Salinas River watershed) during the study monitoring period for which there was application data available (June 2002–May 2003).

Table 4.1 Applications of pesticides (active-ingredients) to the study watersheds (excluding Salinas) during a portion of the study period (June 2002–May 2003).

Sub-basin	Area (km^2)	Chlorpyrifos (kg)	Concentration (kg/km^2)	Diazinon (kg)	Concentration (kg/km^2)
BLA-COO	25.5	897	35.1	3783	148.1
BLA-PUM	28.4	977	34.4	4310	151.9
EP1-ROG	1.7	200	119.7	705	421.1
EPL-EPL	9.1	750	82.7	2339	257.9
REC-JON	281.2	1867	6.6	8536	30.4
OLS-POT	408.5	4630	11.3	17614	43.1
MOS-SAN	408.8	4634	11.3	17626	43.1

Nearly 72% of all chlorpyrifos applied in the study area use went to treating broccoli and cauliflower (Table 4.2), whereas 77% of diazinon went to treat leafy greens, mostly lettuce (67% of all use). Chlorpyrifos may be toxic to lettuce (EXTOXNET).

Table 4.2 Percentage of pesticide use per commodity in all watersheds (excluding Salinas) for 2002-2003.

Commodity	% of Total Chlorpyrifos Applied	% of Total Diazinon Applied
Broccoli	49.0%	1.4%
Cauliflower	22.6%	2.2%
Greenhouse (all)	13.7%	8.3%
Strawberries	10.3%	7.5%
Leafy Greens (all)	3.8%	77.4%
Flowers, plants, transplants	0.3%	2.1%
Uncultivated Ag	0.0%	0.0%
Misc.	0.2%	0.9%

4.4 Bottom Sediment Size Categories

Pesticides typically reach waterways in soluble aqueous form or – it is more commonly thought – adsorbed onto fine-grained soil particles such as silt and clay (Mount, 1995). Smaller particle sizes translate into greater surface area per mass, thus leading to more adsorption and greater potential for transport of pesticides via adsorption to suspended sediments.

For the October and March runs, a portion of the bottom sediment samples were used to characterize the percentage of sand to the silt/clay component of the samples. The results are summarized in Table 4.3. In October, SAL-DAV, BLA-PUM, OLS-POT and EPL-EPL had relatively high amounts of silt and clay component (from 78-98%), while SAL-MON and REC-JON had slightly lower equal values (66%). In March, SAL-DAV lost nearly all its silt/clay-sized component, presumably flushed by the December connection of the Salinas River system. BLA-PUM changed little in March while OLS-POT had a higher sand component. EPL-EPL was not sampled in March, but being a Lake, was not expected to change. EP1-ROG had a lesser value of 44% silt/clay in October, due likely to the higher velocity of water at this site with little opportunity for upstream accumulation. Although this site was not sampled in March, it too is not expected to change much. MOS-SAN had relatively little silt/clay (6-9%) in either October or March, undoubtedly due to the tidal activity at this site.

Table 4.3 Percent by weight of sand vs. silt/clay of bottom sediment samples obtained during the October 2002 ambient run.

Site	% sand	% silt/clay	% sand	% silt/clay
	October, 2002		March, 2003	
Sal-Dav	12	88	98	2
Sal-Mon	34	66	1	99
Bla-Coo	14	86	8	92
Bla-Pum	22	78	31	69
Rec-Jon	34	66	49	51
Ols-Pot	2	98	22	78
Mos-San	94	6	91	9
Ep1-Rog	56	44	n/a	n/a
Epl - Epl	13	87	n/a	n/a

4.5 Concentrations of Chlorpyrifos and Diazinon

The concentrations of chlorpyrifos and diazinon for samples collected during the summer 2002 and 2003 ambient monitoring periods and winter storm events are summarized in Appendix 1, Table 7.3 and illustrated by site in Appendix 1, Fig 7.1, and grouped in Appendix 1, Fig 7.2.

4.5.1 Chlorpyrifos

Chlorpyrifos APC ranged from non-detectable (ND) to 5,786 ng/L at BLA-COO. SPC ranged from ND at several locations to 67 mg/kg at EP1-ROG. TPC ranged from ND to 28 μg/L at EP1-ROG. The fraction FSPC ranged from 0 to 100%, with the average at 19% (SD=27%). BPC ranged from ND at several locations to 1.36 mg/kg at EP1-ROG.

The average summer 2002 and 2003 ambient chlorpyrifos concentrations for each of the nine sites are summarized in Appendix 1, Table 7.3. The average TPC and BPC is depicted in Fig 4.6. Chlorpyrifos TPC did not vary greatly over time, or between sites - with the exception of the Espinosa system. Excluding Espinosa, TPC averaged 74 ppt (%CV=39) for 2002 and 69 ppt (%CV=56) for 2003. This exceeds the CMC of 20 ppt for chlorpyrifos. The Espinosa Lake tributary consistently had much higher values than all other sites. Bottom sediment concentrations were highly variable between sites, and to a lesser extent, between times.

4.5.2 Diazinon

Diazinon APCs ranged from ND at several locations to 67 μg/L at EP1-ROG. SPC ranged from ND to 927 mg/kg at EP1-ROG. TPC ranged from ND to 742 μg/L at EP1-ROG. FSPC fractions ranged from 0 to 100%, with the average at 30% (SD=34%). BPC ranged from ND to 20 mg/kg at EP1-ROG.

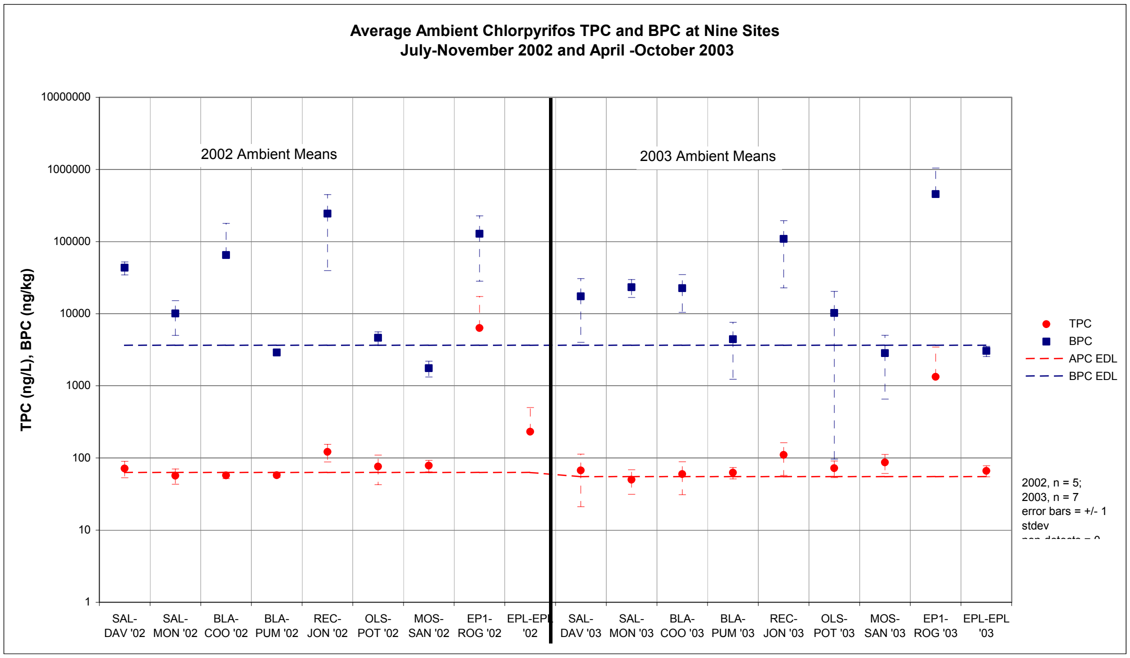


Figure 4.6 Average ambient chlorpyrifos TPC at the nine sites.

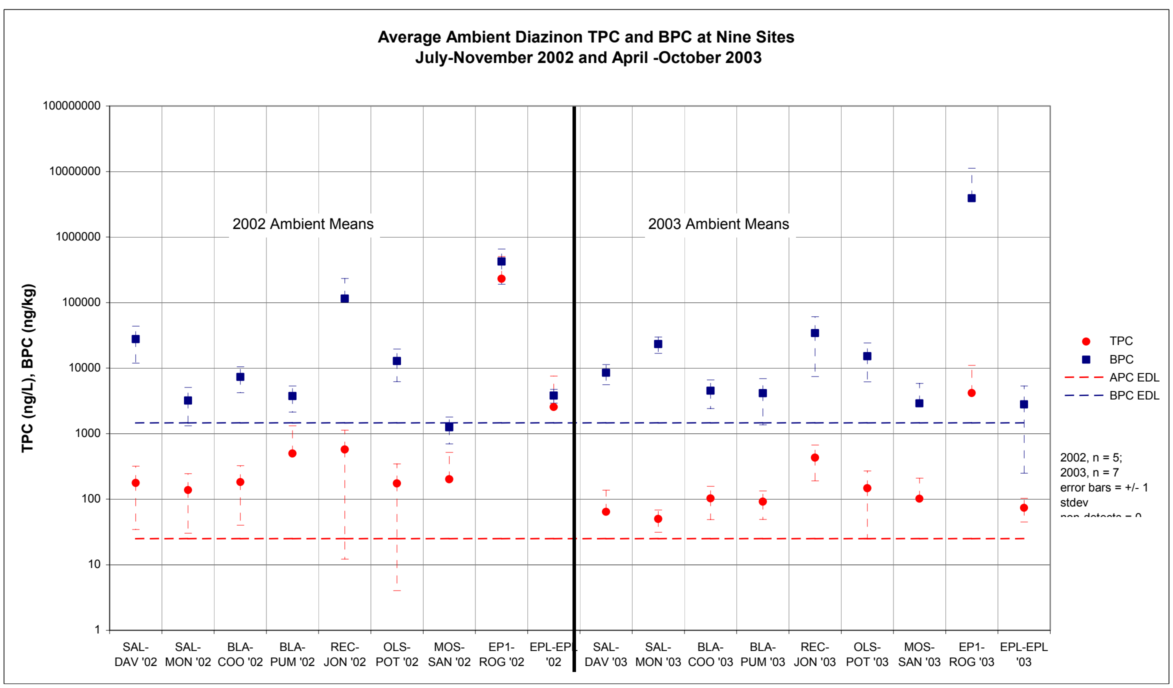


Figure 4.5 Average ambient diazinon TPC at the nine sites.

The average ambient diazinon concentrations for each of the nine sites are summarized in Appendix 1, Table 7.3. The average TPCs and BPCs are depicted in Fig 4.5. This figure indicates that diazinon values in the water column are more variable temporally and spatially compared to chlorpyrifos. Again, EP1-ROG has the highest concentrations of all sites.

With the exception of the Espinosa system, the average ambient TPC for all sites in 2002 was 319 ng/L (CV=138%), 139 ng/L (CV=119%) in 2003. Both the Reclamation Ditch and the Blanco Drain systems TPC averages are higher than the Salinas River system sites, with REC-JON having the highest values overall for both BPC and TPC (again, outside the Espinosa system). REC-JON is just downstream (approx. 4 km) from the City of Salinas, which uses the Reclamation Ditch as a conduit for urban run off. With the exception of SAL-MON in 2003, all sites have average diazinon TPCs well above the EDLs of the test.

BPC at SAL-DAV is generally higher than at SAL-MON. This may indicate that SAL-DAV is closer to an input source, as water velocities were not sufficient to transport bedload during this period. The same may be true of the Blanco system, which exhibits the same pattern.

4.6 Concentrations by Watershed Area

Average ambient TPC and BPC are compared to watershed area in Fig 4.7. The pattern is for generally lower concentrations at sampling points below larger watersheds. This is most likely due to a combination of two effects: gradual degradation of chemical compounds over time as material is slowly moved down a watershed; and in some cases, dilution as cleaner water from less intensely used land becomes incorporated into the total watershed area. The relationship is more pronounced for diazinon, and more pronounced for TPCs than for BPCs.

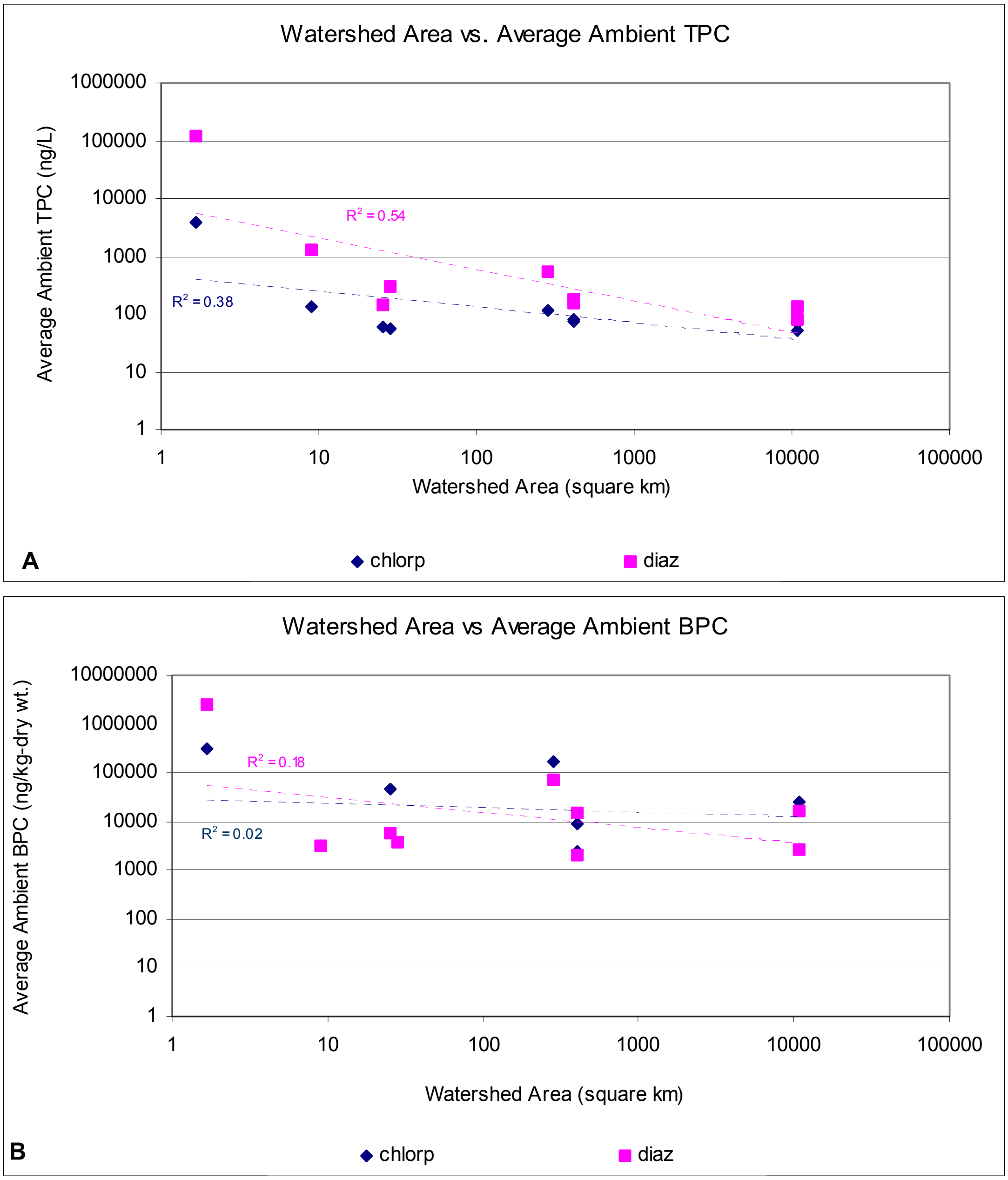


Figure 4.7 A&B. Watershed area vs. average ambient TPC and BPC.

4.7 Comparisons between Pesticide and Suspended Solids Concentrations

The relationship between TPC and SSC for all sites and times is illustrated in Fig 4.8. A weak positive correlation was indicated. This relationship is further developed in the graphs of Appendix 1, Figs. 7.7 A–L. SPCM did not appear to vary appreciably with SSC (Fig D), so the high correlation between SPC and SSC (Fig C) was simply due to the fact that SSC is one of the terms in the computation of SPC (SPC = SPCM × SSC). There was also slight correlation between APC and SSC.

The visual observation was made that much of the material sampled as suspended sediment, was in fact algae. This was particularly so in the Salinas River and Old Salinas River systems, and Espinosa Lake. Thus, data were isolated from those sites where this was a lesser factor (EP1-ROG, BLA-COO, BLA-PUM, and REC-JON), and for storm flows only, when algae do not survive well. As shown in Appendix 1, Figs. 7.7 E–H, a stronger relationship between TPC and SSC was indicated (Fig E). This occurs not only because of the slight correlation between APC and SSC (Fig F), but also due to the strengthened positive relationship between SPCM and SSC (H). Not only is more sediment delivered and entrained in the water column during storm events, but the sediment tends to be higher in adsorbed pesticides per unit mass of sediment. This combines to show the strong positive relationship between SPC and SSC in Fig G.

The correlations are examined separately for silt/clay (<63υm) and sand (>=63υm) in Figures I and J (all sites and times) and Figures K and L ('non-algal' sites, storms only). Contrary to expectations, the correlations are not stronger for finer sediments.

In general, the data tend to contradict the common assumption that suspended sediment transport is the dominant factor governing the transport of OP pesticides.

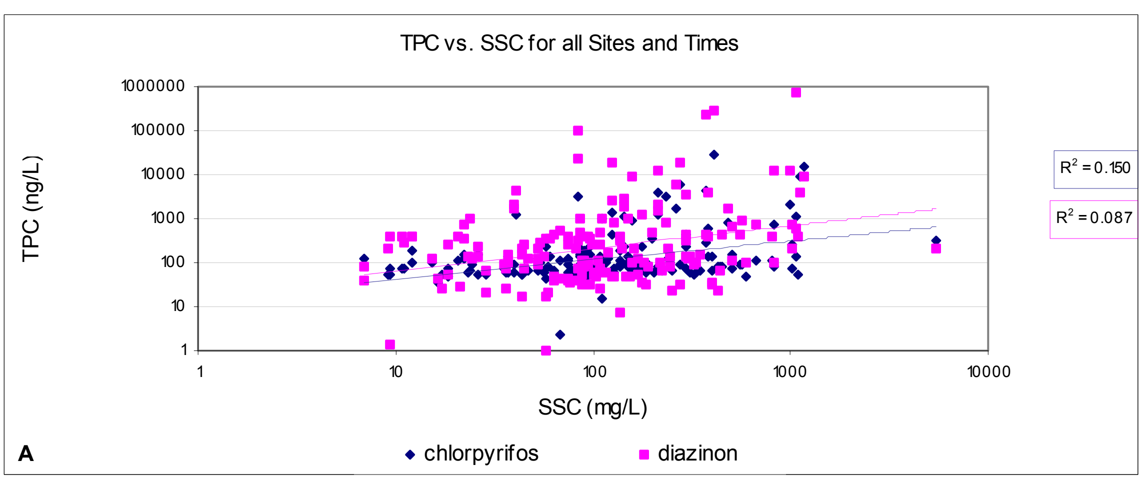


Figure 4.8 Chlorpyrifos and diazinon TPC vs. SSC for all sites and times.

4.8 Fraction of pesticides adsorbed to suspended sediments

The fraction of pesticides adsorbed to suspended sediments (FSPC) varied markedly across both sites and sampling times (Appendix 1, Fig 7.4). At most sites, only about 0% to 20% of pesticides in the water column were adsorbed to suspended sediments, the remainder being held in aqueous form. A notable exception is EP1-ROG, which often had FSPC values in the 50% to 90% range. Interestingly, a large portion of the filtered 'sediment' from this site was actually vermiculite, a particulate soil aerator used in greenhouse plantings - as well as other unidentified anthropogenic materials such as fibrous particles presumed to be soil amendments of some kind. It is possible that pesticide adsorption to these anthropogenic particles explains the EP1-ROG FSPC anomaly.

Another anomaly may be due to algal bio-concentration of pesticides. The water at EPL-EPL in particular contained large amounts of algae that were retained on filters. This may explain the higher FSPC values at this site - often above 50% for diazinon in fall - and at other similarly sluggish, algal sites such as SAL-DAV, SAL-MON, and OLS-POT.

Although FSPC increases during peak storm flows (Figs. 7.7H), there is minimal evidence that sediment adsorption becomes the dominant mode of transport during storms. Other than the consistently high levels at EP1-ROG, storm FSPC values only exceeded 50% in two samples - at REC-JON during the peaks of Storm 1 and Storm 3.

4.9 Discharge measurement summary

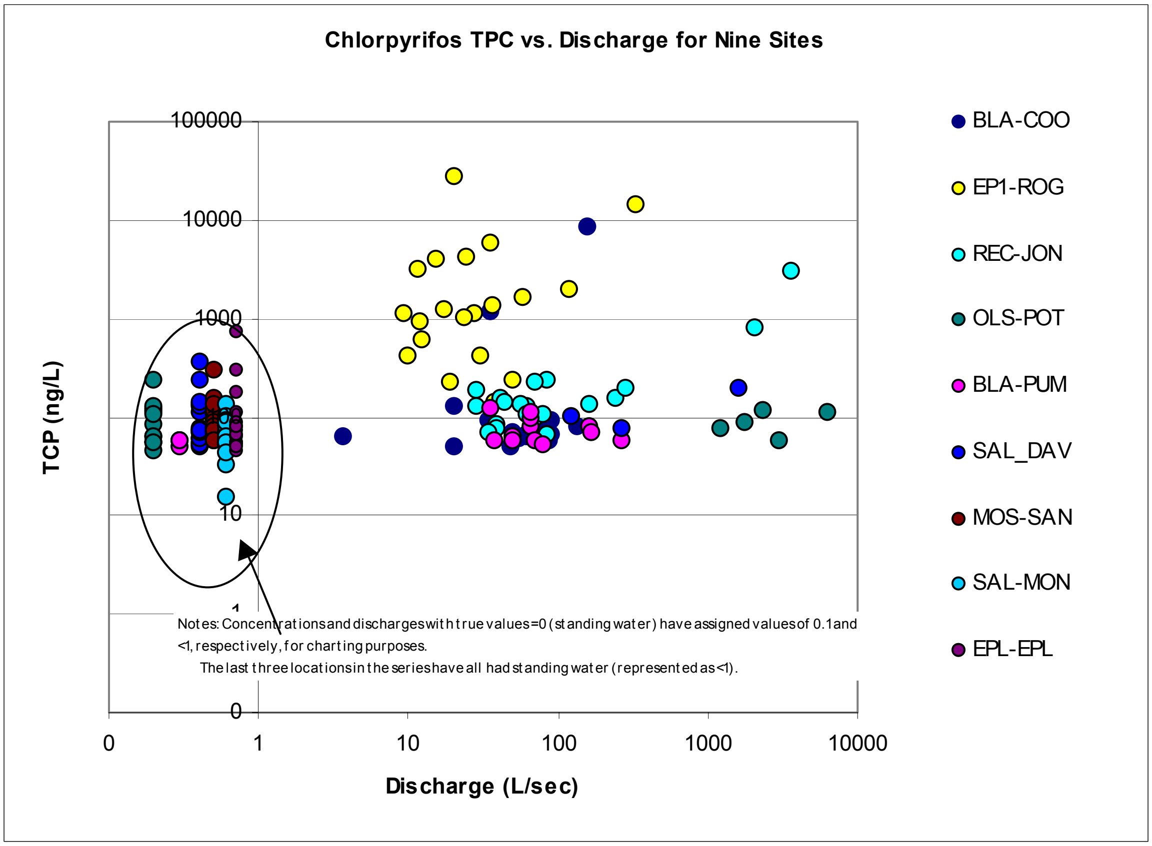
Note that some sites did not have measured discharges. At SAL-DAV, SAL-MON, OLS-POT and MOS-SAN, discharge was difficult to estimate due to low or no velocities in deep (unwadable) water. SAL-DAV, SAL-MON and OLS-POT behaved more as pools (receiving sites) than streams (flux sites) most of the time. The tidal influence also confounds the issue at OLS-POT and MOS-SAN, while OLS-POT has tide gates that further complicate flow measurements. EPL-EPL, being a lake, had no loads leaving its basin except at the pump site during storms. BLA-COO, REC-JON and EP1-ROG all had consistently measurable discharges for load calculations.

One BLA-PUM discharge measurement was obtained during the last ambient run of 2002. Earlier sampling runs had higher water levels than this last one (with the exception of the August run). The pumping of water from this site to the Salinas also occurred intermittently, but at times the pump was inoperable (noticed during the first ambient run). Loads from BLA-PUM were estimated based on the discharge of overflow water from the last ambient run. Therefore, loads could be higher at this site than were estimated. Storm loads were not estimated for this site. Estimated ambient and storm loads along with relative APC and SPC load contributions for each measurable location are depicted in.

4.10 Concentration versus Discharge

Concentrations are examined with respect to discharge in Figure 4.9. The data are biased toward lower discharges. Our interpretation is based on the relatively small number of samples that were obtained at higher discharges. In general, a positive correlation indicates that storm processes lead to enhanced delivery of pesticides to sampling sites relative to non-storm periods. In contrast, a negative correlation indicates either decomposition of previously applied pesticides before the storm, or a dilution effect, whereby the storm runoff arrives via different runoff processes to the dry-season runoff.

Two high-discharge samples at REC-JON indicate a large increase in TPC at this site during storms. This indicates that pesticides are still present in the system in the storm season, and they are available for mobilization by storm runoff (either directly from source areas, or after having previously being deposited in the ditch system). Similar evidence is given by one or two of the higher-discharge samples from BLA-COO - a purely agricultural watershed - and SAL-DAV. The more depositional sites, such as OLS-POT and BLA-PUM showed no TPC increase with discharge. The Espinosa tributary data were ambiguous for chlorpyrifos, and showed a negative relationship for diazinon. This may be because storm runoff at this site arrives via a different pathway (such as greenhouse roof drainage) to the (unknown) pathway that delivered very high concentrations of pesticides to the stream.



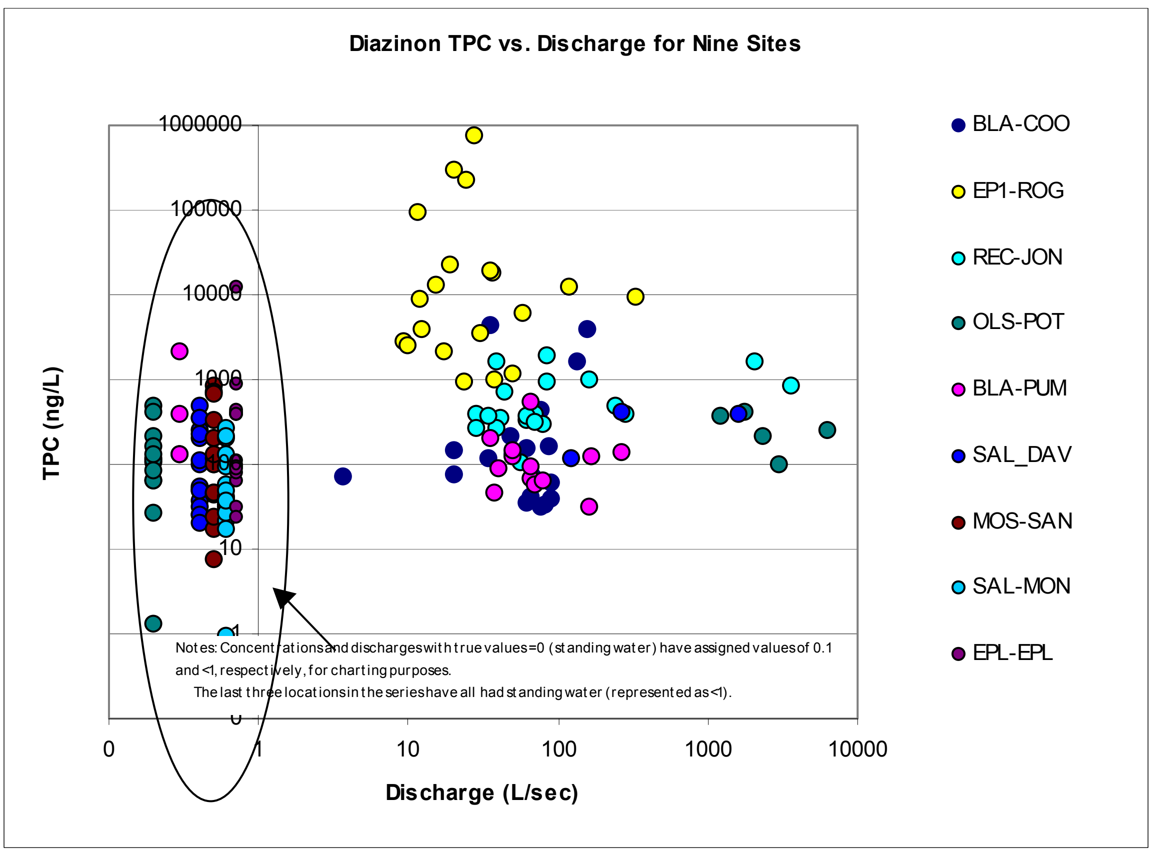


Figure 4.9 TPC vs. discharges for all sites at all times of measurable parameters.

4.11 Loads of Chlorpyrifos and Diazinon

Table 4.4 and Figure 4.10 summarize the mean total instantaneous pesticide load (TIPL) and total pesticide loads (TPL) for each site for both ambient and storm periods (sites with no measurable load are excluded). The complete instantaneous measurement data (SIPL, AIPL, and TIPL) are given in Appendix 1, Table 7.5 and Figure 7.3.

Table 4.4 Mean TIPL, and estimation of TPL.

2002 Ambient monitoring

Site	# of samples in Mean	# of load days	Mean of C Ambient TIPL (g/day)	Mean of D Ambient TIPL (g/day)	Ambient C TPL, kg (July to November)	Ambient D TPL, kg (July to November)
SAL-DAV	6	130	0.47	1.76	0.061	0.229
BLA-COO	6	130	0.22	0.87	0.029	0.113
BLA-PUM	6	130	0.24	2.12	0.031	0.276
REC-JON	6	130	0.50	2.10	0.065	0.274
EP1-ROG	6	130	11.00	480.90	1.430	62.517

Site	# of samples in Mean	# of load days	C Storm-Peak TIPL (g/day)	D Storm-Peak TIPL (g/day)	Event C TPL, kg	Event D TPL, kg
Storm 1						
SAL-DAV	1	2.5	26.70	52.47	0.067	0.131
BLA-COO	1	2.5	3.53	13.11	0.009	0.033
REC-JON	1	2.5	929.25	257.32	2.323	0.643
EP1-ROG	1	2.5	20.66	131.86	0.052	0.330
Storm 2						
BLA-COO	1	2.5	0.74	0.46	0.002	0.001
REC-JON	1	2.5	1.89	13.74	0.005	0.034
EP1-ROG	1	2.5	8.33	30.84	0.021	0.077
Storm 3						
BLA-COO	1	2	118.19	54.18	0.236	0.108
REC-JON	1	2	146.86	295.64	0.294	0.591
EP1-ROG	1	2	415.60	262.23	0.831	0.524
OLS-POT	1	2	44.25	193.05	0.088	0.386

2003 Ambient monitoring

Site	# of samples in Mean	# of load days	Mean of C Ambient TIPL (g/day)	Mean of D Ambient TIPL (g/day)	Ambient C TPL, kg (April to October)	Ambient D TPL, kg (April to October)
BLA-COO	8	218	0.35	0.53	0.076	0.116
BLA-PUM	8	218	0.56	1.16	0.121	0.254
REC-JON	8	218	1.18	3.50	0.257	0.762
EP1-ROG	8	218	3.25	10.87	0.709	2.370
OLS-POT	8	218	5.56	15.68	1.213	3.418

An approximate comparison between ambient (dry-season) and storm loads can be made by considering that a typical storm season delivers about 5 to 10 storms of the type measured during the study. At some sites, the ambient load was greater than the probable combined storm load, while at other sites, the reverse was true. Smaller watersheds, such as EP1-ROG, appear to be dominated by dry-season loads. Conversely, in larger watersheds such as REC-JON and OLS-POT, the majority of pesticides sampled are estimated to have been transported past the site during storms. These comparisons are crude, since individual storm load estimates are based on just one peak sample per storm per site (see Sec. 3.3).

The fraction of TPLs due to sediment-adsorbed transport (SPL) versus aqueous transport (APL) varied considerably between sites. Sediment-adsorbed transport was dominant at EP1-ROG, and occasionally for chlorpyrifos at REC-JON. Aqueous transport was marginally dominant at the other sites.

A site by site description of these results follows.

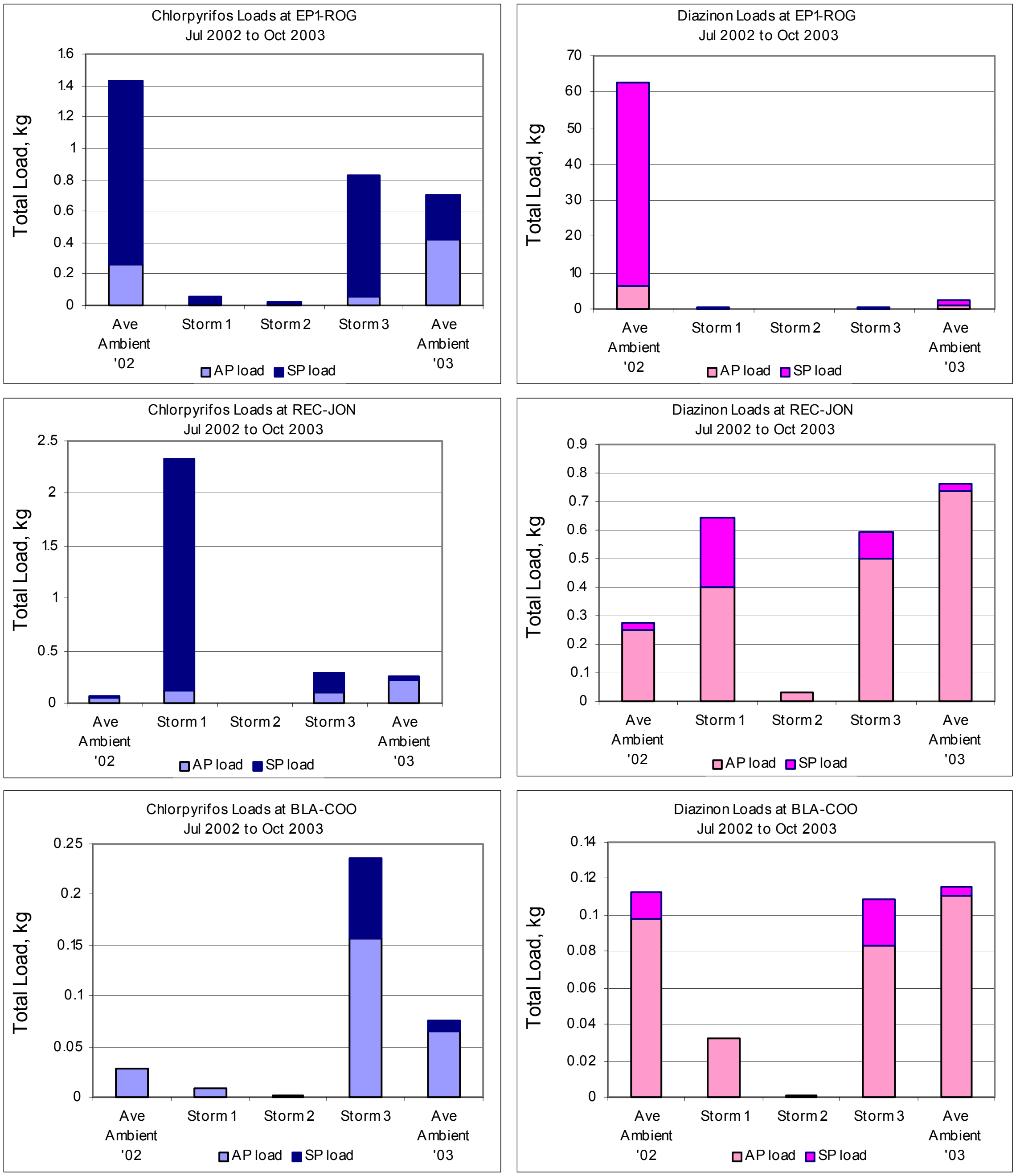


Figure 4.10 Estimated ambient and storm loads represented by relative AP and SP load contributions for EP1-ROG, REC-JON and BLA-COO.

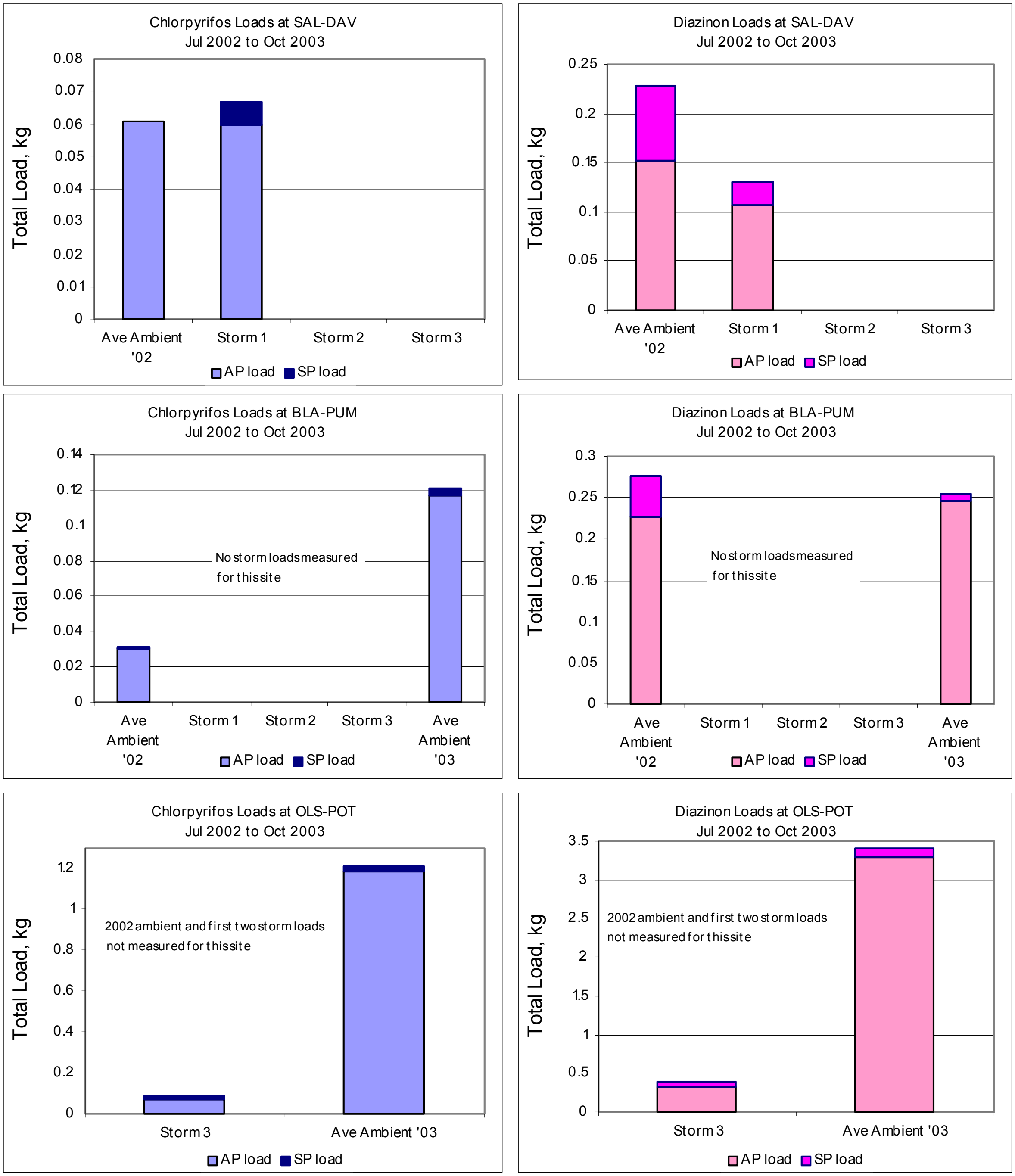


Figure 4.10 (cont.). Estimated ambient and storm loads represented by relative AP and SP load contributions for SAL-DAV, BLA-PUM and OLS-POT.

SAL-DAV had only three periods of flow measured. Total chlorpyrifos load for the 2002 ambient monitoring period was estimated to be 0.06 kg. This load was entirely aqueous (Appendix 1, Fig 7.4). Total 2002 ambient diazinon load was 0.23 kg, mostly aqueous (Appendix 1, Fig. 7.4), except for the July 2002 run, where 62% of the load was adsorbed to suspended sediments. The only measurable storm load occurred during Storm 1, where 0.07 kg of chlorpyrifos and 0.13 kg of diazinon were estimated to have been transported past the site. Load from the one storm transported about as much chlorpyrifos and about half the diazinon that was moved during the whole ambient monitoring period.

BLA-COO had a total 2002 ambient chlorpyrifos load of 0.03 kg and total 2002 ambient diazinon load of 0.11 kg during the monitoring period. Most of the load at all times for both analytes was aqueous (Appendix 1, Fig 7.4), although storm loads for chlorpyrifos were primarily adsorbed. Storm 1 chlorpyrifos loads were about a third of 2002 ambient loads and diazinon about a fourth. While Storm 2 loads were found to be low, Storm 3 chlorpyrifos loads were about 8 times 2002 ambient loads and Storm 3 diazinon loads were approximately equal to 2002 ambient loads. Ambient loads did not change greatly between 2002 and 2003.

BLA-PUM exhibited a total 2002 ambient chlorpyrifos load of 0.03 kg and diazinon load of 0.28 kg. Again, most of these loads were aqueous (Appendix 1, Fig 7.4) with the exception of the October 2002 sample. While the chlorpyrifos load had increased slightly from the upstream BLA-COO load, the diazinon load was estimated to be nearly 2 ½ times as high, possibly indicating a diazinon source downstream of BLA-COO. No BLA-PUM loads were determined for storm periods. Ambient diazinon load changed little between 2002 and 2003, but ambient chlorpyrifos load increased in 2003.

REC-JON total 2002 ambient chlorpyrifos load for the monitoring period was 0.06 kg; diazinon, 0.27 kg. Chlorpyrifos 2002 ambient loads were approximately double for the Reclamation Ditch system than for the Blanco Drain system, while the diazinon loads were about the same (despite the much larger watershed area of REC-JON). The diazinon load was mainly aqueous (Appendix 1, 7.4). During storms, the chlorpyrifos load was almost entirely adsorbed (SAL-DAV FSPC averaged 0%, BLA-PUM 2%, and REC-JON, 28%). Both chlorpyrifos and diazinon ambient loads increased from 2002 to 2003.

EP1-ROG transported a total estimated 2002 ambient chlorpyrifos load of 1.43 kg and a diazinon load of 62.52 kg. This site exhibited highly variable TPCs, with some very high concentrations and some much lower ones. The stated averages are thus less certain than for sites that exhibit relatively stable pesticide concentration over time. Unlike most other sites, most of the load was adsorbed - with FSPC averaging 82% for chlorpyrifos and 90% for diazinon (Appendix1, 7.4). Most storm loads at this site were relatively small, with the exception of the Storm 3 estimated chlorpyrifos load, which exceeded the 2003 ambient load.

Discharge measurement at OLS-POT was difficult because the site was tidal, often with very low velocity flow moving back and forth through numerous partially closed tide gates. At times, conditions were placid enough that the flow could be visually estimated as zero. At other times, this was not possible and the discharge was entered as 'not recorded'. During Storm 1, some high flows occurred but an appropriate flow gauging technique had not yet been devised for the site, so flow was again not recorded. During latter storms, and most of the 2003 ambient season, flow was either measured, or estimated to be zero. During the third storm event, OLS-POT was estimated to have delivered 0.09 kg of chlorpyrifos and 0.39 kg of diazinon to MOS-SAN. 2003 ambient loads were estimated to be 1.21 kg of chlorpyrifos and 3.42 kg of diazinon – although this is probably an overestimate since many of the measurements were made during low tide. [illegible] expected, loads passing OLS-POT are of the same order of magnitude as those passing REC-JON (upstream from OLS-POT) – although the precision of the estimates is not sufficient to determine whether the intervening reaches acted as a pesticide source (i.e. from additional land use inputs) or a pesticide sink (i.e. due to degradation processes). More frequent and sensitive discharge measurements would be required in order to address such questions.

4.12 Estimated daily loads at REC-JON

REC-JON is also a USGS site, with a daily flow record. By fitting a curve to the concentration-discharge data for this site, we can obtain daily load estimates. These can be integrated over time to examine the importance of storm loads versus ambient loads. The concentration-discharge curves are shown in Figure 4.11 below. The chlorpyrifos relationship is strong, showing a clear increase in concentration once discharge rises to storm levels (above about 200 L/s). The diazinon curve is weak. While concentrations are high at high discharge, they can also be high at low discharge.

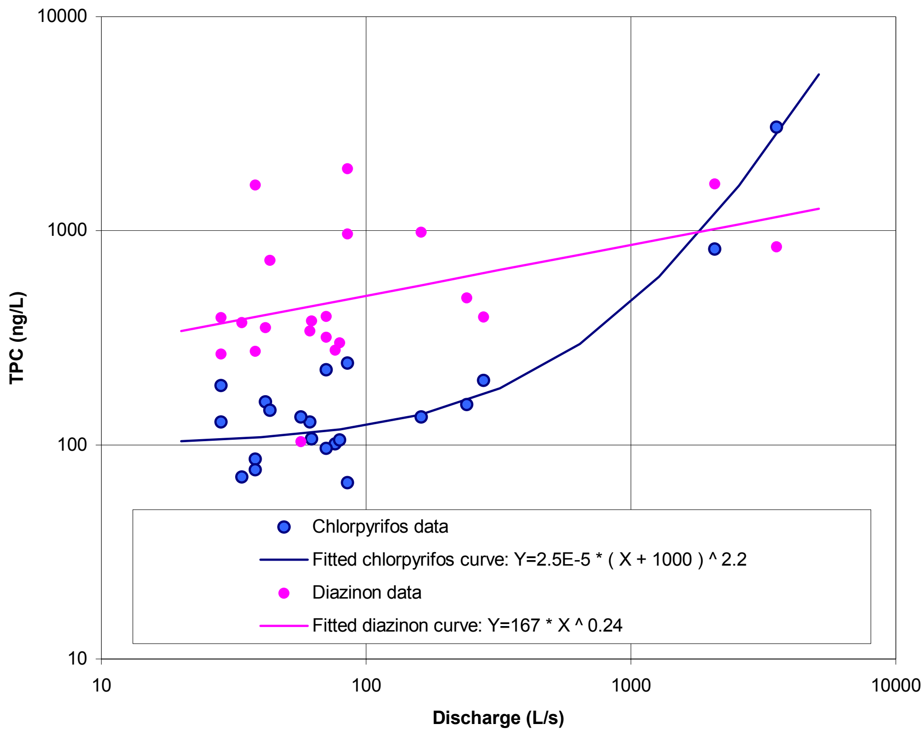


Figure 4.11. Curves used to estimate pesticide concentrations from discharge.

Daily pesticide loads (g/day) at REC-JON were estimated for the 2002-3 water year by applying the fitted curves to daily USGS discharge data. The resulting time series is shown in Figure 4.12 below. The estimated loads match the measured loads well. Assuming an approximate threshold for 'storm flow' of 100 L/s, the estimated total storm and non-storm loads for the 2002-3 water year were computed. For chlorpyrifos, the estimated total annual load was 6.6 kg, with 98% of this being transported by storm flows (≥100 L/s). For diazinon, the estimated total annual load was 5.4 kg, with 91% being transported by storm flows.

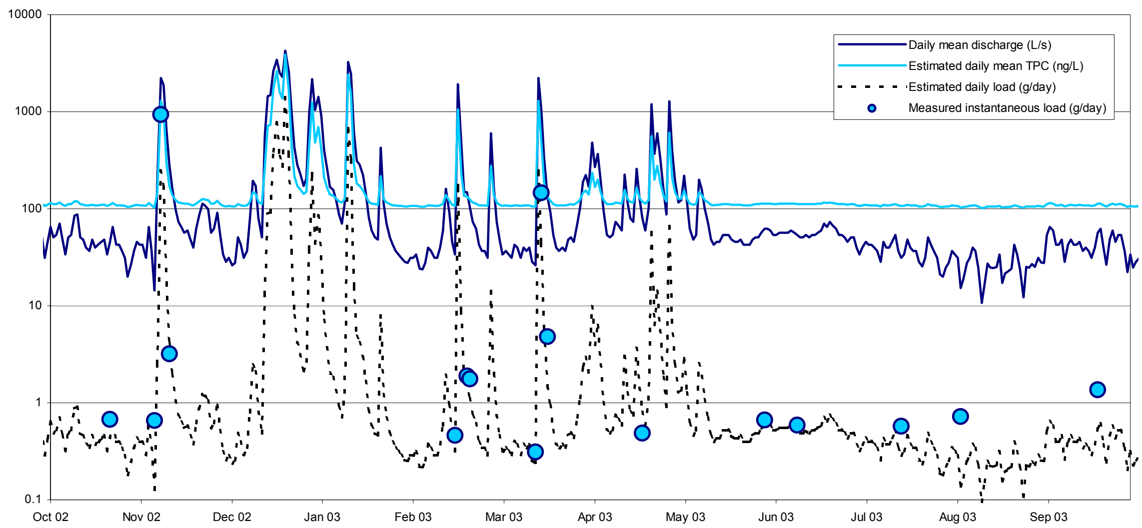


Figure 4.12. Time series of estimated daily chlorpyrifos concentrations and loads at REC-JON.

4.13 Timing of pesticide applications and pesticide runoff

The correspondence between the timing of commercial pesticide applications and pesticide occurrence in waterways is examined in Figures 7.8 A-S, Appendix 1. Separate plots are given for each site for application data aggregated at daily, weekly, and monthly time scales; and for TPC, TIPL, and BPC data in waterways. The data are consistent with pesticide half-lives on the order of a few months. If half-lives were only a few days, then TPCs would follow the application data more closely. In particular, near-zero TPCs would be expected in the storm season when applications were greatly reduced - which is not the case. Conversely, if half-lives were years, then we would expect very little variability in TPCs over time - which is also not the case. In some sites, such as EP1-ROG (a small watershed), there is some evidence for near-zero TPCs and TPLs just before the onset of the storm season. However, high TPCs and TPLs were observed at these sites once the storm season commenced. This suggests a process of deposition of pesticides within bottom sediments during and after the application season, with degradation processes occurring only slowly, such that significant amounts of pesticide remain available to be re-entrained in the flow throughout the storm season.

4.14 Pesticide runoff ratio

We define the pesticide runoff ratio (PRR) as the proportion of (permitted) applied pesticides that are later measured as pesticide loads in waterways. The time-spans over which to make such a comparison are somewhat arbitrary. A first approximation is presented in Table 4.5, which compares loads to applications in the 2002 ambient sampling period (July 1st 2002 to November 8th 2002). Estimates could be made for four sites. The three sites with medium to large watersheds, each exhibited estimated ambient PRRs of 0.01% for both chlorpyrifos and diazinon. The smallest watershed, EP1-ROG, exhibited very high estimated PRRs: 6% for chlorpyrifos and 41% for diazinon. These latter two estimates are uncertain because they rely heavily on the assumption that pesticide applications with a given Section (approximately one square mile) are uniform. Note however that the highest TPCs and TPLs were also measured at this site, so it is not unexpected that the site would exhibit a much higher PRR than other sites.

The PRR estimates made above are generally underestimates of the mean annual PRR. This is because the storm season is unaccounted for, but would have a higher PRR than the ambient season. Applications are much lower in the storm season, while total storm loads are usually of the same order of magnitude or greater than ambient loads. The exact situation would depend on the comparative timing of storms and in-channel degradation processes.

Table 4.5 Chlorpyrifos and diazinon application compared to estimated total load.

Site	Total C Ambient Load, kg (Jul 1, '02-Nov 8, '02)	Applied C, kg (Jul 1, '02-Nov 8, '02)	% C load to application	Total D Ambient Load, kg (Jul 1, '02-Nov 8, '02)	Applied D, kg (Jul 1, '02-Nov 8, '02)	% D load to application
BLA-COO	0.029	263	0.011%	0.113	1,696	0.007%
BLA-PUM	0.031	287	0.011%	0.276	1,911	0.014%
REC-JON	0.065	590	0.011%	0.274	3,175	0.009%
EP1-ROG	1.430	23	6.127%	62.517	154	40.679%

5 Summary and Conclusions

Nine sampling sites in lower Salinas Valley 303(d) listed water bodies were monitored for the pesticides chlorpyrifos and diazinon five times during the summer of 2002 from July through October and seven times during the summer of 2003 from April through October to determine ambient levels. These same sites were monitoring during 3 winter storms occurring in November 2002, and February and March 2003. At each site water was filtered and collected for analysis while the filter and retained material were collected as another sample. A bottom sediment sample was also obtained. The samples were analyzed using ELISA technology.

Average 2002 and 2003 ambient chlorpyrifos concentrations in the water column at four of the nine sites were near the estimated detection limit (EDL, 50 ng/L) for the ELISA test, the remainder were above the EDL. At this level, any chlorpyrifos detected is over the criterion maximum concentration (CMC) of 20 ng/L. Concentrations ranged from non-detectable to 28.5 µg/L. Of 175 water column samples analyzed, 30 were at or below the test EDL. Concentrations in the bottom sediment samples ranged from non-detectable (ND) to 1.36 mg/kg. The highest average ambient chlorpyrifos concentrations for both water column and bottom sediment samples were obtained from site EP1-ROG. Loads for the period ranged from 0.002 kg in the Blanco system to 2.32 kg at REC-JON during the first storm event. In general, aqueous transport was greater than adsorbed transport, except at two sites: EP1-ROG and REC-JON. Suspended solids concentrations were generally low in most cases, with the exception of the Espinosa system.

Diazinon concentrations in the water column ranged from ND to 741.6 µg/L. Only eleven sample values were below the test EDL (25 ng/L). Of 175 water column samples analyzed, 121 were above the CMC of 80 ng/L. Bottom sediment concentrations ranged from non-detectable to 20 mg/kg. The highest average ambient diazinon concentrations for both water column and bottom sediment samples were obtained from site EP1-ROG. Loads ranged from 0.001 kg in the Blanco system to 62.52 kg at EP1-ROG for the ambient sampling period. As with chlorpyrifos, aqueous transport was greater than adsorbed transport, except at EP1-ROG.

In general, the highest concentrations were measured in the Reclamation Ditch and the Espinosa system. These sites have runoff sources from agricultural, urban, and greenhouse land uses.

The study sought to answer the following questions:

Are concentrations of chlorpyrifos and diazinon above levels that limit aquatic ecosystem health?

Yes. Based on published toxicity values established by the Department of Fish and Game (DFG), chlorpyrifos and diazinon are present in sampled waterways in concentrations that are acutely toxic to aquatic ecosystems, more so since the two pesticides exhibit joint toxicity effects (Table 5.1).

Table 5.1 Percentage of all aqueous samples above the test's EDL that exceed the Criterion Maximum Concentration established by DFG, by site.

Site	% of All Samples Exceeding Chlorpyrifos CMC (20 ng/L)	% of All Samples Exceeding Diazinon CMC (80 ng/L)	Number of Samples
SAL-DAV	76%	52%	21
SAL-MON	56%	28%	18
BLA-COO	71%	52%	21
BLA-PUM	61%	67%	18
REC-JON	95%	100%	21
OLS-POT	86%	81%	21
MOS-SAN	94%	61%	18
EP1-ROG	100%	100%	21
EPL-EPL	63%	75%	16

Chlorpyrifos TPCs exceeded Criterion Maximum Concentration (CMC) values over 75% of the time at 5 sites, 100% if the time at one site and no sites had CMC exceedances fewer than 56% of the time. These are most likely under-estimates, since APC data were excluded that were both lower than the EDL by more than 10%, and above the CMC. Inclusion of these below-EDL values would increase exceedance rates to 89-100%.

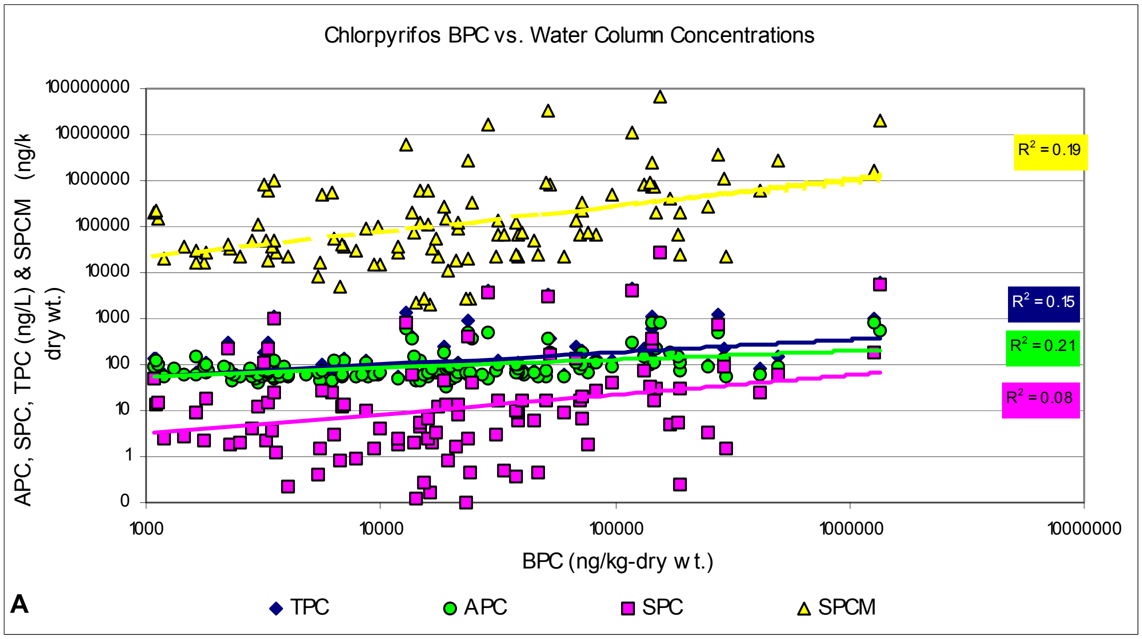
Diazinon concentrations in water samples exceeded CMC values over 75% of the time at 4 sites, 100% if the time at 2 sites and no sites had CMC exceedances fewer than 52% of the time.

Although the sampling scheme of this study did not allow for a direct determination of whether the Criterion Continuous Concentration (CCC) was exceeded at any site, the frequency with which the CMC is exceeded at each site indicates the strong likelihood that it was exceeded at all sites, especially when joint toxicity effects are considered.

Chlorpyrifos was present in concentrations that exceed the 96-hour LC50 values for rainbow trout (*Oncorhynchus mykiss*) in less than 30% of all water samples. Exceedance was found at only two sites, BLA-COO and EP1-ROG. Diazinon was never measured in the water column to be present at concentrations that exceed the 96-hour LC50 values for rainbow trout at any of the sites.

What is the variability of in situ (bottom) sediment chlorpyrifos and diazinon concentration and load during ambient non-winter conditions?

Chlorpyrifos and diazinon BPC varies over time by a factor of about 10 to 100 at any given site (Appendix 1, Fig 7.2). Some of this variation is correlated with TPCs in the water column, thus indicating some degree of rapid hydraulic connection between the water column and the underlying sediments (Fig 5.1, and Fig 7.6 A-R in Appendix 1). Some of the variation may be due to random sampling variation, but not all, since BPCs exhibit a degree of auto-correlation over time that would not be expected from a random process. Therefore, it is most likely that a significant amount of the variation in BPCs is due to episodes of pesticide deposition, removal, and degradation. It follows that the bottom sediments of the study area thus act as temporary pesticide repositories.



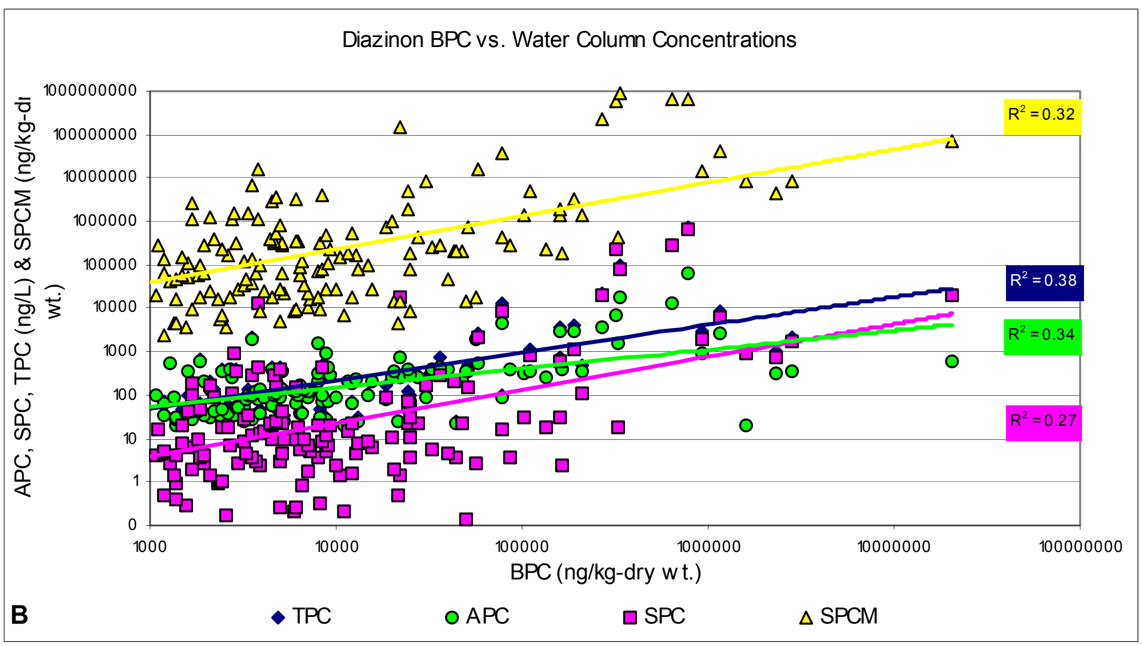


Figure 5.1 A&B. Bottom sediment concentrations vs. water column chlorpyrifos and diazinon concentrations for all sites at all times.

Is it possible to measure loads of chlorpyrifos and diazinon that explain this variability?

Possibly. None of the sites for which frequent load data are available show an obvious relationship between periods of high TPL, and subsequent increases in BPC (Appendix 1, Fig 7.5). However, these are the more upstream non-depositional sites. The more depositional sites (MOS-SAN, OLS-POT, SAL-MON, and BLU-PUM) each showed increases in BPC during and immediately after the winter months, followed by gradual decreases in BPC during the dry-season. These sites also showed positive TPC-discharge relationships, implying that their greatest TPLs occur during the winter months. It is probable then that the higher BPCs during winter are due to higher TPLs. The challenge remains to accurately measure net discharges in sluggish tidal sloughs during both dry and wet seasons.

Are loads significant during ambient non-winter conditions?

Yes. A ‘significant’ pesticide load can be viewed as a pesticide load that carries pesticides at concentrations exceeding the CMC. Seventy percent of all ambient samples fell above the CMC for chlorpyrifos, while 68% of diazinon samples were above the CMC. Measurable discharge occurred at all upstream sites during non-winter conditions. These frequent exceedances thus indicate significant non-winter pesticide loads at these sites. Discharge was un-measurably slow at the downstream sites during non-winter conditions, and so non-winter loads at these sites may be less important than winter loads.

Are loads significant during winter events?

Yes. During the 2002-2003 winter storms, 97% of all samples had chlorpyrifos TPCs exceeding both the CMC. Seventy-two percent of the samples exceeded the CMC for diazinon. All sites had measurable loads in winter. The total load delivered during storms appears to have exceeded the entire dry-season load at most sites. Loads measured at OLS-POT discharge directly into Moss Landing Harbor, Elkhorn Slough, and the Monterey Bay National Marine Sanctuary. At this site, instantaneous chlorpyrifos loads were frequently above 10 g/day and reached 61 g/day during the February storm, and instantaneous diazinon loads were frequently above 30 g/day, reaching 193 g/day during the March storm.

Is there evidence that agricultural loads are significant?

Yes. Two sites in particular, BLA-COO and BLA-PUM, drain purely agricultural land. Year-round flow is observed at BLA-COO, and concentrations exceeded the CMC for chlorpyrifos in 71% of the samples; and for diazinon in 52% of the samples. While not exclusively agricultural, all other sites had high proportions of agricultural land use, and exhibited frequent exceedances.

Is there evidence that urban loads are significant?

Yes. The REC-JON watershed contains a large urban area (much of the City of Salinas) which is a source of rapid runoff during storms. Ninety-five percent of REC-JON samples exceeded the CMC for chlorpyrifos, compared to 66% exceedance in the purely agricultural watershed of Blanco Drain. Diazinon CMC exceedance was 100% in REC-JON and 52% in BLA-COO. Notwithstanding the probability of considerable variation in agricultural contributions, and of contributions from greenhouses upstream of REC-JON, the above differences in exceedances rates constitute *evidence* of significant urban loads.

Are the data consistent with published half-lives?

Yes. Published half-lives for chlorpyrifos and diazinon range from 1-2 weeks up to 6 months (Sec. 1.3). Our data are consistent with this. If half-lives were on the order of a year, we would see almost no intra-annual variability in TPCs and BPCs - which was not the case. If half-lives were only a few days, we would see near-zero TPCs and BPCs during the storm season - which was also not the case.

Is aqueous transport of chlorpyrifos and diazinon significant?

Yes. At most sites, the majority of pesticide loads were transported in aqueous form – i.e. in water such as can be passed through a 0.7 micron filter (Appendix 1, Fig 7.4). Further, aqueous concentrations (APCs) exceeded CMCs at most sites most of the time (Table 5.2).

Is adsorbed transport of chlorpyrifos and diazinon significant?

Yes. Pesticide concentrations adsorbed to suspended sediments (SPCs) exceeded CMCs at least once at all sites, although significantly less often than aqueous concentrations. SPC exceedances for chlorpyrifos occurred mainly during storms, while exceedances for diazinon were slightly more common during ambient sampling. This suggests that chlorpyrifos may be more susceptible to storage in ditch sediments during the growing season prior to re-mobilization during storms.

Table 5.2 Percentage of samples by site exceeding the CMC for each pesticide in three classes: TPC, APC, and SPC (SPC divided into ambient and storm divisions).

	Chlorp CMC (20 ng/L)					Diazinon CMC (80 ng/L)				
Site	TPC exceeding criterion	APC exceeding criterion	SPC exceeding criterion	SPC, ambient	SPC, storm	TPC exceeding criterion	APC exceeding criterion	SPC exceeding criterion	SPC, ambient	SPC, storm
SAL-DAV	76%	76%	19%	0%	44%	52%	43%	14%	33%	22%
SAL-MON	56%	56%	11%	8%	17%	28%	17%	17%	25%	17%
BLA-COO	71%	71%	10%	0%	22%	52%	48%	10%	27%	22%
BLA-PUM	61%	61%	0%	0%	0%	67%	61%	11%	17%	0%
REC-JON	95%	95%	52%	42%	67%	100%	100%	19%	42%	33%
OLS-POT	86%	86%	10%	17%	13%	81%	62%	19%	33%	25%
MOS-SAN	94%	94%	17%	8%	33%	61%	33%	22%	50%	17%
EP1-ROG	100%	100%	100%	100%	100%	100%	95%	100%	100%	100%
EPL-EPL	63%	63%	31%	25%	50%	75%	38%	38%	58%	25%

Is there a relationship between suspended solids concentration and transport of chlorpyrifos and diazinon?

Yes – at some sites. At the higher velocity, more upstream sites, a reasonable correlation existed between TPC and SSC – indicating that management to reduce sediment transport might also lead to some reduction in pesticide transport. As expected, most of the correlation was due to adsorbed material (SPC). Note however, that APCs are significant at these sites, and not highly correlated with SSC, and so reductions in sediment transport would not be sufficient to completely eliminate pesticide transport (see Section 4.7 & Fig. 7.7).

At the more sluggish, downstream sites, pesticide/sediment correlations were weaker. This is perhaps because of relatively low SSC values normally found at these depositional sites. These sites also exhibit confounding factors, such as large amounts of suspended algae, which bio-concentrate OP pesticides by a factor of 2 to 10 (Favari et al, 2002), releasing them and their metabolites back into the water column once they die (Hawxby, 1979).

6 References

Anderson, B., J. Hunt, B. Phillips, P. Nicely, K. Gilbert, V. De Vlaming, V. Connor, N. Richard and R. Tjeerdema. 2003a. Ecotoxicologic impacts of agricultural drain water in the Salinas River, California, USA. Environmental Toxicologic Chemistry 22 (2003). pp. 10.

Anderson, B., J. Hunt, B. Phillips, P. Nicely, V. de Vlaming, V. Connor, N. Richard and R. Tjeerdema. 2003b. Integrated assessment of the impacts of agricultural drainwater in the Salinas River California, USA). Environmental Pollution 124 (2003). pp. 10.

Anderson, T., F. Watson, W. Newman, J. Hager, D. Kozlowski, J. Casagrande and J. Larson. 2003. Nutrients in surface waters of southern Monterey Bay watersheds. Central Coast Watershed Studies (CCoWS), Watershed Institute, CSU Monterey Bay. Report No. WI-2003-11. http://science.csumb.edu/%7Eccows/pubs/reports/CCoWS_NutrientSources_030529b_ta.pdf.

Azimi-Gaylon, S., M. Menconi, L.Groger, and J. Karkoski. 2001. Diazinon and chlorpyrifos target analysis: workplan product for development of diazinon and chlorpyrifos total maximum daily loads in the Lower Sacramento River, Lower Feather River, Lower San Joaquin River, and the main channels of the Sacramento-San Joaquin River delta. Regional Water Quality Control Board, Central Valley Region Draft Report. pp 30.

Bailey, H., J. Miller, M. Miller, L. Wiborg, L. Deanovic, and T. Shed. 1997. Joint acute toxicity of diazinon and chlorpyrifos to Ceriodaphnia dubia. Environ. Toxicol. Chem. 16. pp. 5.

California Department of Pesticide Regulation, 2001. Pesticide use data for 2000 [digital data]. Sacramento, Department of Pesticide Regulation.

Dileanis, P., K. Bennett and J. Domagalski. 2002. Occurrence and transport of diazinon in the Sacramento River, California, and selected tributaries during three winter storms, January-February 2000. U.S. Geological Survey Water -Resources Investigations Report 02-4101. pp 71.

EXTOXNET. Extension Toxicology Network. Pesticide Information Profile. Chlorpyrifos and Diazinon. Cornell University, 2001. Available at: http://extoxnet.orst.edu/pips/ghindex.html Accessed 20 February 2002.

Favari, L., Lopez, E., Martinez-Tabche, L., Diaz-Pardo. E. (2002) Effect of Insecticides on Plankton and Fish of Ignacio Ramirez Reservoir (Mexico): A Biochemical and Biomagnification Study. Ecotoxoccolgy and Environmental safety 51, 177-186 (2002). Available at: http://idealibrary.com, Accessed 17 February 2004.

Ganapathy, C., C. Nordmark, K. Bennett, A. Bradley, H. Feng, J. Hernadez, and J. White. 1997. Temporal distribution of insecticide residues in four California rivers. California Department of Pesticide Regulation report EH97-06. pp.106.

Hawxby, K.W., Mehta, R. (1979). The Fate of Aquazine in a Small Pond. Proc. Okla. Acad. Sci. 59:16-19 (1979). Available at: http://digital.library.okstate.edu/oas/oas_pdf/v59/p16_19.pdf, Accessed 17 February 2004.

Hunt, J., B. Anderson, B. Phillips, R. Tjeerdema, H. Puckett, and V. deVlaming. 1999. Patterns of aquatic toxicity in an agriculturally dominated coastal watershed in California. Agriculture Ecosystems and Environment 75. pp.16.

Hunt, J., B. Anderson, B. Phillips, P. Nicely, R. Tjeerdema, H. Puckett, M. Stephenson, K. Worcester and V. deVlaming. 2003. Ambient toxicity due to chlorpyrifos and diazinon in a central California coastal watershed. Environmental Monitoring and Assessment 82. pp. 30.

Katznelson, R. and A. Feng. 1998. ELISA measurement of diazinon in water and sediment: principles and operating procedures. State Water Resource Control Board draft publication for the Alameda County Flood Control and Water Conservation District. pp 38.

Kratzer, C., C. Zamora, and D. Knifong. 2002. Diazinon and chlorpyrifos loads in the San Joaquin River basin, California, January and February 2000. U.S. Geological Survey Water Resources Investigations Report 02-4103. pp 38.

Montgomery, J. 1997. Agrochemicals desk reference 2nd ed. CRC Press LLC. pp 656.

Mount, J. 1995. California rivers and streams: the conflict between fluvial process and land use. University of California Press, Berkeley and Los Angeles, California. pp. 359.

Siepmann, S. and B. Finlayson. 2000. Water quality criteria for diazinon and chlorpyrifos: California Department of Fish and Game Administrative Report 00-3. pp59.

State Water Resources Control Board. 1993. 1991 Toxics Substance Monitoring Program Report. State Water Resources Control Board, Sacramento, California. pp 26.

State Water Resources Control Board. 1994. State mussel watch program, 1987-1993 data report. State Water Resources Control Board, Sacramento, California. pp 20.

State Water Resources Control Board. 1995a. Toxic Substances Monitoring Program Report 1992-93. State Water Resources Control Board, Sacramento, California. pp 32.

State Water Resources Control Board. 1995b. Toxic substances monitoring Program, 1994-95 data report. State Water Resources Control Board, Sacramento, California. pp 29.

State Water Resources Control Board. 1996. State mussel watch program, 1993-1995 data report. State Water Resources Control Board, Sacramento, California. pp 16.

State Water Resources Control Board, California Regional Water Quality Control Board Region 3, California Department of Fish and Game, University of California Santa Cruz, Moss Landing Marine Labs. 1998. Chemical and biological measures of sediment quality in the Central Coast region. State Water Resources Control Board Division of Water Quality, Sacramento, California. pp 84.

State Water Resources Control Board. 2000. State mussel watch program, 1995-1997 data report. State Water Resources Control Board, Sacramento, California. pp 22.

Sullivan, J. and K. Goh. 2000. Evaluation and validation of a commercial ELISA for diazinon in surface waters. Journal of Agricultural Food Chemistry 2000, 48. pp 8.

Watson, F., W. Newman, T. Anderson, D. Kozlowski, J. Hager, and J. Casagrande. 2002. Protocols for water quality and stream ecology research. Central Coast Watershed Studies (CCoWS), Watershed Institute, CSU Monterey Bay. Report No. WI-2002-05c. http://science.csumb.edu/~ccows/dpr_2002/CCoWS_Protocols_020625.

7 Appendix 1, Tables and Figures

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides.

Central Coast Ambient Monitoring Program (CCAMP):

This list comprises all data within the CCAMP database that has examined chlorpyrifos and diazinon in sediment or water.
Negative numbers indicate non-detectable amounts, with values indicating detection limits

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
309ALD	REC-BOR	Salinas Reclamation Canal	Boronda Rd	24-06-1999 0:00	SED	-1.25	-1
309ALU	ALI-AIR	Salinas Reclamation Canal	Airport Rd	24-06-1999 0:00	SED	-1.25	-1
306MOR	MCS-HWI	Moro Cojo Slough	Highway 1	30-03-1998 9:15	SED	-2.5	-5
306MOR	MCS-HWI	Moro Cojo Slough	Highway 1	28-06-1999 17:05	SED	-1.25	-1
306MOS	MCS-MOS	Moss Landing Harbor	Moss Landing Rd	30-03-1998 11:10	SED	-2.5	-5
309OLD	OLS-MON	Old Salinas River	Monterey Dunes Colony Rd	30-03-1998 11:00	SED	-2.5	-5
309POT	OLS-POT	Old Salinas River	Potero Rd (Tide Gates)	28-06-1999 15:40	SED	-1.25	-1
309SBR		Salinas River (Lower)	#N/A	30-03-1998 10:30	SED	-2.5	-5
309DAV	SAL-DAV	Salinas River (Lower)	Davis Rd	24-06-1999 0:00	SED	-1.25	-1
309SAC	SAL-CHU	Salinas River (Lower)	Chualar River Rd	24-06-1999 0:00	SED	-1.25	-1
309SDR	DRN-DAV	Salinas River (Lower)	300m upstream from Davis Rd	24-06-1999 0:00	SED	-1.25	-1
309SBR		Salinas River (Lower)	#N/A	28-06-1999 16:20	SED	-1.25	-1
309DSA	SAL-CAT	Salinas River (Mid)	along Cattleman Rd	24-06-1999 0:00	SED	-1.25	-1
309GRN	SAL-GRE	Salinas River (Mid)	Greenfield	24-06-1999 0:00	SED	-1.25	-1
309KNG	SAL-KIN	Salinas River (Mid)	King City	24-06-1999 0:00	SED	-1.25	-1
309PSO	SAL-CRE	Salinas River (Upper)	Creston Rd	23-06-1999 0:00	SED	-1.25	-1
309USA	SAL-BRA	Salinas River (Upper)	Bradley Rd	23-06-1999 0:00	SED	-1.25	-1
309TEM	TEM-PRE	Tembladero Slough	Preston Rd	30-03-1998 10:45	SED	-2.5	-5
309TEM	TEM-PRE	Tembladero Slough	Preston Rd	28-06-1999 16:45	SED	-1.25	-1
305WAT		Watsonville Slough	#N/A	30-03-1998 12:45	SED	-2.5	-5
306ELK	ELK-KIR	Elkhorn Slough	Kirby Park	30-03-1998 11:45	SED	-2.5	-5
306ELK	ELK-KIR	Elkhorn Slough	Kirby Park	28-06-1999 14:35	SED	-1.25	-1
309SDW		#N/A	#N/A	28-06-1999 15:55	SED	-1.25	-1
309SUN	SAL-GAR	#N/A	River Rd (Nr East Garrison)	23-06-1999 0:00	SED	-1.25	-1
309SEC	ARR-ELM	Arroyo Seco River	Elm Rd (USGS stn) (Green br.)	24-06-1999 0:00	SED	-1.25	-1
309ATS	ATA-H41	Atascadero Creek(309)	Hwy 41, Atascadero	23-06-1999 0:00	SED	-1.25	-1
309SAN	ANT-101	San Antonio River	Hwy 101	23-06-1999 0:00	SED	-1.25	-1
309LOK	SLC-FIR	San Lorenzo Creek	First Street (G15, King City)	24-06-1999 0:00	SED	-1.25	-1
309LOR	SLC-BIT	San Lorenzo Creek	Bitterwater Rd (USGS stn)	24-06-1999 0:00	SED	-1.25	-1
309MON		Monterey Harbor	#N/A	30-03-1998 9:45	SED	-2.5	-5
309NAC	NAC-101	Nacimiento River	Hwy 101	23-06-1999 0:00	SED	-1.25	-1

Bay Protection and Toxic Cleanup Program (BPTC)

(data from "Chemical & biological measures of sediment quality in the central coast region" SWRCB, 1998.
Negative numbers indicate non-detectable amounts, with values indicating detection limits

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	09-May-96	H2O	-0.008	
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	21-Dec-92	SED	-9	
30011	SAL-MON	Salinas River Lagoon	Del Monte Rd	21-Dec-92	SED	-9	
30019	MCS-HWI	Moro Coho Slough	#N/A	22-Dec-92	SED	-9	
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	15-Jun-94	SED	-9	
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	15-Jun-94	SED	-9	

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides (cont')

Bay Protection and Toxic Cleanup Program (BPTC) (data from "Chemical & biological measures of sediment quality in the central coast region" SWRCB, 1998.

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	15-Jun-94	SED	-9	
30019	MCS-HWI	Moro Coho Slough	#N/A	17-Jun-94	SED	-9	
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	09-May-96	SED	6.31	
30007	MOS-SAN	Moss Landing Harbor	Sandholt Rd	08-May-97	SED	3.29	
36003		Central Tembladero	#N/A	08-May-97	SED	1.68	
36002		Tembladero Mouth	#N/A	08-May-97	SED	5.95	
36004		Upper Tembladero-Salinas (	#N/A	08-May-97	SED	17.7	
36005	EPL-EPL	Espinosa Slough	Espinosa Lake	08-May-97	SED	2.7	
36006		Alisal Slough	#N/A	08-May-97	SED	16.4	
36007	OLS-POT	Old Salinas River Channel	Potero Rd (Tide Gates)	08-May-97	SED	0.95	

Department of Pesticide Regulation (DPR) (data from: "Temporal distribution of insecticide residues in four California rivers" Ganapathy et. al. 1998)

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
	SAL-GON	Salinas R	River Rd Gonzales Bridge	07-Jul-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	01-Aug-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	09-Aug-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	16-Aug-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	23-Aug-02	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	30-Aug-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	06-Sep-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	08-Sep-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	13-Sep-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	20-Sep-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	27-Sep-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	04-Oct-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	11-Oct-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	18-Oct-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	25-Oct-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	01-Nov-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	08-Nov-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	15-Nov-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	22-Nov-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	29-Nov-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	06-Dec-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	08-Dec-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	13-Dec-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	20-Dec-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	27-Dec-94	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	03-Jan-95	H2O	0	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	10-Jan-95	H2O	0.11	0
	SAL-GON	Salinas R	River Rd Gonzales Bridge	17-Jan-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	24-Jan-95	H2O	0	0

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides (cont')

Department of Pesticide Regulation (DPR) (data from: "Temporal distribution of insecticide residues in four California rivers" Ganapathy et. al. 1998)

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
	SAL-CHU	Salinas R	Chualar River Rd	31-Jan-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	07-Feb-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	14-Feb-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	21-Feb-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	23-Feb-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	28-Feb-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	07-Mar-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	14-Mar-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	21-Mar-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	28-Mar-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	04-Apr-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	11-Apr-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	18-Apr-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	25-Apr-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	02-May-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	09-May-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	16-May-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	23-May-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	30-May-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	06-Jun-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	13-Jun-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	20-Jun-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	26-Jun-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	27-Jun-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	04-Jul-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	11-Jul-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	18-Jul-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	25-Jul-95	H2O	0	0
	SAL-CHU	Salinas R	Chualar River Rd	01-Aug-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	29-Aug-94	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	04-Oct-94	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	02-Nov-94	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	28-Nov-94	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	03-Jan-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	06-Feb-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	06-Mar-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	06-Apr-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	03-May-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	30-May-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	31-May-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	26-Jun-95	H2O	0	0.2
	SAL-MON	Salinas Lagoon	Del Monte Rd	01-Aug-95	H2O	0	0
	SAL-MON	Salinas Lagoon	Del Monte Rd	01-Aug-95	H2O	0	0

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides (cont')

United States Geological Survey (USGS) (data from water quality website @ http://waterdata.usgs.gov/nwis/qwdata&introduction) "0" values assumed not-detects

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
11143500	SAL-POZ	Salinas R	Pozo Rd	12-29-71 13:30	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	3-7-72 11:00	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	11-22-72 13:15	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	2-13-73 13:00	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	3-20-73 12:30	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	4-19-73 16:30	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	9-5-73 11:15	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	12-11-73 12:30	H2O		0
11143500	SAL-POZ	Salinas R	Pozo Rd	1-21-74 15:30	H2O		0
11145000	SAL-PIL	Salinas R	Las Pilitas Rd	3-7-72 11:45	H2O		0.01
11145000	SAL-PIL	Salinas R	Las Pilitas Rd	6-29-72 11:00	H2O		0
11145000	SAL-PIL	Salinas R	Las Pilitas Rd	6-30-72 8:30	H2O		0
11145000	SAL-PIL	Salinas R	Las Pilitas Rd	12-11-73 13:20	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	12-29-71 10:00	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	3-7-72 12:15	H2O		0.01
11147500	SAL-CRE	Salinas R	Creston Rd	1-11-73 12:40	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	2-13-73 16:00	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	3-20-73 14:00	H2O		0.01
11147500	SAL-CRE	Salinas R	Creston Rd	5-17-73 13:15	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	1-21-74 13:15	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	3-4-74 12:30	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	4-15-74 13:00	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	5-10-74 12:45	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	2-3-75 15:30	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	3-4-75 12:00	H2O		0
11147500	SAL-CRE	Salinas R	Creston Rd	5-6-75 12:30	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	12-28-71 15:30	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	3-7-72 14:45	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	11-27-72 11:15	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	2-7-73 10:30	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	3-21-73 14:30	H2O		0.01
11150500	SAL-WUN	Salinas R	Wunpost Rd	5-17-73 16:00	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	9-5-73 14:30	H2O		0.01
11150500	SAL-WUN	Salinas R	Wunpost Rd	12-11-73 15:00	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	1-31-74 12:15	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	3-4-74 13:45	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	4-15-74 14:40	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	10-3-74 10:00	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	2-4-75 16:00	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	3-4-75 14:30	H2O		0
11150500	SAL-WUN	Salinas R	Wunpost Rd	5-19-75 14:00	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	12-28-71 10:30	H2O		0

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides (cont')

United States Geological Survey (USGS) (data from water quality website @ http://waterdata.usgs.gov/nwis/qwdata&introduction) (-- = non-detect, "0" values assumed not-detects)

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	3-8-72 9:00	H2O		0.01
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	11-27-72 13:30	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	2-8-73 9:30	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	3-23-73 10:00	H2O		0.01
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	5-18-73 11:30	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	9-6-73 10:15	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	12-10-73 9:45	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	1-31-74 13:45	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	3-4-74 15:00	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	4-16-74 9:40	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	5-13-74 11:15	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	10-3-74 11:30	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	2-5-75 13:30	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	3-5-75 12:10	H2O		0
11151700	SAL-SOL	Salinas R	Hwy 101 at Soledad	5-7-75 13:00	H2O		0
11152300	SAL-CHU	Salinas R	Chualar River Rd	8-16-77 13:15	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	12-12-77 12:15	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	12-12-77 12:15	SED		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	2-27-78 15:30	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	5-22-78 12:15	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	5-22-78 12:15	SED		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	8-14-78 14:00	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	11-13-78 14:30	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	11-13-78 14:30	SED		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	2-12-79 13:00	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	5-15-79 12:30	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	5-15-79 12:30	SED		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	8-20-79 13:00	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	11-19-79 11:00	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	11-19-79 11:00	SED		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	3-10-80 13:00	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	8-19-80 13:30	H2O		--
11152300	SAL-CHU	Salinas R	Chualar River Rd	5-17-82 13:30	H2O		0.01
11152500	SAL-SPR	Salinas R	Hwy 68	12-27-71 16:00	H2O		0.01
11152500	SAL-SPR	Salinas R	Hwy 68	3-8-72 10:30	H2O		0.02
11152500	SAL-SPR	Salinas R	Hwy 68	4-12-72 9:10	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	6-28-72 9:30	H2O		0.07
11152500	SAL-SPR	Salinas R	Hwy 68	2-8-73 15:45	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	3-23-73 14:00	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	5-18-73 14:30	H2O		0.01
11152500	SAL-SPR	Salinas R	Hwy 68	12-12-73 11:15	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	1-31-74 14:30	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	3-2-74 17:40	H2O		0

Table 7.1 Summary of data found to date of chlorpyrifos and diazinon concentrations (ppb) in sediment or water of the Salinas Valley, California 303(d) listed waterbodies for pesticides (cont')

United States Geological Survey (USGS) (data from water quality website @ http://waterdata.usgs.gov/nwis/qwdata&introduction) (-- = non-detect, "0" values assumed not-detects)

Project SiteTag	CCoWS Site Code	Waterbody	Location/bridge	DateTime	MATRIX	CLPYR (ppb)	DIAZN (ppb)
11152500	SAL-SPR	Salinas R	Hwy 68	4-16-74 13:00	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	5-13-74 13:15	H2O		0.03
11152500	SAL-SPR	Salinas R	Hwy 68	2-3-75 14:45	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	3-6-75 14:00	H2O		0
11152500	SAL-SPR	Salinas R	Hwy 68	4-29-75 12:00	SED		--
11152500	SAL-SPR	Salinas R	Hwy 68	5-28-75 13:00	H2O		0.03
11152500	SAL-SPR	Salinas R	Hwy 68	9-9-75 11:30	H2O		--
11152500	SAL-SPR	Salinas R	Hwy 68	11-11-75 13:40	H2O		--
11152500	SAL-SPR	Salinas R	Hwy 68	11-11-75 13:40	SED		--
11152500	SAL-SPR	Salinas R	Hwy 68	2-9-76 12:00	H2O		--
11152500	SAL-SPR	Salinas R	Hwy 68	5-4-76 13:00	H2O		--
11152500	SAL-SPR	Salinas R	Hwy 68	5-4-76 13:00	SED		--
11152500	SAL-SPR	Salinas R	Hwy 68	11-16-76 11:00	SED		--
11152500	SAL-SPR	Salinas R	Hwy 68	9-1-77 16:50	H2O		0.08
11152500	SAL-SPR	Salinas R	Hwy 68	9-1-77 16:50	SED		0.4

Table 7.2 Schedule for Diazinon and Chlorpyrifos Monitoring in Impaired Surface Waters of the Lower Salinas Region.

		Jul	Aug	Sep"a"	Sep"b"	Oct	Nov & Dec'02, Jan, Feb, Mar'03									Apr	May	Jun	Jul	Aug	Sep	Oct
		Summer '02 Ambient Monitoring					Storm 1			Storm 2			Storm 3			Summer '03 Ambient Monitoring						
Site #	Site Code						Pre-	Peak	Post-	Pre-	Peak	Post-	Pre-	Peak	Post-							
1	SAL-DAV	X	O	O	O	O	O bdg	#	O	O	#	O	O	#	O	O	O	O	O	X	O	O
2	SAL-MON	O	X	O	O	O	O		O wdg	O		O	O		O	O	O	O	X	O	O	O
3	BLA-COO	O	O	X	O	O	O	#	O	O wdg	#	O	O	#	O	O	O	O	O	O	O	O
4	BLA-PUM	O	O	O	X	O	O		O	O		O bdg	O		O	O	O	O	O	O	O	O
5	REC-JON	O	O	O	O	X	O	#	O	O	#	O	O wdg	#	O	O	O	O	O	O	O	O
6	OLS-POT	O	O	O	O	O	O	#	O	O	#	O	O	#	O bdg	O	O	O	O	O	O	O
7	MOS-SAN	O	O	O	O	O	O		O	O		O	O		O	O	X	O	O	O	O	O
8	EP1-ROG	O	O	O	O	O	O	#	O	O	#	O	O	#	O	X	O	X	O	O	X	O
9	EPL-EPL	O	O	O	O	O	O		O	O		O	O		O	O	O	O	O	O	O	X

O = Normal sampling scheme (Water, Benthic and Suspended Sediment samples for ELISA analysis)
X = Normal sampling scheme with additional Water and Benthic duplicates plus Water and Benthic sampling for GCMS analysis
# = Peak storm sampling collects only Water and Suspended Solids samples for ELISA analysis
wdg = water duplicate & water GCMS
bdg = benthic duplicate & benthicGCMS

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids).

2002 Ambient Monitoring

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Jul-02													
SAL-DAV	15.4	102	27011	24719	0	102	37548	45	4772651	4771634	73	118	24157
SAL-MON	35.7	71	11648	9975	0	71	n/d	89	151500	149392	5	94	934
BLA-COO	107.6	63	n/a	n/a	0	63	41296	72	n/a	n/a	0	72	9039
BLA-PUM	47.1	63	n/d	n/d	0	63	2974	121	68312	66157	3	124	3758
REC-JON	96.2	81	807196	806030	78	158	n/d	248	1095622	1092048	105	353	2778
OLS-POT	158.0	111	23626	21817	3	115	n/d	74	190276	189080	30	104	25078
MOS-SAN	139.3	85	10544	9249	1	86	n/d	31	1265727	1265245	176	208	2090
EP1-ROG	1076.1	119	956927	956609	1029	1148	3535	67235	626868360	626688780	674365	741601	778821
EPL-EPL	804.4	91	31114	29660	24	114	n/d	103	369665	368017	296	399	4639
Aug-02													
SAL-DAV	18.6	48	87075	83613	2	49	n/d	29	1271581	1269470	24	53	697
SAL-MON	16.6	34	n/d	n/d	0	34	18844	37	279040	278316	5	42	5166
BLA-COO	23.1	58	108059	105582	2	60	15876	100	1469671	1465377	34	134	3330
BLA-PUM	26.2	51	n/d	n/d	0	51	2929	124	363741	360946	9	134	6030
REC-JON	22.1	86	2656643	2654536	59	145	499278	697	1381607	1364603	30	728	159153
OLS-POT	53.1	64	8582	7826	0	65	5417	102	354094	352895	19	120	6230
MOS-SAN	183.1	70	n/d	n/d	0	70	1817	73	160938	159790	29	102	538
EP1-ROG	83.3	132	1120107	1119255	93	225	292805	3605	234657100	234633849	19534	23139	268495
EPL-EPL	448.3	55	59748	58829	26	81	n/d	43	857442	856728	384	427	5055
Sep a-02													
SAL-DAV	10.9	76	n/d	n/d	0	76	51260	387	1982660	1961671	21	409	24489
SAL-MON	44.7	45	558833	557809	25	70	6156	108	3591853	3589374	160	269	4817
BLA-COO	63.9	55	23707	22630	1	57	294992	444	118398	109719	7	451	9109
BLA-PUM	39.6	56	38523	37645	1	58	n/d	1869	7121387	7092330	281	2150	3521
REC-JON	40.3	62	586688	585084	24	86	417248	1620	474671	432819	17	1638	327563
OLS-POT	43.8	53	27561	26878	1	54	3619	192	520311	517845	23	214	12205
MOS-SAN	57.2	68	34230	33212	2	70	2267	n/d	520311	297583	17	17	1097
EP1-ROG	410.4	849	67300931	67296082	27616	28465	157012	12419	681041686	680970782	279448	291867	644321
EPL-EPL	1088.6	55	n/d	n/d	0	55	n/d	52	311818	310479	338	390	2874

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

2002 Ambient Monitoring (Cont.)

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Sep b-02													
SAL-DAV	18.2	54	870502	866041	16	70	50420	86	8897509	8890415	162	248	30443
SAL-MON	9.2	53	n/d	n/d	0	53	8868	203	302039	296647	3	206	1943
BLA-COO	81.7	51	n/d	n/d	0	51	20363	202	196559	183194	15	217	11663
BLA-PUM	74.8	54	52983	52102	4	58	2811	372	240969	234905	18	390	2432
REC-JON	11.1	69	631198	629845	7	76	16083	262	1014682	1009561	11	274	20158
OLS-POT	91.0	44	17696	17032	2	46	5485	104	98445	96877	9	113	14737
MOS-SAN	126.9	56	21112	20263	3	59	1202	n/d	6554178	6554178	832	832	826
EP1-ROG	83.6	386	34341987	34336446	2869	3255	51902	17829	927366733	927110755	77471	95300	336422
EPL-EPL	821.8	58	846104	845068	694	753	n/d	81	15422138	15420686	12673	12754	3770
Oct-02													
SAL-DAV	17.3	55	26358	25032	0	56	47136	22	212636	212108	4	26	44007
SAL-MON	162.0	55	n/d	n/d	0	55	6914	27	1181311	1180461	191	218	1685
BLA-COO	45.1	61	53162	51354	2	64	3222	50	525795	524327	24	73	4736
BLA-PUM	37.4	58	n/d	n/d	0	58	n/d	53	2519568	2518442	94	147	1701
REC-JON	22.3	111	771097	766337	17	128	147715	309	1428675	1415393	32	340	103097
OLS-POT	107.9	72	474212	469457	51	122	n/d	71	3914845	3910106	422	493	8439
MOS-SAN	146.8	91	16527	14739	2	94	n/d	25	142531	142041	21	46	1477
EP1-ROG	375.6	294	10790019	10786652	4051	4345	118000	6939	587827635	587799735	220769	227709	320406
EPL-EPL	566.3	87	n/d	n/d	0	87	n/d	36	1559150	1558102	882	918	2835
2002 Ambient Means:													
SAL-DAV	16	67	252736	249851	5	71	46591	114	3427407	3421060	57	171	24759
SAL-MON	54	51	285241	283892	13	57	10195	93	1101149	1098838	73	166	2909
BLA-COO	64	58	61643	59855	2	59	75150	173	577606	570654	20	189	7576
BLA-PUM	45	56	45753	44874	3	57	2905	508	2062795	2054556	81	589	3488
REC-JON	38	82	1090564	1088366	37	119	270081	627	1079051	1062885	39	666	122550
OLS-POT	91	69	110336	108602	11	80	4840	109	1015594	1013361	100	209	13338
MOS-SAN	131	74	20603	19366	2	76	1762	43	1728737	1683767	215	241	1206
EP1-ROG	406	356	22901994	22899009	7132	7488	124651	21606	611552303	611440780	254317	275923	469693
EPL-EPL	746	69	312322	311186	248	218	#DIV/0!	63	3704043	3702802	2915	2978	3834

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

Storm 1, Nov 2002

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Pre-													
SAL-DAV	1026.7	76	n/d	n/d	0	76	30952	n/d	202309	202309	208	208	43238
SAL-MON	0.0	58	105557	103664	0	58	9733	n/d	316004	316004	0	0	4656
BLA-COO	43.9	45	128565	126285	6	51	14881	n/d	3337598	3337598	146	146	6140
BLA-PUM	104.1	59	n/d	n/d	0	59	n/d	44	28647	27590	3	47	5048
REC-JON	37.1	101	904523	902032	33	135	140339	86	453812	451683	17	103	77492
OLS-POT	9.3	55	23538	22804	0	55	4028	n/d	144828	144828	1	1	10630
MOS-SAN	135.4	90	17671	16010	2	92	1759	n/d	55216	55216	7	7	1479
EP1-ROG	378.7	347	717289	710551	269	616	144633	2865	3142555	3094514	1172	4036	191751
EPL-EPL	374.5	73	604965	603440	226	299	3281	n/d	1165905	1165905	437	437	3768
Peak-													
SAL-DAV	89.6	175	230393	226649	20	195	n/a	310	827498	820860	74	383	n/a
BLA-COO	40.7	1142	740417	717264	29	1171	n/a	4343	200061	297015	12	4355	n/a
REC-JON	232.3	150	12437362	12433382	2889	3038	n/a	520	1396328	1382497	321	841	n/a
OLS-POT	296.8	222	49015	44758	13	236	n/a	360	178579	171677	51	411	n/a
EP1-ROG	1002.9	230	1767966	1765768	1771	2001	n/a	2958	9814386	9786160	9814	12772	n/a
Post-													
SAL-DAV	201.1	186	868485	858539	173	359	52610	357	734837	715761	144	501	51718
SAL-MON	59.4	80	34876	32586	2	82	16673	n/d	369004	369004	22	22	4410
BLA-COO	7.0	123	632317	625188	4	128	14794	58	2882345	2879023	20	78	4558
BLA-PUM	52.4	123	59582	56800	3	126	6348	205	n/d	n/d	0	205	7951
REC-JON	85.6	148	70938	66500	6	154	185313	370	1352145	1341074	115	485	211436
OLS-POT	118.0	110	88163	86060	10	120	8588	78	756709	755225	89	167	18342
MOS-SAN	75.4	104	39288	37619	3	107	n/d	32	162708	162195	12	44	701
EP1-ROG	213.1	497	16814425	16808093	3582	4079	28675	4735	38127099	38066755	8112	12847	78989
EPL-EPL	97.5	56	n/d	n/d	0	56	3143	24	81731	80636	8	32	13085

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

Storm 2, Feb 2003

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Pre-													
SAL-MON	398.7	107	68998	67947	27	134	83490	23	21343	21115	8	32	n/d
OLS-POT	241.0	101	69906	68705	17	117	31532	204	29338	26907	6	210	15796
MOS-SAN	506.3	145	18671	17021	9	154	1619	115	n/d	n/d	0	115	n/d
SAL-DAV	94.6	96	154397	150368	14	110	1127	94	94836	90887	9	102	424
BLA-COO	213.3	65	78801	77682	17	82	40048	1590	37975	18104	4	1594	8072
BLA-PUM	84.3	69	125549	124230	10	79	38168	68	19290	17987	2	70	12272
REC-JON	12.2	184	428163	423660	5	189	171155	390	203251	193710	2	393	164754
EP1-ROG	126.1	603	6295254	6279279	792	1395	12744	714	141866770	141847860	17890	18604	21985
EPL-EPL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Peak-													
SAL-DAV	100.5	63	107317	105585	11	73	n/a	52	25465	24036	2	54	n/a
BLA-COO	115.2	79	141476	139755	16	95	n/a	53	55706	54550	6	60	n/a
REC-JON	85.3	107	327142	325152	28	135	n/a	965	249763	231904	20	985	n/a
OLS-POT	109.0	125	59003	57539	6	131	n/a	61	36721	36008	4	65	n/a
EP1-ROG	263.1	860	2998564	2987931	786	1646	n/a	1003	19359963	19347563	5090	6093	n/a
Post-													
SAL-DAV	87.1	112	334348	312636	27	139	n/d	101	134637	132101	12	112	3518
SAL-MON	246.4	85	68367	66972	16	102	71012	41	372224	371547	92	133	2222
BLA-COO	92.6	68	88997	87985	8	76	21316	28	38283	37868	4	31	3545
BLA-PUM	93.5	83	143689	142499	13	97	19114	90	28003	26716	2	93	10095
REC-JON	143.7	212	203486	201053	29	241	148107	1943	40436	18146	3	1945	57155
OLS-POT	109.0	98	127030	125007	14	112	21513	235	200850	196030	21	256	47616
MOS-SAN	5410.7	86	41930	40103	217	303	2238	94	23341	21337	115	210	352
EP1-ROG	157.0	511	2616380	2606229	409	920	23632	2613	40110704	40058752	6290	8903	1161499

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

Storm 3, Mar 2003

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Pre-													
SAL-MON	274.8	85	22792	21328	6	91	38744	24	33191	32774	9	33	3189
BLA-COO	400.8	53	24251	23174	9	63	60043	26	23285	22762	9	35	5279
BLA-PUM	101.7	54	38627	37693	4	58	3458	55	28624	27668	3	58	2977
OLS-POT	550.1	75	23757	22897	13	88	17701	410	21796	17096	9	419	4577
MOS-SAN	661.4	97	28457	27151	18	115	1820	682	61248	52107	34	717	638
SAL-DAV	76.1	59	39383	37392	3	62	1445	33	51583	50486	4	37	508
REC-JON	75.4	89	524318	520548	39	128	97330	247	248922	238400	18	265	133075
EP1-ROG	144.7	788	2433177	2423931	351	1138	142440	900	13740840	13730276	1987	2887	937279
EPL-EPL	592.2	47	n/d	n/d	0	47	2337	87	26293	24721	15	101	4080
Peak-													
OLS-POT	1061.5	106	30179	27766	29	136	n/a	489	108380	97278	103	592	n/a
SAL-DAV	58.0	222	352930	348446	20	242	n/a	350	185564	178483	10	361	n/a
BLA-COO	1125.6	5786	2650081	2575173	2899	8685	n/a	3066	853156	813468	916	3981	n/a
REC-JON	486.0	283	1111944	1107767	538	822	n/a	1393	558984	538457	262	1654	n/a
EP1-ROG	1176.6	938	11789291	11781977	13862	14801	n/a	1783	6435468	6421568	7555	9339	n/a
Post-													
SAL-DAV	60.1	119	232045	228229	14	132	1113	342	115273	104267	6	348	1591
SAL-MON	75.1	87	12095	11314	1	88	19213	34	65644	65342	5	39	1197
BLA-COO	64.1	65	53769	52371	3	68	17236	36	67165	66389	4	40	1932
BLA-PUM	68.1	107	61321	58323	4	111	n/d	548	56539	41241	3	551	1281
REC-JON	93.3	181	215724	212399	20	200	72726	391	53677	46483	4	395	40454
OLS-POT	379.1	122	37083	35247	13	135	6972	385	24629	18826	7	392	2712
MOS-SAN	501.1	51	50065	49239	25	76	3510	624	104979	94902	48	671	1854
EP1-ROG	126.2	374	335771	326942	41	415	24561	538	16392398	16379707	2067	2605	57826
EPL-EPL	137.8	71	808396	803603	111	182	3213	345	333306	309991	43	388	5157

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

2003 Ambient Monitoring

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Apr-03													
SAL-DAV	26.02	143.31	79908.55	76954.19	2.00	145.31	13843.19	223.30	183525.60	173107.80	4.50	227.80	12724.02
SAL-MON	112.2	n/d	140088	140088	16	16	31501	40	172728	169812	19	59	2600
BLA-COO	7.0	n/d	69621	69621	0	0	33634	40	124013	122886	1	41	6558
BLA-PUM	28.6	52	31375	30329	1	53	7904	66	10456	9138	0	66	6126
REC-JON	23.7	65	79909	77812	2	67	76930	954	535358	504457	12	966	8848
OLS-POT	136.0	75	22620	21276	3	78	30835	366	20383	13804	2	368	20383
MOS-SAN	297.3	61	43625	42578	13	73	6841	305	74206	68937	20	326	8081
EP1-ROG	299.0	353	212867	208293	62	415	13659	2952	1979127	1940851	580	3533	160228
EPL-EPL	106.1	41	116763	114384	12	54	3030	101	83227	77423	8	109	8428
May-03													
SAL-DAV	67.5	n/d	35055	35055	2	2	11876	38	88943	87540	6	44	6450
SAL-MON	78.9	68	2208	2000	0	68	16405	40	3792	3669	0	40	1557
BLA-COO	36.2	58	n/d	n/d	0	58	4789	66	131907	129355	5	71	1196
BLA-PUM	87.3	52	26434	25303	2	54	n/d	52	41633	40486	4	56	411
REC-JON	54.5	73	514929	511221	28	101	5619	253	437327	424452	23	277	27614
OLS-POT	97.7	59	15795	14791	1	60	9457	261	19144	14687	1	262	22097
MOS-SAN	190.6	93	n/d	n/d	0	93	3859	80	11839	9880	2	82	1699
EP1-ROG	1015.0	114	131594	130480	132	247	68222	430	276002	271814	276	706	36027
EPL-EPL	170.6	74	n/d	n/d	0	74	2799	44	55810	54632	9	53	1804
Jun-03													
SAL-DAV	63.9	51	29528	27293	2	53	11767	30	301651	300312	19	50	8124
SAL-MON	21.4	n/d	n/d	n/d	0	0	27585	27	45234	44666	1	27	1387
BLA-COO	0.0	58	n/d	n/d	0	58	26937	164	60838	57408	0	164	6422
BLA-PUM	55.9	58	22282	21026	1	59	n/d	131	26981	24119	1	133	2119
REC-JON	12.2	93	283862	281328	3	96	248119	395	306825	296057	4	399	85964
OLS-POT	328.6	59	n/d	n/d	0	59	4042	93	23078	21413	7	100	7025
MOS-SAN	215.9	90	n/d	n/d	0	90	2143	96	21365	19751	4	100	1090
EP1-ROG	150.9	109	203025	201759	30	140	189883	308	4690054	4686490	707	1015	2329568
EPL-EPL	222.2	63	n/d	n/d	0	63	2395	60	18906	17047	4	64	1871

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

2003 Ambient Monitoring (Cont.)

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Jul-03													
SAL-DAV	186.5	61	n/d	n/d	0	61	8388	27	27256	26023	5	32	8896
SAL-MON	125.1	60	29610	20239	3	62	23631	23	199987	199223	25	48	n/d
BLA-COO	347.0	68	n/d	n/d	0	68	38913	137	84446	65487	23	159	5171
BLA-PUM	307.7	58	n/d	n/d	0	58	3751	130	37740	32374	10	140	6763
REC-JON	20.6	100	325865	322814	7	107	71814	374	272180	260784	5	379	32951
OLS-POT	439.6	84	n/d	n/d	0	84	2793	60	9468	8694	4	64	25095
MOS-SAN	434.1	81	n/d	n/d	0	81	1304	21	6892	6596	3	24	n/d
EP1-ROG	176.0	190	265973	263790	46	236	18717	345	4745155	4741188	834	1179	110591
EPL-EPL	245.5	75	n/d	n/d	0	75	n/d	53	117137	116087	28	81	3209
Aug-03													
SAL-DAV	36.2	69	2891	2667	0	69	23309	25	9076	8993	0	26	8129
SAL-MON	43.4	52	n/d	n/d	0	52	28795	18	3823	3770	0	18	2576
BLA-COO	178.3	70	2830	2618	0	70	24183	33	5959	5858	1	34	2354
BLA-PUM	87.6	82	2613	2372	0	82	n/d	31	4692	4602	0	31	1383
REC-JON	136.9	96	68659	68297	9	105	38553	289	82167	81077	11	300	25165
OLS-POT	108.0	62	2785	2591	0	62	15334	26	4667	4588	0	26	21542
MOS-SAN	154.2	74	n/d	n/d	0	74	1845	46	7022	6874	1	47	2457
EP1-ROG	111.1	858	1654141	1652638	184	1042	1264908	20	8543682	8543647	949	969	1587153
EPL-EPL	253.5	66	n/d	n/d	0	66	3681	20	16698	16641	4	24	1375
Sep-03													
SAL-DAV	127.5	66	52350	49593	6	73	45237	36	103742	102236	13	49	3924
SAL-MON	86.6	55	19990	18690	2	57	20833	24	157399	156823	14	38	n/d
BLA-COO	296.3	65	14852	14315	4	69	10027	130	9183	8112	2	132	3922
BLA-PUM	305.9	60	32014	30389	9	69	1627	122	20029	16715	5	127	7171
REC-JON	84.7	153	844874	839634	71	224	131794	298	246771	236532	20	318	9224
OLS-POT	168.9	107	5095	4766	1	107	6672	127	10920	10529	2	128	7060
MOS-SAN	244.9	88	207443	206058	50	138	1077	20	457378	457058	112	132	n/d
EP1-ROG	274.2	563	19936836	19929902	5464	6027	1358554	574	69407461	69400387	19028	19602	20367689
EPL-EPL	829.4	68	19198	17705	15	82	3323	54	52650	51472	43	96	1618

Table 7.3 Summary of concentration data used for calculations of chlorpyrifos and diazinon values derived from ELISA analysis (SSC, suspended solids concentration; C, chlorpyrifos; D, diazinon; ss, suspended solids)

2003 Ambient Monitoring (Cont.)

Column:	A	B	C	D	H	I	J	K	L	M	N	O	P
Formula					A*D/1e6	B+H					A*M/1e6	K+M	
Site	SSC mg/L	C APC ng/L	Measured C SPCM ng/kg	Adjusted C SPCM ng/kg	C SPC ng/L	C TPC ng/L	C BPC ng/kg	D APC ng/L	Measured D SPCM ng/kg	Adjusted D SPCM ng/kg	D SPC ng/L	D TPC ng/L	D BPC ng/kg
Oct-03													
SAL-DAV	28.8	n/d	n/d	n/d	0	0	7191	20	7312	7236	0	20	11127
SAL-MON	57.8	45	2286	2140	0	45	14262	n/d	16680	16680	1	1	2332
BLA-COO	24.1	94	n/d	n/d	0	94	19911	120	9061	8600	0	121	5944
BLA-PUM	52.6	n/d	n/d	n/d	0	0	n/d	88	5515	5163	0	88	5008
REC-JON	9.3	71	25674	25481	0	71	190260	372	15146	14131	0	373	49856
OLS-POT	91.0	53	23126	22972	2	55	2521	80	47816	47585	4	84	3250
MOS-SAN	204.1	57	1553	1451	0	58	n/d	n/d	2385	2385	0	0	1176
EP1-ROG	215.3	477	3587613	3586518	772	1249	274975	336	8481368	8480596	1826	2162	2825563
EPL-EPL	323.0	51	n/d	n/d	0	51	n/d	88	4782	4543	1	89	1349
2002 Ambient Means:													
SAL-DAV	76.6	78.0	39946.5	38312.4	2.5	67.1	17373.1	57.3	103072.2	100778.3	6.9	64.1	8482.0
SAL-MON	75.1	55.9	38836.5	36631.4	4.0	49.9	23287.4	28.6	85663.1	84949.1	8.6	33.1	2090.2
BLA-COO	127.0	68.8	29100.9	28851.4	1.7	59.7	22627.8	98.5	60772.4	56815.1	4.6	103.0	4509.6
BLA-PUM	132.2	60.2	22943.8	21883.9	2.8	62.5	4427.2	88.6	21006.6	18942.6	3.0	91.6	4140.0
REC-JON	48.9	92.9	306253.1	303798.2	17.2	110.1	109012.6	419.4	270825.0	259641.5	10.8	430.2	34231.6
OLS-POT	195.7	71.2	13884.3	13279.4	1.5	72.3	10236.3	144.4	19353.6	17328.5	3.0	147.4	15207.3
MOS-SAN	248.7	77.6	84207.2	83362.0	21.1	86.7	2844.7	94.7	83012.5	81640.2	20.4	101.6	2900.6
EP1-ROG	320.2	380.6	3713149.8	3710482.8	955.9	1336.5	455559.8	709.3	14017549.8	14009281.8	3457.2	4166.5	3916688.5
EPL-EPL	307.2	62.5	67980.5	66044.5	13.4	66.4	3045.8	59.9	49887.2	48263.4	14.0	73.9	2807.7

Table 7.4 Data of depth profiles performed during sampling runs taken with a multi-probe data logger system for each site.

July 2002 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	BP	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
SAL-DAV	8/7:00	0	17.68	0.47	5.95	7.83	-62.0	14.75	0.41	62.5	2.47	0.23	0.31
SAL-DAV	8/7:00	0.5	17.67	0.47	6.12	7.74	-57.5	14.76	0.41	64.3	2.47	0.23	0.31
SAL-DAV	8/7:00	1	17.68	0.47	6.18	7.73	-56.9	14.75	0.41	64.9	2.47	0.23	0.31
SAL-DAV	8/7:00	1.5	17.68	0.47	6.23	7.80	-60.8	14.76	0.41	65.5	2.47	0.23	0.31
SAL-DAV	8/7:00	2	17.67	0.47	6.23	7.78	-59.4	14.76	0.41	65.5	2.46	0.23	0.31
SAL-DAV	8/7:00	2.5	17.67	0.47	6.17	7.79	-60.0	14.76	0.41	64.8	2.47	0.23	0.31
SAL-MON	8/16:20	0	19.06	0.06	9.90	8.07	-75.7	14.76	0.05	106.8	18.93	0.03	0.04
SAL-MON	8/16:20	0.5	22.27	1.57	8.43	8.74	-113.3	14.76	1.49	97.4	0.67	0.79	1.02
SAL-MON	8/16:20	1	22.25	1.58	8.62	8.80	-116.2	14.76	1.50	99.5	0.67	0.80	1.03
SAL-MON	8/16:20	1.5	22.23	1.60	8.59	8.79	-115.6	14.76	1.51	99.1	0.66	0.81	1.04
BLA-COO	8/10:00	0	17.90	2.64	6.09	7.81	-61.3	14.83	2.28	64.7	0.44	1.37	1.71
BLA-COO	8/10:00	0.5	17.72	2.64	5.77	7.77	-58.7	14.86	2.27	61.1	0.44	1.37	1.72
BLA-PUM	8/11:15	0	20.44	2.63	10.35	8.27	-86.5	14.78	2.40	115.7	0.42	1.36	1.71
BLA-PUM	8/11:15	0.5	18.97	2.59	8.08	8.18	-81.3	14.77	2.29	87.7	0.44	1.34	1.68
BLA-PUM	8/11:15	1	18.86	2.60	7.57	8.11	-77.8	14.77	2.29	82	0.44	1.35	1.69
REC-JON	8/12:15	0	21.84	1.36	17.32	9.15	-135.3	14.73	1.27	198.2	0.78	0.68	0.88
OLS-POT	9/10:45	0	21.82	8.80	21.31	9.02	-128.0	14.79	8.27	250.0	0.12	4.92	5.72
OLS-POT	9/10:45	0.5	18.17	33.29	13.51	8.43	-95.0	14.81	28.95	162.3	0.03	20.90	21.64
MOS-SAN	9/9:45	0	14.54	48.62	5.46	7.99	-70.0	14.73	38.90	65.2	0.03	31.74	31.60
MOS-SAN	9/9:45	0.5	14.11	48.94	5.38	7.94	-67.5	14.73	38.76	63.8	0.03	31.96	31.81
EP1-ROG	8/13:35	0	28.36	1.42	6.90	8.31	-90.6	14.82	1.51	89.1	0.66	0.71	0.92
EPL-EPL	8/15:00	0	29.41	5.22	21.17	9.79	-174.6	14.79	5.66	281.4	0.18	2.79	3.39

October 2002 sampling run

SAL-DAV	22/7:30	0	16.74	1.69	10.87	7.83	-67.5		1.42	112.4	0.70	0.86	1.10
SAL-DAV	22/7:30	0.5	16.75	1.69	10.99	7.84	-68.2		1.42	113.7	0.70	0.86	1.10
SAL-DAV	22/7:30	1	16.74	1.69	10.96	7.83	-67.7		1.42	113.4	0.70	0.86	1.10
SAL-DAV	22/7:30	1.5	16.61	1.70	10.83	7.83	-67.7		1.43	111.8	0.70	0.86	1.10
SAL-DAV	22/7:30	2	16.43	1.71	10.51	7.82	-66.9		1.43	108.0	0.70	0.87	1.11
SAL-DAV	22/7:30	2.5	16.33	1.71	10.06	7.77	-64.3		1.43	103.2	0.70	0.87	1.11
SAL-MON	22/17:00	0	15.87	1.24	8.61	8.28	-92.2		1.03	87.3	0.98	0.62	0.81
SAL-MON	22/17:00	0.5	15.88	1.24	8.67	8.36	-97.0		1.03	88.0	0.97	0.62	0.81
SAL-MON	22/17:00	0.75	15.89	1.24	8.85	8.40	-99.0		1.03	89.7	0.97	0.62	0.81
BLA-COO	22/11:10	0	14.13	2.75	5.41	7.81	-66.0		2.18	53.1	0.46	1.44	1.79
BLA-PUM	22/10:20	0	15.24	2.44	6.31	8.09	-81.4		1.99	63.4	0.50	1.27	1.59
BLA-PUM	22/10:20	0.5	15.22	2.44	6.95	8.25	-90.8		1.99	69.7	0.50	1.27	1.59
BLA-PUM	22/10:20	0.75	15.42	2.49	7.25	8.22	-89.2		2.03	73.1	0.49	1.29	1.62
REC-JON	22/12:20	0	14.52	1.43	5.47	7.97	-74.9		1.15	53.9	0.87	0.72	0.93
OLS-POT	22/15:20	0	14.60	9.28	8.49	8.16	-85.2		7.43	86.1	0.13	5.23	6.03
OLS-POT	22/15:20	0.5	15.11	32.73	8.08	7.92	-71.9		26.55	91.1	0.04	20.51	21.28
OLS-POT	22/15:20	0.75	15.10	38.84	7.28	7.89	-70.8		31.50	84.2	0.03	24.75	25.24
MOS-SAN	22/15:20	0	14.91	42.79	6.23	7.65	-57.5		34.55	73.0	0.03	27.55	27.82
MOS-SAN	22/15:20	0.5	14.89	42.89	5.93	7.72	-61.0		34.61	69.5	0.03	27.63	27.88
MOS-SAN	22/15:20	1	14.89	42.93	6.16	7.72	-61.4		34.64	72.2	0.03	27.66	27.91
EP1-ROG	22/13:30	0	17.71	1.06	8.66	8.28	-92.8		0.91	91.3	1.10	0.53	0.69
EPL-EPL	23/13:45	0	14.97	4.53	12.98	8.54	-106.8		3.66	130.6	0.27	2.43	2.94
EPL-EPL	23/13:45	0.3	15.00	4.52	11.07	8.54	-106.3		3.66	111.4	0.27	2.43	2.94

Table 7.4 Data of depth profiles performed during sampling runs taken with a multi-probe data logger system for each site.

March 2003 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
BLA-COO	12/16:08	0	20.79	2.63	12.18	8.25	-89.6	2.42	137.1	0.41	1.36	1.71
BLA-PUM	12/15:23	0	18.69	2.55	11.30	8.06	-78.3	2.25	122.0	0.45	1.32	1.66
BLA-PUM	12/15:24	0.5	18.62	2.57	10.69	8.16	-84.0	2.26	115.2	0.44	1.33	1.67
EP1-ROG	13/10:48	0	16.76	1.76	9.84	8.19	-85.3	1.48	101.8	0.68	0.89	1.14
EPL-EPL	13/15:14	0	19.86	2.58	6.46	7.44	-43.7	2.32	71.4	0.43	1.33	1.67
MOS-SAN	12/12:53	0	19.30	24.69	7.52	6.91	-13.9	22.01	89.1	0.05	15.06	16.05
MOS-SAN	12/12:54	0.5	19.30	24.78	7.24	7.54	-49.7	22.08	85.9	0.05	15.12	16.11
MOS-SAN	12/12:55	1	15.04	47.17	6.01	7.58	-51.1	38.20	72.1	0.03	30.70	30.66
MOS-SAN	12/12:57	1.3	14.68	48.20	5.14	7.62	-53.1	38.70	61.4	0.03	31.44	31.33
OLS-POT	12/13:29	0	20.94	20.86	9.38	7.84	-66.3	19.24	113.1	0.05	12.52	13.56
OLS-POT	12/13:31	0.35	21.47	23.28	9.99	8.01	-76.4	21.71	122.8	0.05	14.10	15.13
REC-JON	13/10:08	0	16.75	1.35	8.10	8.67	-112.0	1.14	83.8	0.88	0.68	0.88
SAL-DAV	13/9:09	0	17.12	1.35	6.61	7.55	-49.7	1.15	68.8	0.87	0.68	0.88
SAL-DAV	13/9:10	0.5	17.16	1.35	6.85	7.66	-55.7	1.15	71.4	0.87	0.68	0.88
SAL-DAV	13/9:12	1	16.64	1.36	5.12	7.62	-53.7	1.14	52.8	0.87	0.68	0.88
SAL-DAV	13/9:14	1.5	15.18	1.39	3.84	7.53	-48.6	1.13	38.4	0.89	0.70	0.90
SAL-DAV	13/9:15	2	14.06	1.43	3.05	7.40	-40.9	1.13	29.7	0.88	0.72	0.93
SAL-DAV	13/9:17	2.5	13.63	1.60	0.37	7.24	-32.3	1.25	3.5	0.80	0.81	1.04
SAL-MON	12/14:19	0	19.30	18.63	12.39	7.79	-63.2	16.60	143.5	0.06	11.08	12.11
SAL-MON	12/14:20	0.5	19.73	18.53	12.46	7.99	-74.8	16.67	145.5	0.06	11.02	12.05
SAL-MON	12/14:21	1	19.58	18.83	12.20	8.12	-82.1	16.88	142.1	0.06	11.21	12.24
SAL-MON	12/14:23	1.5	18.57	21.25	7.70	7.92	-70.5	18.64	88.8	0.05	12.79	13.81
SAL-MON	12/14:24	2	16.65	27.96	1.50	7.62	-53.4	23.50	17.1	0.04	17.26	18.17
SAL-MON	12/14:25	2.5	16.12	37.67	0.39	7.53	-48.3	31.28	4.5	0.03	23.95	24.49

May 2003 sampling run

sal-dav	30/12:11	0.00	19.94	0.86	6.83	7.64	-60.10	0.78	75.20	1.29	0.42	0.56
sal-dav	30/12:13	0.50	19.46	0.86	6.33	7.59	-57.20	0.77	69.10	1.30	0.42	0.56
sal-dav	30/12:14	1.00	18.81	0.87	5.49	7.48	-51.00	0.77	59.00	1.30	0.43	0.57
sal-dav	30/12:16	1.50	18.32	0.87	4.84	7.36	-44.40	0.76	51.60	1.32	0.43	0.56
sal-dav	30/12:17	2.00	18.21	0.87	4.51	7.24	-37.70	0.76	47.90	1.32	0.43	0.57
sal-dav	30/12:17	2.50	18.21	0.88	4.38	7.13	-31.70	0.77	46.60	1.31	0.43	0.57
bla-coo	30/12:58	0.00	18.55	3.06	12.97	8.07	-84.20	2.68	139.90	0.37	1.60	1.99
bla-pum	30/13:31	0.00	18.32	2.83	11.55	8.09	-85.10	2.47	123.90	0.40	1.48	1.84
bla-pum	30/13:35	0.50	17.38	2.87	10.38	7.92	-75.30	2.45	109.20	0.41	1.50	1.87
sal-mon	30/14:44	0.00	20.31	1.10	6.82	8.11	-86.70	1.00	75.70	1.00	0.55	0.72
sal-mon	30/14:45	0.50	20.31	1.10	6.84	8.10	-86.00	1.00	76.00	1.00	0.55	0.71
sal-mon	30/14:45	1.00	20.32	1.10	6.80	8.06	-83.70	1.00	75.50	1.00	0.55	0.72
sal-mon	30/14:45	1.50	20.32	1.10	6.78	7.98	-79.70	1.00	75.30	1.00	0.55	0.71
sal-mon	30/14:46	2.00	20.32	1.10	6.79	7.94	-77.30	1.00	75.30	1.00	0.55	0.71
sal-mon	30/14:46	2.50	20.31	1.10	6.79	7.88	-73.60	1.00	75.30	1.00	0.55	0.71
sal-mon	30/14:47	3.00	19.92	1.13	6.39	7.80	-69.00	1.02	70.40	0.98	0.56	0.73
sal-mon	30/14:49	3.50	19.68	2.08	0.36	7.52	-53.60	1.87	4.00	0.54	1.07	1.35
mos-san	30/15:40	0.00	20.11	24.77	7.81	7.87	-73.10	22.46	94.10	0.04	15.11	16.10
mos-san	30/15:42	0.50	16.78	43.70	6.35	7.81	-69.40	36.84	77.60	0.03	28.23	28.40
mos-san	30/15:43	1.00	15.08	49.92	6.14	7.81	-69.20	40.47	74.60	0.02	32.71	32.45
mos-san	30/15:44	1.50	14.23	50.98	5.77	7.81	-69.00	40.49	69.20	0.02	33.46	33.13
rec-jon	31/10:13	0.00	17.29	1.59	6.37	8.48	-106.50	1.36	66.60	0.74	0.81	1.04
ep1-rog	31/10:54	0.00	22.04	0.79	4.90	8.08	-85.70	0.74	56.20	1.35	0.38	0.51
epl-epl	31/11:36	0.00	20.78	3.13	7.17	8.34	-100.10	2.88	80.80	0.35	1.64	2.03
ols-pot	31/12:09	0.00	21.30	2.83	7.48	8.19	-91.60	2.63	85.10	0.38	1.47	1.84
ols-pot	31/12:10	0.50	17.46	30.35	6.02	7.81	-69.50	25.98	70.50	0.04	18.88	19.73
ols-pot	31/12:12	0.75	16.83	35.85	5.65	7.79	-68.40	30.25	66.80	0.03	22.68	23.30

Table 7.4 Data of depth profiles performed during sampling runs taken with a multi-probe data logger system for each site.

June 2003 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
sal-dav	9/10:24	0.00	19.02	1.29	7.65	7.38	-45.70	1.15	82.80	0.87	0.65	0.84
sal-dav	9/10:25	0.50	19.03	1.29	7.31	7.32	-42.30	1.15	79.20	0.87	0.65	0.84
sal-dav	9/10:26	1.00	19.01	1.30	6.85	7.18	-34.20	1.15	74.10	0.87	0.65	0.85
sal-dav	9/10:27	1.50	18.84	1.33	5.20	7.00	-24.20	1.17	56.10	0.85	0.67	0.86
sal-dav	9/10:30	2.00	18.81	1.34	4.55	7.00	-24.30	1.18	49.00	0.85	0.67	0.87
sal-dav	9/10:31	2.50	18.74	1.36	4.25	7.04	-26.60	1.20	45.80	0.84	0.68	0.88
bla-coo	9/11:16	0.00	16.34	3.09	6.79	7.54	-53.90	2.58	70.00	0.39	1.62	2.01
bla-pum	9/11:48	0.00	16.11	2.95	6.55	7.65	-60.50	2.45	67.10	0.41	1.55	1.92
mos-san	9/12:32	0.00	18.18	18.30	11.86	8.04	-82.60	15.91	134.10	0.06	10.87	11.89
mos-san	9/12:35	1.50	14.98	47.22	6.72	7.77	-67.10	38.18	80.50	0.03	30.74	30.70
ols-pot	9/13:11	0.00	20.11	12.15	11.30	8.31	-98.00	11.02	129.80	0.09	6.98	7.90
ols-pot	9/13:12	0.50	20.13	12.06	11.30	8.31	-97.90	10.94	129.80	0.09	6.91	7.84
sal-mon	10/10:11	0.00	19.11	1.79	7.68	7.96	-78.20	1.59	83.40	0.63	0.91	1.17
sal-mon	10/10:12	0.50	19.11	1.79	7.65	7.98	-79.10	1.59	83.10	0.63	0.91	1.17
sal-mon	10/10:12	1.00	19.11	1.80	7.55	7.91	-75.20	1.60	82.00	0.63	0.92	1.17
sal-mon	10/10:13	1.50	19.12	1.82	7.56	7.86	-72.60	1.61	82.10	0.62	0.93	1.18
sal-mon	10/10:13	2.00	19.08	1.87	7.54	7.83	-70.60	1.66	81.80	0.60	0.95	1.21
sal-mon	10/10:14	2.50	19.00	2.03	7.22	7.76	-66.90	1.80	78.40	0.56	1.04	1.32
rec-jon	10/11:12	0.00	18.09	1.25	11.77	8.57	-112.30	1.09	125.00	0.92	0.63	0.82
ep1-rog	10/11:58	0.00	22.50	0.95	7.89	8.10	-86.70	0.90	91.30	1.11	0.47	0.62
epl-epl	10/12:31	0.00	22.57	3.39	3.88	7.92	-76.60	3.23	45.40	0.31	1.78	2.20

July 2003 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
sal-dav	14/10:57	0.00	21.71	1.92	6.81	7.80	-69.80	1.80	77.90	0.56	0.98	1.25
sal-dav	14/10:57	0.50	21.41	1.90	5.77	7.81	-70.40	1.77	65.60	0.56	0.97	1.24
sal-dav	14/10:58	1.00	20.46	1.90	5.06	7.79	-69.00	1.74	56.40	0.58	0.97	1.24
sal-dav	14/10:59	1.50	20.27	1.89	5.38	7.79	-69.00	1.72	59.80	0.58	0.97	1.23
sal-dav	14/10:59	2.00	20.28	1.90	5.47	7.78	-68.30	1.73	60.80	0.58	0.97	1.23
sal-dav	14/11:00	2.50	20.05	1.89	5.05	7.77	-68.00	1.71	55.90	0.58	0.96	1.23
sal-dav	14/11:01	3.00	20.04	1.89	4.45	7.74	-66.00	1.71	49.20	0.59	0.96	1.23
bla-coo	14/11:54	0.00	19.20	2.96	6.56	7.77	-67.70	2.63	71.60	0.38	1.55	1.92
bla-coo	14/11:55	0.50	19.06	2.96	5.01	7.65	-61.40	2.63	54.60	0.38	1.55	1.93
bla-coo	14/11:55	0.80	18.98	2.98	5.44	7.60	-58.30	2.63	59.20	0.38	1.56	1.94
bla-pum	14/12:24	0.00	19.65	2.80	8.92	7.87	-73.00	2.52	98.20	0.40	1.46	1.82
bla-pum	14/12:24	0.50	19.35	2.83	8.37	7.81	-70.00	2.53	91.70	0.40	1.48	1.84
bla-pum	14/12:25	0.80	19.06	2.85	7.74	7.73	-65.40	2.53	84.30	0.40	1.49	1.85
rec-jon	14/13:45	0.20	22.97	1.41	8.38	8.29	-96.80	1.35	98.10	0.74	0.70	0.92
ep1-rog	14/14:34	0.15	26.98	1.27	5.87	7.97	-80.00	1.32	73.80	0.76	0.63	0.83
sal-mon	15/14:00	0.00	20.81	2.78	7.57	8.19	-91.30	2.55	85.30	0.39	1.44	1.80
sal-mon	15/14:01	0.50	21.05	2.77	8.17	8.34	-99.20	2.56	92.50	0.39	1.44	1.80
sal-mon	15/14:02	1.00	20.98	2.77	8.51	8.36	-100.40	2.56	96.20	0.39	1.44	1.80
sal-mon	15/14:02	1.50	20.87	2.77	8.59	8.38	-101.60	2.55	96.90	0.39	1.44	1.80
sal-mon	15/14:02	2.00	20.79	2.79	8.57	8.38	-101.40	2.56	96.50	0.39	1.45	1.81
sal-mon	15/14:02	2.50	20.73	2.80	8.38	8.38	-101.50	2.57	94.30	0.39	1.46	1.82
sal-mon	15/14:03	3.00	20.65	2.90	7.02	8.30	-97.30	2.66	78.90	0.38	1.51	1.89
sal-mon	15/14:03	3.60	20.63	2.87	5.74	8.25	-94.40	2.63	64.50	0.38	1.50	1.87
ols-pot	15/15:11	0.00	22.54	19.32	10.38	8.41	-103.90	18.41	128.20	0.05	11.50	12.56
ols-pot	15/15:13	0.50	16.51	42.55	13.01	8.18	-89.50	35.65	157.30	0.03	27.41	27.66
ols-pot	15/15:13	0.75	15.93	43.94	11.80	8.08	-84.10	36.33	141.80	0.03	28.39	28.56
mos-san	15/16:06	0.00	16.81	48.18	8.27	7.79	-68.60	40.65	103.10	0.02	31.47	31.32
mos-san	15/16:06	0.50	17.06	48.01	7.99	7.85	-71.80	40.73	100.00	0.02	31.34	31.20
mos-san	15/16:07	1.00	16.82	48.22	7.87	7.85	-71.80	40.69	98.10	0.02	31.50	31.35
mos-san	15/16:07	1.50	13.34	50.49	5.97	7.74	-65.40	39.24	70.20	0.03	33.07	32.82
mos-san	15/16:08	2.20	13.08	50.54	5.78	7.69	-62.80	39.04	67.50	0.03	33.10	32.85

Table 7.4 Data of depth profiles performed during sampling runs taken with a multi-probe data logger system for each site.

August 2003 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
bla-coo	3/10:54	0.00	19.61	2.80	3.86	7.26	-53.40	2.52	42.50	0.40	1.46	1.82
bla-pum	3/11:39	0.00	20.15	2.61	4.78	7.66	-75.30	2.37	53.10	0.42	1.35	1.70
rec-jon	3/12:46	0.00	21.64	1.47	14.01	8.21	-106.10	1.37	159.80	0.73	0.74	0.95
epl-epl	3/13:44	0.00	24.34	3.73	9.94	8.18	-104.90	3.69	120.20	0.27	1.97	2.43
ep1-rog	3/14:18	0.00	27.46	0.88	6.95	7.75	-81.30	0.92	88.20	1.09	0.43	0.57
mos-san	4/9:25	0.00	20.35	15.65	8.56	7.95	-91.50	14.26	100.00	0.07	9.17	10.17
mos-san	4/9:27	0.50	19.06	25.12	6.15	7.74	-79.60	22.27	72.70	0.04	15.34	16.33
ols-pot	4/10:02	0.00	21.76	6.90	7.30	8.16	-103.20	6.47	85.00	0.15	3.79	4.48
ols-pot	4/10:03	0.50	21.77	6.83	7.43	8.14	-102.30	6.41	86.40	0.16	3.75	4.44
ols-pot	4/10:03	1.00	21.78	6.82	7.47	8.14	-101.90	6.40	86.90	0.16	3.75	4.43
sal-dav	4/12:15	0.00	22.66	0.56	5.89	7.87	-87.30	0.54	68.40	1.86	0.27	0.37
sal-dav	4/12:16	0.50	22.36	0.56	5.49	7.82	-84.60	0.54	63.40	1.87	0.27	0.37
sal-dav	4/12:18	1.00	21.29	0.57	3.87	7.70	-77.80	0.53	43.70	1.89	0.28	0.37
sal-dav	4/12:19	1.50	20.90	0.58	3.47	7.57	-70.60	0.53	38.90	1.88	0.28	0.38
sal-dav	4/12:21	2.00	20.81	0.61	3.19	7.37	-59.50	0.56	35.70	1.80	0.29	0.39
sal-dav	4/12:22	2.50	20.76	0.66	2.65	7.21	-50.50	0.61	29.70	1.65	0.32	0.43
September 2003 sampling run												
sal-dav	18/11:28	0.00	19.59	1.85	16.16	7.88	-80.10	1.66	177.20	0.60	0.94	1.20
sal-dav	18/11:30	0.50	19.21	1.85	15.13	7.99	-85.70	1.65	164.70	0.61	0.94	1.20
sal-dav	18/11:30	1.00	18.83	1.85	14.91	8.01	-87.00	1.63	161.10	0.61	0.94	1.20
sal-dav	18/11:31	1.50	18.49	1.84	15.05	8.03	-88.00	1.61	161.40	0.62	0.94	1.20
sal-dav	18/11:34	2.00	18.32	1.84	13.96	8.06	-89.40	1.61	149.20	0.62	0.94	1.20
bla-coo	18/12:22	0.00	21.05	2.80	21.80	7.96	-84.60	2.59	246.90	0.39	1.46	1.82
bla-pum	18/12:54	0.00	18.49	2.75	18.34	7.93	-82.30	2.40	197.30	0.42	1.43	1.78
rec-jon	18/13:51	0.00	19.63	1.44	15.54	8.11	-92.60	1.29	170.40	0.77	0.73	0.94
sal-mon	18/14:57	0.00	21.95	3.16	26.89	8.64	-121.30	2.98	310.10	0.34	1.65	2.06
sal-mon	18/14:59	0.50	21.95	3.16	25.53	8.69	-124.40	2.98	294.50	0.34	1.65	2.06
sal-mon	18/14:59	1.00	21.92	3.16	25.46	8.69	-124.00	2.97	293.50	0.34	1.65	2.05
sal-mon	18/15:01	1.50	21.41	3.14	24.21	8.68	-123.40	2.93	276.30	0.34	1.64	2.04
sal-mon	18/15:03	2.00	20.32	3.16	17.68	8.57	-117.40	2.88	197.50	0.35	1.66	2.06
sal-mon	18/15:05	2.50	20.06	3.23	14.41	8.43	-109.70	2.93	160.30	0.34	1.70	2.10
ep1-rog	19/9:34	0.00	17.05	1.14	16.47	7.79	-74.70	0.96	171.20	1.04	0.57	0.74
epl-epl	19/10:26	0.00	22.21	3.72	19.27	8.81	-130.80	3.53	223.80	0.28	1.97	2.42
mos-san	19/11:10	0.00	18.79	27.84	17.68	8.10	-91.60	24.53	210.10	0.04	17.17	18.09
mos-san	19/11:12	0.50	16.42	47.73	11.03	7.85	-77.90	39.91	136.20	0.03	31.14	31.03
mos-san	19/11:13	1.00	15.21	49.27	10.73	7.80	-75.10	40.05	130.20	0.02	32.23	32.02
mos-san	19/11:14	1.50	14.93	49.33	10.96	7.80	-74.90	39.84	132.20	0.03	32.27	32.06
ols-pot	19/12:32	0.00	22.18	8.93	18.62	8.53	-115.60	8.44	219.90	0.12	5.00	5.80
ols-pot	19/12:33	0.50	18.14	40.07	9.40	7.87	-79.30	34.82	116.10	0.03	25.65	26.04
ols-pot	19/12:34	0.75	18.05	41.50	8.97	7.83	-76.90	35.99	111.20	0.03	26.66	26.97

Table 7.4 Data of depth profiles performed during sampling runs taken with a multi-probe data logger system for each site.

October 2003 sampling run

Site	Day/Time	Depth (m)	Temp ©	SpCond mS/cm	DO Conc (mg/L)	pH	pHmV	Cond mS/cm	DO %	Resistivity Kohm.cm	Salinity PPT	TDS (g/L)
sal-dav	21/8:16	0.00	16.74	2.10	11.20	7.91	-93.10	1.77	116.00	0.57	1.08	1.37
sal-dav	21/8:17	0.50	16.72	2.10	10.85	7.94	-94.90	1.77	112.30	0.57	1.08	1.37
sal-dav	21/8:19	1.00	16.40	2.10	9.81	7.89	-91.90	1.76	100.90	0.57	1.08	1.37
sal-dav	21/8:20	1.50	15.95	2.10	8.20	7.79	-86.60	1.74	83.50	0.58	1.08	1.37
sal-dav	21/8:22	1.75	15.73	2.11	5.57	7.66	-79.70	1.74	56.50	0.58	1.08	1.37
bla-coo	21/9:03	0.00	14.82	2.70	6.41	7.55	-74.20	2.17	63.80	0.46	1.41	1.75
bla-pum	21/9:31	0.00	16.73	2.69	10.62	8.03	-99.50	2.27	110.20	0.44	1.40	1.75
sal-mon	21/10:33	0.00	17.34	2.81	6.64	8.26	-112.00	2.40	69.80	0.42	1.47	1.83
sal-mon	21/10:35	0.50	17.33	2.81	6.50	8.34	-116.50	2.40	68.30	0.42	1.47	1.83
sal-mon	21/10:36	1.00	17.27	2.81	6.81	8.32	-115.10	2.40	71.50	0.42	1.47	1.83
sal-mon	21/10:36	1.50	17.17	2.81	6.06	8.34	-116.00	2.39	63.50	0.42	1.47	1.83
sal-mon	21/10:38	2.00	17.04	2.82	5.89	8.35	-116.70	2.39	61.50	0.42	1.47	1.83
sal-mon	21/10:39	2.50	16.87	2.91	5.71	8.30	-113.80	2.46	59.40	0.41	1.52	1.89
sal-mon	21/10:42	2.75	16.98	2.83	4.52	8.03	-99.60	2.39	47.10	0.42	1.48	1.84
rec-jon	21/11:43	0.00	17.49	1.74	8.18	8.24	-110.80	1.49	86.00	0.67	0.88	1.13
ep1-rog	21/12:17	0.00	22.33	1.53	8.15	8.03	-100.50	1.45	94.20	0.69	0.77	0.99
epl-epl	21/12:55	0.00	19.27	3.67	7.45	7.70	-82.40	3.27	81.70	0.31	1.94	2.38
mos-san	21/13:46	0.00	16.98	37.23	5.94	7.47	-70.10	31.53	70.90	0.03	23.65	24.20
mos-san	21/13:48	0.50	15.13	46.02	5.77	7.48	-70.10	37.34	68.80	0.03	29.87	29.91
mos-san	21/13:49	1.00	14.14	49.25	7.00	7.51	-71.90	39.03	83.10	0.03	32.19	32.01
mos-san	21/13:51	1.50	14.11	49.34	5.96	7.55	-73.80	39.08	70.80	0.03	32.26	32.07
ols-pot	21/14:33	0.00	18.74	9.80	8.66	8.00	-98.30	8.63	96.00	0.12	5.54	6.37
ols-pot	21/14:35	0.50	14.72	46.58	6.45	7.41	-66.70	37.43	76.50	0.03	30.27	30.27
ols-pot	21/14:36	0.75	14.57	48.05	6.42	7.41	-66.30	38.47	76.50	0.03	31.33	31.23

Table 7.5 Summary of load calculations of chlorpyrifos and diazinon. Data is based on concentration values in Table 7.3. (Q, discharge; C, chlorpyrifos; D, diazinon; Q = 0.0 indicates no flow or flow too low to measure. * =not recorded.

Date	Site	Q (L/sec)	C AIPL g/day	C SIPL g/day	C TIPL g/day	D AIPL g/day	D SIPL g/day	D TIPL g/day
08-Jul-02	SAL-DAV	121.4	1.07	0.00	1.07	0.47	0.77	1.24
29-Aug-02	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Sep-02	SAL-DAV	264.1	1.74	0.00	1.74	8.84	0.49	9.33
25-Sep-02	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-02	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
06-Nov-02	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
08-Nov-02	SAL-DAV	1584.7	23.92	2.78	26.70	42.41	10.07	52.47
11-Nov-02	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Feb-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Feb-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
20-Feb-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
14-Mar-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
16-Mar-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Apr-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
30-May-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Jul-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
04-Aug-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Sep-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-03	SAL-DAV	0.0	0.00	0.00	0.00	0.00	0.00	0.00
08-Jul-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
29-Aug-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Sep-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
25-Sep-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
06-Nov-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
11-Nov-02	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
14-Feb-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Feb-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Mar-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Apr-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
30-May-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Jul-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
04-Aug-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Sep-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-03	SAL-MON	0.0	0.00	0.00	0.00	0.00	0.00	0.00
08-Jul-02	BLA-COO	66.7	0.36	*	0.36	0.41	*	0.41
29-Aug-02	BLA-COO	53.8	0.27	0.01	0.28	0.46	0.16	0.62
13-Sep-02	BLA-COO	77.0	0.37	0.01	0.38	2.95	0.05	3.00
25-Sep-02	BLA-COO	47.8	0.21	0.00	0.21	0.83	0.06	0.90
22-Oct-02	BLA-COO	3.7	0.02	0.00	0.02	0.02	0.01	0.02
06-Nov-02	BLA-COO	20.0	0.08	0.01	0.09	0.00	0.25	0.25
08-Nov-02	BLA-COO	34.8	3.44	0.09	3.53	13.07	0.04	13.11
11-Nov-02	BLA-COO	20.0	0.21	0.01	0.22	0.10	0.03	0.13
15-Feb-03	BLA-COO	134.6	0.76	0.19	0.95	18.49	0.04	18.54
19-Feb-03	BLA-COO	89.8	0.61	0.12	0.74	0.41	0.05	0.46
20-Feb-03	BLA-COO	76.0	0.44	0.05	0.50	0.18	0.02	0.20
13-Mar-03	BLA-COO	62.0	0.29	0.05	0.34	0.14	0.05	0.19
16-Mar-03	BLA-COO	157.5	78.74	39.44	118.19	41.72	12.46	54.18
18-Mar-03	BLA-COO	90.1	0.51	0.03	0.53	0.28	0.03	0.31
19-Apr-03	BLA-COO	65.0	0.00	0.00	0.00	0.22	0.00	0.23
30-May-03	BLA-COO	75.1	0.38	0.00	0.38	0.43	0.03	0.46
10-Jun-03	BLA-COO	87.4	0.44	0.00	0.44	1.24	0.00	1.24

Table 7.5 Summary of load calculations of chlorpyrifos and diazinon. Data is based on concentration values in Table 7.3. (Q, discharge; C, chlorpyrifos; D, diazinon; Q = 0.0 indicates no flow or flow too low to measure. * =not recorded.

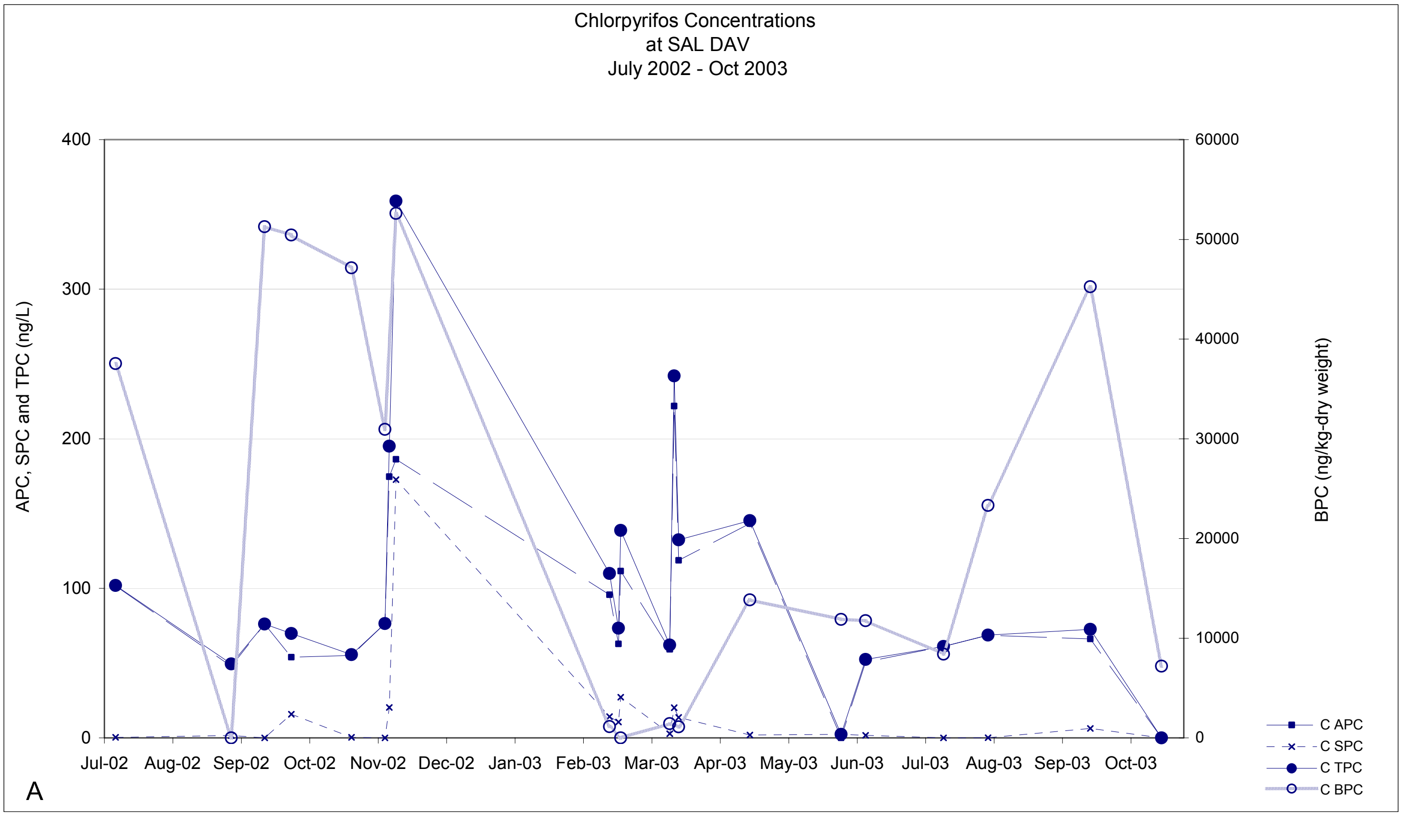
Date	Site	Q (L/sec)	C AIPL g/day	C SIPL g/day	C TIPL g/day	D AIPL g/day	D SIPL g/day	D TIPL g/day
15-Jul-03	BLA-COO	61.3	0.36	0.00	0.36	0.72	0.12	0.84
04-Aug-03	BLA-COO	81.9	0.49	0.00	0.50	0.24	0.01	0.24
19-Sep-03	BLA-COO	50.0	0.28	0.02	0.30	0.56	0.01	0.57
21-Oct-03	BLA-COO	33.7	0.27	0.00	0.27	0.35	0.00	0.35
08-Jul-02	BLA-PUM	49.5	0.27	0.00	0.27	0.52	0.01	0.53
29-Aug-02	BLA-PUM	49.5	0.22	0.00	0.22	0.53	0.04	0.57
13-Sep-02	BLA-PUM	49.5	0.24	0.01	0.25	7.99	1.20	9.19
25-Sep-02	BLA-PUM	49.5	0.23	0.02	0.25	1.59	0.08	1.67
22-Oct-02	BLA-PUM	49.5	0.25	0.00	0.25	0.23	0.40	0.63
06-Nov-02	BLA-PUM	37.6	0.19	0.00	0.19	0.14	0.01	0.15
11-Nov-02	BLA-PUM	35.0	0.37	0.01	0.38	0.62	0.00	0.62
15-Feb-03	BLA-PUM	64.8	0.39	0.06	0.44	0.38	0.01	0.39
20-Feb-03	BLA-PUM	64.8	0.47	0.07	0.54	0.51	0.01	0.52
13-Mar-03	BLA-PUM	68.7	0.32	0.02	0.34	0.33	0.02	0.34
18-Mar-03	BLA-PUM	66.0	0.61	0.02	0.64	3.13	0.02	3.14
19-Apr-03	BLA-PUM	80.0	0.36	0.01	0.37	0.46	0.00	0.46
30-May-03	BLA-PUM	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	BLA-PUM	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Jul-03	BLA-PUM	261.2	1.30	0.00	1.30	2.93	0.22	3.15
04-Aug-03	BLA-PUM	162.4	1.15	0.00	1.15	0.43	0.01	0.43
19-Sep-03	BLA-PUM	165.6	0.86	0.13	0.99	1.75	0.07	1.82
21-Oct-03	BLA-PUM	40.0	0.00	0.00	0.00	0.30	0.00	0.31
08-Jul-02	REC-JON	41.7	0.29	0.28	0.57	0.89	0.38	1.27
29-Aug-02	REC-JON	43.5	0.32	0.22	0.54	2.62	0.11	2.73
13-Sep-02	REC-JON	38.3	0.21	0.08	0.28	5.35	0.06	5.41
25-Sep-02	REC-JON	38.3	0.23	0.02	0.25	0.87	0.04	0.90
22-Oct-02	REC-JON	61.3	0.59	0.09	0.68	1.63	0.17	1.80
06-Nov-02	REC-JON	56.6	0.50	0.16	0.66	0.42	0.08	0.51
08-Nov-02	REC-JON	3540.0	45.77	883.47	929.25	159.08	98.24	257.32
11-Nov-02	REC-JON	239.5	3.07	0.12	3.19	7.65	2.38	10.03
15-Feb-03	REC-JON	28.3	0.45	0.01	0.46	0.96	0.01	0.96
19-Feb-03	REC-JON	161.5	1.50	0.39	1.89	13.46	0.28	13.74
20-Feb-03	REC-JON	85.0	1.56	0.21	1.77	14.27	0.02	14.29
14-Mar-03	REC-JON	28.3	0.22	0.10	0.31	0.61	0.04	0.65
16-Mar-03	REC-JON	2068.3	50.65	96.22	146.86	248.88	46.77	295.64
18-Mar-03	REC-JON	277.7	4.33	0.48	4.81	9.37	0.10	9.48
19-Apr-03	REC-JON	85.0	0.47	0.01	0.49	7.00	0.09	7.09
30-May-03	REC-JON	76.5	0.48	0.18	0.67	1.67	0.15	1.83
10-Jun-03	REC-JON	70.8	0.57	0.02	0.59	2.42	0.02	2.44
15-Jul-03	REC-JON	62.3	0.54	0.04	0.58	2.01	0.03	2.04
04-Aug-03	REC-JON	79.3	0.66	0.06	0.72	1.98	0.08	2.06
19-Sep-03	REC-JON	70.8	0.93	0.44	1.37	1.82	0.12	1.95
21-Oct-03	REC-JON	34.0	0.21	0.00	0.21	1.09	0.00	1.09
08-Jul-02	OLS-POT	*						
29-Aug-02	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Sep-02	OLS-POT	*						
25-Sep-02	OLS-POT	*						
22-Oct-02	OLS-POT	*						
06-Nov-02	OLS-POT	*						
08-Nov-02	OLS-POT	*						
11-Nov-02	OLS-POT	*						
14-Feb-03	OLS-POT	2304.0	20.03	3.30	23.33	40.57	1.29	41.86
19-Feb-03	OLS-POT	*						
20-Feb-03	OLS-POT	6267.7	53.32	7.38	60.70	127.05	11.57	138.62
13-Mar-03	OLS-POT	1733.7	11.23	1.89	13.12	61.37	1.41	62.78
15-Mar-03	OLS-POT	3774.7	34.64	9.61	44.25	159.37	33.68	193.05

Table 7.5 Summary of load calculations of chlorpyrifos and diazinon. Data is based on concentration values in Table 7.3. (Q, discharge; C, chlorpyrifos; D, diazinon; Q = 0.0 indicates no flow or flow too low to measure. * =not recorded.

Date	Site	Q (L/sec)	C AIPL g/day	C SIPL g/day	C TIPL g/day	D AIPL g/day	D SIPL g/day	D TIPL g/day
17-Mar-03	OLS-POT	1792.2	18.84	2.07	20.91	59.56	1.11	60.67
19-Apr-03	OLS-POT	1222.5	7.90	0.31	8.20	38.66	0.20	38.85
30-May-03	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	OLS-POT	3011.2	15.39	0.00	15.39	24.08	1.83	25.91
15-Jul-03	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
04-Aug-03	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Sep-03	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-03	OLS-POT	0.0	0.00	0.00	0.00	0.00	0.00	0.00
08-Jul-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
29-Aug-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Sep-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
25-Sep-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
06-Nov-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
11-Nov-02	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
14-Feb-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
20-Feb-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Mar-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Apr-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
30-May-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Jul-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
04-Aug-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Sep-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-03	MOS-SAN	0.0	0.00	0.00	0.00	0.00	0.00	0.00
08-Jul-02	EP1-ROG	27.4	0.28	2.44	2.72	159.11	1595.88	1755.00
29-Aug-02	EP1-ROG	18.9	0.22	0.15	0.37	5.89	31.90	37.78
13-Sep-02	EP1-ROG	20.3	1.49	48.32	49.80	21.73	488.92	510.65
25-Sep-02	EP1-ROG	11.4	0.38	2.82	3.20	17.51	76.08	93.59
22-Oct-02	EP1-ROG	24.6	0.62	8.61	9.24	14.75	469.33	484.08
06-Nov-02	EP1-ROG	12.3	0.37	0.29	0.66	3.04	1.25	4.29
08-Nov-02	EP1-ROG	119.5	2.38	18.28	20.66	30.54	101.33	131.86
11-Nov-02	EP1-ROG	15.1	0.65	4.68	5.33	6.19	10.60	16.78
15-Feb-03	EP1-ROG	35.9	1.87	2.46	4.33	2.22	55.51	57.72
19-Feb-03	EP1-ROG	58.6	4.36	3.98	8.33	5.08	25.77	30.84
20-Feb-03	EP1-ROG	12.1	0.53	0.43	0.96	2.72	6.55	9.28
14-Mar-03	EP1-ROG	9.3	0.63	0.28	0.92	0.72	1.60	2.32
16-Mar-03	EP1-ROG	325.0	26.35	389.25	415.60	50.08	212.16	262.23
18-Mar-03	EP1-ROG	9.8	0.32	0.03	0.35	0.46	1.75	2.21
19-Apr-03	EP1-ROG	30.1	0.92	0.16	1.08	7.69	1.51	9.20
30-May-03	EP1-ROG	27.9	0.28	0.32	0.59	1.04	0.67	1.70
10-Jun-03	EP1-ROG	37.5	0.35	0.10	0.45	1.00	2.29	3.29
15-Jul-03	EP1-ROG	48.9	0.80	0.20	1.00	1.46	3.53	4.98
04-Aug-03	EP1-ROG	23.4	1.74	0.37	2.11	0.04	1.92	1.96
19-Sep-03	EP1-ROG	35.7	1.74	16.85	18.59	1.77	58.69	60.46
21-Oct-03	EP1-ROG	17.0	0.70	1.13	1.84	0.49	2.68	3.18
08-Jul-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
29-Aug-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
13-Sep-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
25-Sep-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
22-Oct-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
06-Nov-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Nov-02	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
14-Mar-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
18-Mar-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00

Table 7.5 Summary of load calculations of chlorpyrifos and diazinon. Data is based on concentration values in Table 7.3. (Q, discharge; C, chlorpyrifos; D, diazinon; Q = 0.0 indicates no flow or flow too low to measure. * =not recorded.

Date	Site	Q (L/sec)	C AIPL g/day	C SIPL g/day	C TIPL g/day	D AIPL g/day	D SIPL g/day	D TIPL g/day
19-Apr-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
30-May-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
10-Jun-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
15-Jul-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
04-Aug-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
19-Sep-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00
21-Oct-03	EPL-EPL	0.0	0.00	0.00	0.00	0.00	0.00	0.00



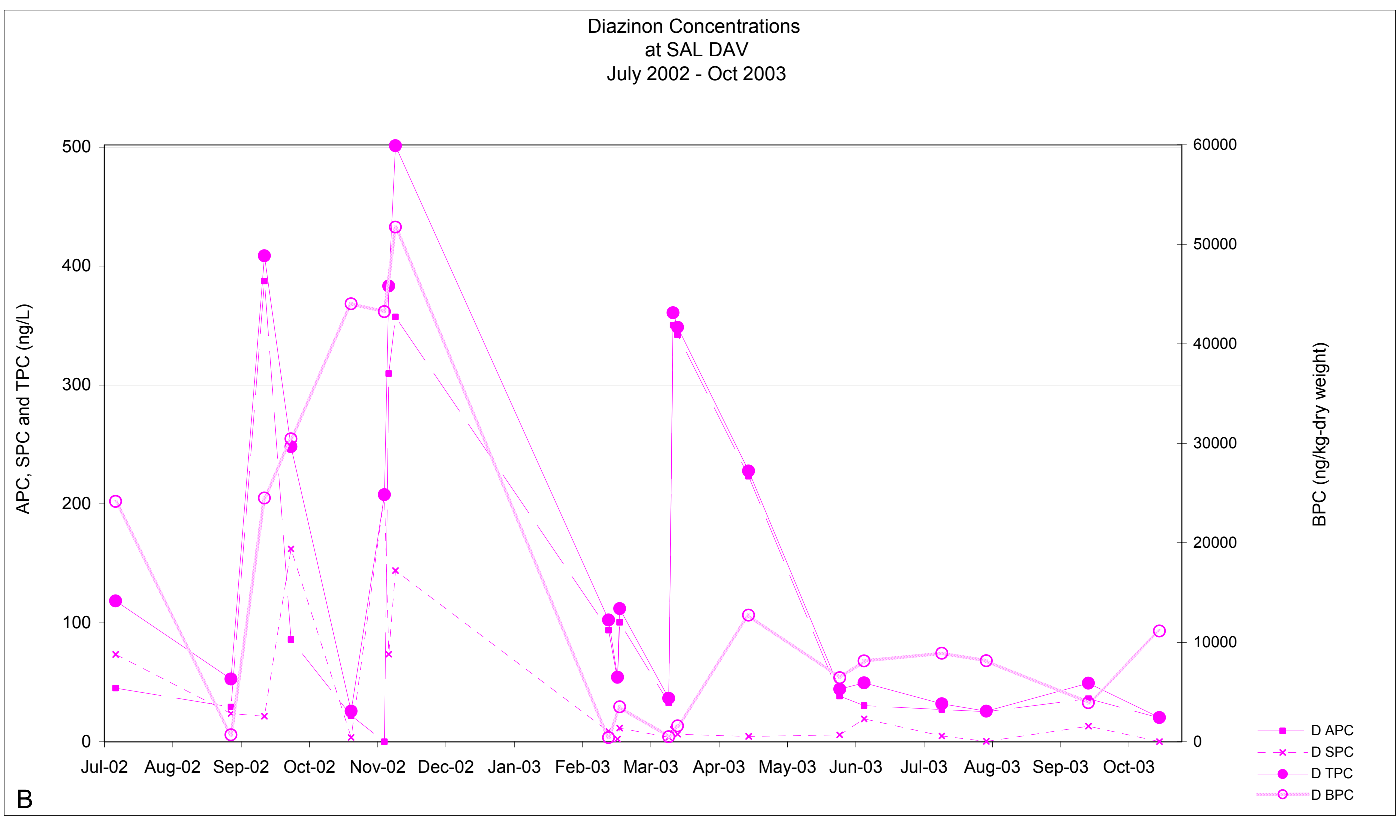
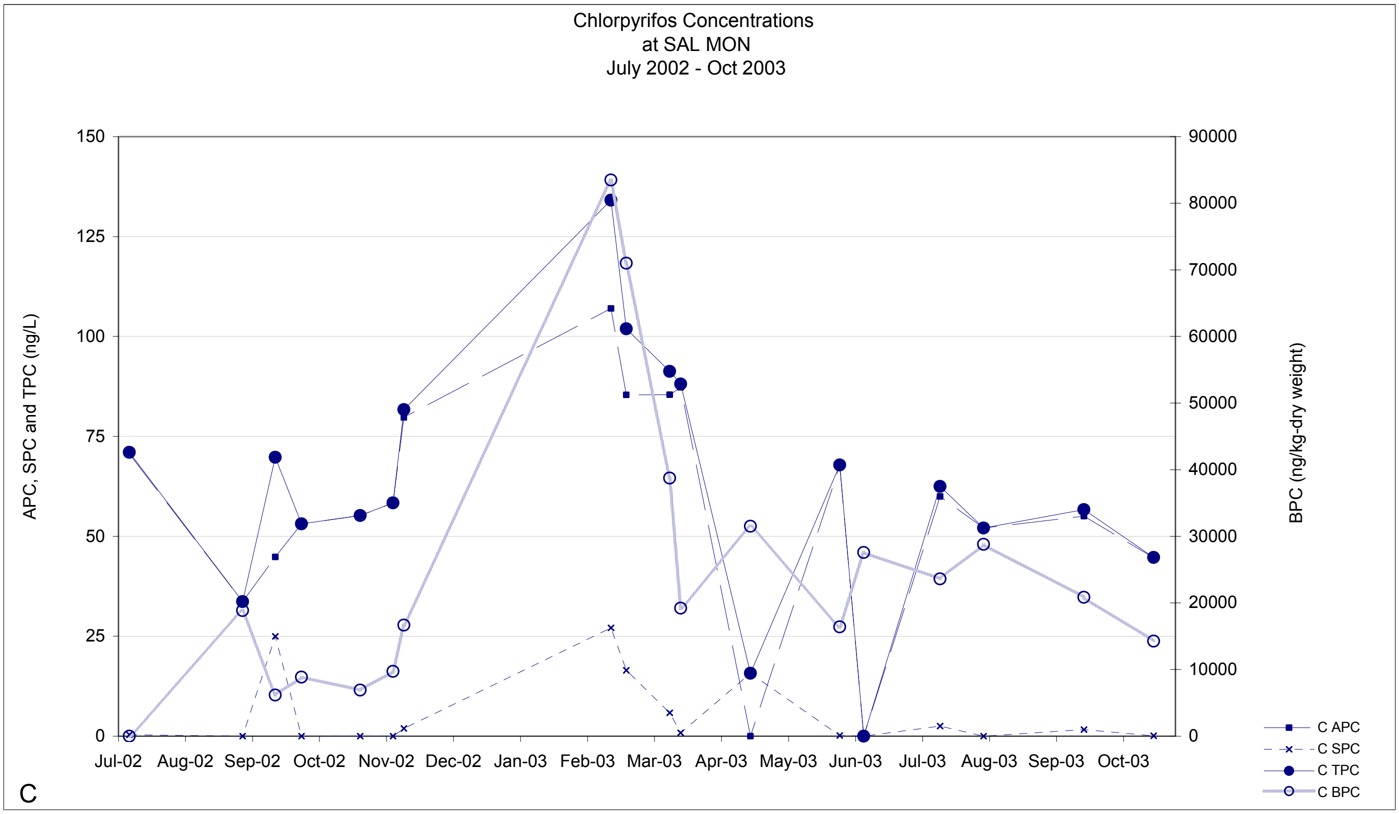


Figure 7.1 A&B SAL-DAV chlorpyrifos and diazinon concentrations.



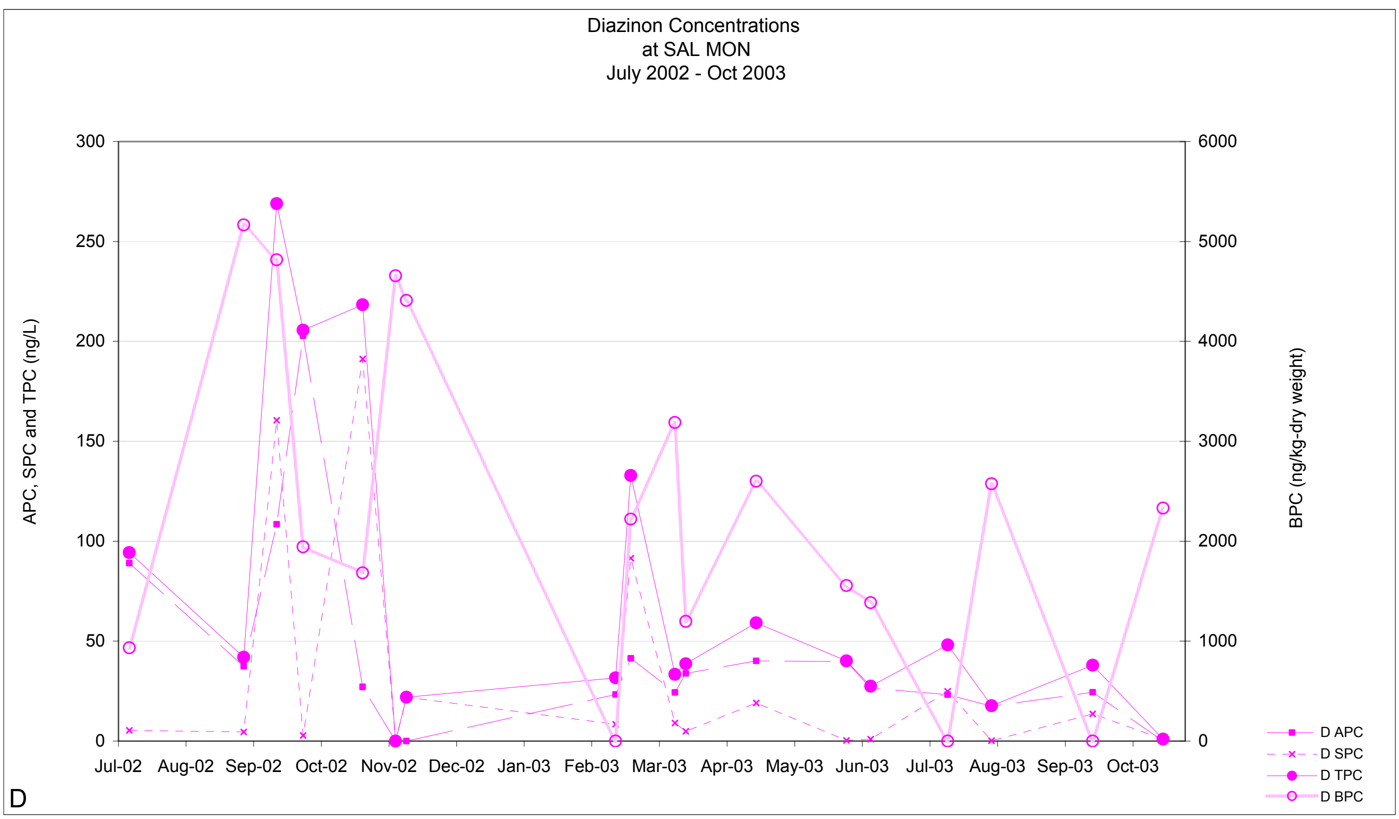


Figure 7.1 C&D SAL-MON chlorpyrifos and diazinon concentrations.

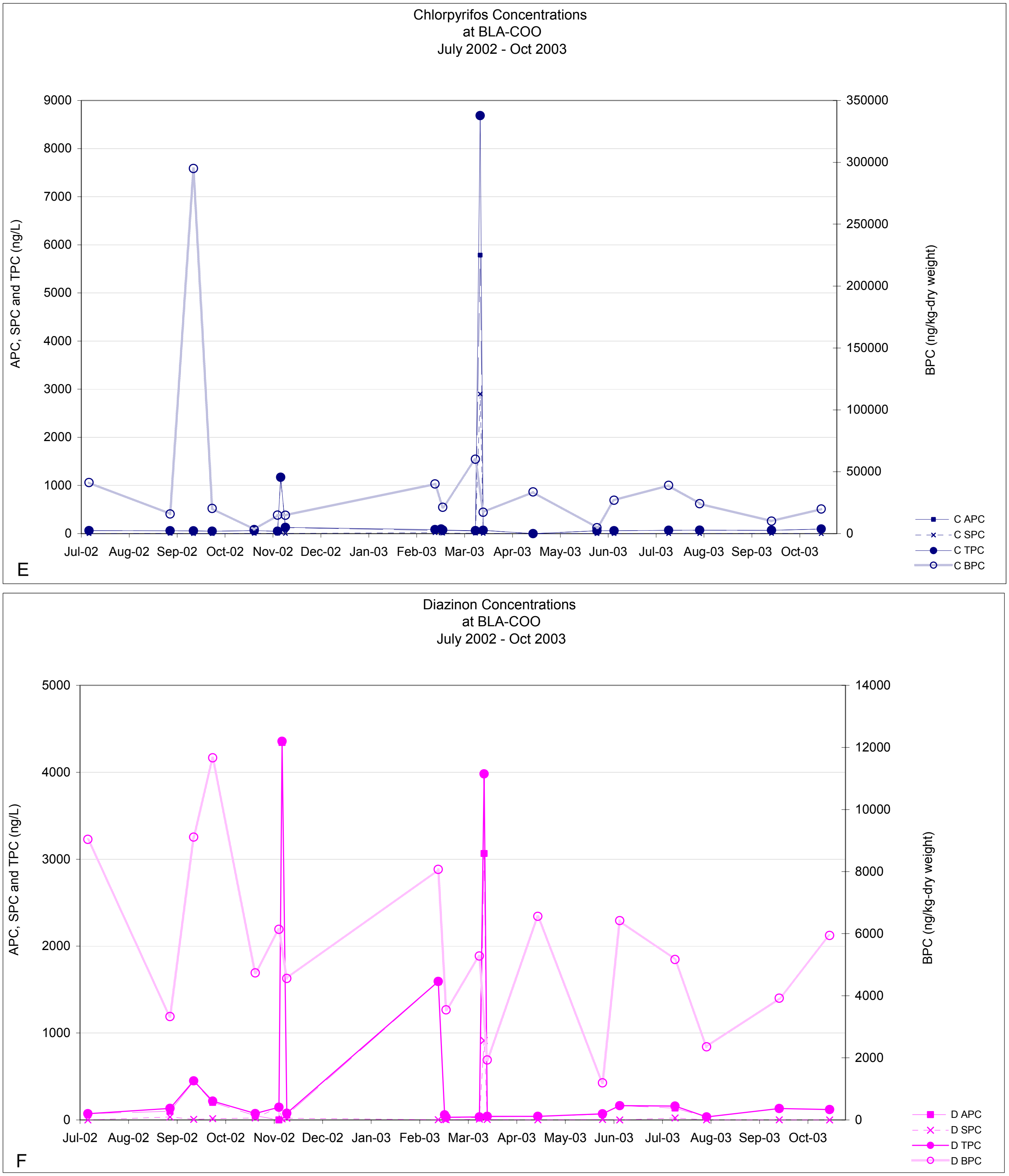


Figure 7.1 E&F BLA-COO chlorpyrifos and diazinon concentrations.

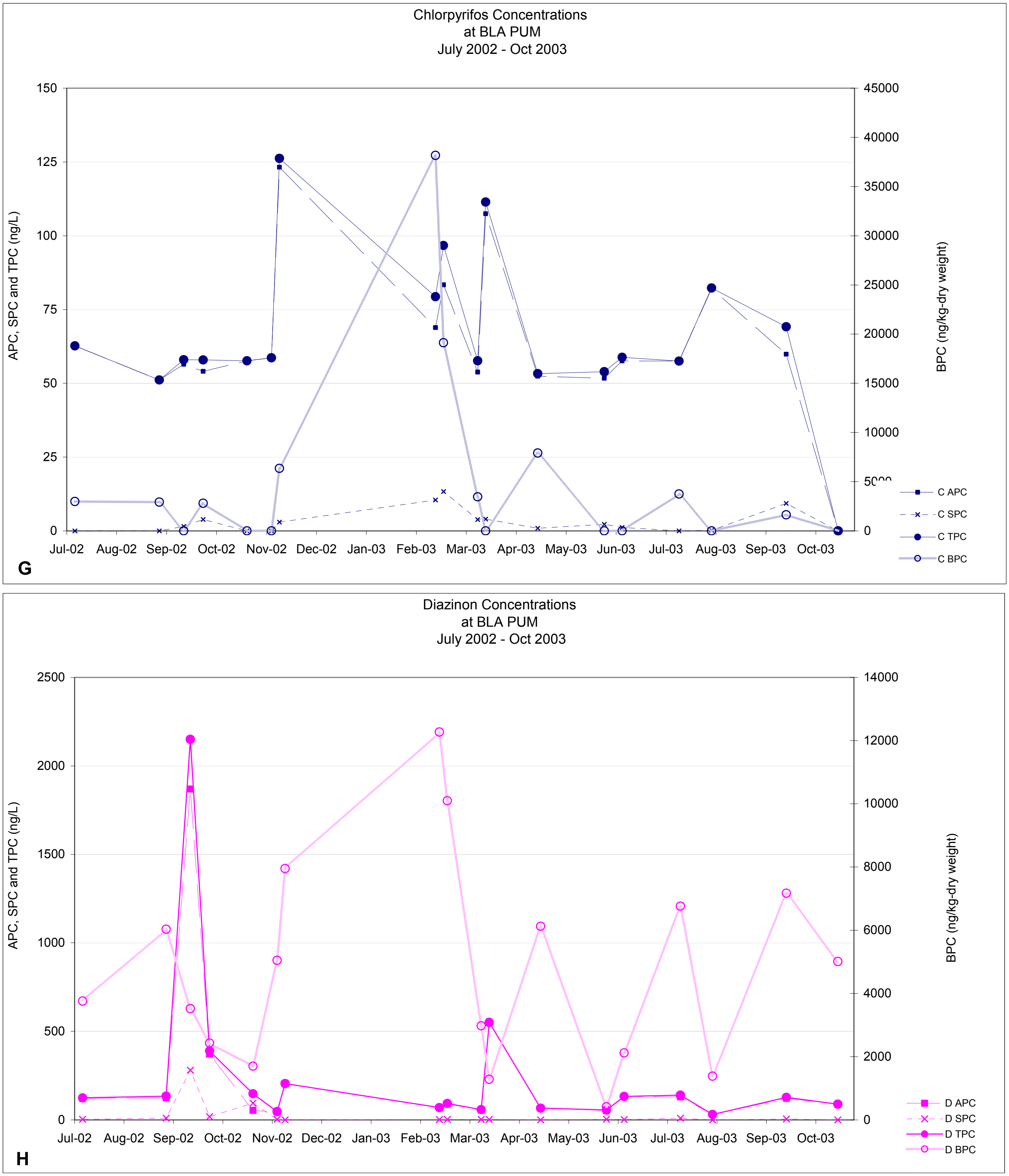
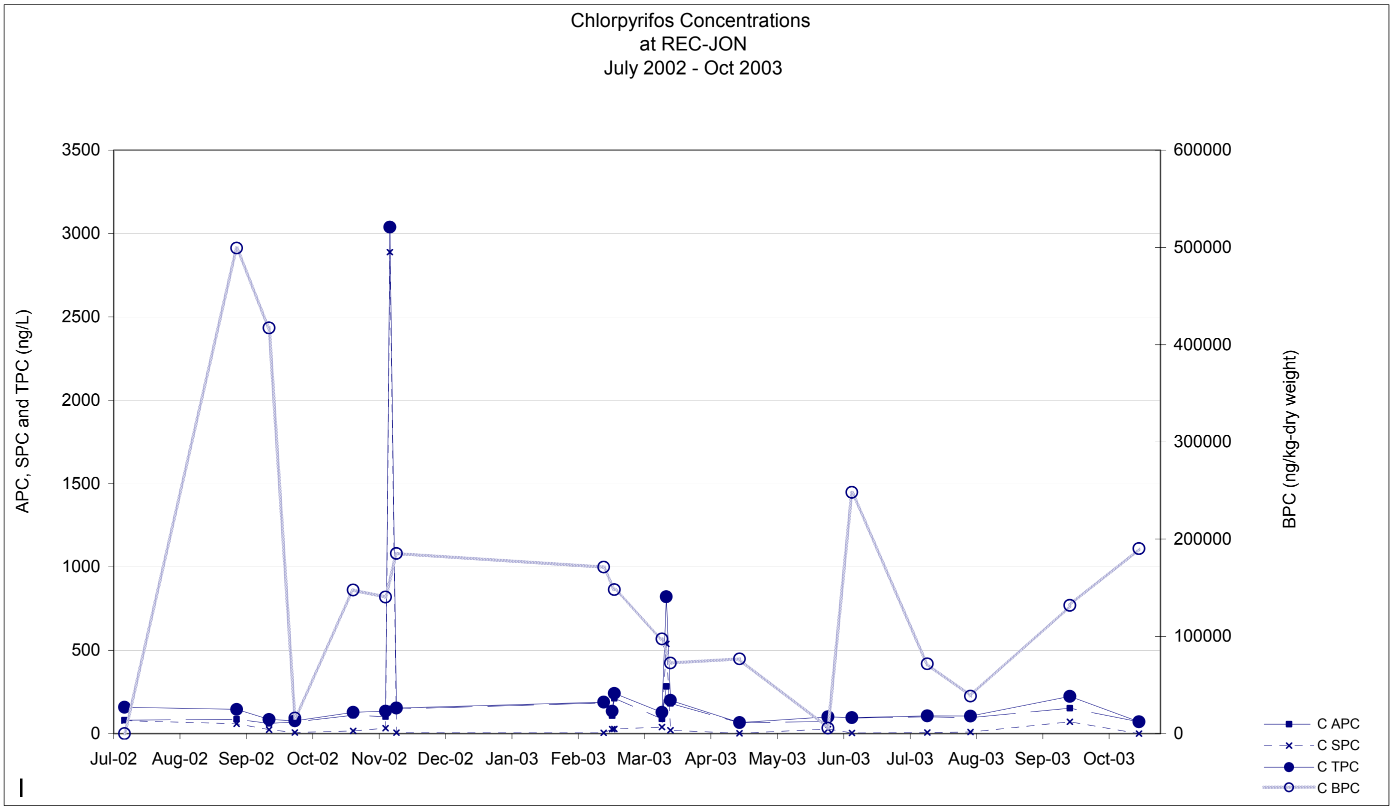


Figure 7.1 G&H BLA-PUM chlorpyrifos and diazinon concentrations.



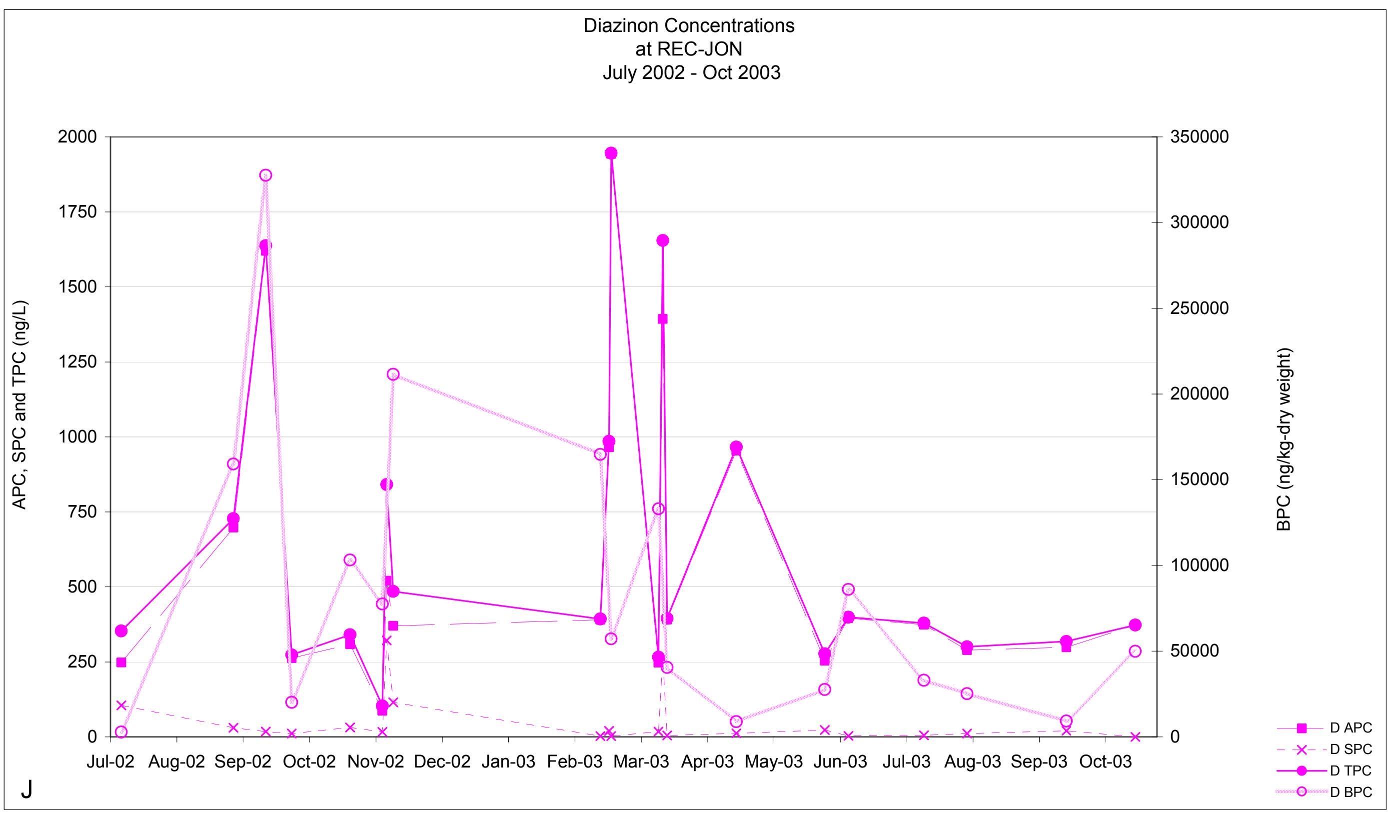
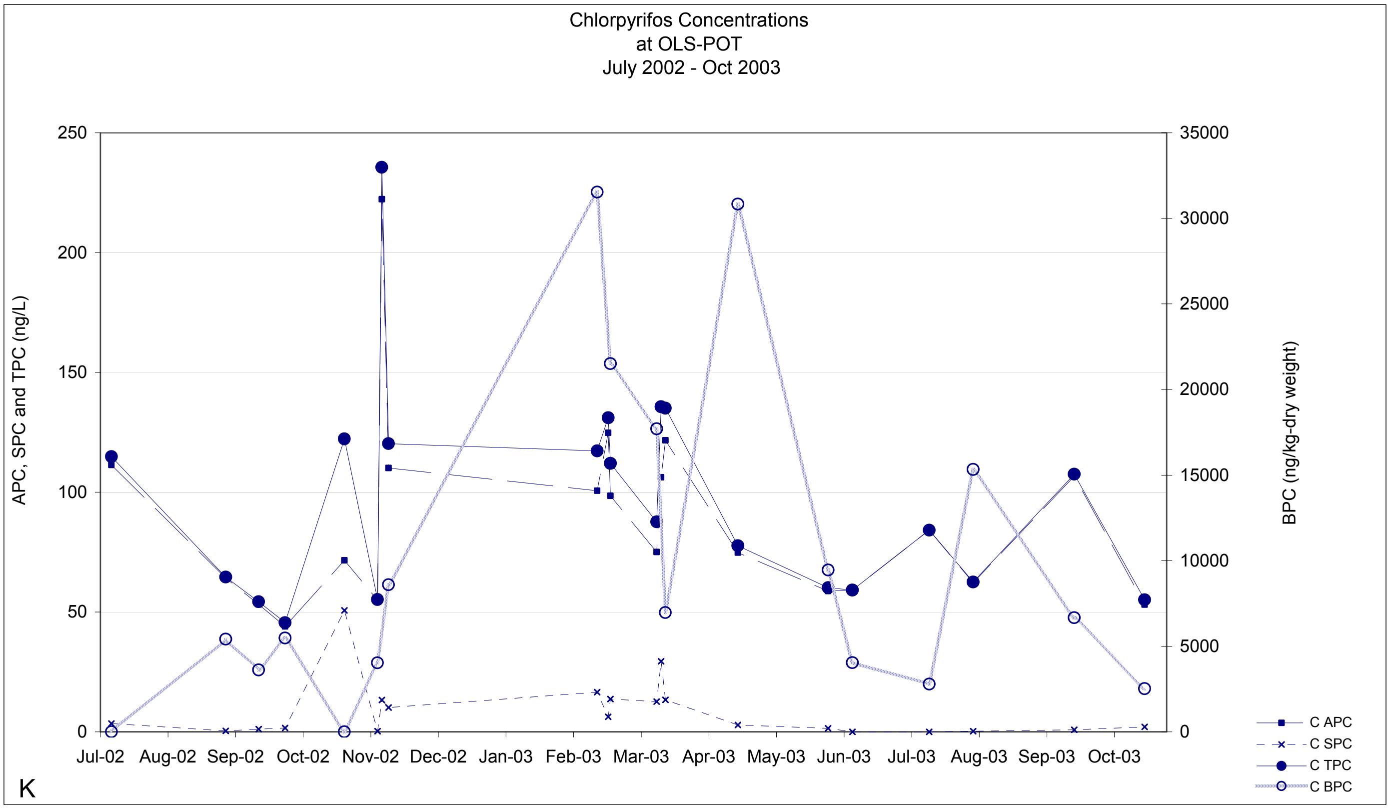


Figure 7.1 I&J REC–JON chlorpyrifos and diazinon concentrations.



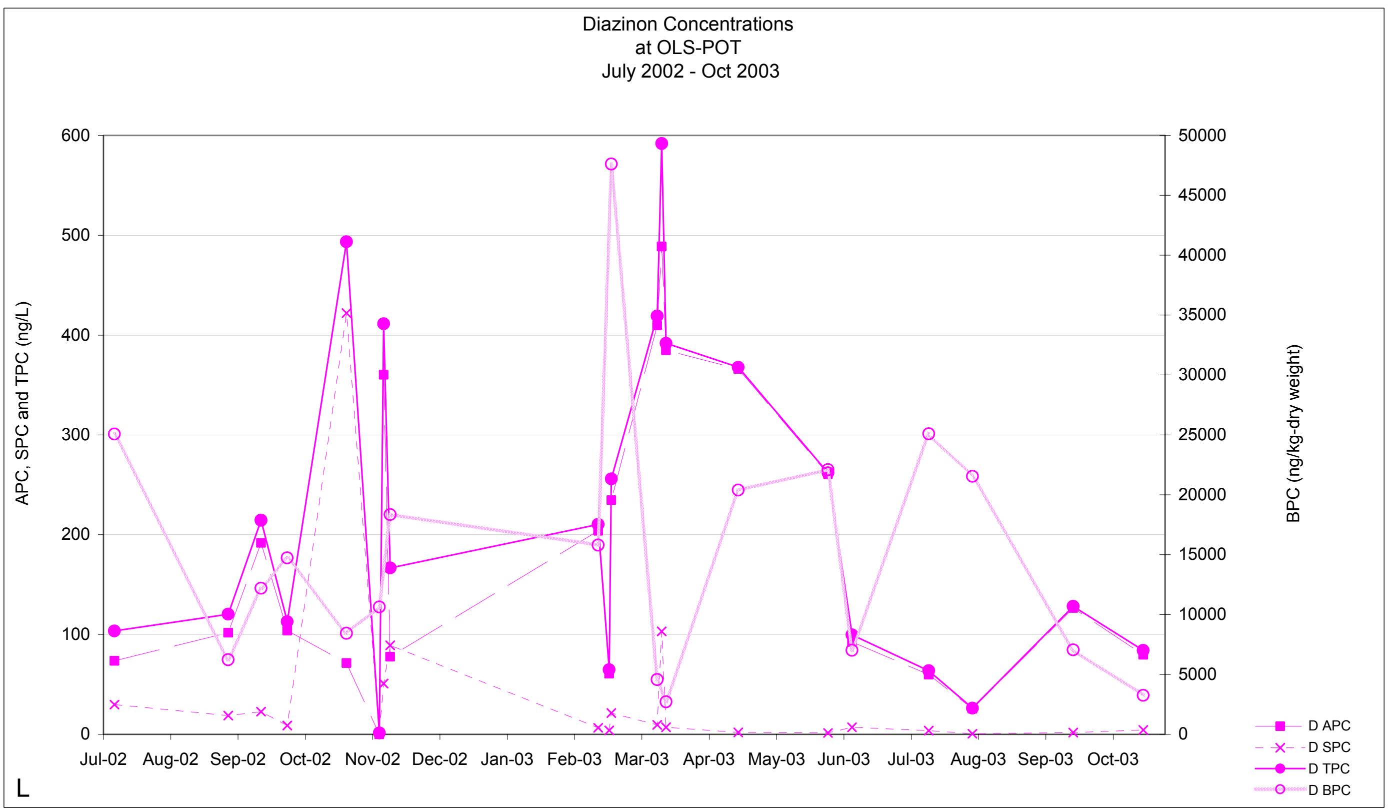
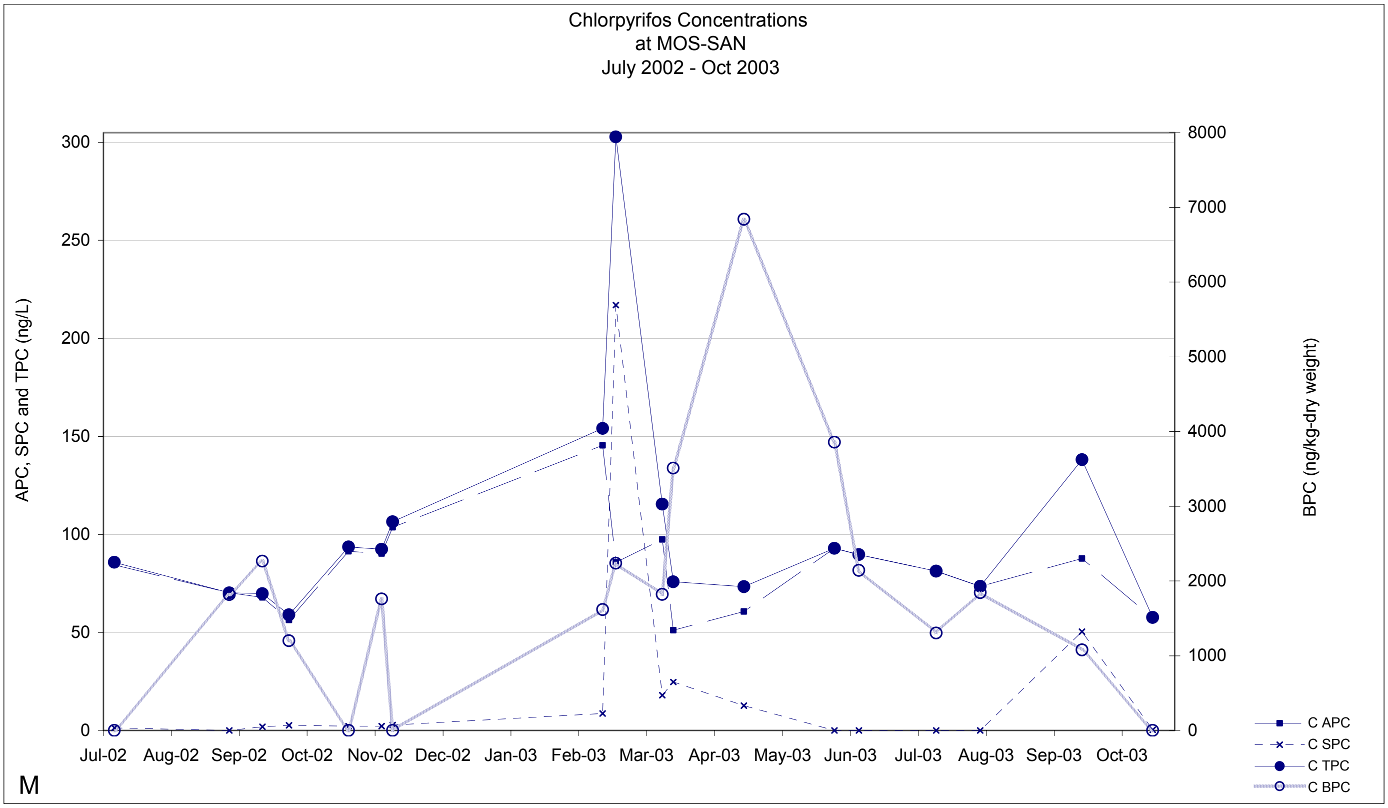


Figure 7.1 K&L OLS-POT chlorpyrifos and diazinon concentrations.



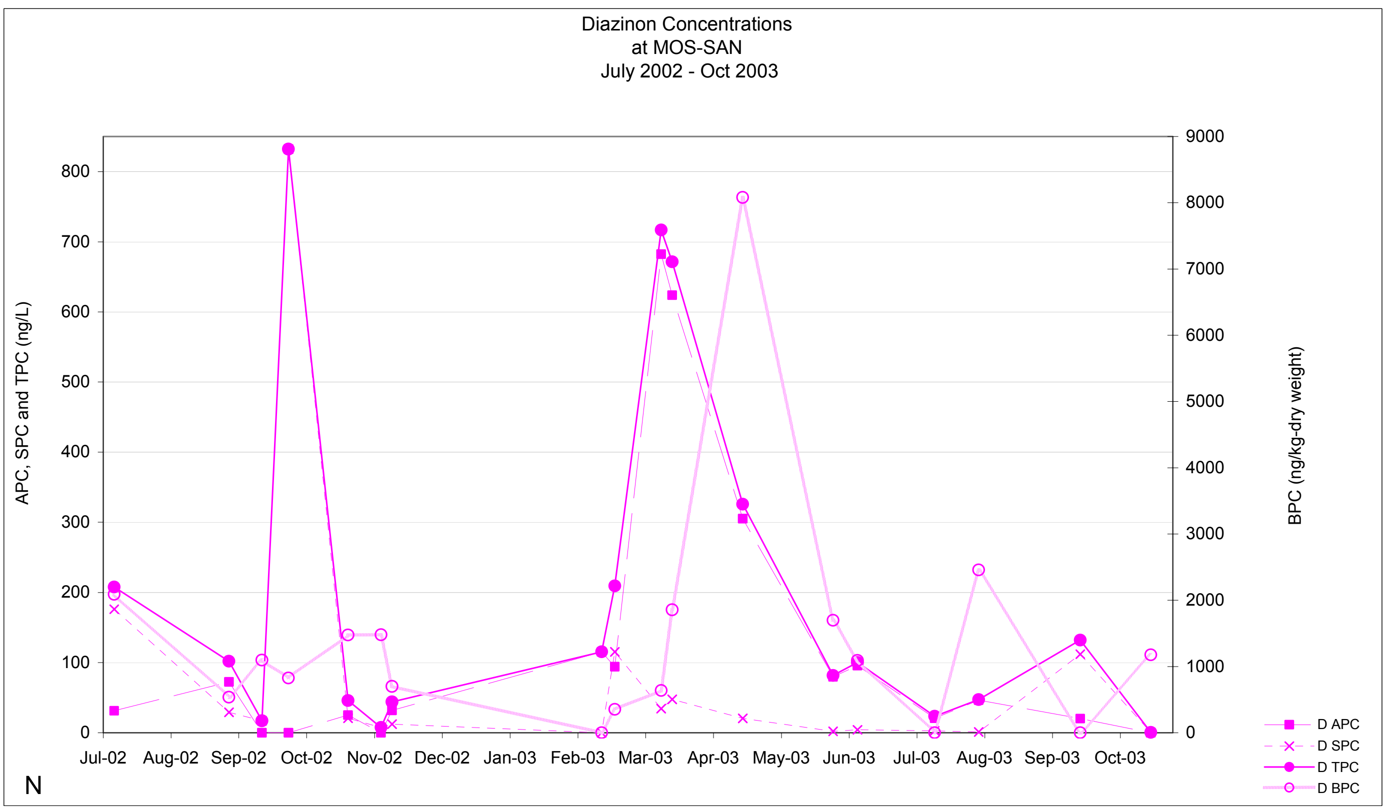
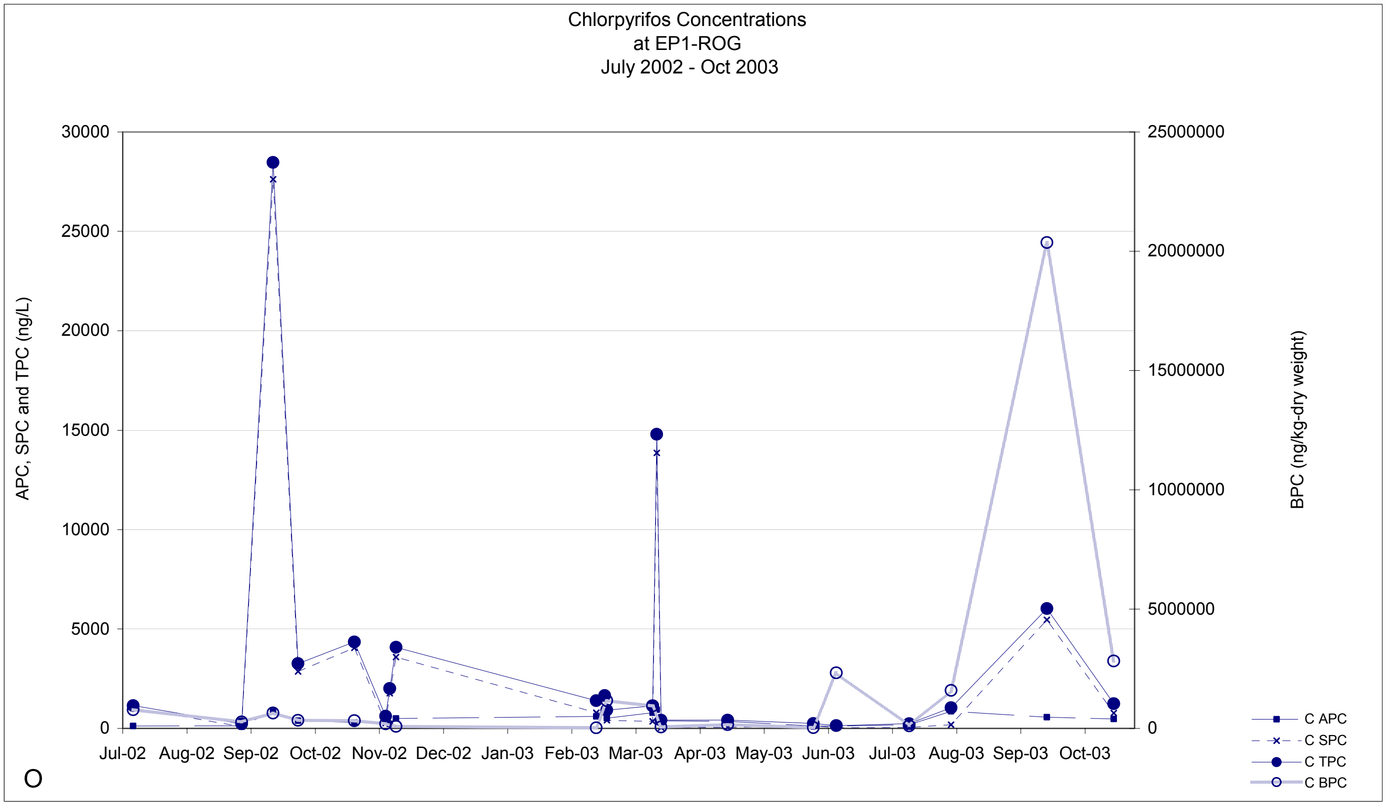


Figure 7.1 M&N MOS-SAN chlorpyrifos and diazinon concentrations.



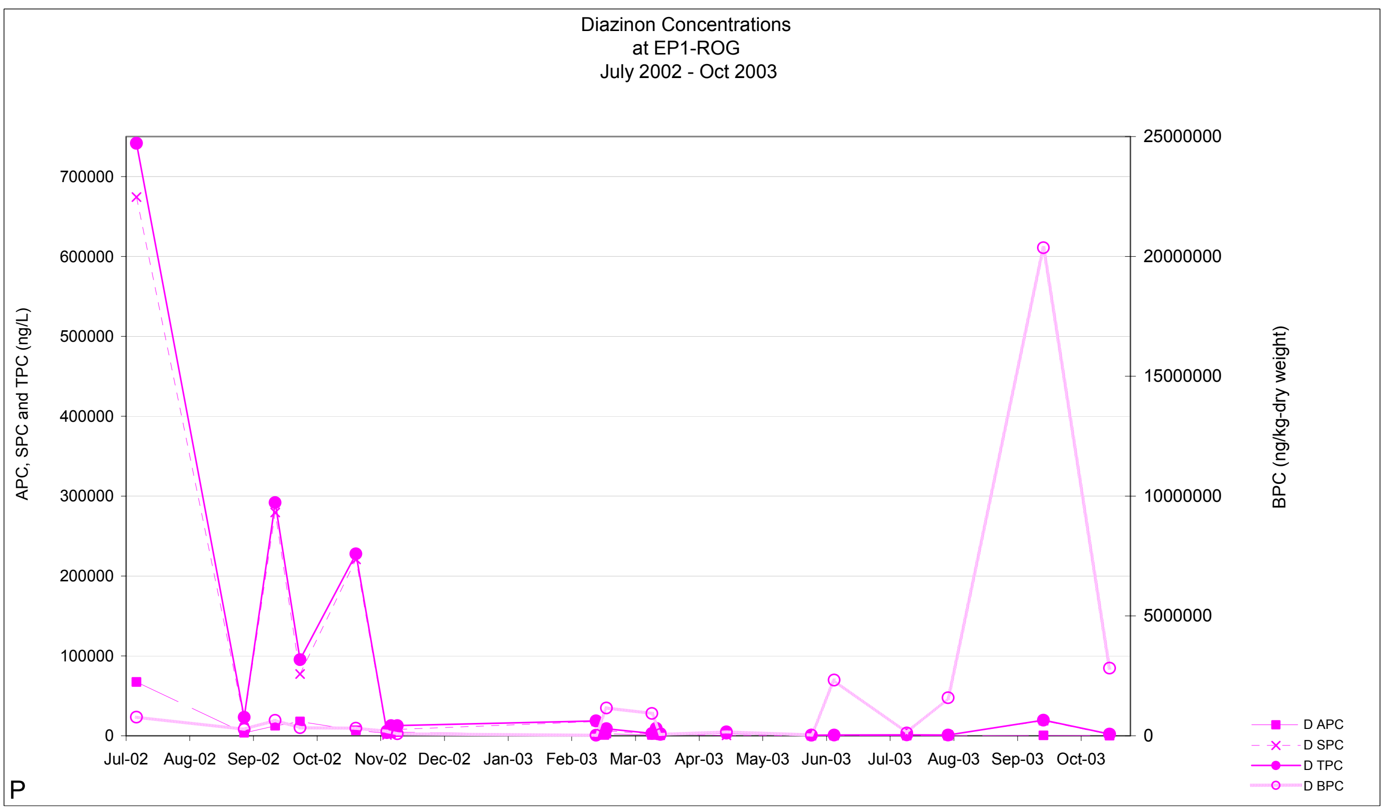
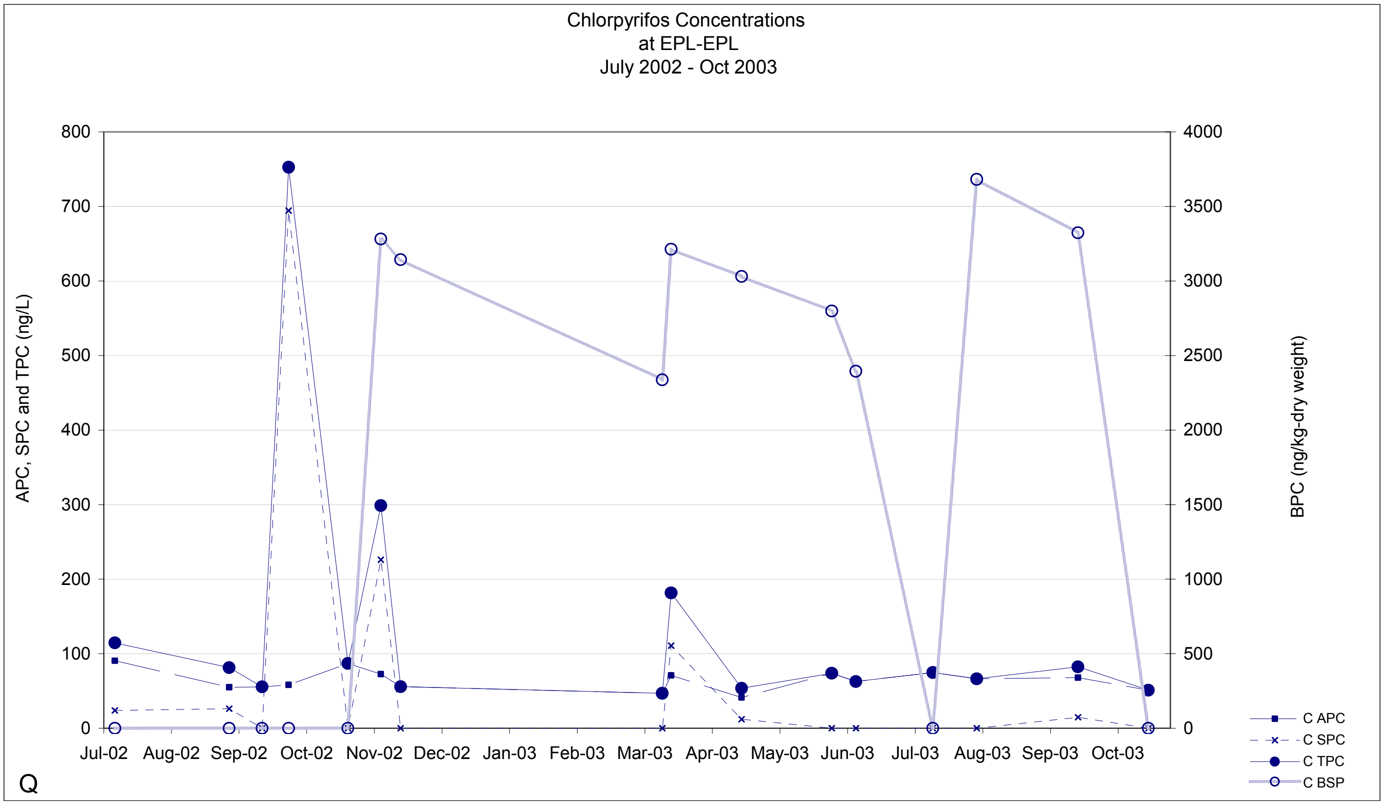


Figure 7.1 O&P EP1-ROG chlorpyrifos and diazinon concentrations.



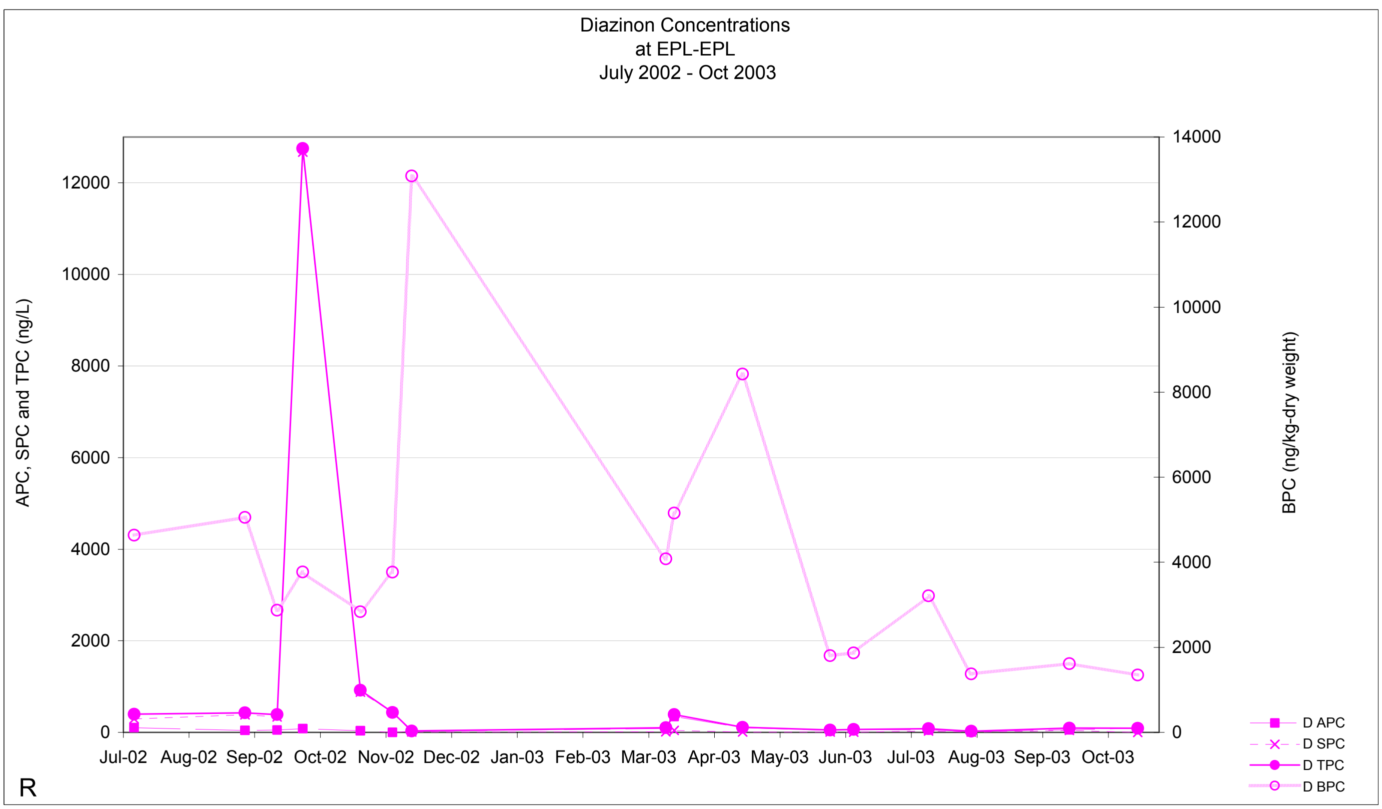
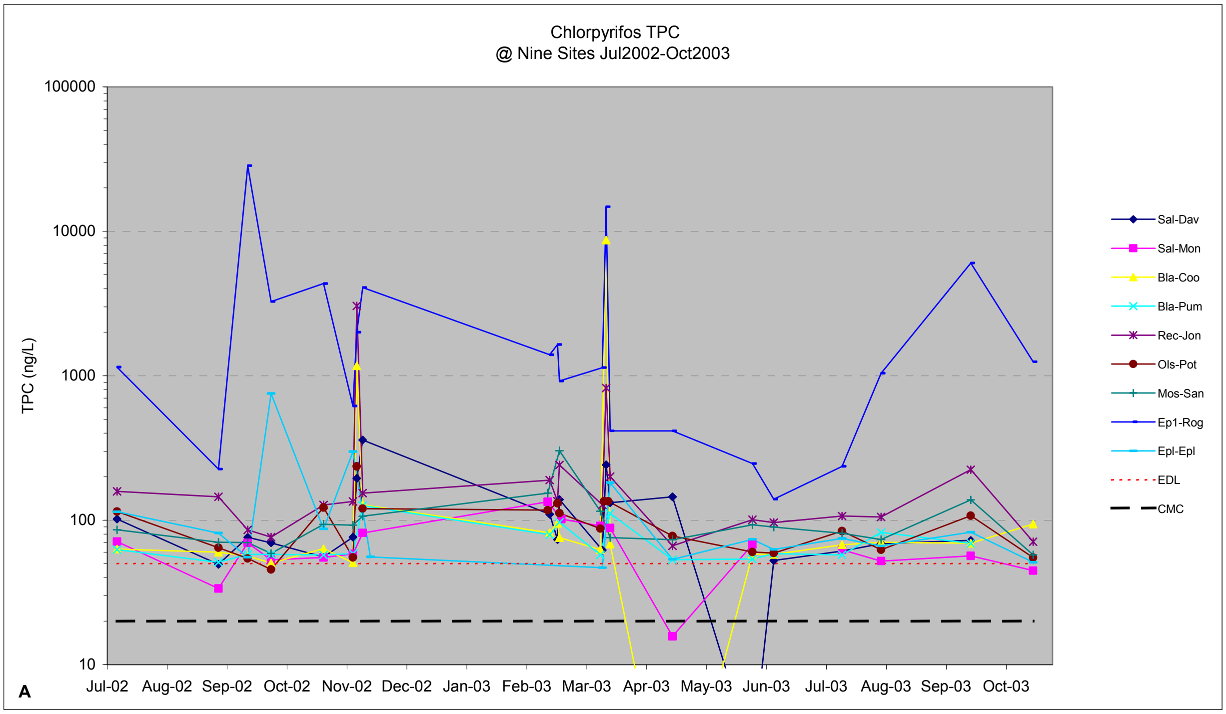


Figure 7.1 Q&R EPL-EPL chlorpyrifos and diazinon concentrations



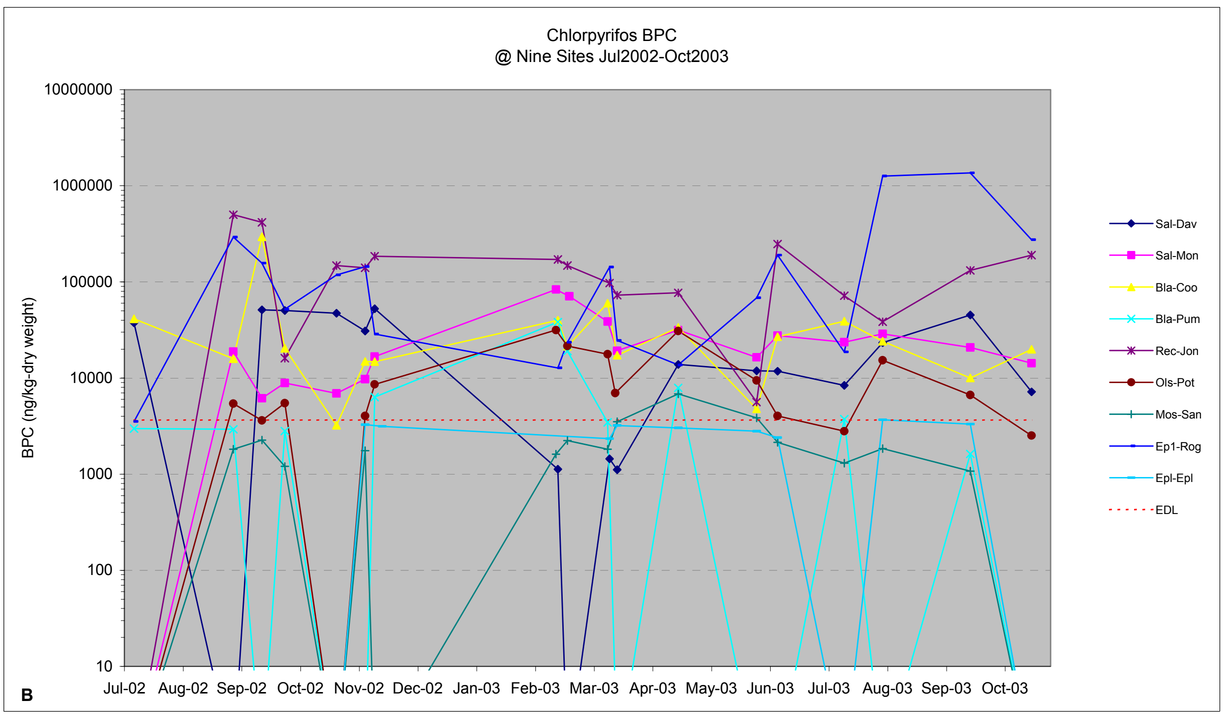
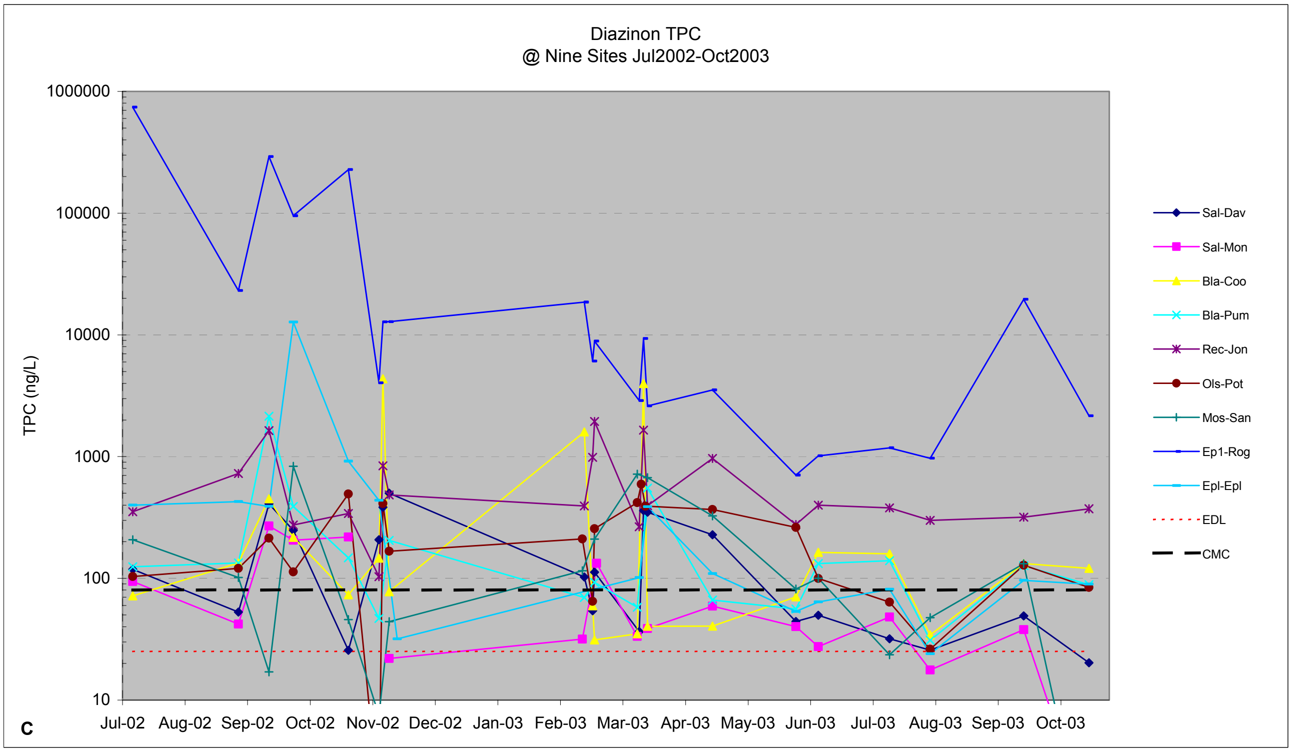


Figure 7.2 A&B Total water column and bottom sediment chlorpyrifos concentrations at nine sites for all dates.



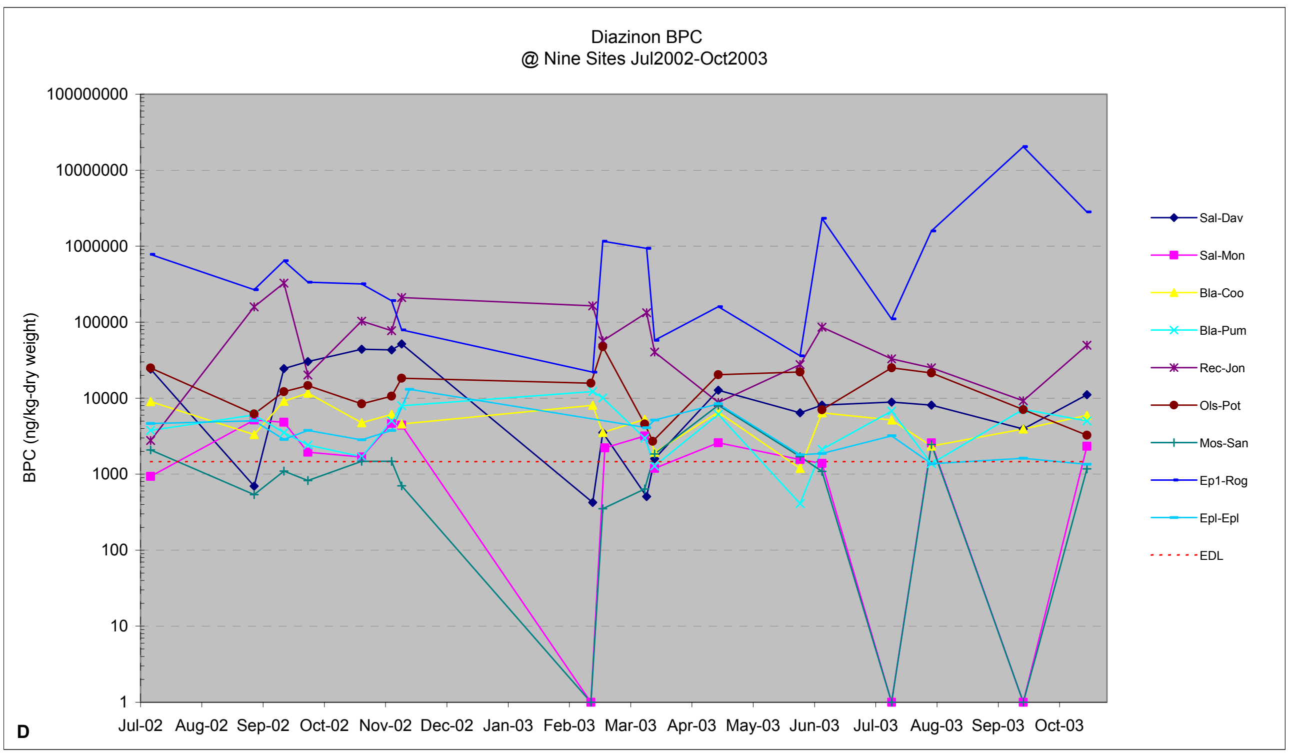


Figure 7.2 C&D Total water column and bottom sediment diazinon concentrations at nine sites for all dates.

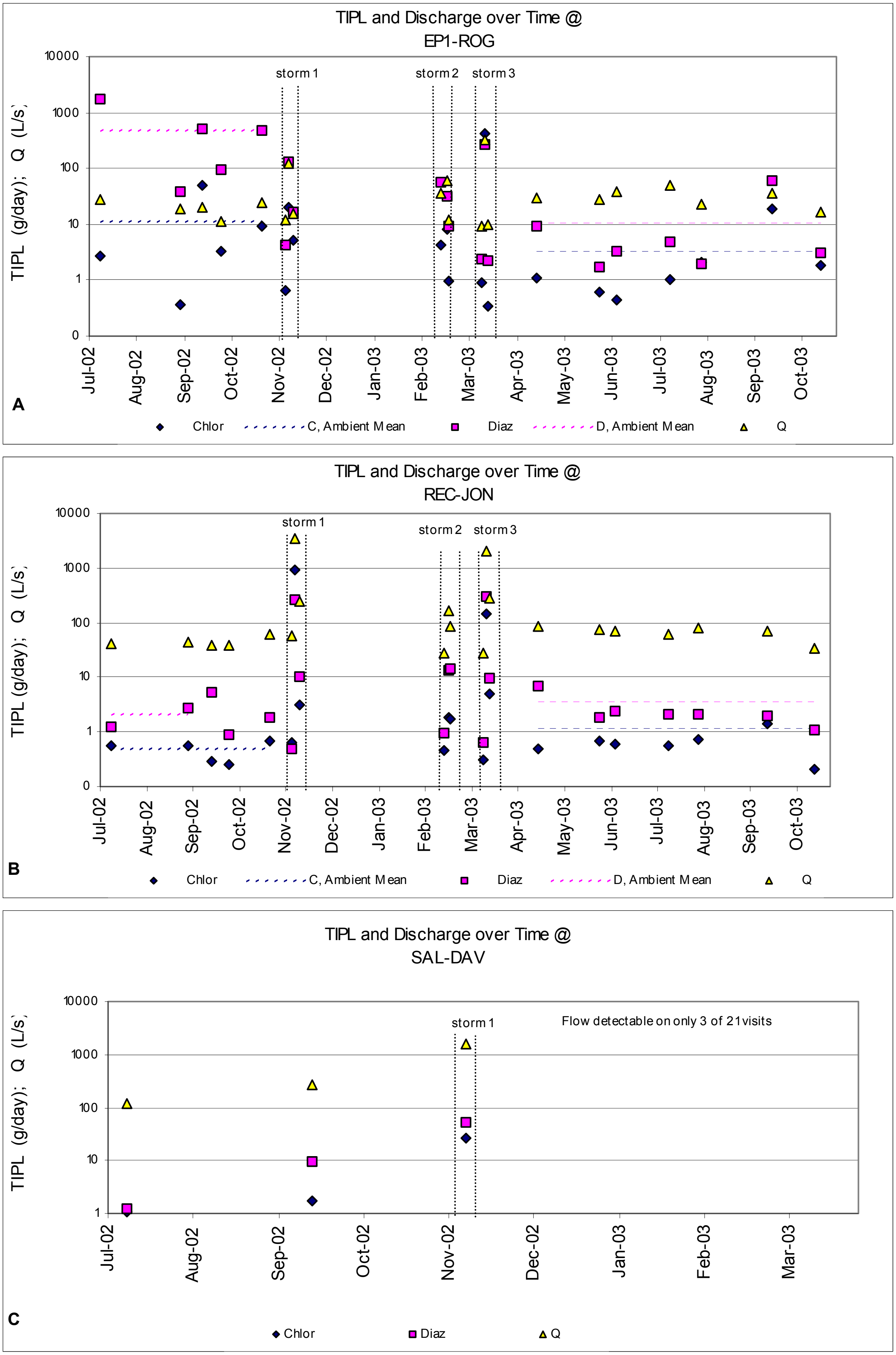
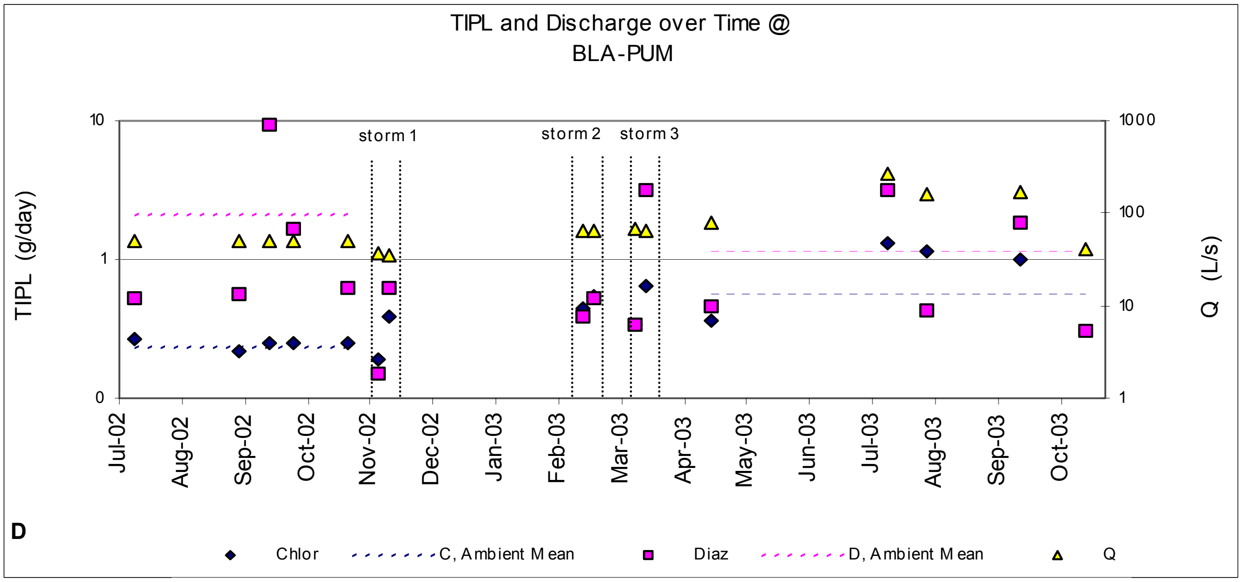
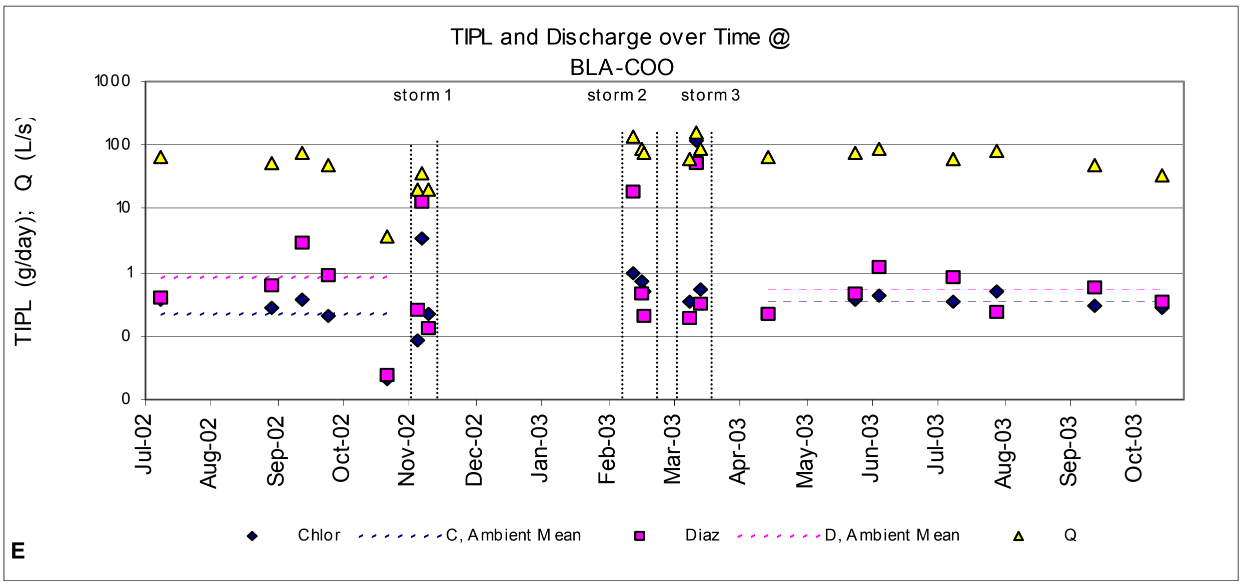


Figure 7.3 A-C Instantaneous pesticide loads and discharge for EP1-ROG, REC-JON and SAL-DAV.





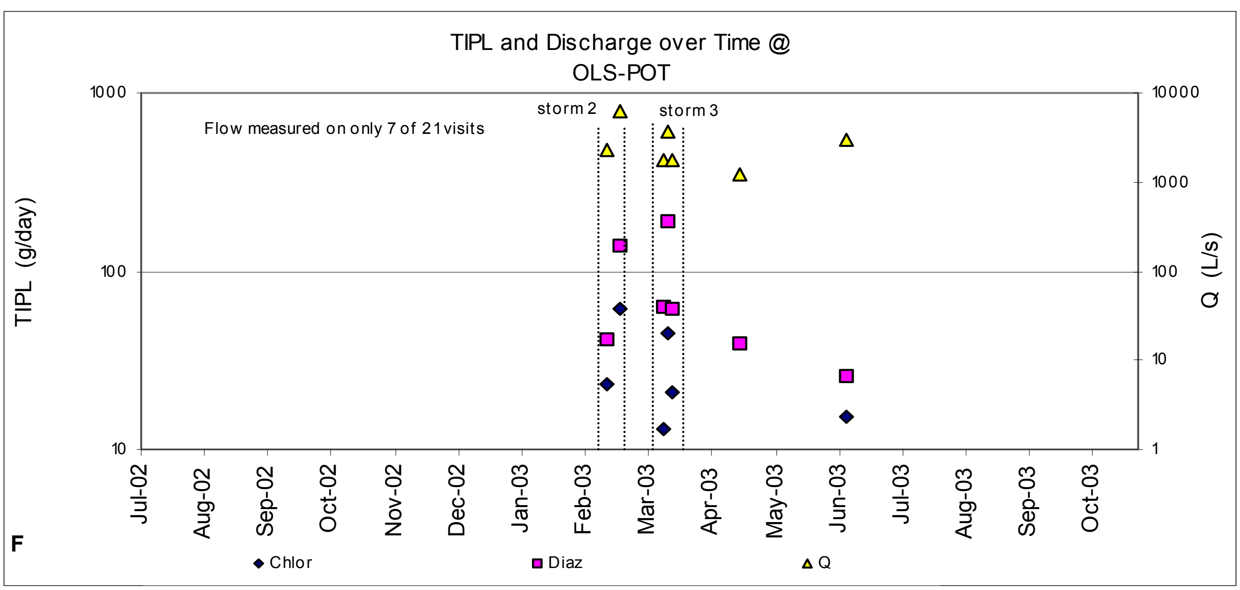


Figure 7.3 D-F Instantaneous pesticide loads and discharge for BLA-PUM, BLA-COO and OLS-POT.

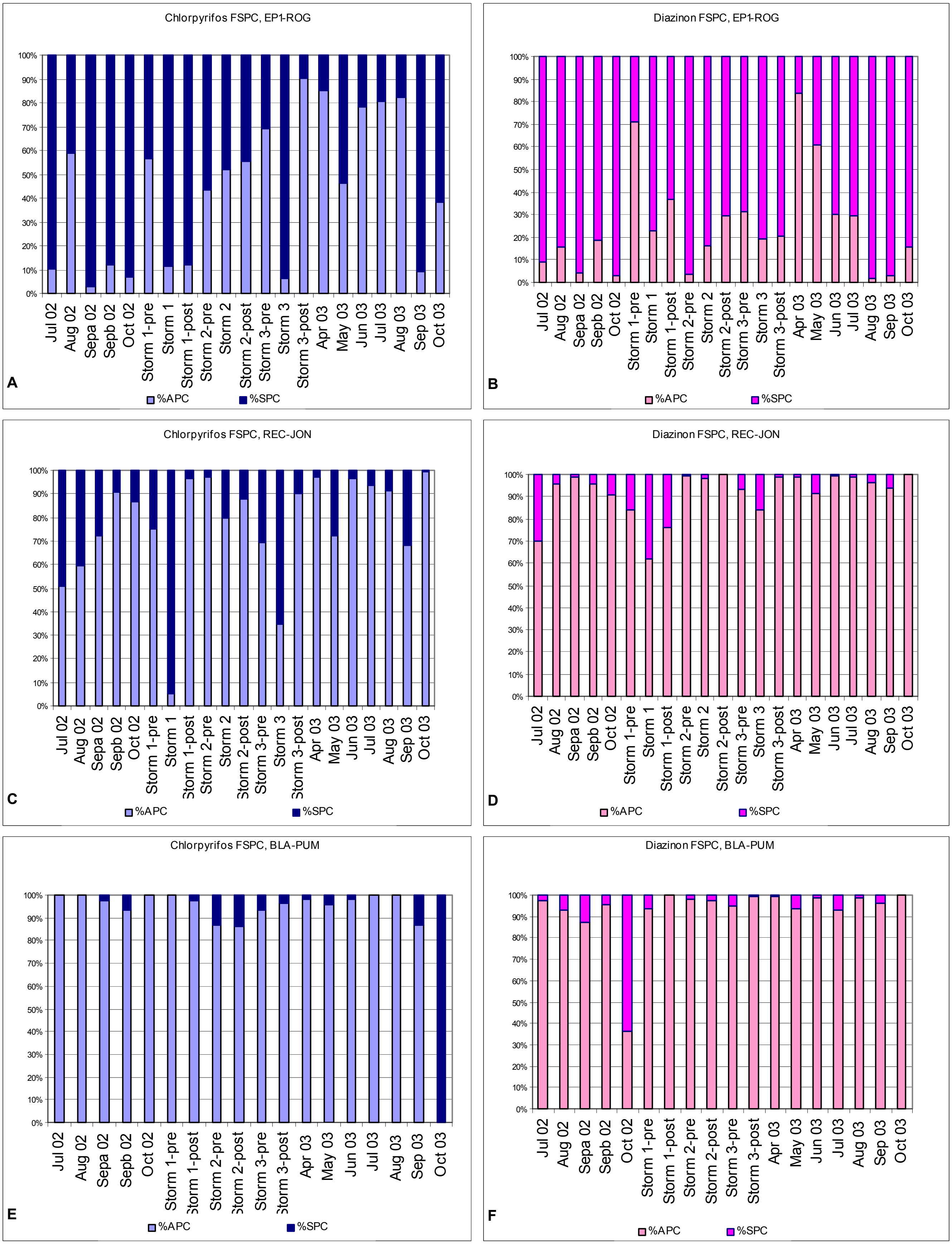


Figure 7.4 A-F Percentage of APC and SPC contribution to TPC .

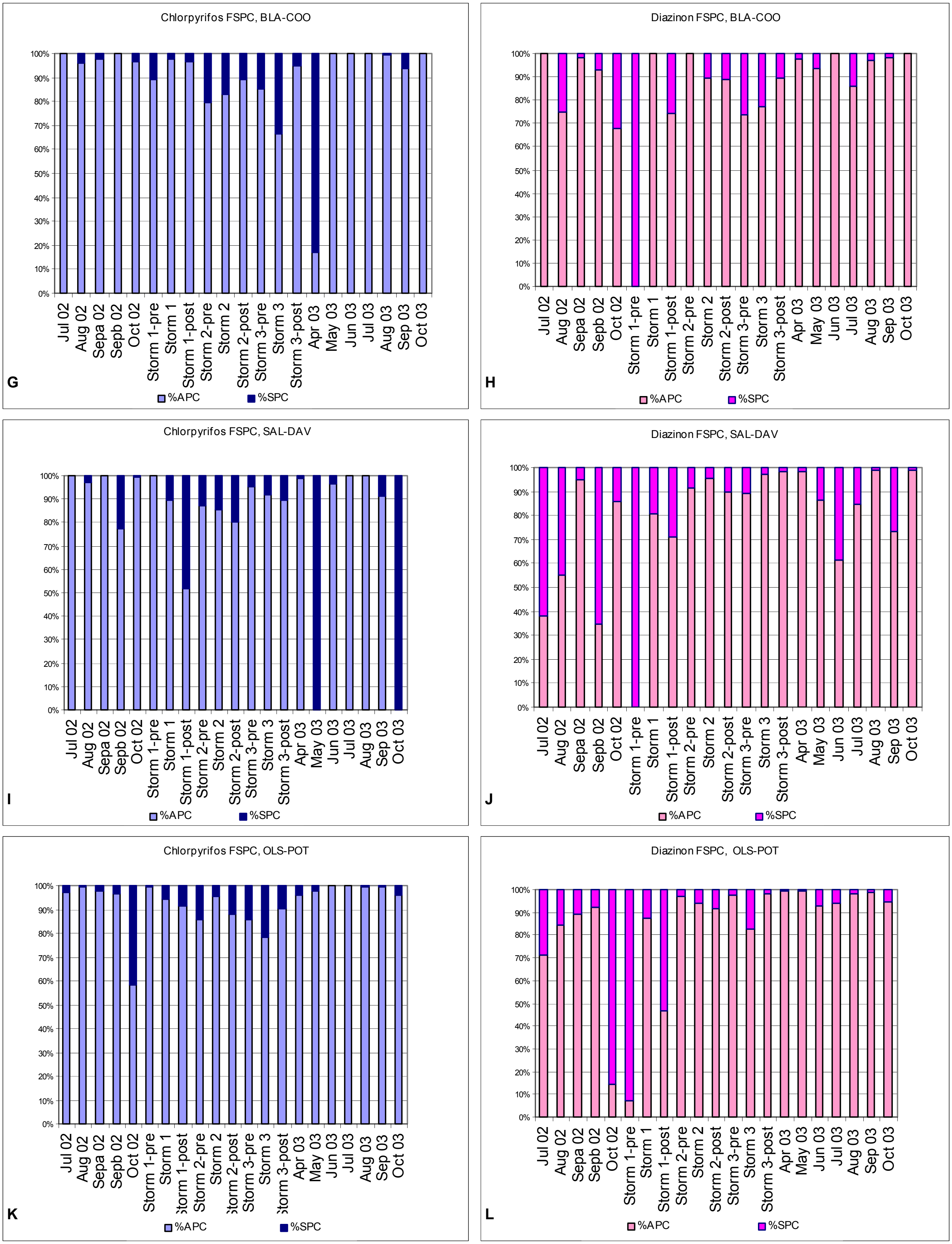


Figure 7.4 G–L Percentage of APC and SPC contribution to TPC .

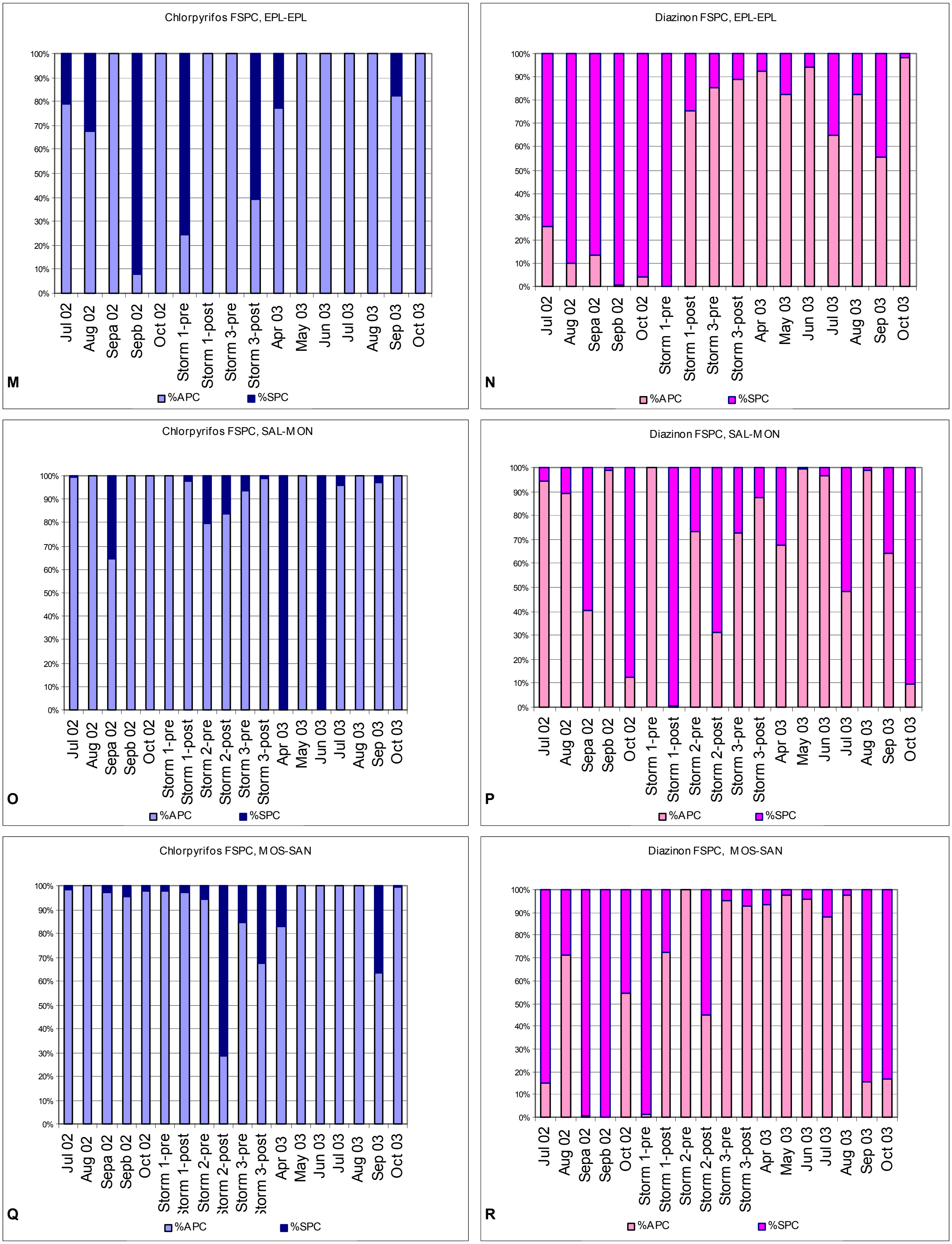
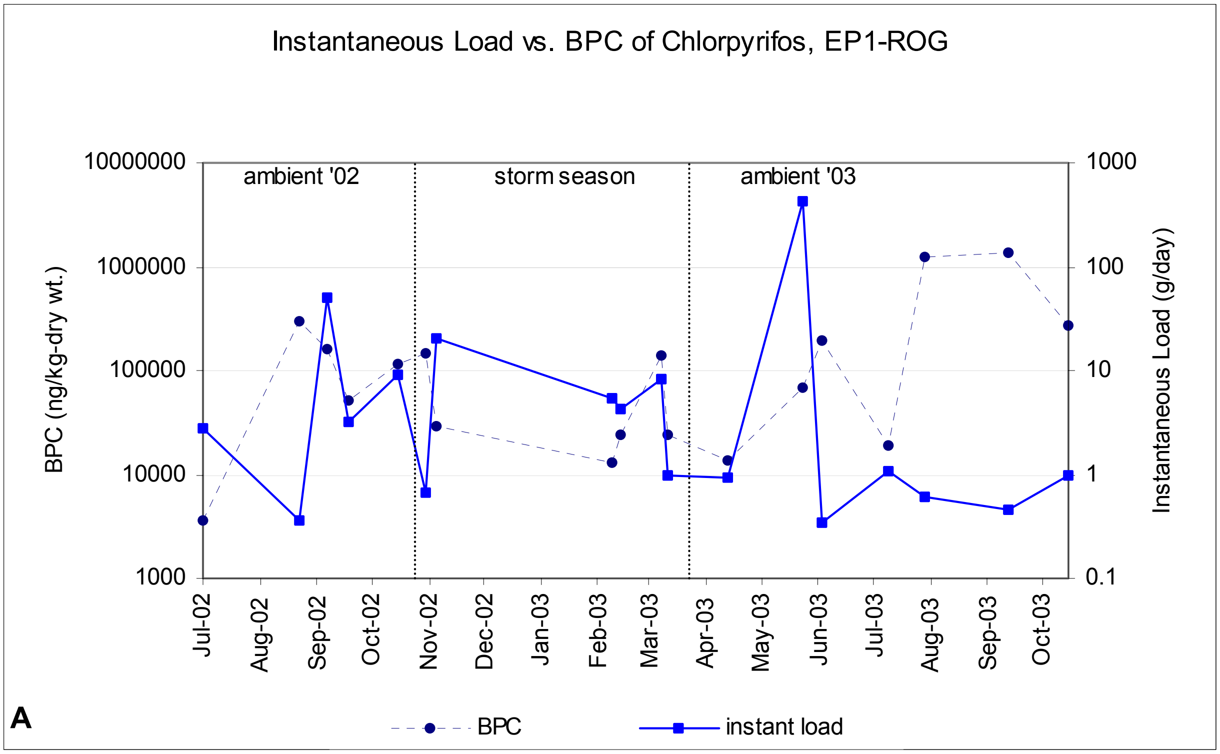


Figure 7.4 M–R Percentage of APC and SPC contribution to TPC .



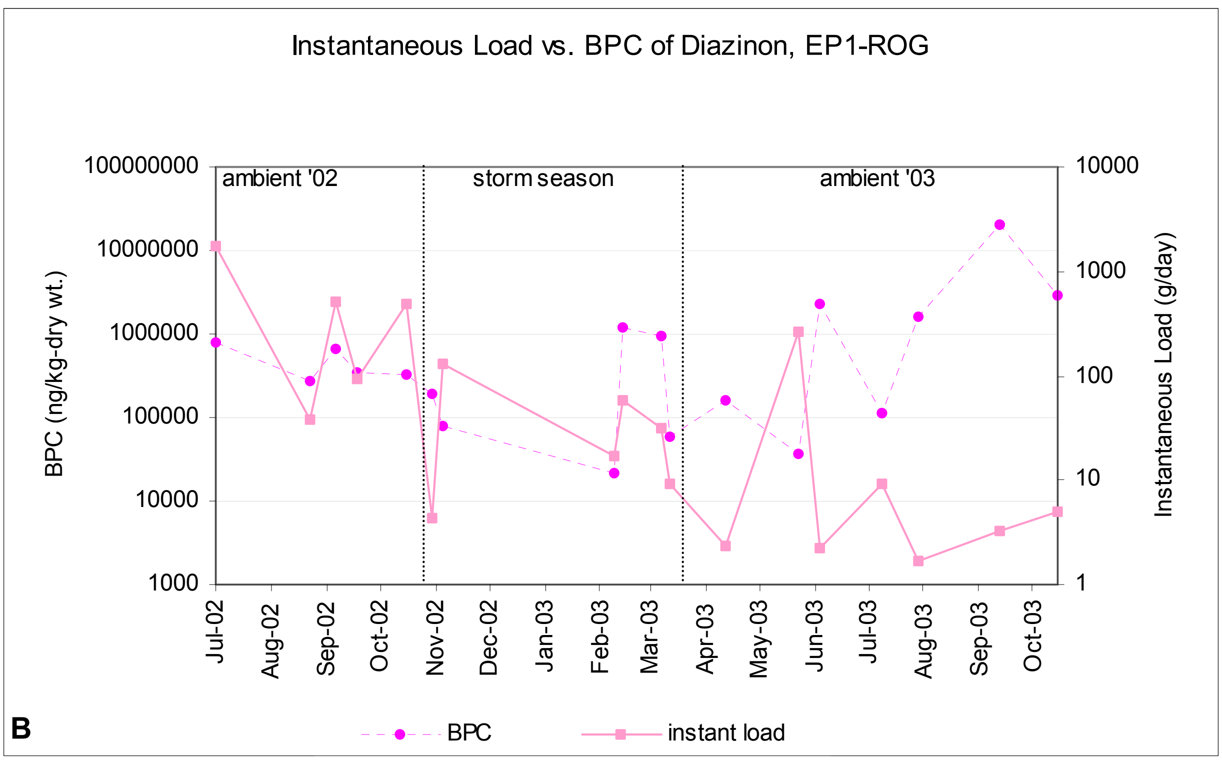
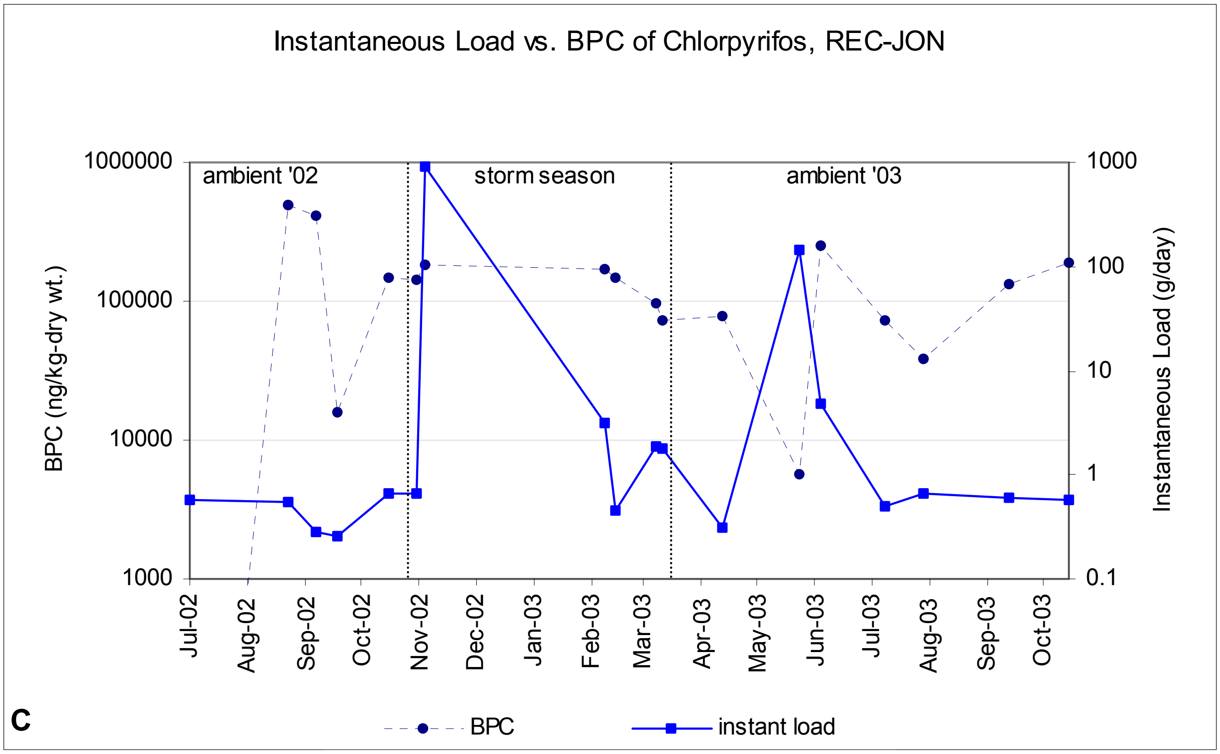


Figure 7.5 A&B Instantaneous load vs. BPC of chlorpyrifos and diazinon for EP1-ROG.



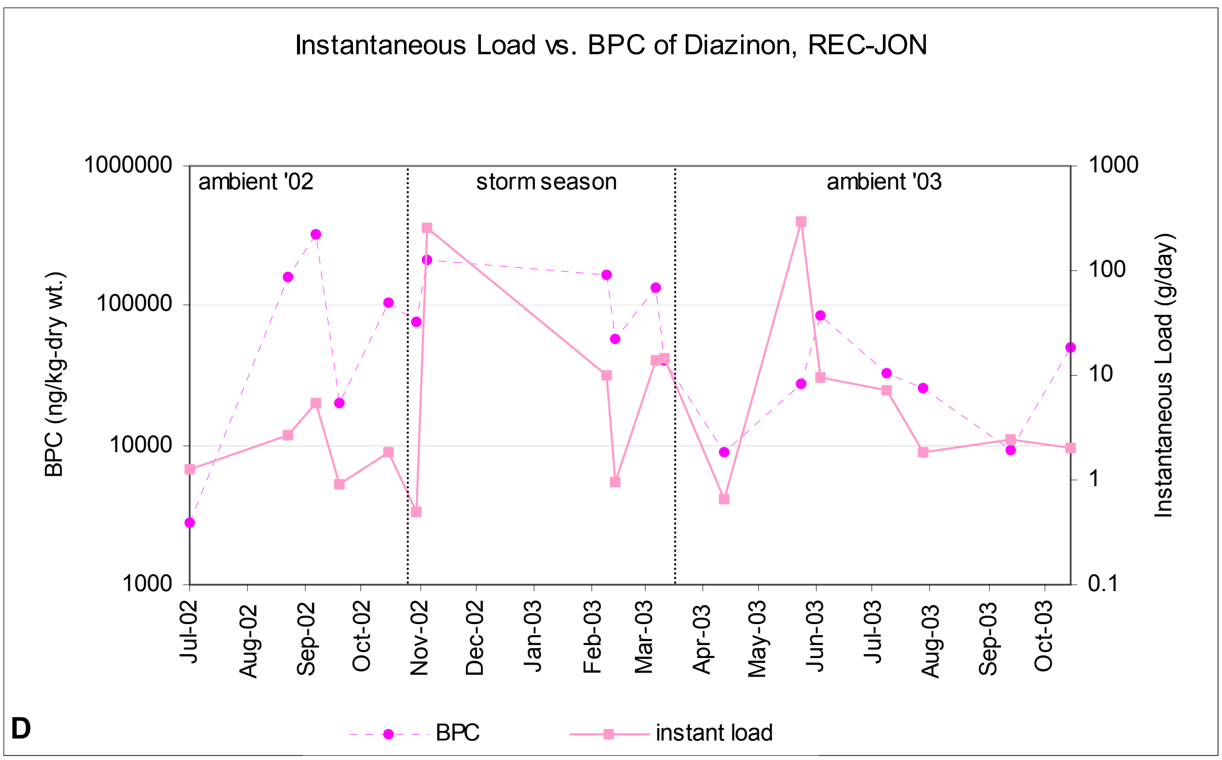
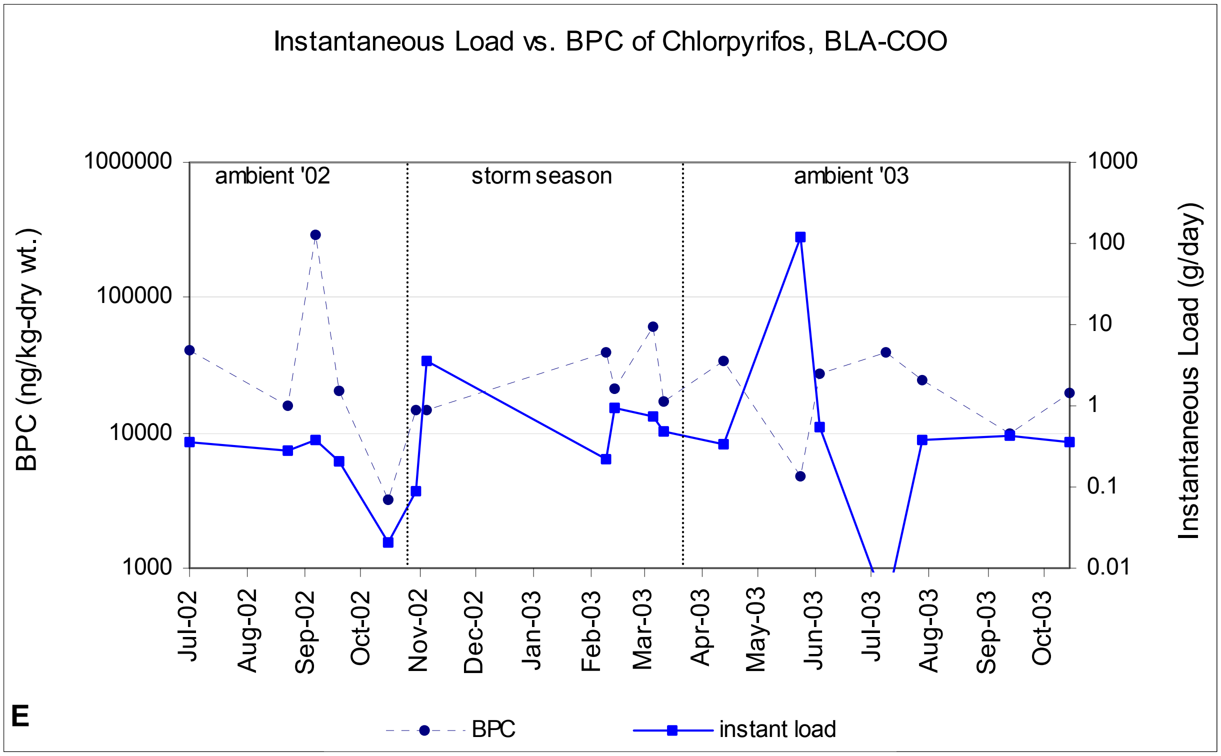


Figure 7.5 C&D Instantaneous load vs. BPC of chlorpyrifos and diazinon for REC-JON.



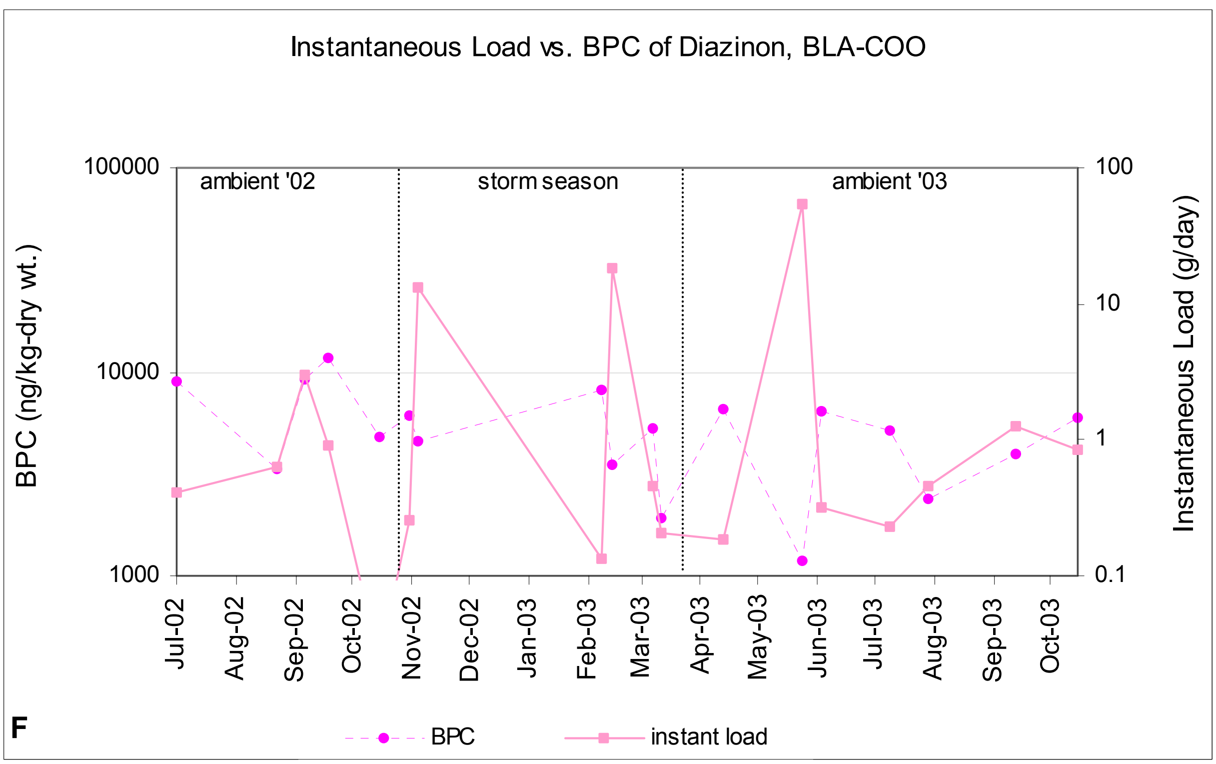
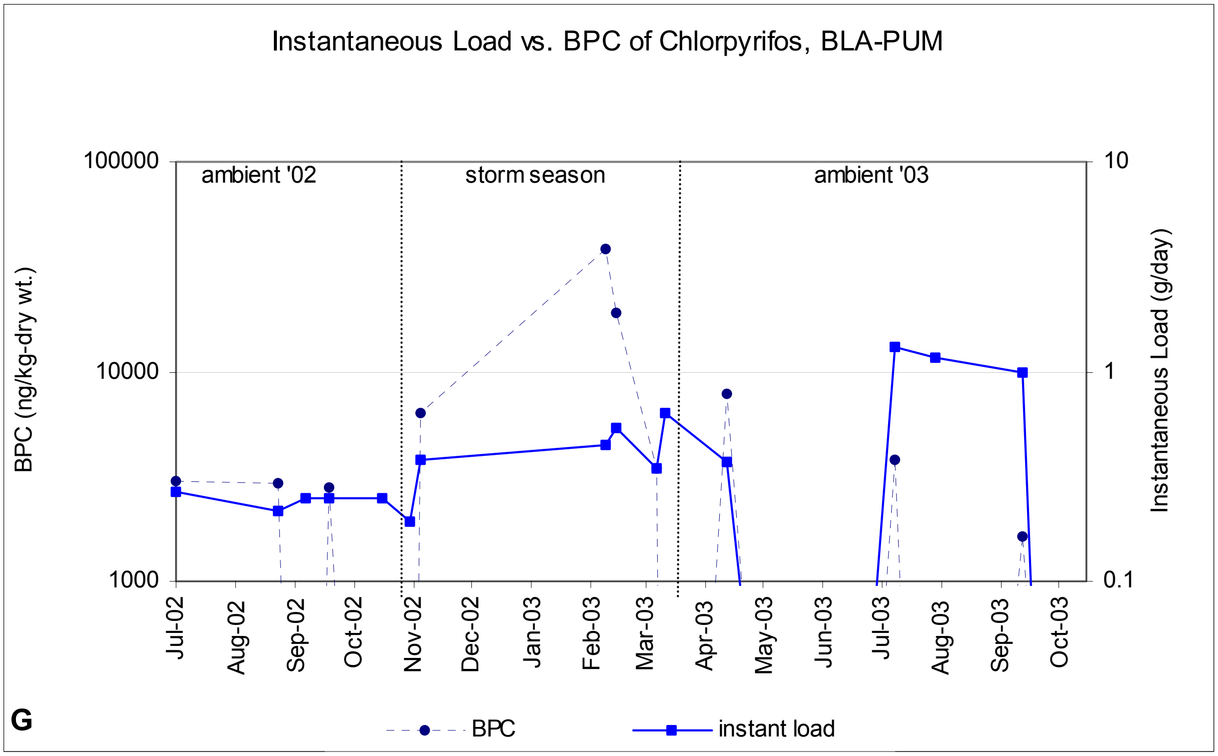


Figure 7.5 E&F Instantaneous load vs. BPC of chlorpyrifos and diazinon for BLA-COO.



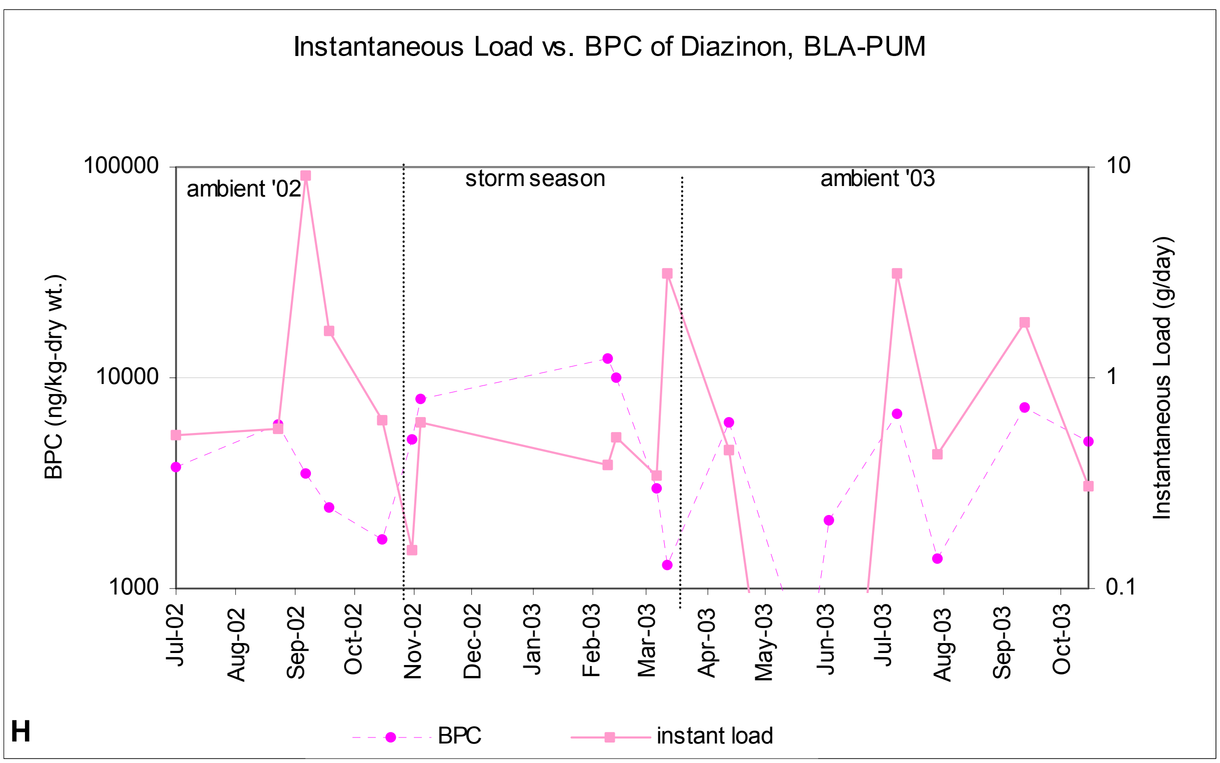
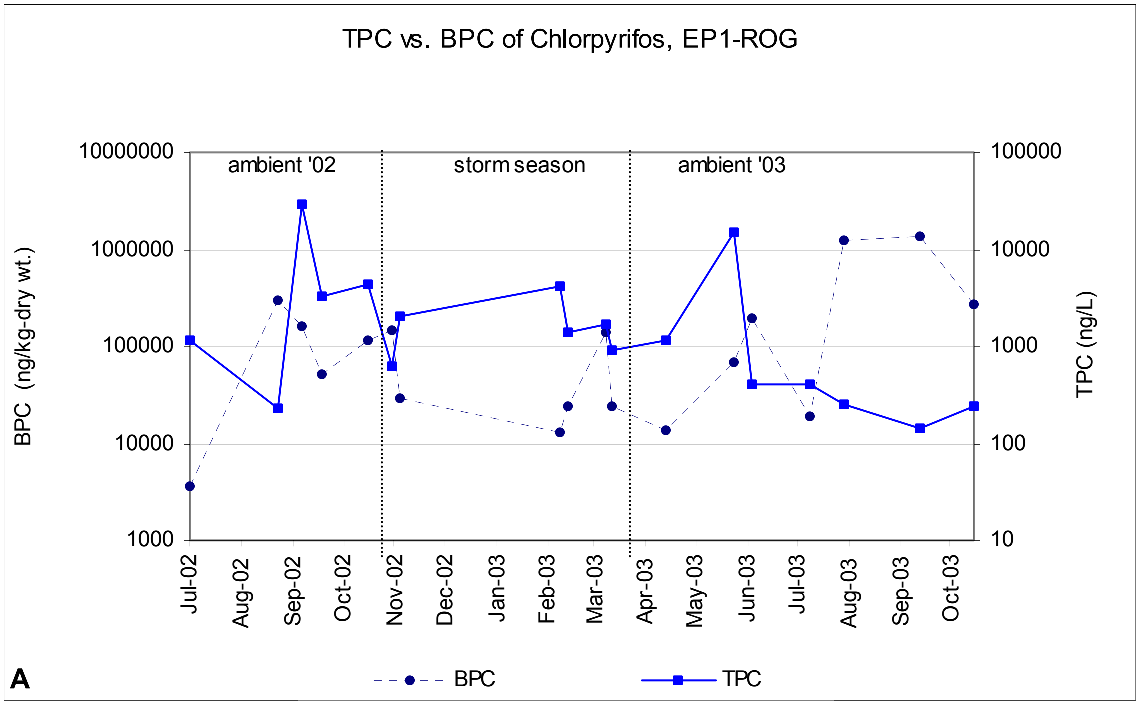


Figure 7.5 G&H Instantaneous load vs. BPC chlorpyrifos and diazinon for BLA-PUM.



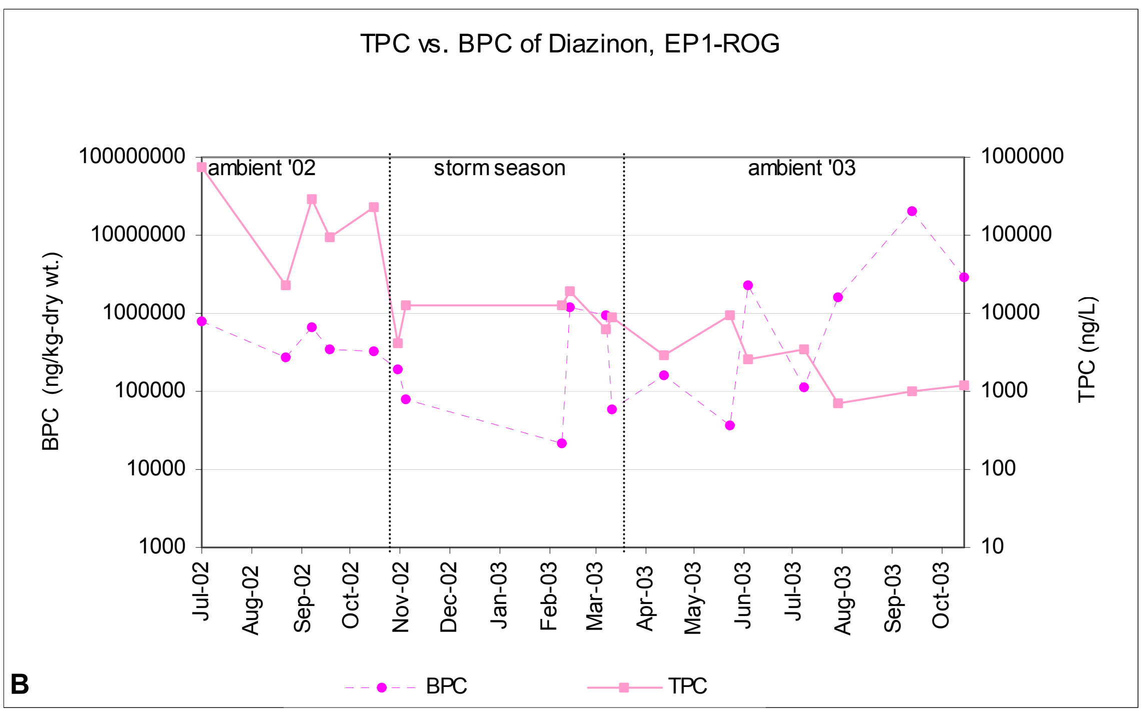


Figure 7.6 A&B TPC vs. BPC for chlorpyrifos and diazinon at EP1-ROG.

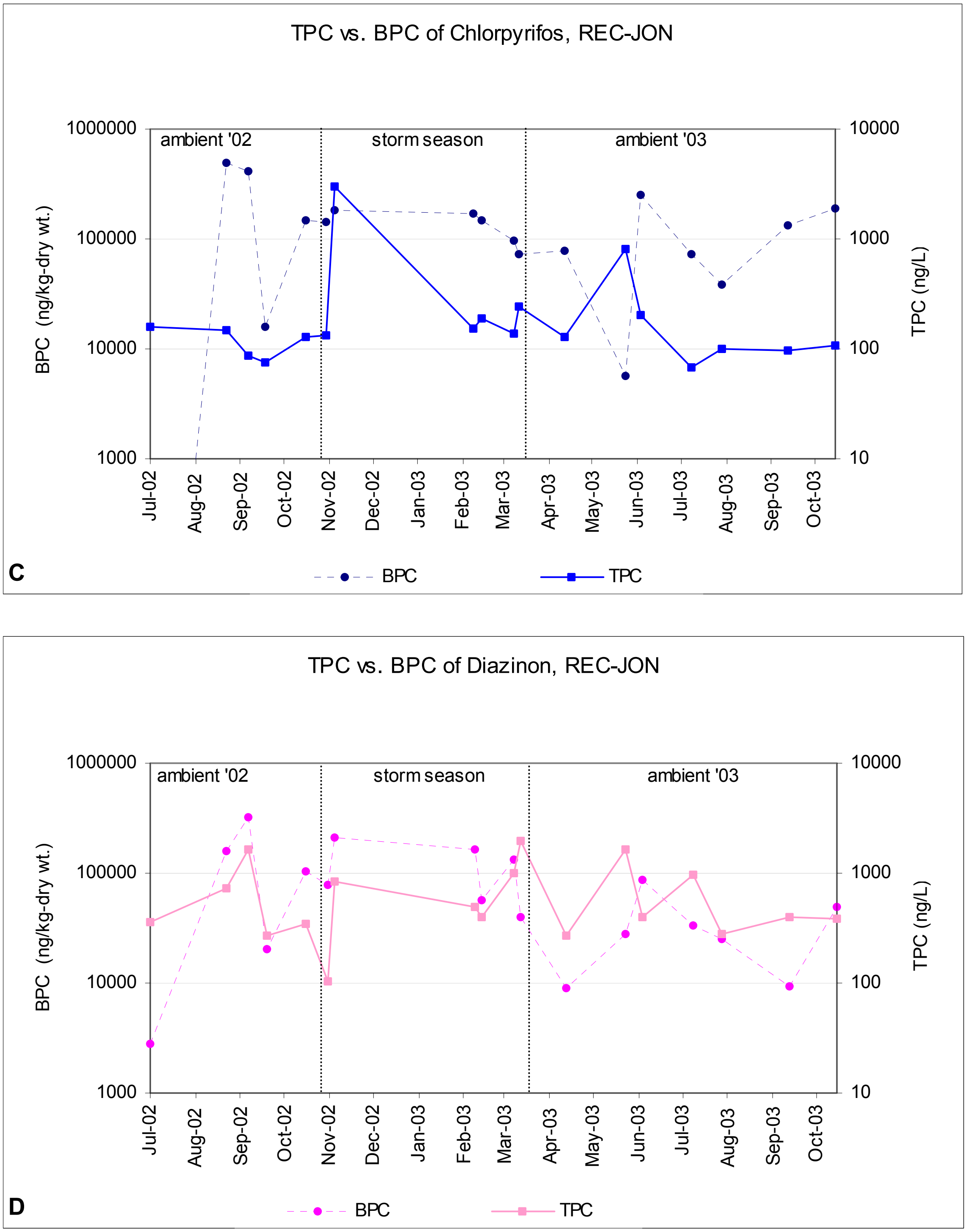
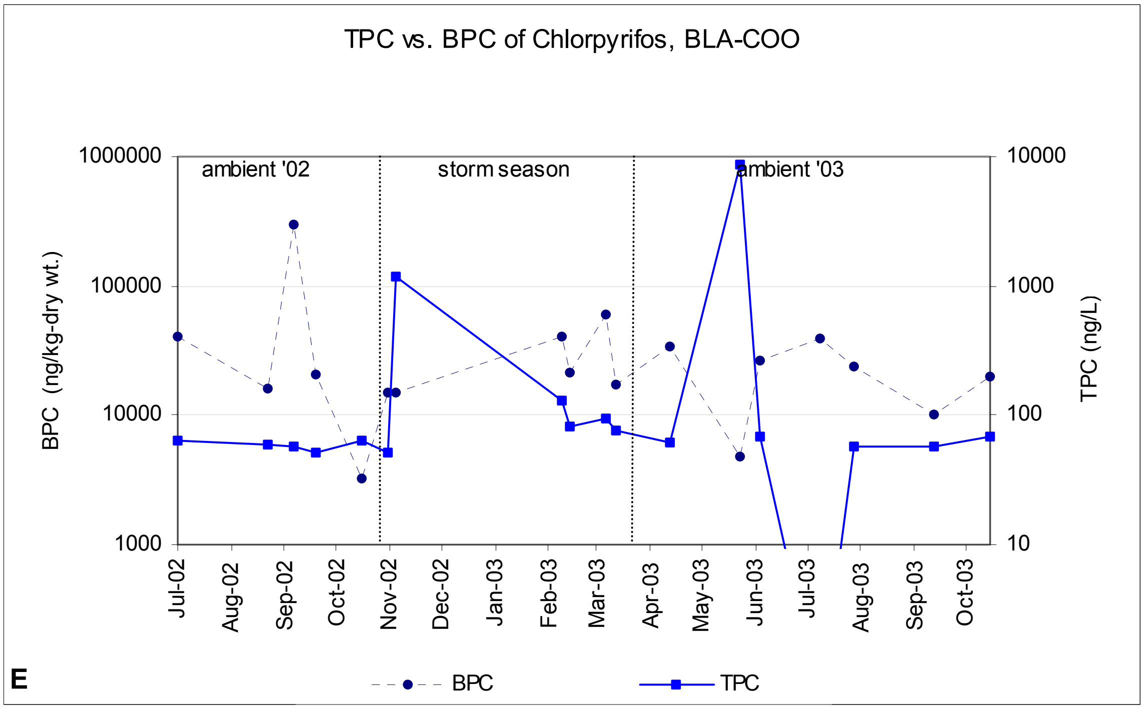


Figure 7.6 C&D TPC vs. BPC for chlorpyrifos and diazinon at REC-JON.



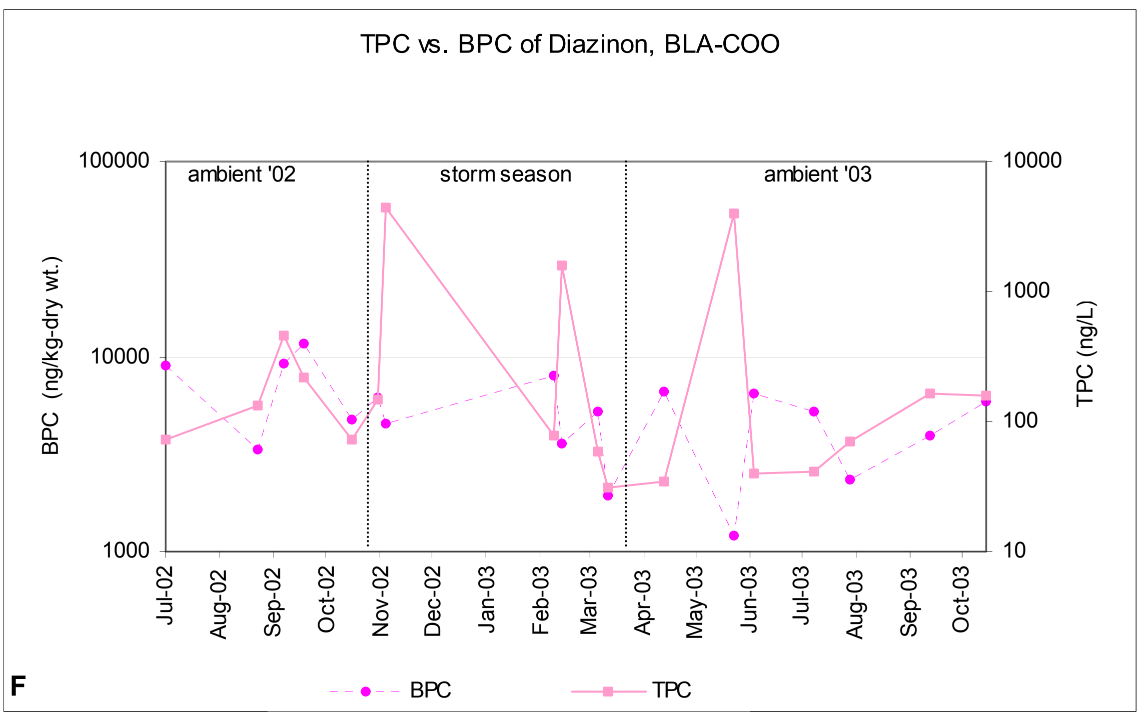
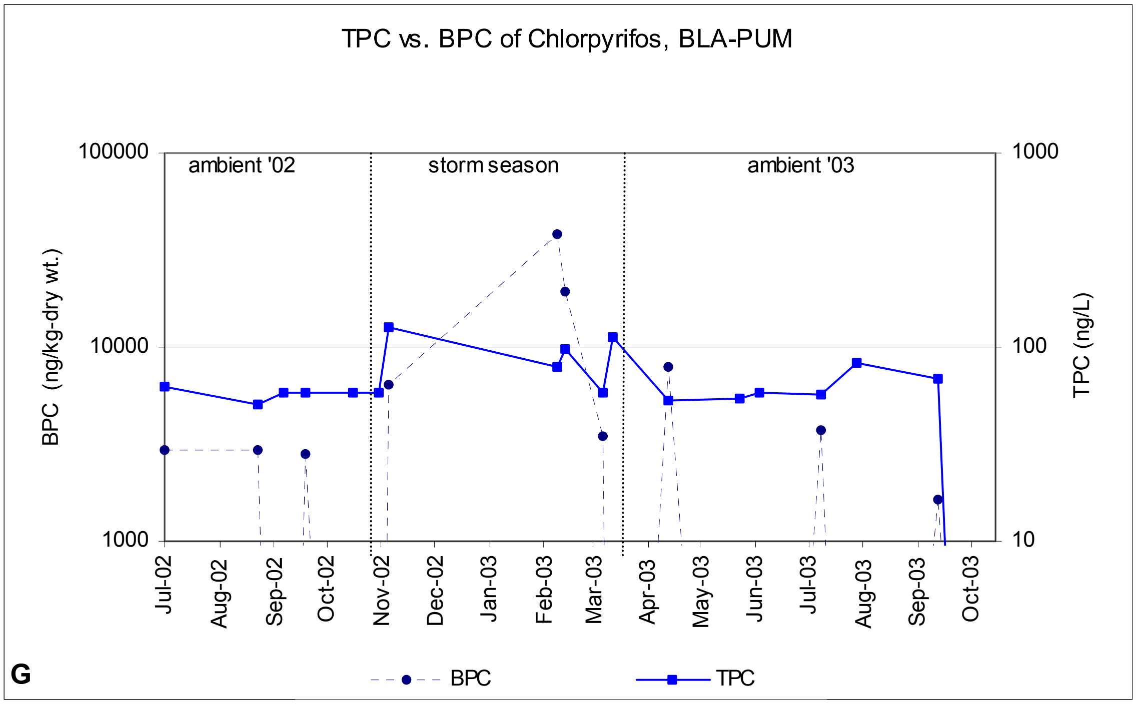


Figure 7.6 E&F TPC vs. BPC for chlorpyrifos and diazinon at BLA-COO.



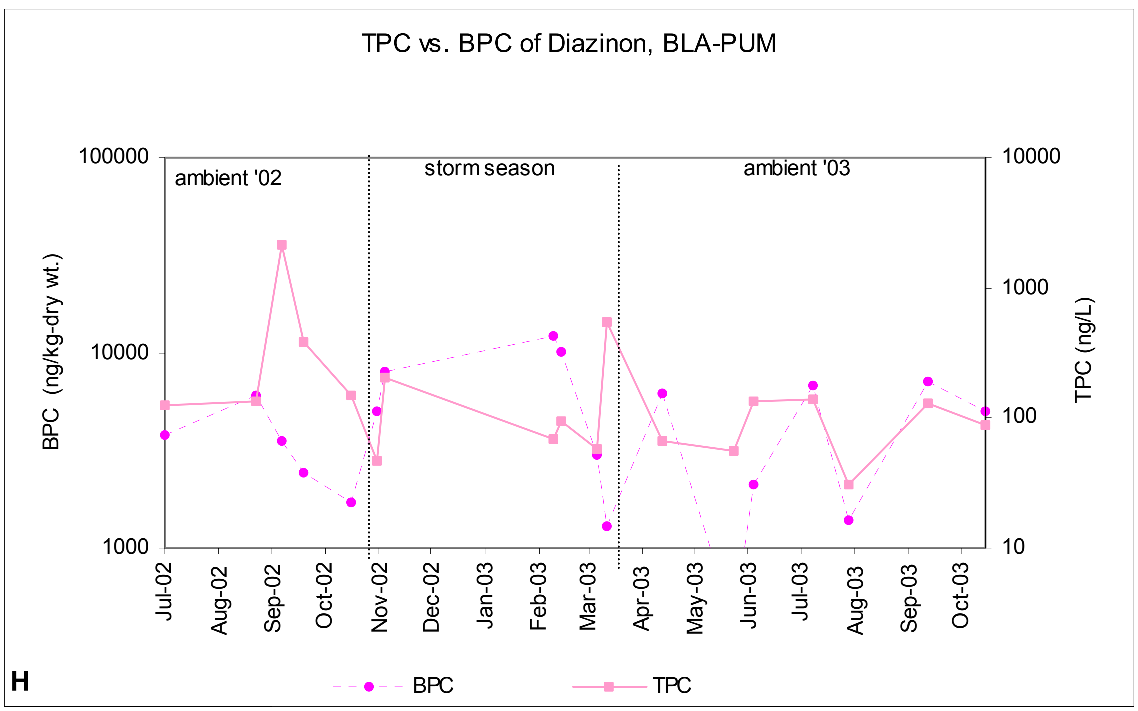
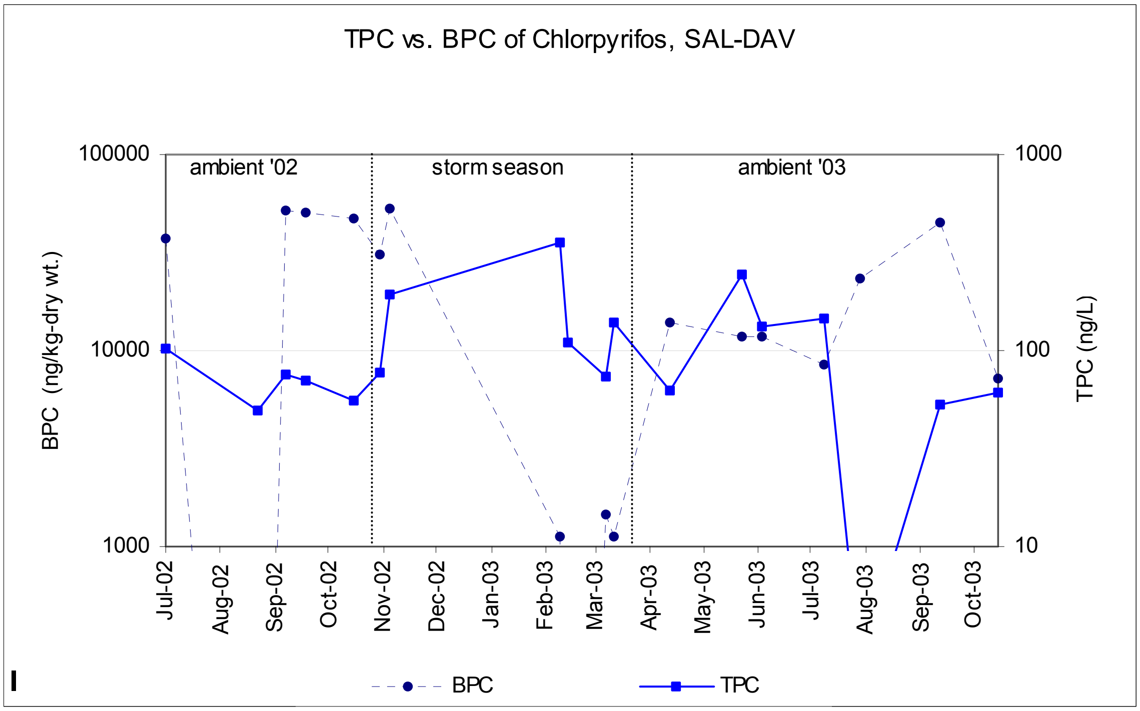


Figure 7.6 G&H TPC vs. BPC for chlorpyrifos and diazinon at BLA-PUM.



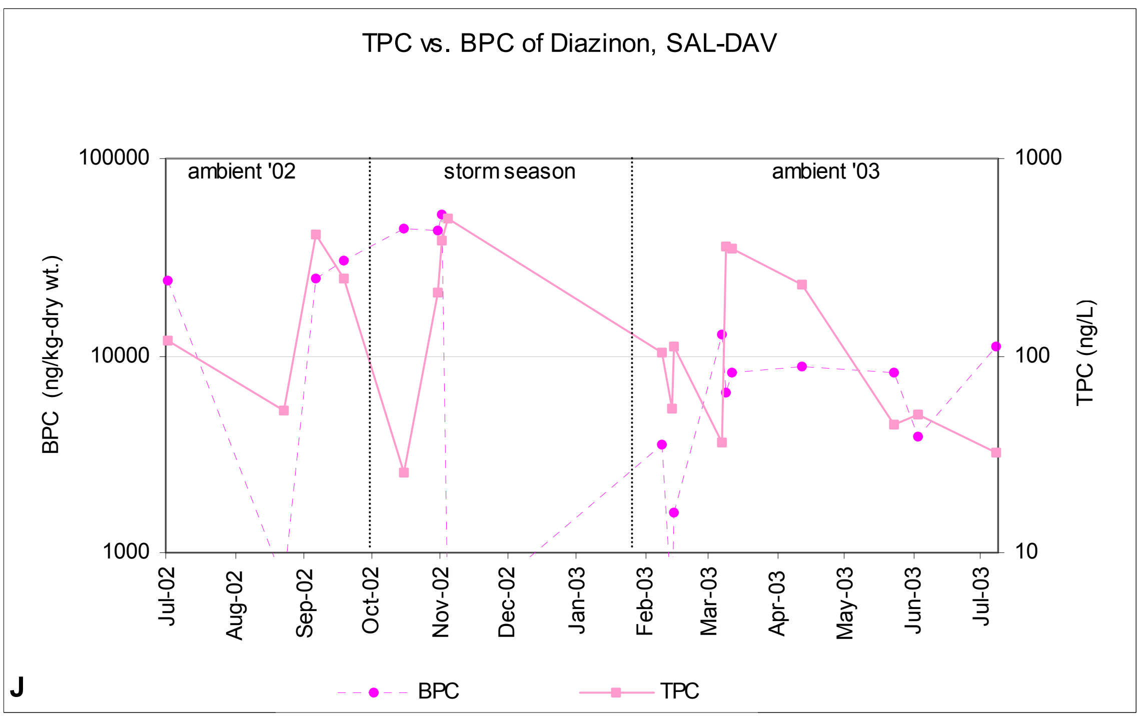
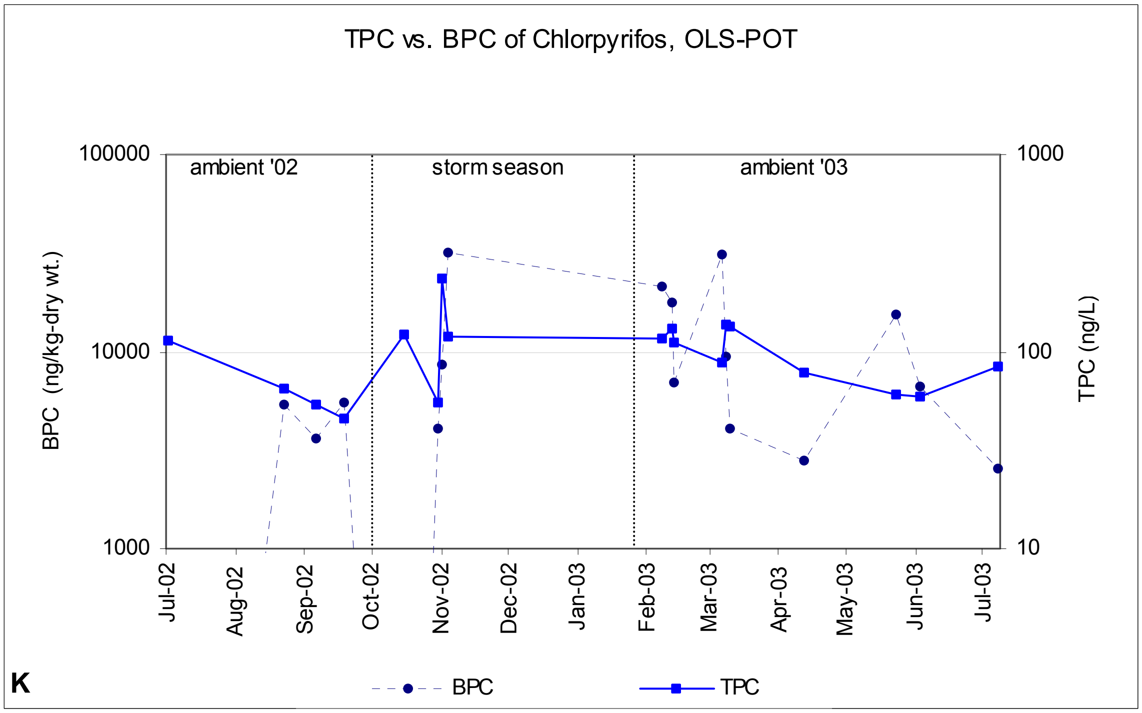


Figure 7.6 I&J TPC vs. BPC for chlorpyrifos and diazinon at SAL-DAV.



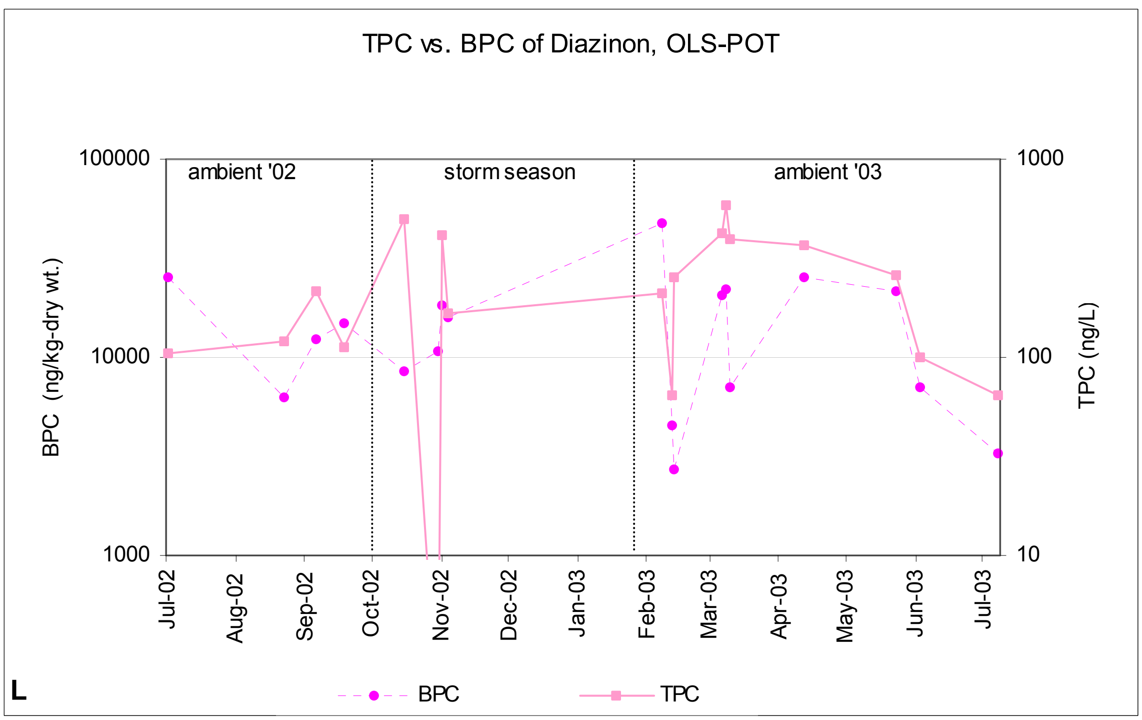
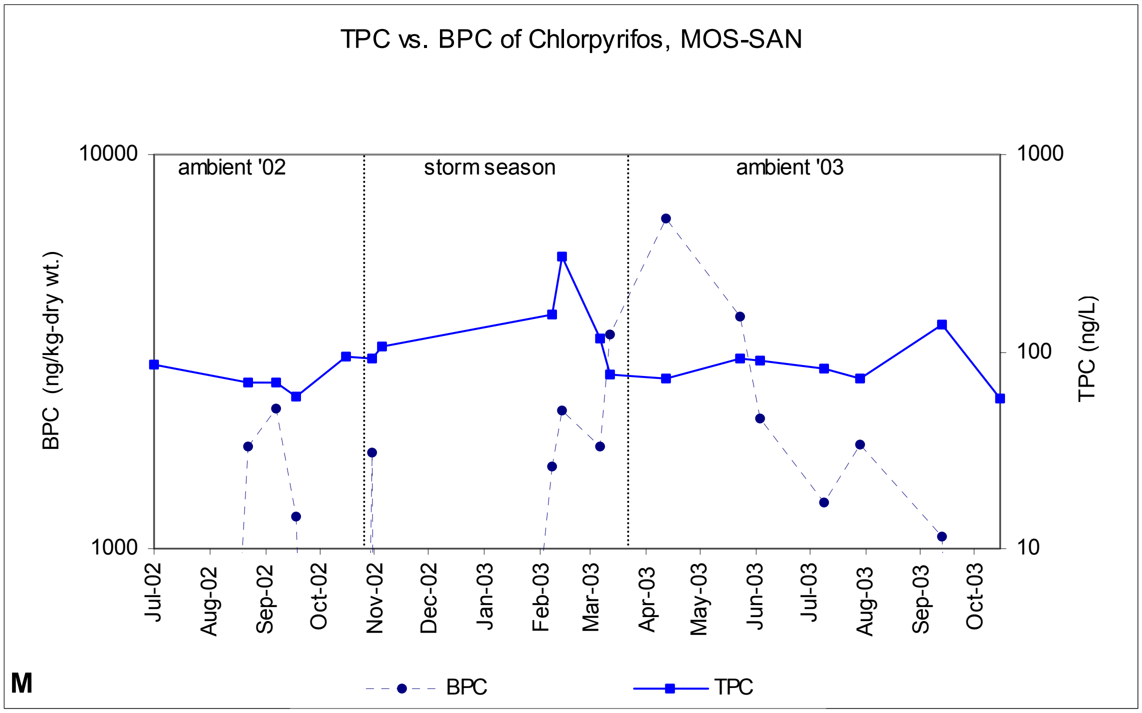


Figure 7.6 K&L TPC vs. BPC for chlorpyrifos and diazinon at OLS-POT.



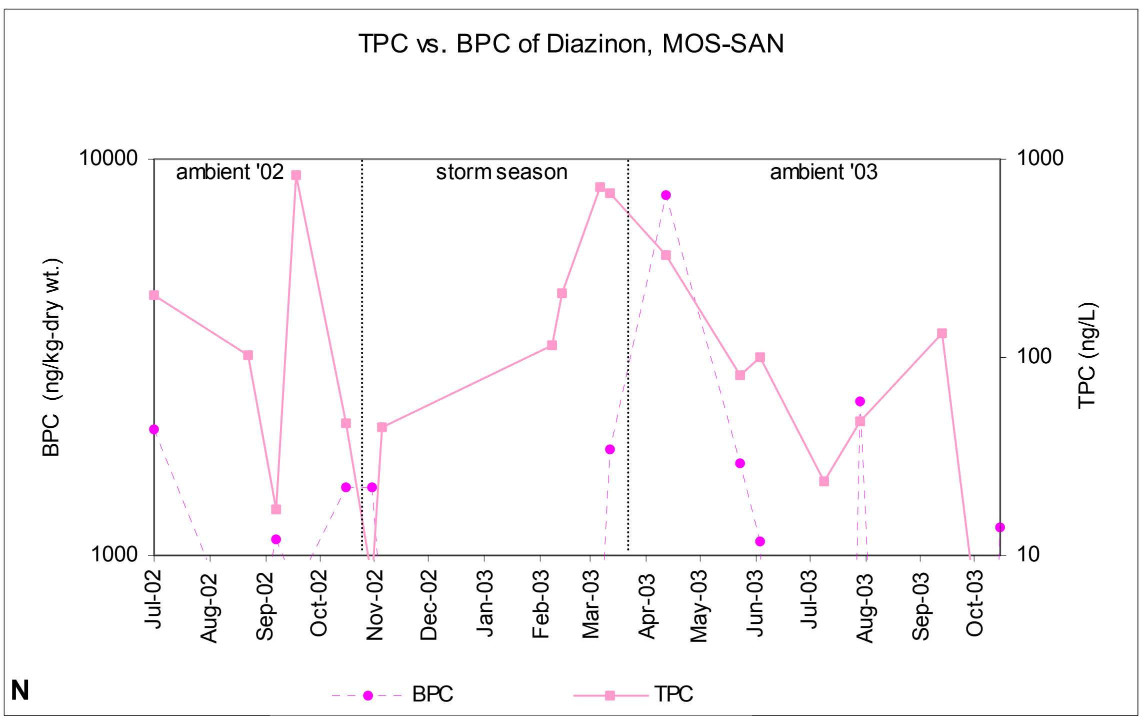
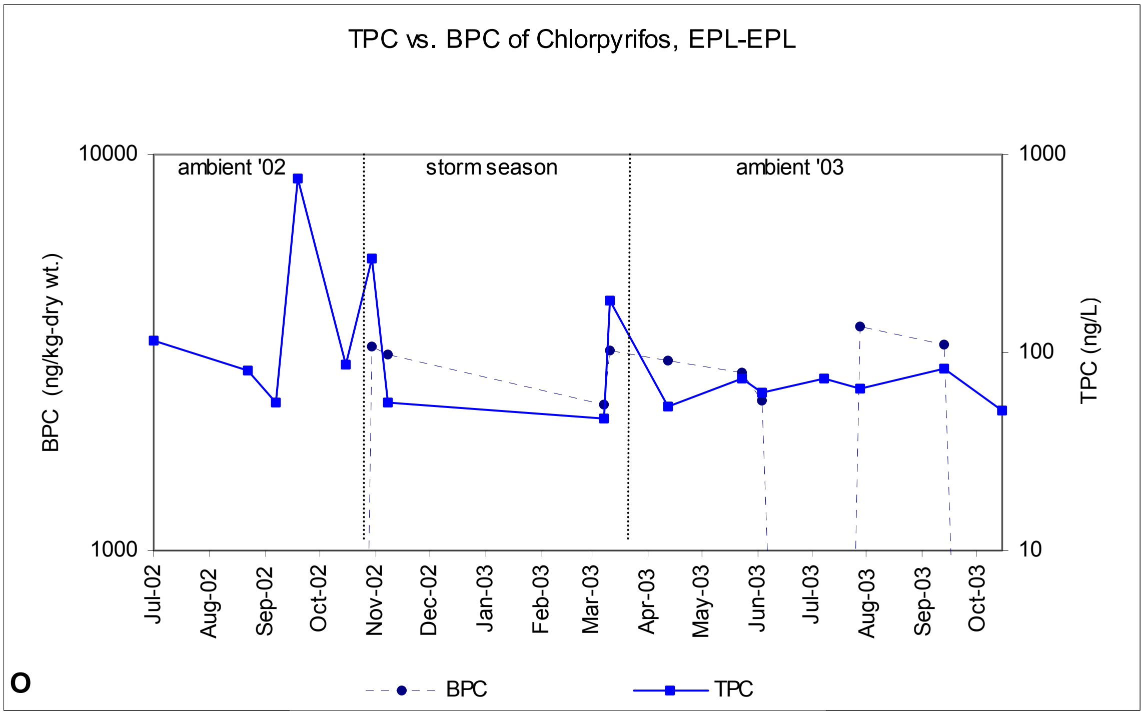


Figure 7.6 M&N TPC vs. BPC for chlorpyrifos and diazinon at MOS-SAN.



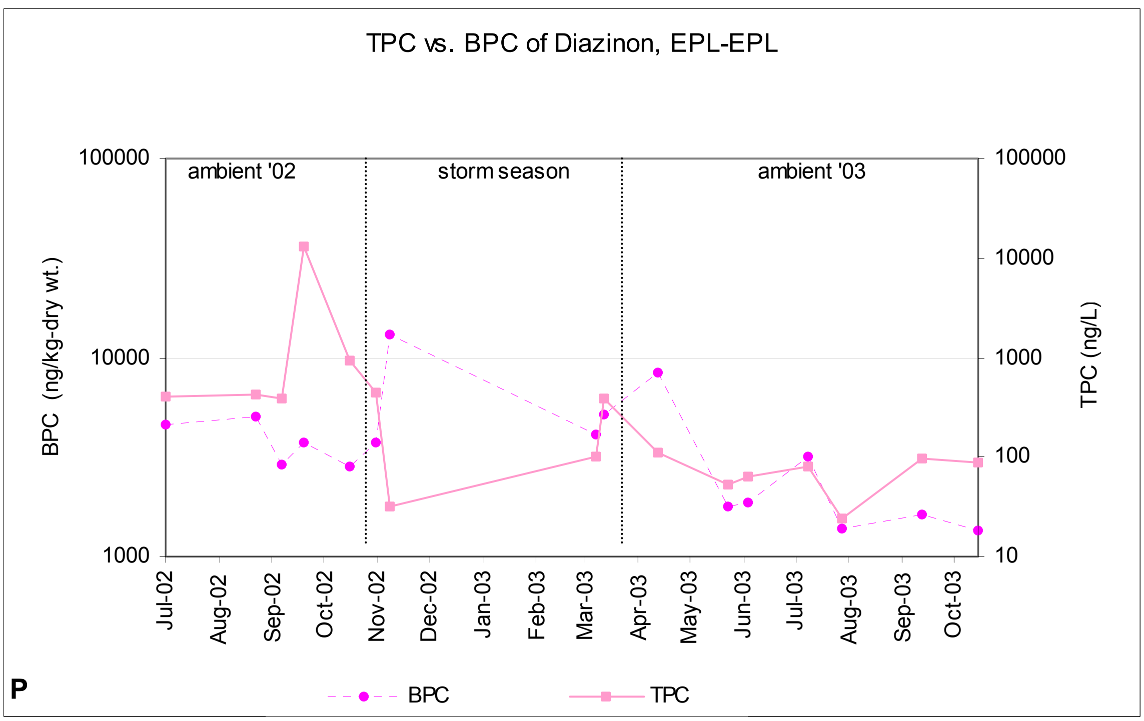
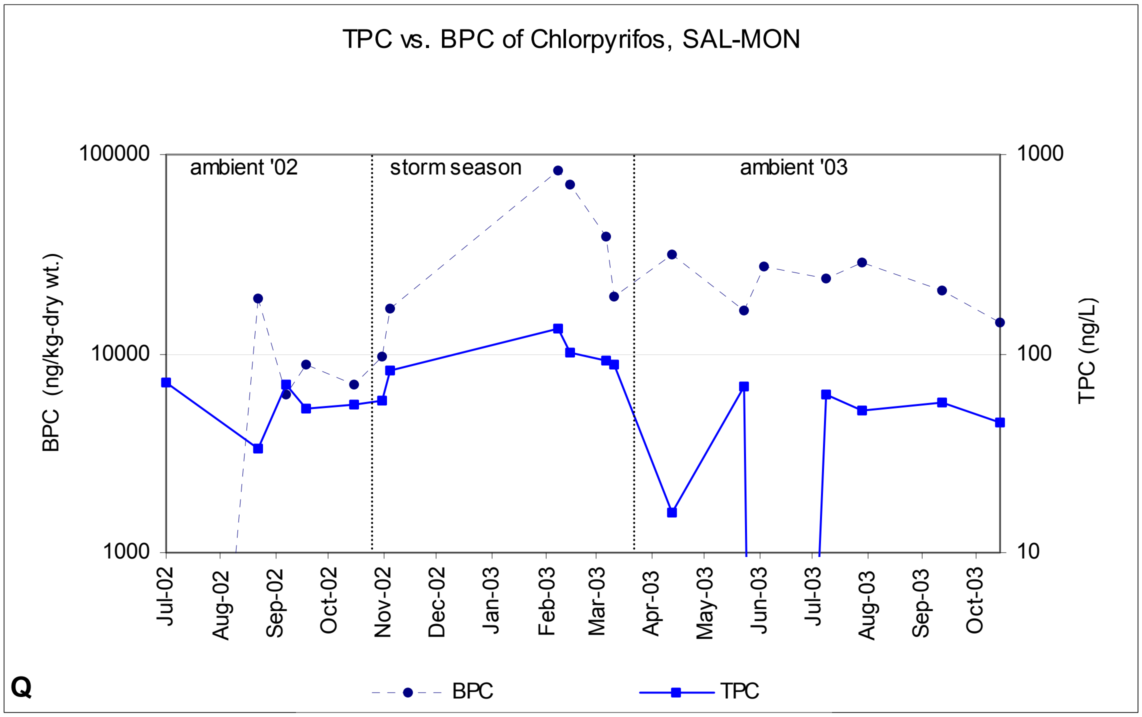


Figure 7.6 O&P TPC vs. BPC for chlorpyrifos and diazinon at EPL-EPL.



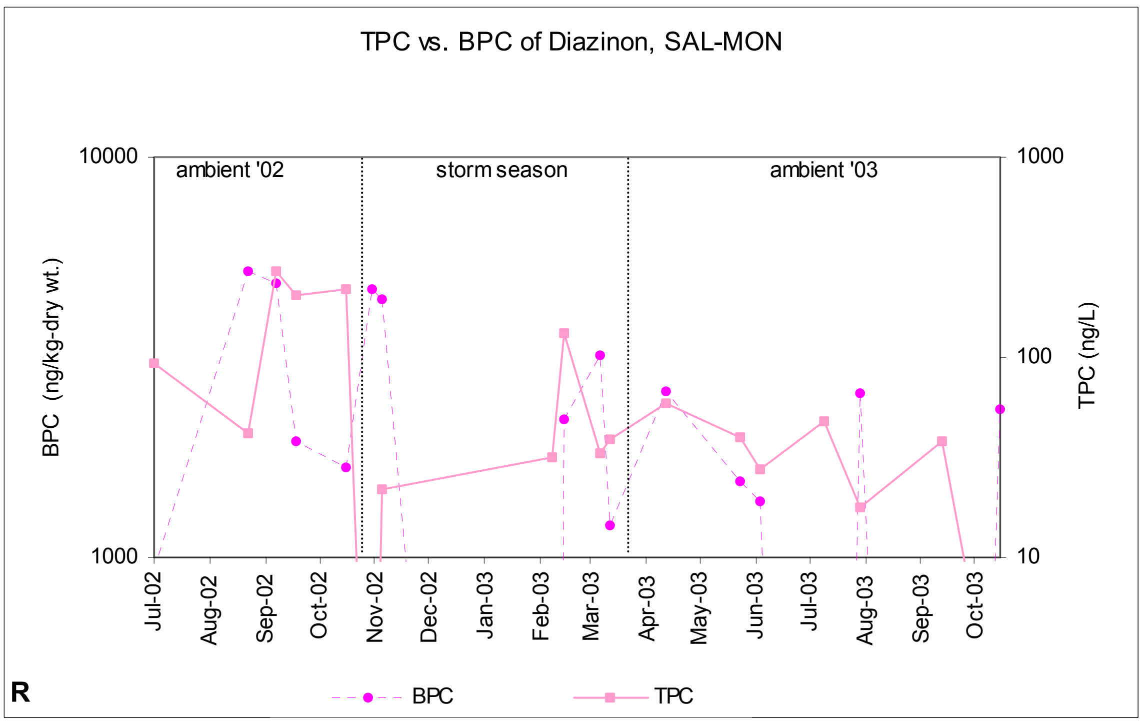


Figure 7.6 Q&R TPC vs. BPC for chlorpyrifos and diazinon at SAL-MON.

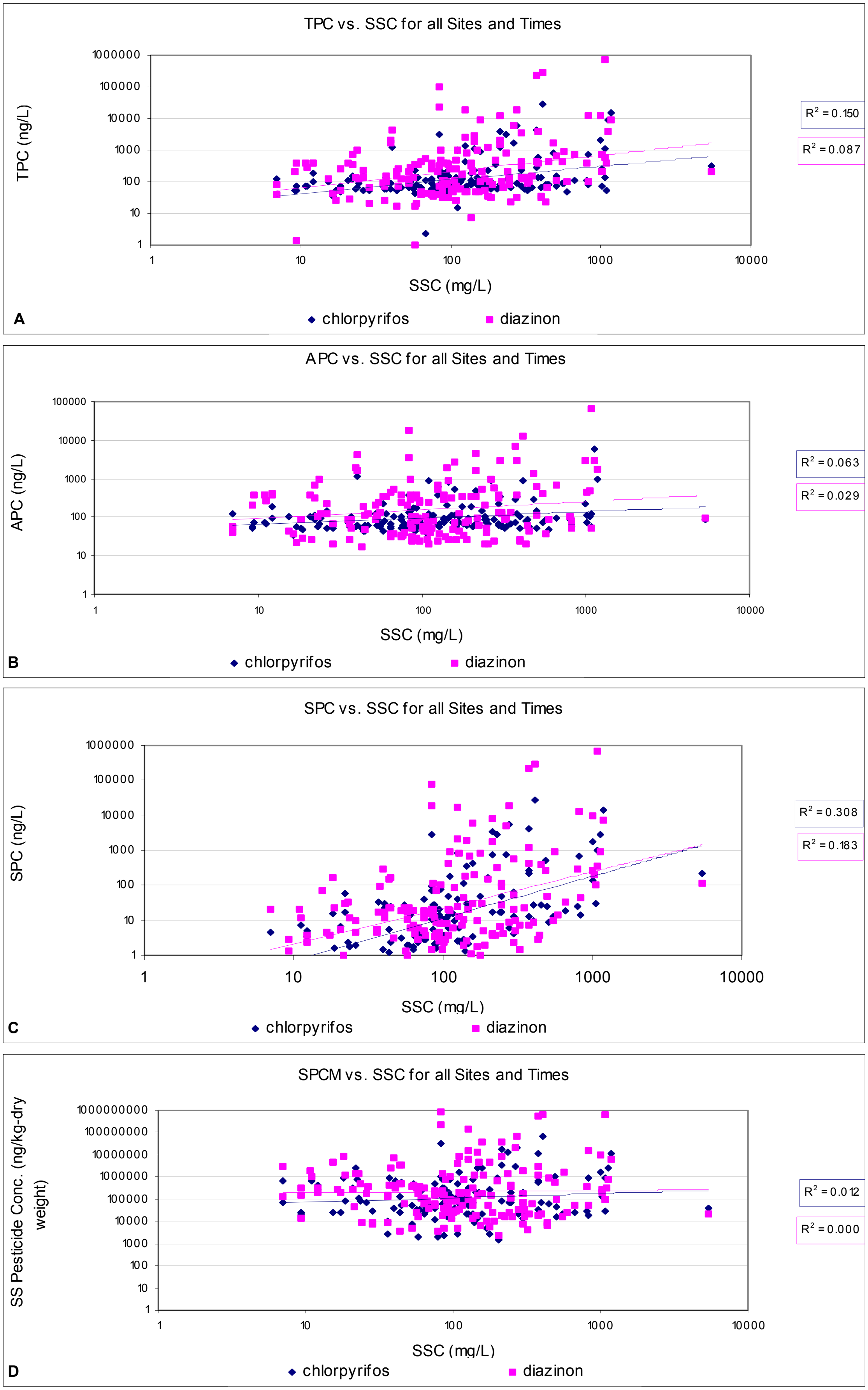


Figure 7.7 A-D Various relationships of pesticide concentrations to the suspended solids concentration in the water column.

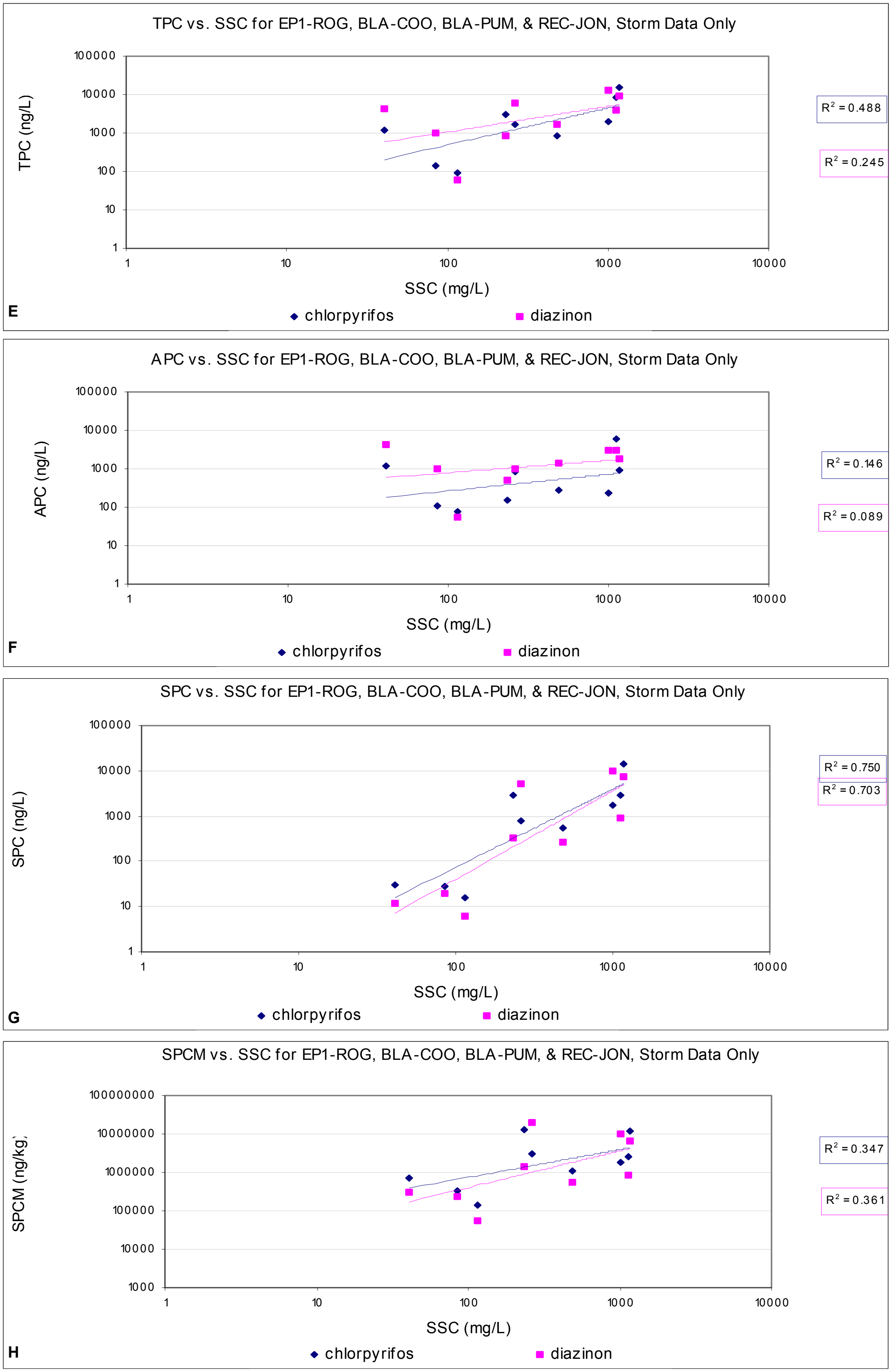


Figure 7.7 E-H Various relationships of pesticide concentrations to the SSC in the water column. Low-algal sites only. Storm peak samples only.

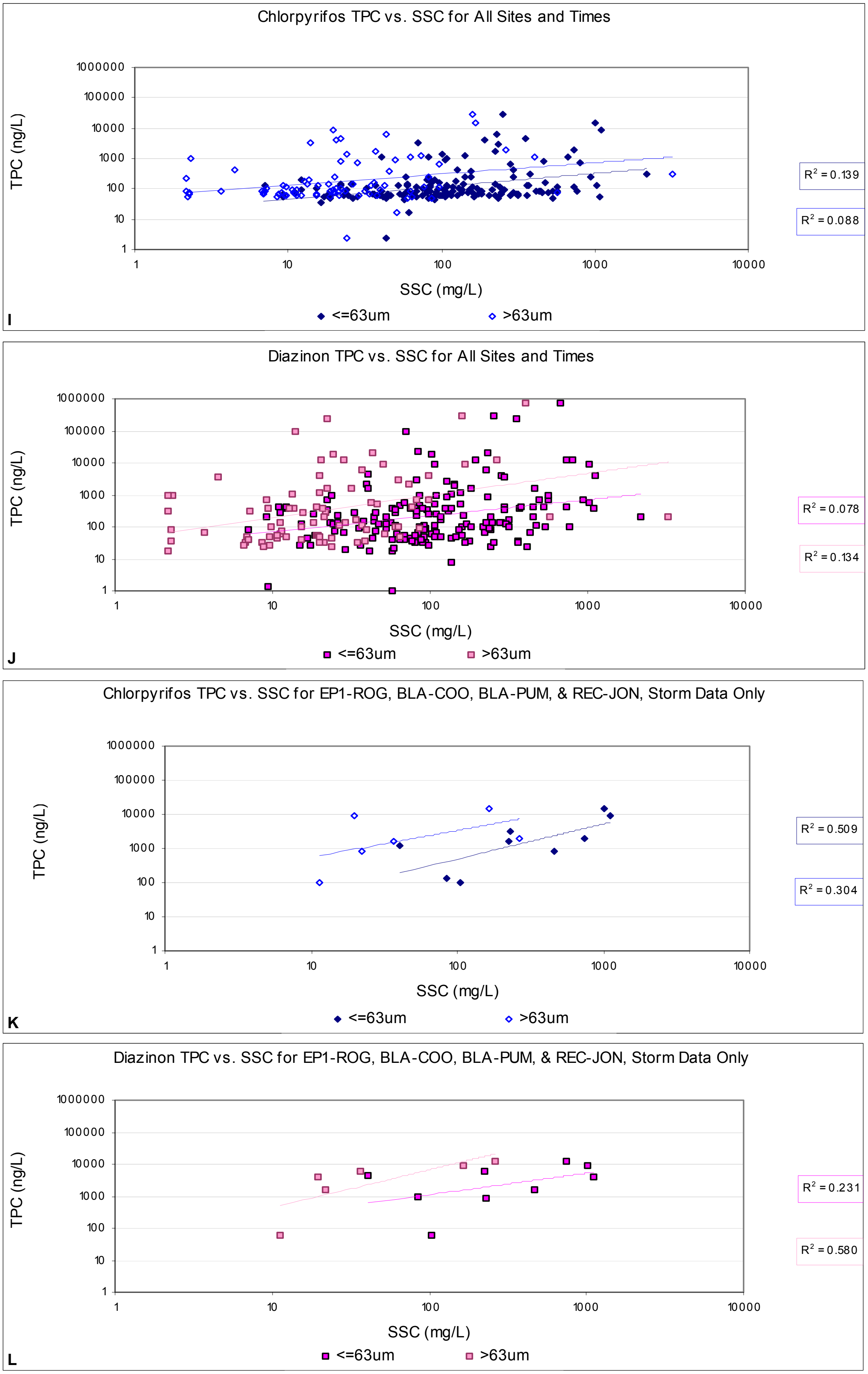


Figure 7.7 I–L Various relationships of pesticide concentrations to the SSC in the water column.

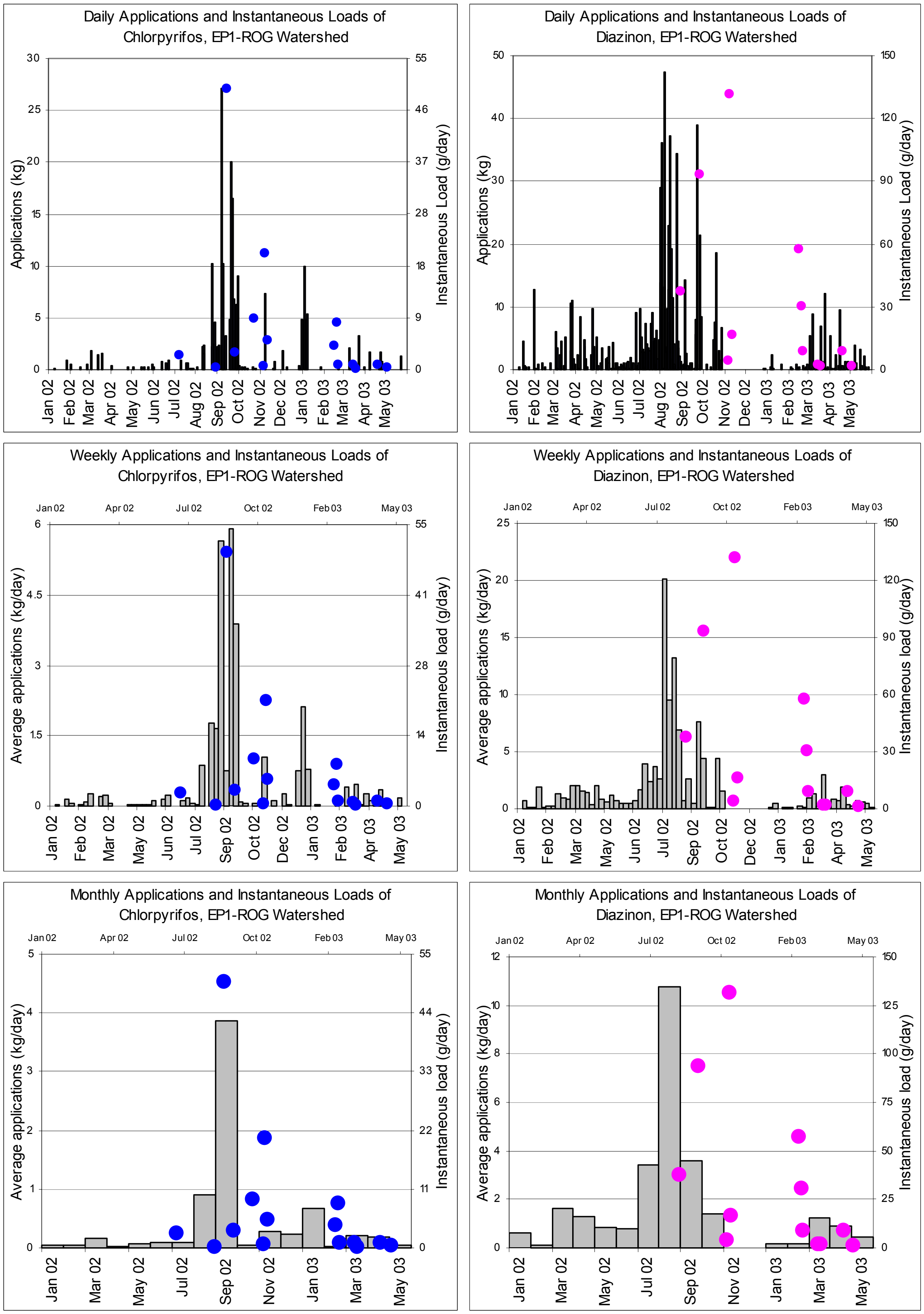


Figure 7.8 A Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. instantaneous load at EP1-ROG.

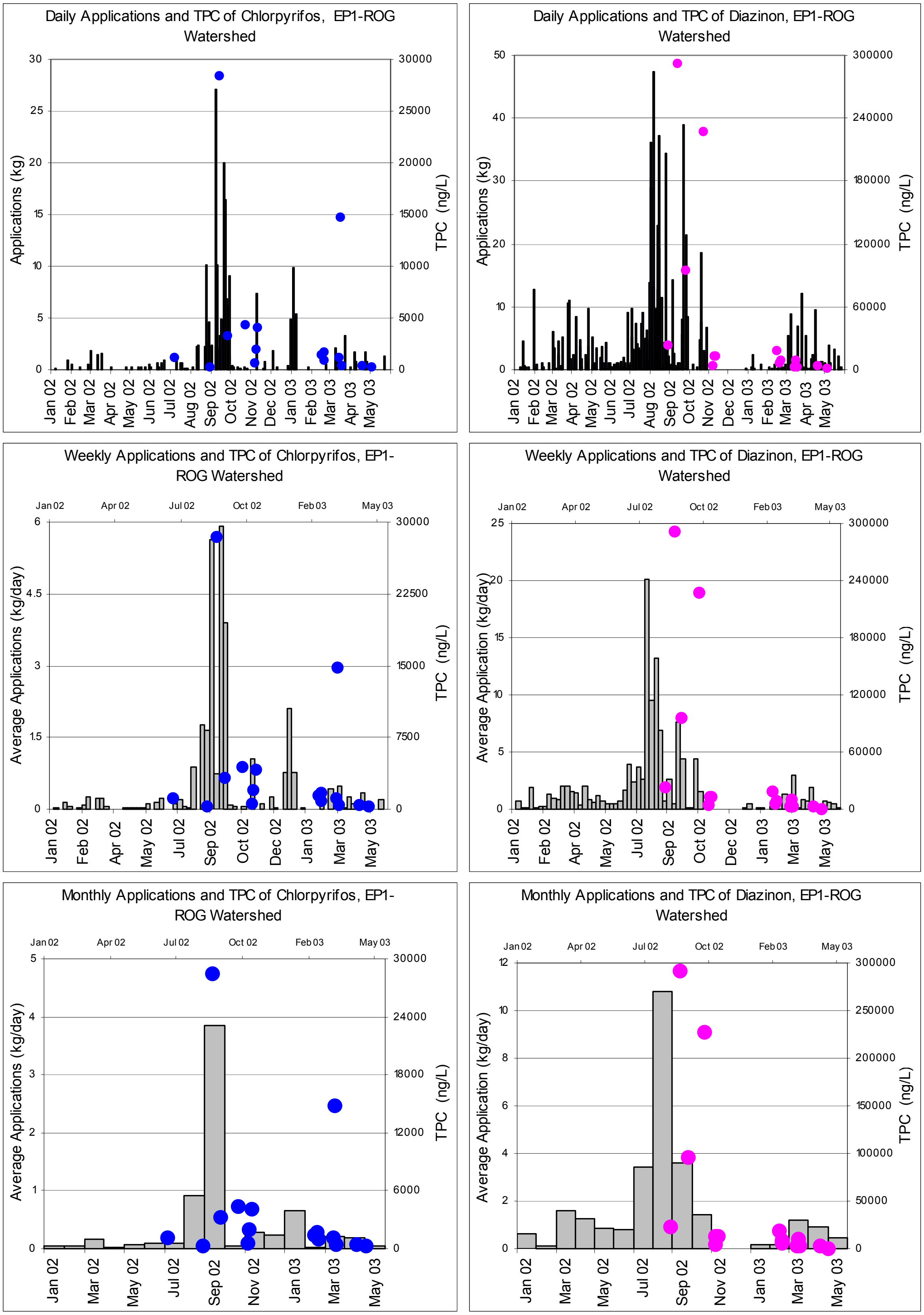


Figure 7.8 B Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at EP1-ROG.

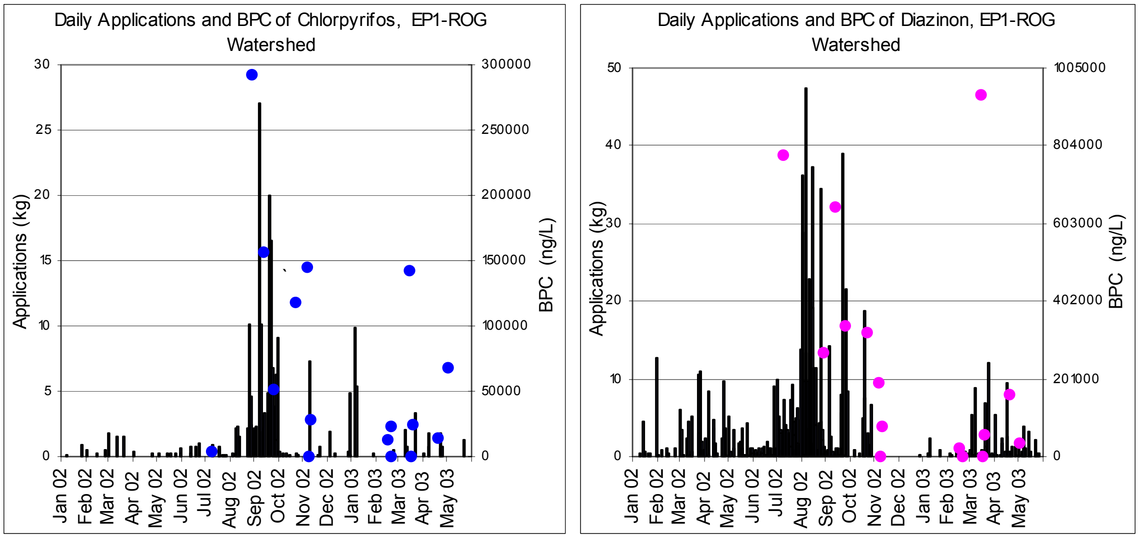


Figure 7.8 C Applications of diazinon and chlorpyrifos represented daily vs. BPC at EP1-ROG.

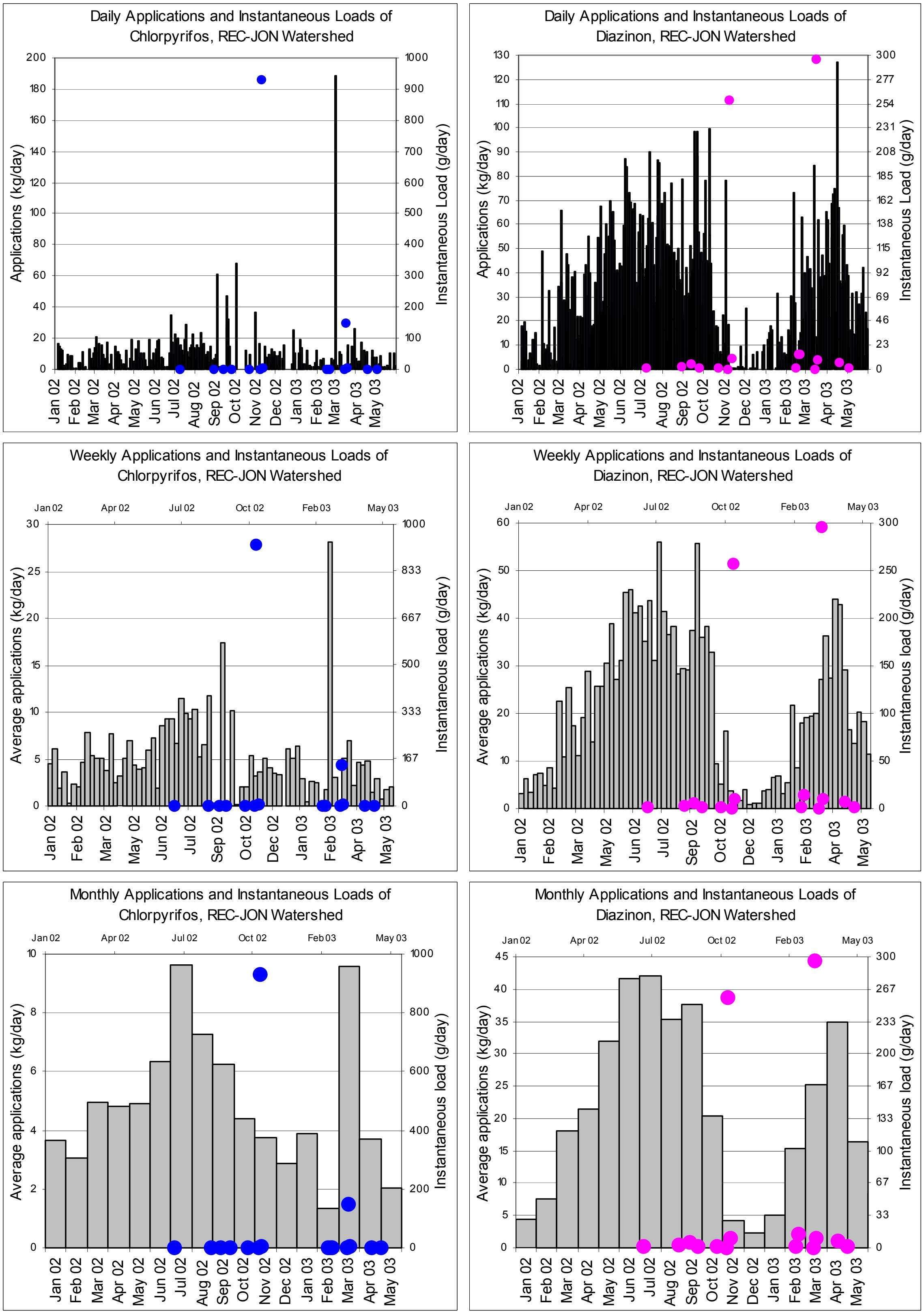


Figure 7.8 D Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. instantaneous load at REC-JON.

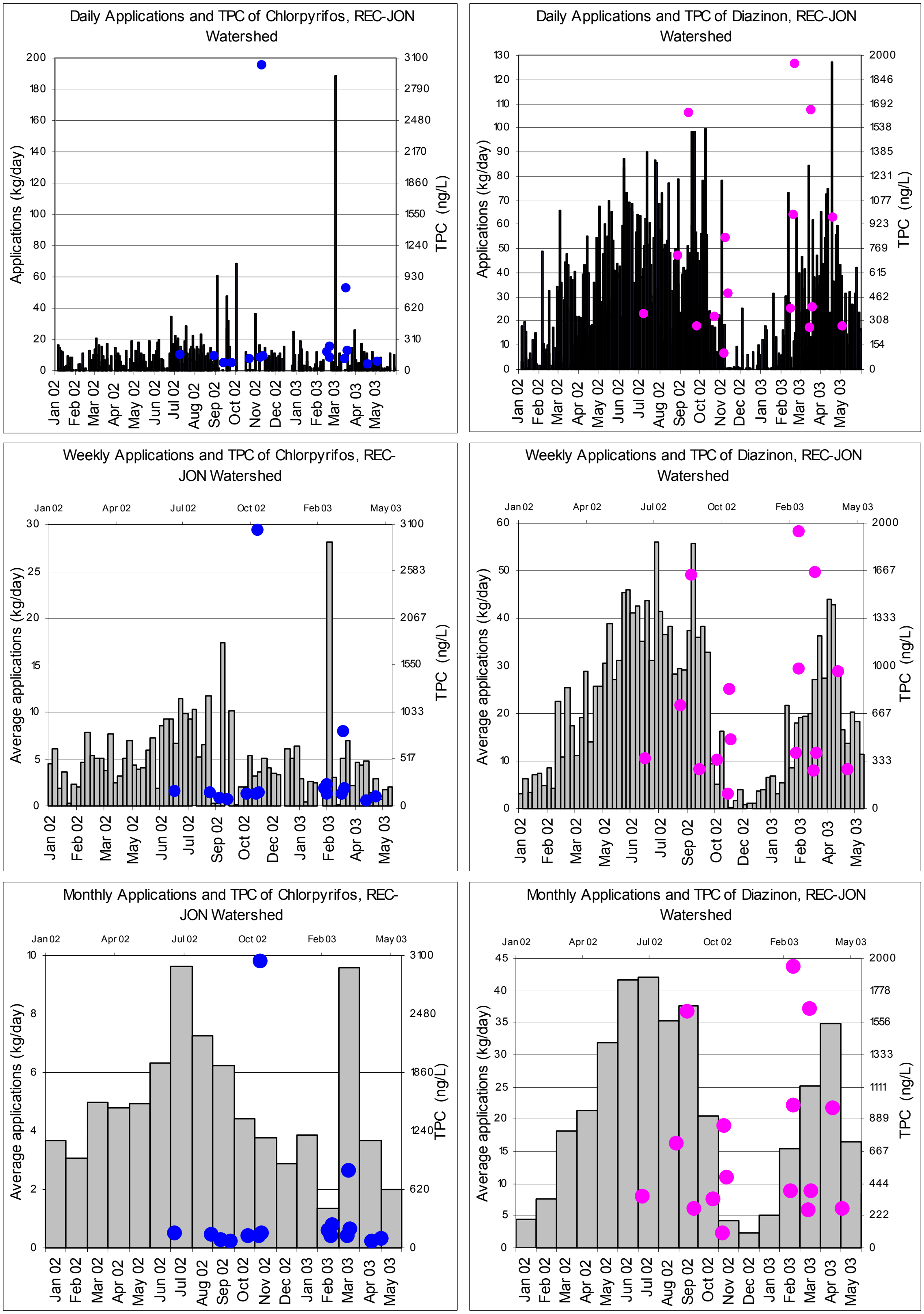
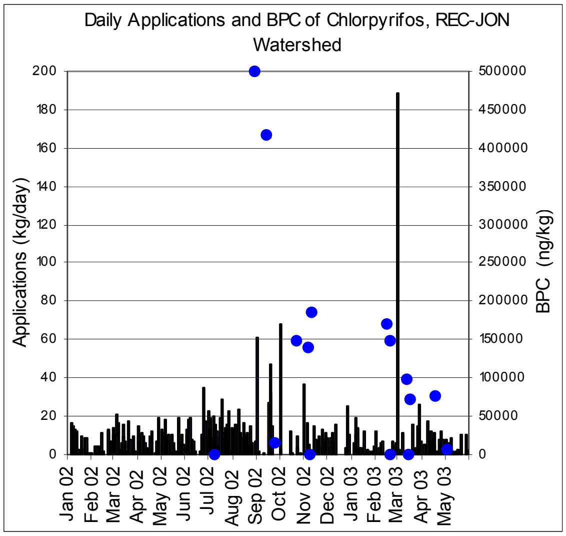


Figure 7.8 E Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at REC–JON.



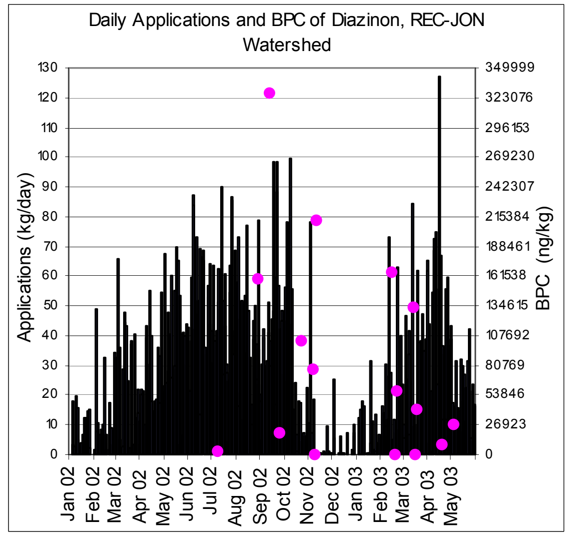


Figure 7.8 F Applications of diazinon and chlorpyrifos represented daily vs. BPC at REC-JON.

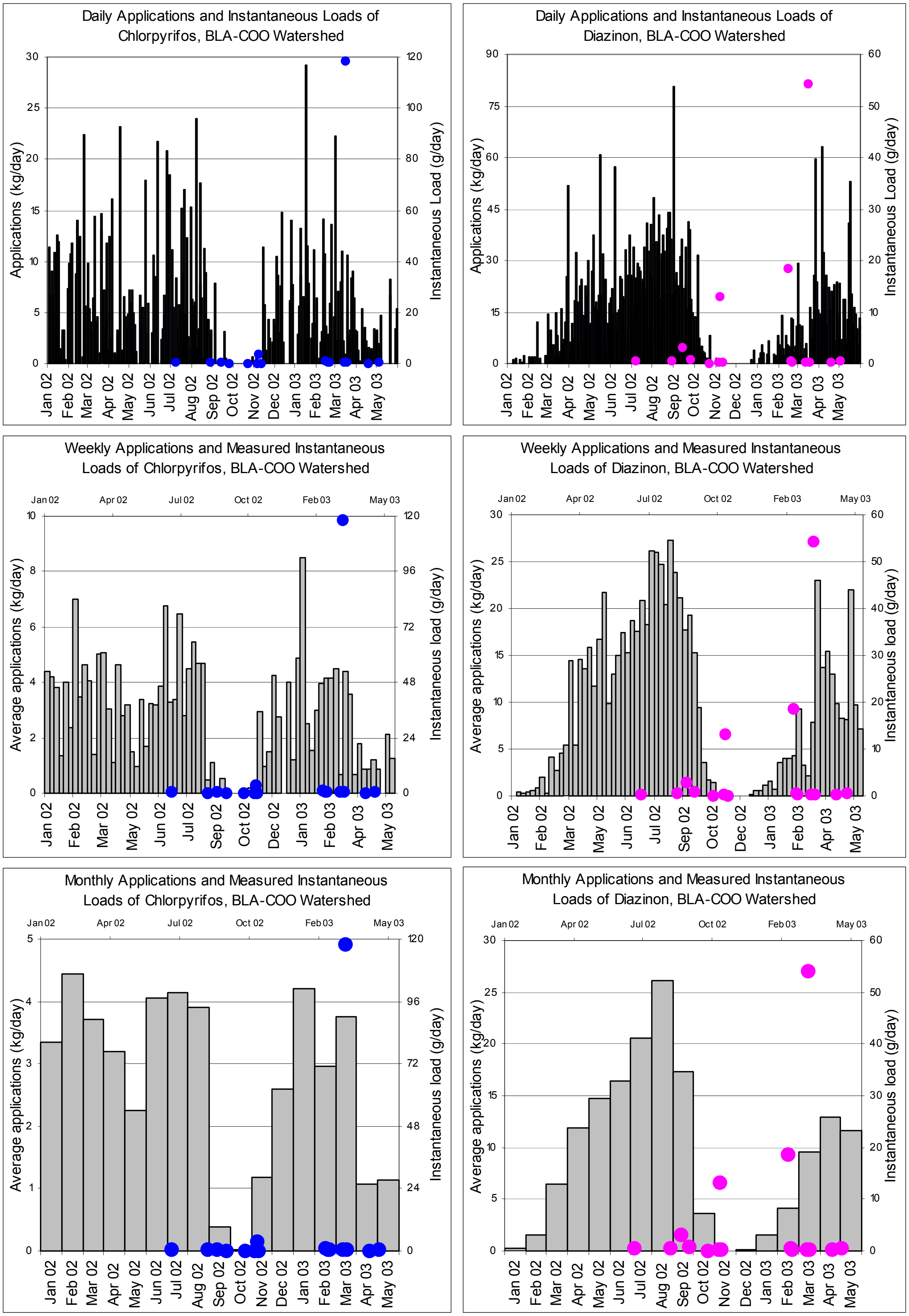


Figure 7.8 G Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. instantaneous load at BLA-COO.

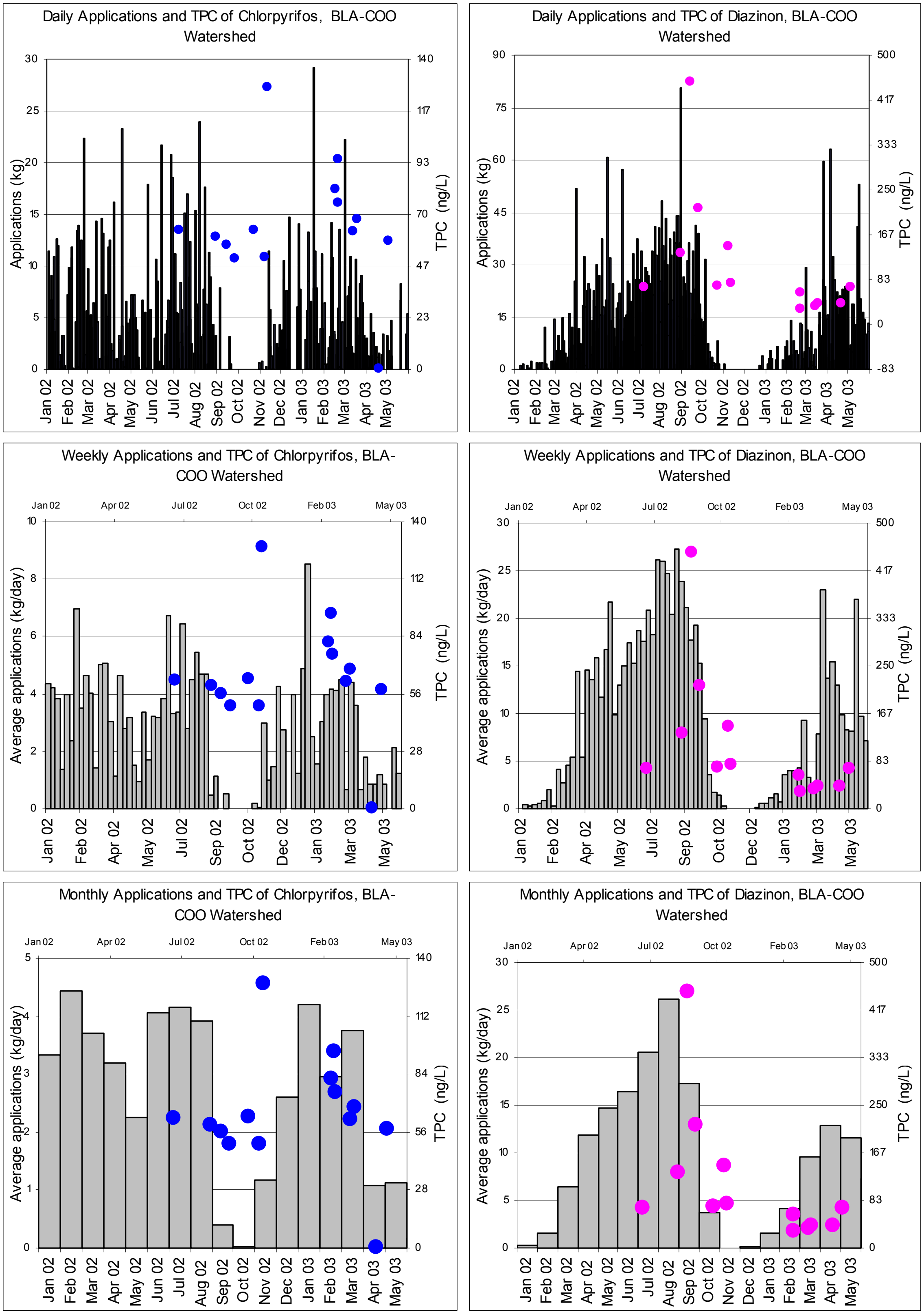


Figure 7.8 H Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at BLA-COO.

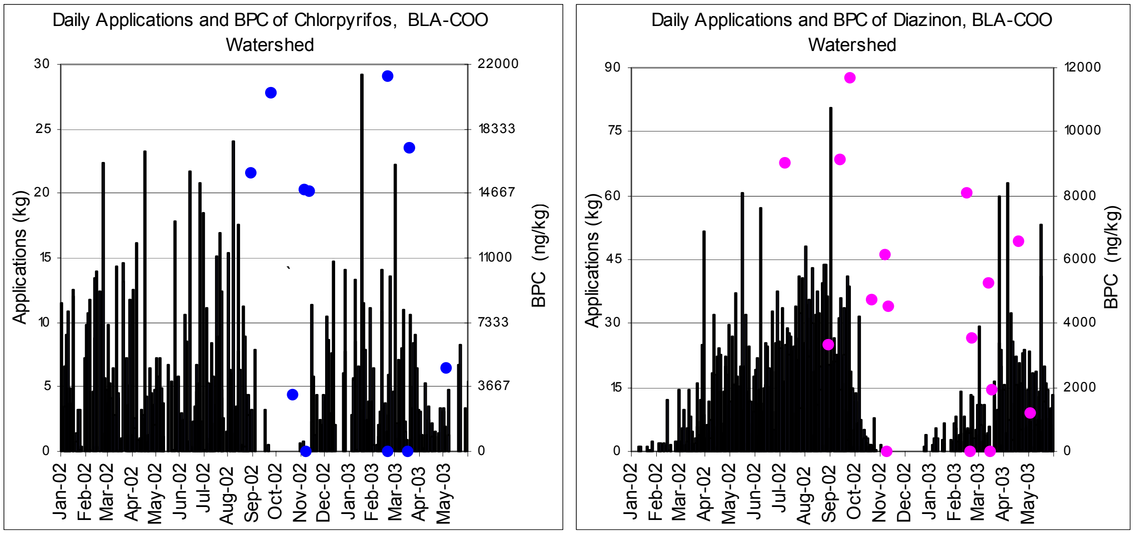


Figure 7.8 l Applications of diazinon and chlorpyrifos represented daily vs. BPC at BLA-COO.

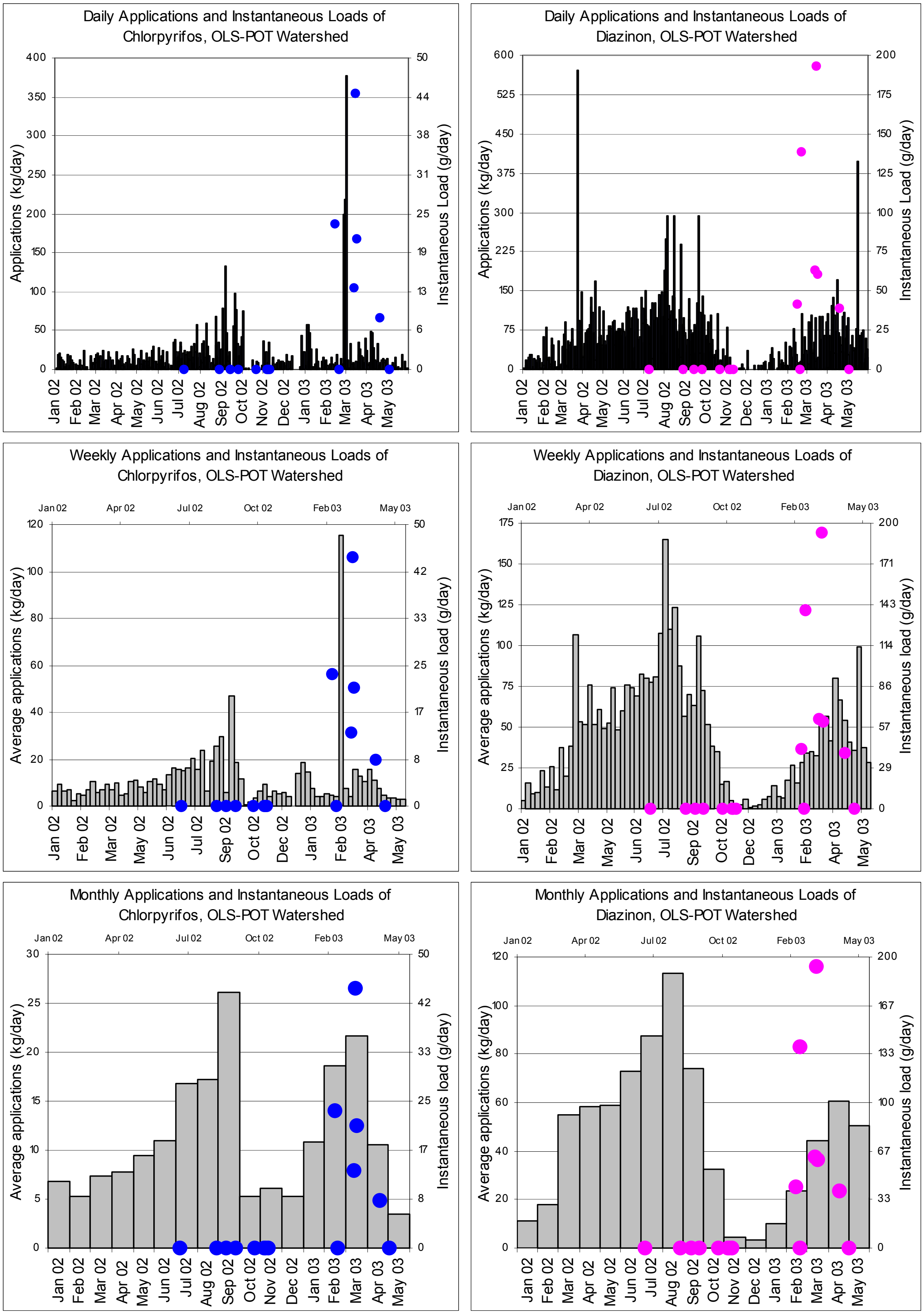


Figure 7.8 J Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. instantaneous load at OLS-POT.

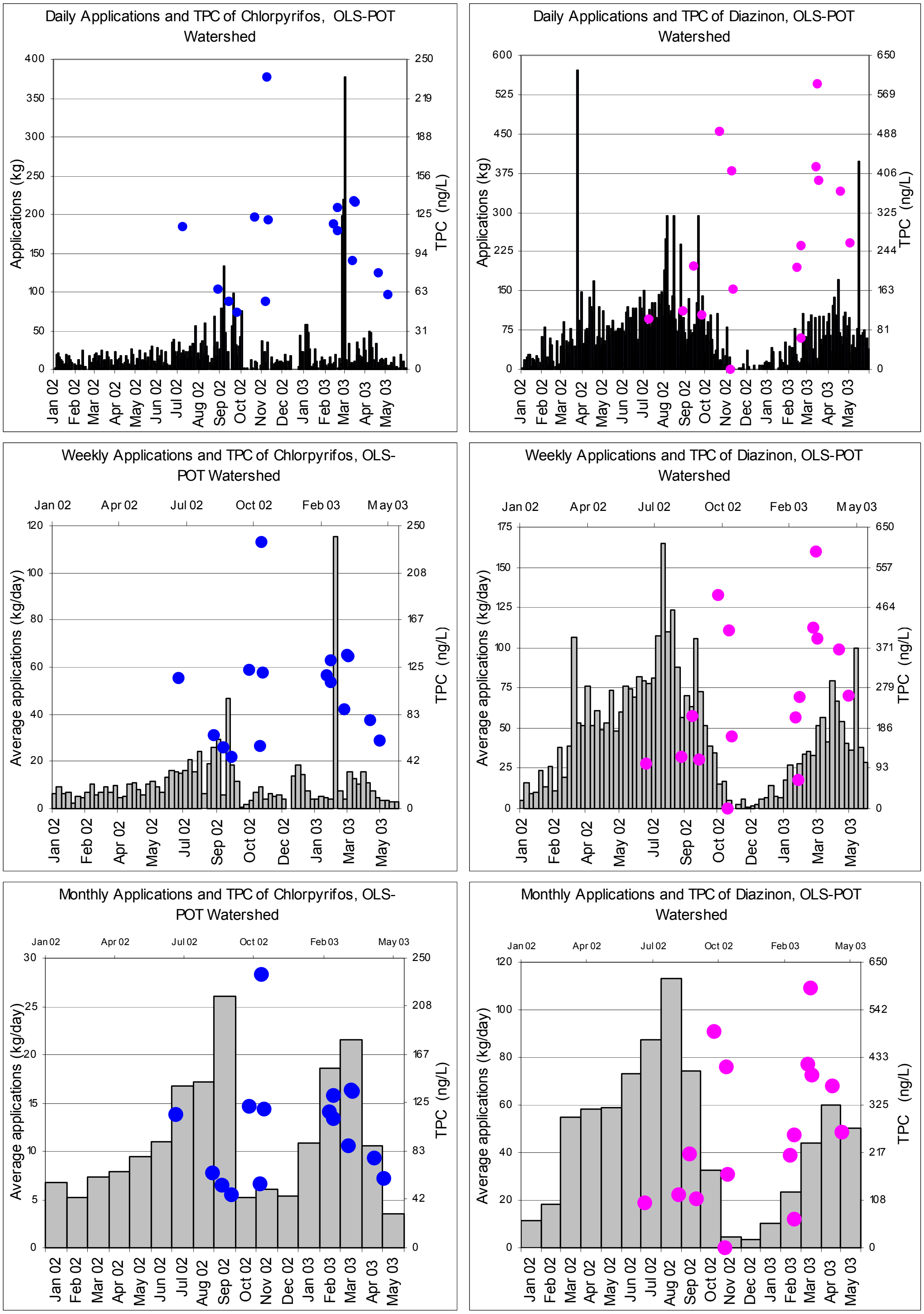


Figure 7.8 K Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at OLS-POT.

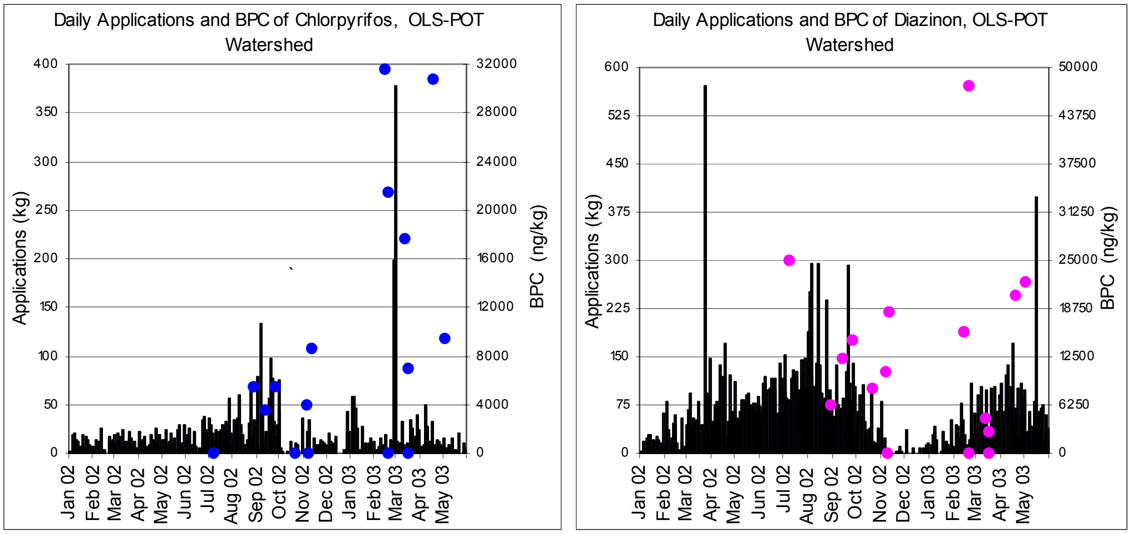


Figure 7.8 L Applications of diazinon and chlorpyrifos represented daily vs. BPC at OLS-POT.

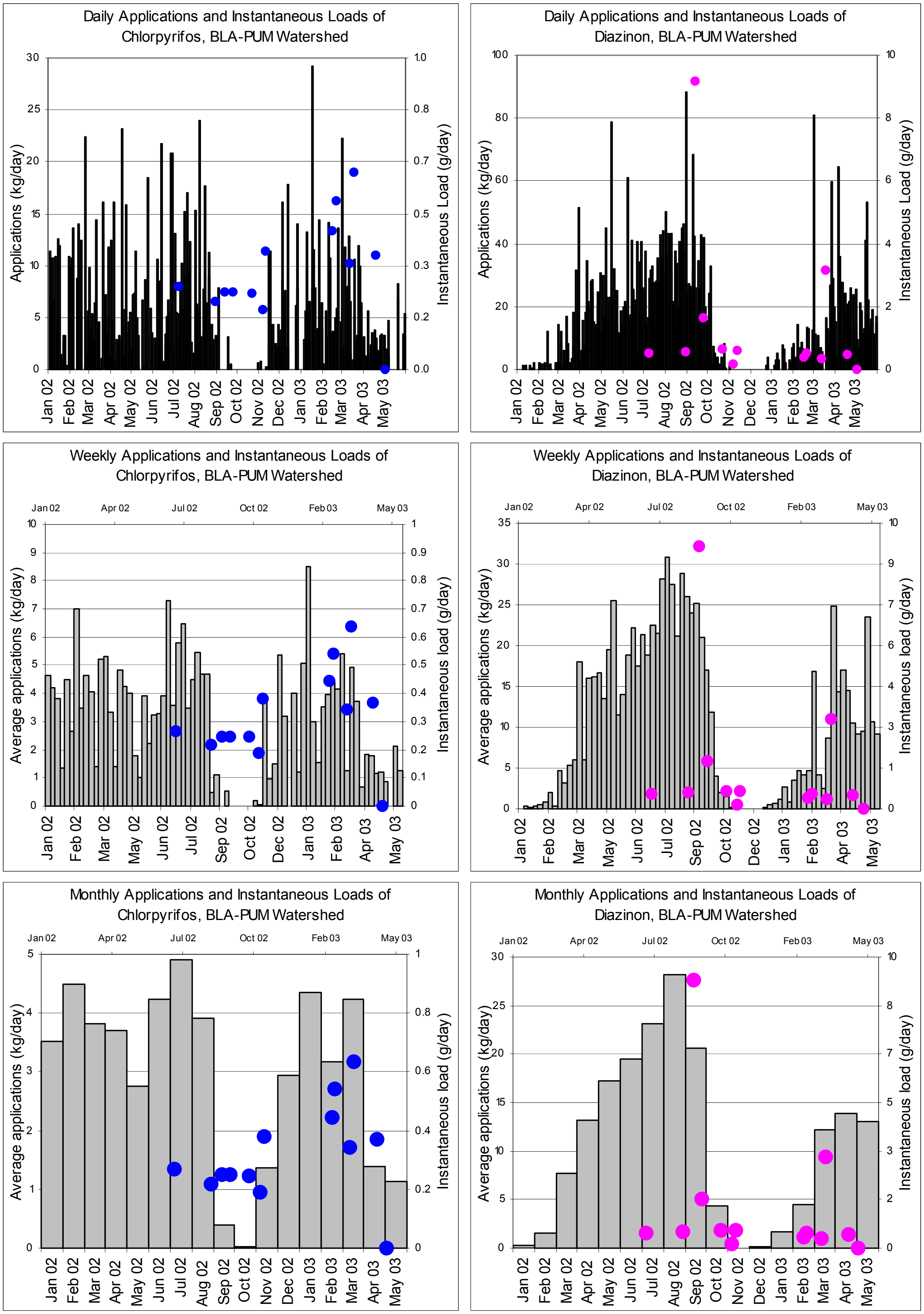


Figure 7.8 M Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. instantaneous load at BLA-PUM.

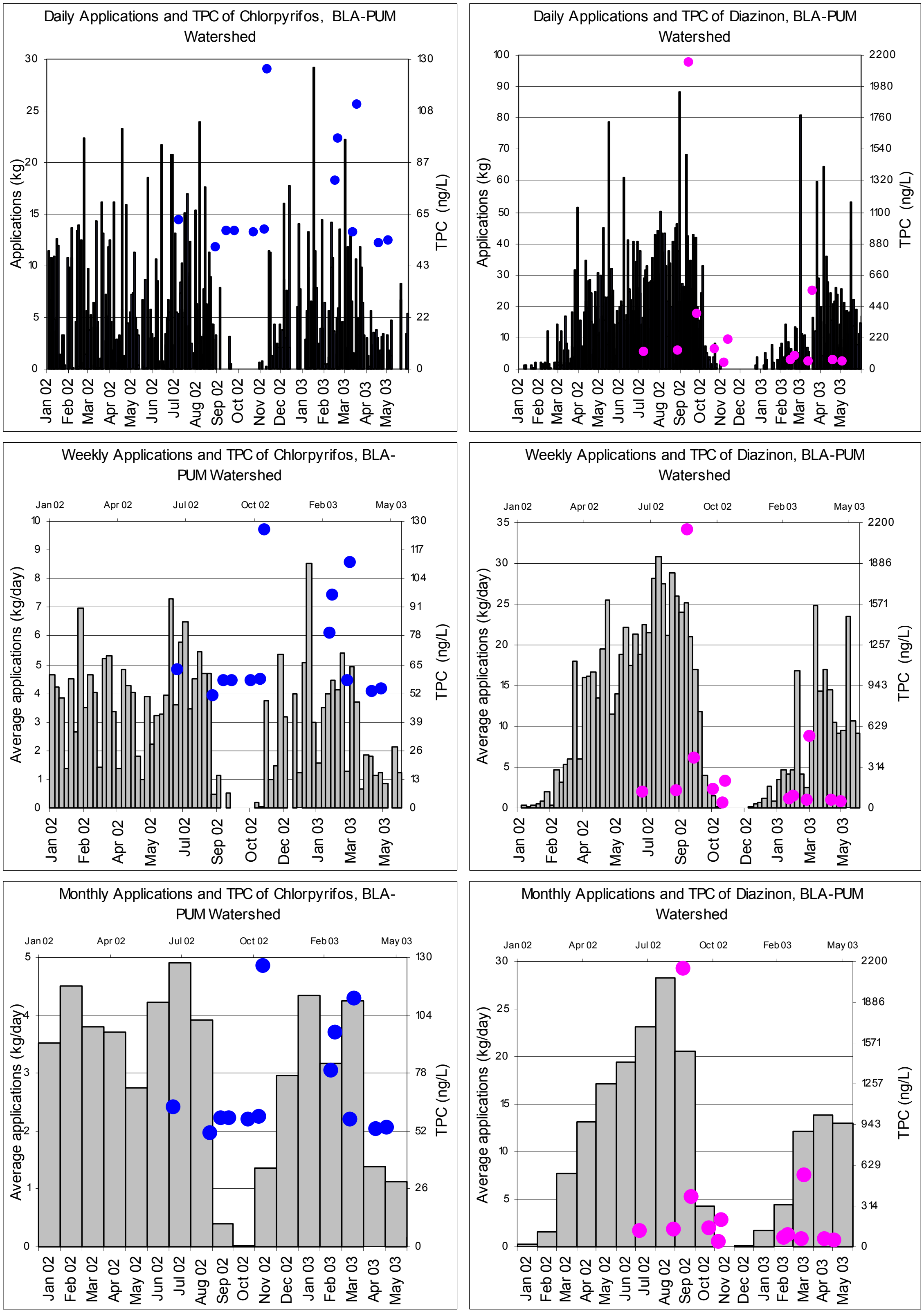


Figure 7.8 N Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPCat BLA-PUM.

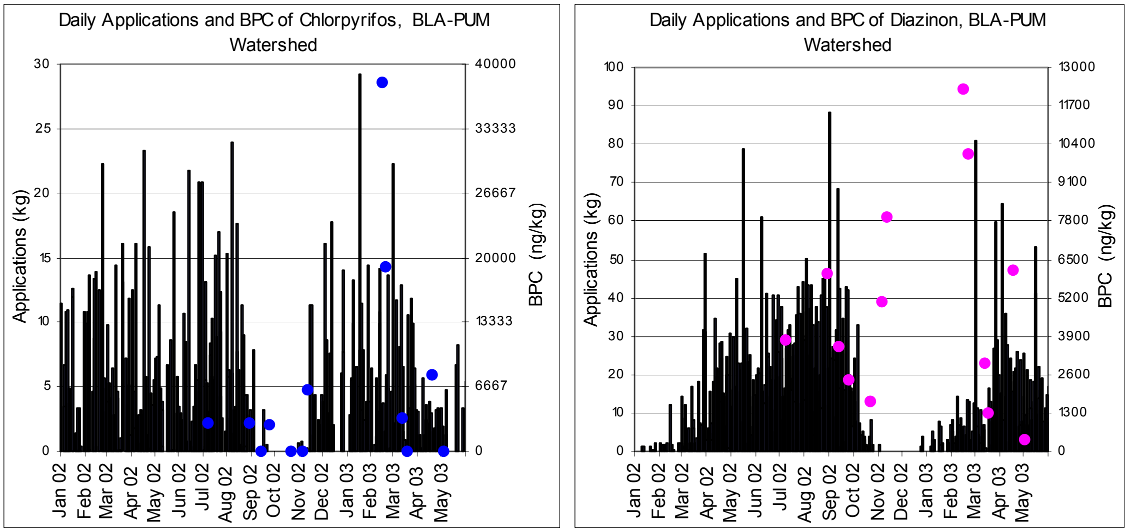


Figure 7.8 O Applications of diazinon and chlorpyrifos represented daily vs. BPC at BLA-PUM.

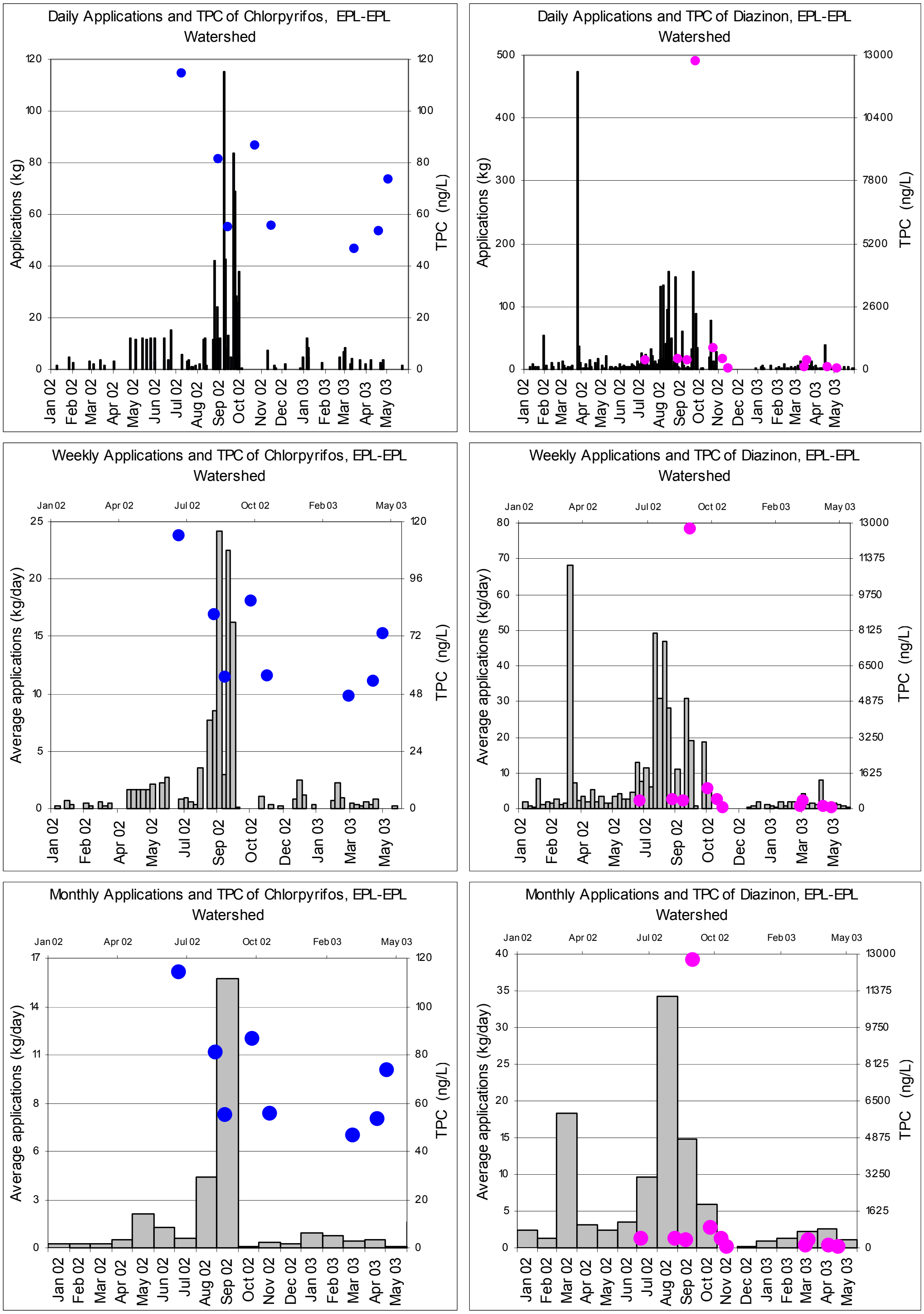


Figure 7.8 P Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at EPL-EPL.

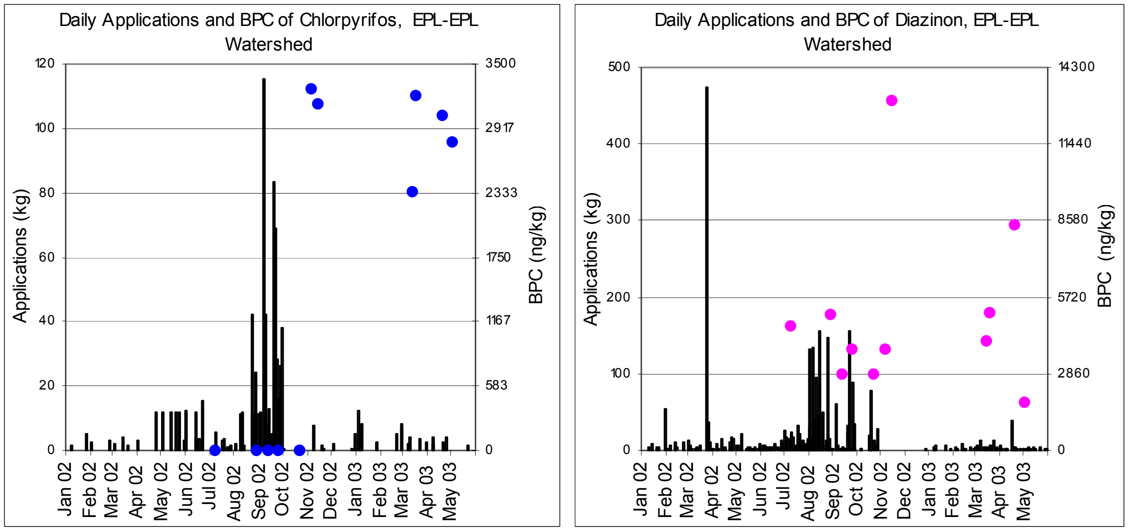


Figure 7.8 Q Applications of diazinon and chlorpyrifos represented daily vs. BPC at EPL-EPL.

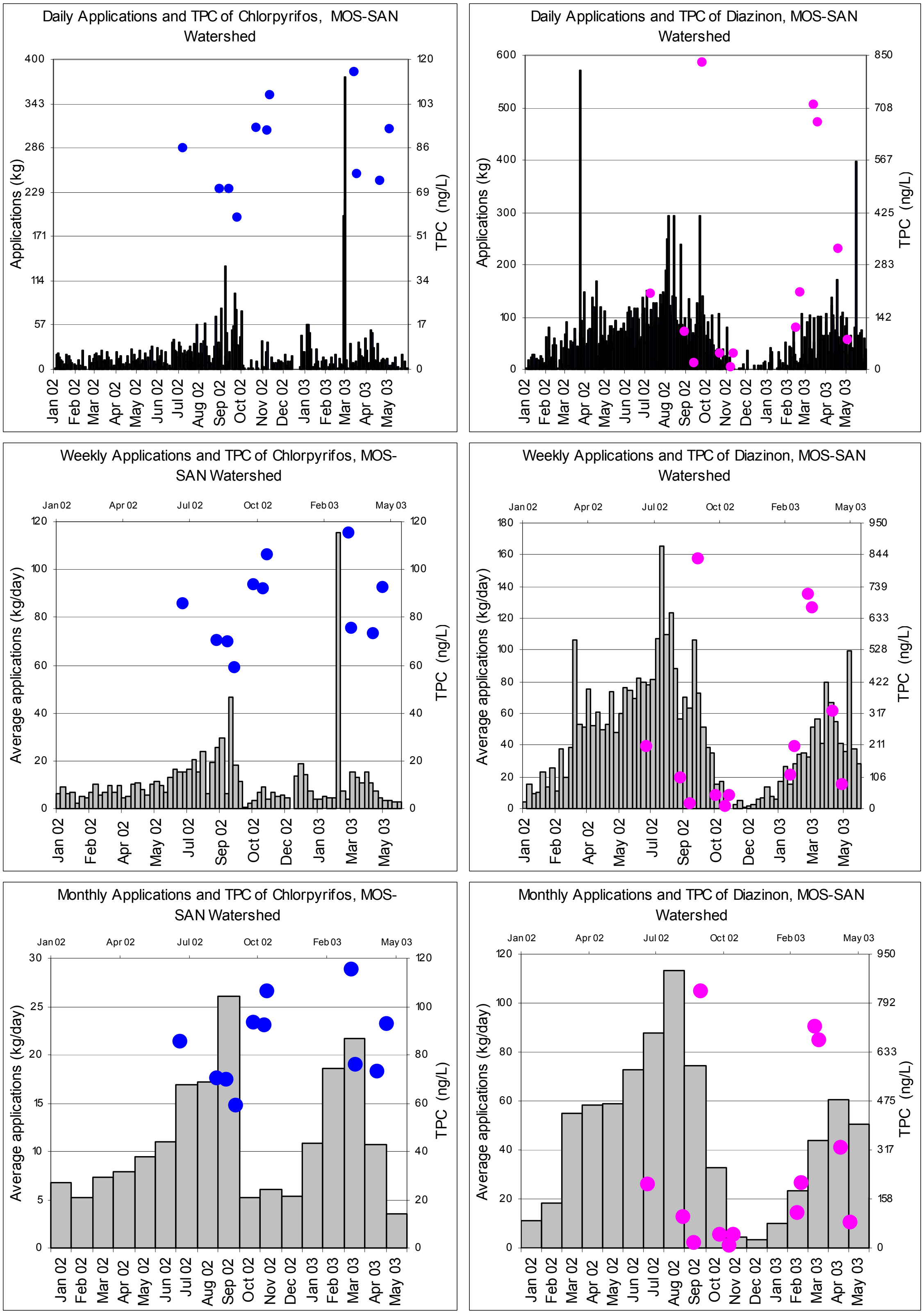


Figure 7.8 R Applications of diazinon and chlorpyrifos represented daily, weekly and monthly vs. TPC at MOS-SAN.

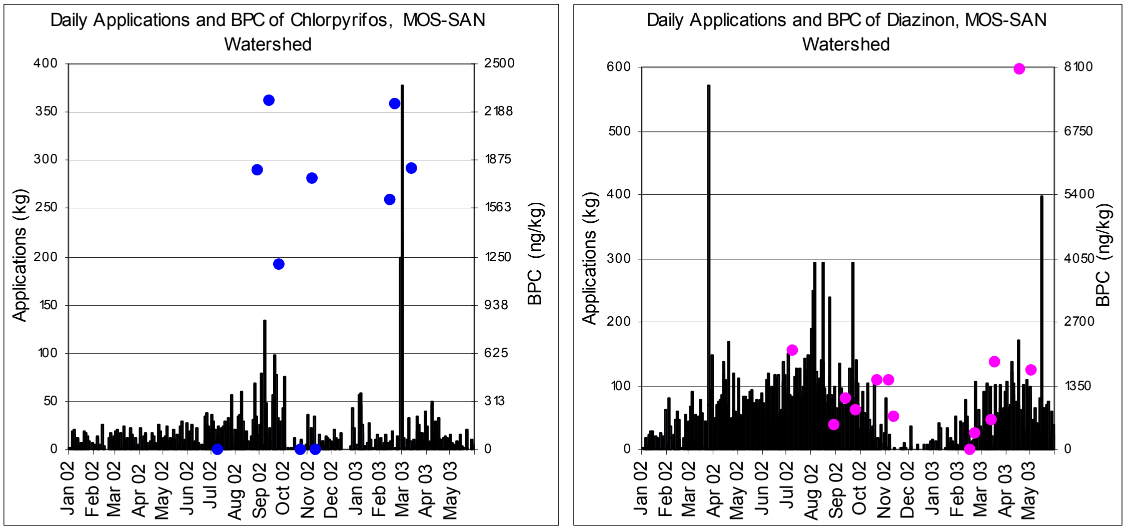


Figure 7.8 S Applications of diazinon and chlorpyrifos represented daily vs. BPC at MOS-SAN.

8 Appendix 2, Quality Control

8.1 Quality Assurance/Quality Control (QA/QC): Methods

Various measures were instituted to ascertain and assure the accuracy, variability and reliability of data obtained from the samples collected. These included the use of:

- field method blanks
- laboratory method blanks
- laboratory-fortified matrices (spikes)
- controls, replicates, duplicates
- analysis of split samples by an external laboratory.

8.1.1 Field Method Blanks

Field method blanks (fmb) are used to assess contamination potential of the field collection equipment and methods. Sampling equipment was cleaned according to protocols after sampling at each site. Following sampling of the final site of a sampling run, deionized (DI) water was run through field-cleaned equipment and collected in sample bottles/jars. Deionized water was run through a freshly cleaned sampling hose and collected for analysis on three occasions. Blanks were then placed in the cooler with other samples and analyzed for target analytes. Level of contamination of the sample due to the combination of multiple factors (i.e. sample jars, filters, sampling equipment, collection technique and storage/transportation) was assessed.

8.1.2 Reagent Blanks and Lab Method Blanks

Reagent blanks (called "blanks") assess potential contamination of laboratory reagents and equipment. High Performance Liquid Chromatography (HPLC) water and methanol used in the processing of samples were tested for contamination during ten of the 15 sampling runs. Emphasis was placed on the assessment of methanol contamination due to its greater likelihood of exposure (used more often) and its ability to preserve the analytes as opposed to HPLC water's ability to degrade them.

Laboratory method blanks (lmb) assess the contamination potential of the methanol extraction process of the suspended solids component of the water sample. Clean filters not exposed to the field are wetted with DI water and then dehydrated and extracted along with collected field samples. These lmb were performed starting with the ninth sampling run to help ascertain whether laboratory methods might be the source of fmb contamination.

8.1.3 Laboratory-Fortified Matrices (Spikes)

Laboratory-fortified matrices (spikes) are samples that have a known concentration of analyte added prior to processing in order to evaluate analyte recovery. Environmental samples of various matrices were spiked with the control standards for chlorpyrifos and diazinon by mixing the sample with an equal volume of control standard then analyzed using ELISA. Recovery is a percentage determined by dividing the value obtained by the value expected. The value expected is the mean of the sample value and the control value. At least one spike per sampling run was analyzed for each analyte during both water and sediment analysis. However, if the spike recovery proved indeterminable due to the analyte concentration being out of the test's range, further spikes may not have been performed.

8.1.4 Controls, Replicates and Duplicates

Controls are standards prepared from stock concentrations of analyte. They are diluted to a specific concentration and used to help determine the accuracy of the test. Controls are analyzed along with environmental samples. At least one control was analyzed for both analytes during water and sediment analysis for all sampling runs.

Replicates are the same sample analyzed more than once in order to indicate variance of the analytical procedure. Replicate values may be from the same analysis batch, a different analysis batch, or determined from dilutions of the sample from any batch.

Duplicates are derived from homogenized sample splits taken in the field from the same location at the same time. They are used to indicate variability between like samples, can give some indication of contamination, and in this study were also used to compare inter-laboratory/inter-analysis method variation.

8.1.5 Inter-Laboratory/Inter-Analysis Method Comparisons

One bottom sediment and one filtered water duplicate sample from a pre-chosen location was sent to Agricultural & Priority Pollutants Laboratories (APPL), Inc for EPA 8141A gas chromatography (GC) analysis immediately following each sampling run. A total of 30 samples were sent for GC analysis for the detection of organophosphates.

8.2 Quality Assurance/Quality Control (QA/QC): Results

Overall performance of the ELISA analysis was acceptable. One hundred thirty six ELISA runs (90 methanol, 46 water) were performed with the average correlation coefficient of the calibrators at 0.96 (SD=0.03). Ninety four percent of the calibrator pairs had CV's of less than 15%. The QA/QC data are presented in Appendix 2, Tables **Error! Reference source not found.** & **Error! Reference source not found.** and are discussed as follows:

8.2.1 Field Method Blanks

The contamination of environmental water samples due to multiple sources was found to be insignificant. The average concentration (n=20) for chlorpyrifos water blanks was 23 ppt (SD=29, non-detects valued at 0); diazinon (n=24), 20 ppt (SD=18, non-detects valued at 0). The estimated detection limits (EDLs) CCoWS established for the ELISA kits are 50-63 ppt for chlorpyrifos and 25 ppt for diazinon. Since the average field method blank (fmb) value for chlorpyrifos concentration is much less than the EDL, minimal contamination is likely to have occurred to water samples. For diazinon, the magnitude of environmental concentrations measured makes the contamination insignificant in comparison.

Contamination of filtered particulate was found low for chlorpyrifos with one exception and variable for diazinon. Fifteen fmbs were processed to evaluate the filtration and methanol extraction process for contamination. Chlorpyrifos had 13 non-detects (nd), one sample concentration at 5,889 ppt (2nd Sept. '02 run) and one at 1,076 ppt (storm 3 run). Diazinon had 4 nd, 8 values ranging from 206 to 1,365 ppt, and one each at 6,148 (Aug. '02 run), 166,757 ppt (2nd Sept. '02 run), and 4,780 ppt (Oct. '03 run).

Field notes indicate that during the second September run there was a question as to whether the field apparatus was actually cleaned before the field method blanks were run (however, there is confidence that cleaning occurred between samples). These fmbs produced the highest values of all blanks for both chlorpyrifos and diazinon (5,889 and 166,757 ppt, respectively), indicating that failure to decontaminate before the blank was taken is likely. This also demonstrates the importance of decontamination. Cleaning methods were modified prior to the storm runs to help further reduce contamination potential and is evidenced by lower diazinon blank values for the storm runs.

The EDL's of chlorpyrifos and diazinon in suspended particulate are approximately 47,000 and 18,800 ppt, respectively. Since the values obtained from the blanks were well below the EDLs, contamination due to field collection or methanol extraction techniques was not significant in most cases. (Note: contamination levels can be lower than the EDL's due to the absence of the particulate matrix, making the comparison not quite straightforward. The blank is measuring ng/L in the methanol matrix of a known volume. From this, the amount of analyte measured in ng is determined and associated with the average amount of particulate retained on the filters in kg, giving ng/kg. This is then compared to the actual amounts obtained from particulate/filter extraction.)

For the August '02 run, a diazinon contamination level of 6,148 ppt could account for up to 79% of the lowest SS diazinon concentration measured, while it is much less than 1% for the highest measured levels. Similarly, a blank value of 1365 ppt in the first September '02 run could account for as much as 54% of the lowest SS diazinon concentration measured, while it is again much less than 1% for the highest measured levels. For the winter storms monitored, the greatest contamination measured could account for at most 25% of the lowest concentrations measured, and again much less than 1% for higher levels. August '03 fmb values could account for 41% of measured SS concentrations in the lowest measured levels and again less than 1% in the highest, while October '03 fmbs could account for 100% of SS concentration values at all sites but two (OLS-POT, 55%; EP1-ROG, <1%).

The chlorpyrifos contamination measured during the pre-storm 3 run is significant. The value of 1,076 ppt could account for fully 100% of six of the nine site values, while it could account for only 8% of REC-JON's value and 2% of EP1-ROG's. Significant contamination of the six sites' samples is unlikely. REC-JON and EP1-ROG were sampled last in the run and the FMB was collected immediately following the sampling of EP1-ROG. Therefore, it is likely that the cleaning method was compromised due to the high levels of chlorpyrifos in those waters, not affecting samples already obtained. This may indicate a need to refine current decontamination methods. Post-storm 3 values do not demonstrate contamination.

Contamination to rinse water used to clean bottom sediment sampling equipment was found insignificant. Samples of rinse water were collected and analyzed for contamination on three sampling runs. The average value for these blanks were 17 ppt for chlorpyrifos and 49 ppt for diazinon, well below the bottom sediment EDLs of 3,650 ppt (chlorpyrifos) and 1,459 ppt (diazinon). The nature of bottom sediment collection techniques lends itself to low contamination potential.

8.2.2 Reagent Blanks and Lab Method Blanks

No level of contamination was detected in laboratory reagents. High Performance Liquid Chromatography (HPLC) water and methanol used in the processing of samples were tested for contamination 26 times during ten sampling runs. No levels of chlorpyrifos or diazinon were detected in these blanks.

No level of contamination was detected in laboratory method blanks analyzed for chlorpyrifos. However, contamination potential was indicated in four out of six sampling runs tested for diazinon:

- Run 9 Apr ’03, 502 ppt
- Run 10 May ’03, 473 ppt
- Run 14 Sep ’03, 194 ppt
- Run 15 Oct ’03, 93 ppt

Contamination by these levels of concentrations is insignificant in comparison to levels found in the environmental samples.

8.2.3 Laboratory-fortified matrices (spikes)

Recovery percentages are high but variable, indicating good overall capability of the ELIZA method to recover target analytes. Thirty-seven environmental samples with replicates of various matrices were spiked with the control standards for chlorpyrifos and diazinon and analyzed using ELISA. The average recovery for all measurable spikes (n=60) was 94% (SD=58%). Recovery percentages were about equal between analytes; however, recovery was higher for methanol matrices (108%) than the water matrix (76%). This may in part be due to degradation of the analytes in the water matrix.

8.2.4 Controls, replicates and duplicates

Control analysis indicates a potential overestimate of true environmental values. At least one control per sampling run was analyzed for each analyte during both water and sediment analysis. The mean concentration of all controls (n=44) for chlorpyrifos was 638 ppt (CV=28%), giving a percent difference from its intended value (500 ppt) of 28%. The mean value of all controls (n=48) for diazinon was 330 ppt (CV=79%), giving a percent difference from its intended value (300 ppt) of 10%. When compared to results from an outside laboratory using GC analysis, the average relative percent difference (RPD) of chlorpyrifos values was 30% (SD=66%) above and the average diazinon RPD values 46% (SD=71%) above. This suggests a potential positive bias of ELISA, and is consistent with results from other studies (Sullivan and Goh, 2000; Dileanis, 2002).

The ELISA analytical method is somewhat variable between sample replicates. The average CV for all replicates (n=211) is 24% (SD=30%). This variation is due to many factors including but not limited to:

- Pipetting of minute (5-100µL) volumes
- Serial dilutions of several orders of magnitude
- Variance of microwell antibody coating
- Operator error and technique
- Quality of calibration model
- Position of derived value on modeled curve

Diazinon analysis of replicates tended to be more variable than chlorpyrifos. Chlorpyrifos replicates analyzed (n=74) averaged CV=15% (SD=23%). Diazinon replicates analyzed averaged CV= 29% (SD=32 %).

The variation between like environmental samples was less than the variation in test methodology. The average RPD for all (n=53) duplicates analyzed by ELISA was 30% (SD=36%); the average CV=21% (SD=26%). The CV for all duplicates (21%) is lower than the CV for all replicates (24%). This suggests that the variation that has been determined between like environmental samples (duplicates) is likely due to the analytical method used.

8.2.5 Inter-laboratory/inter-analysis method comparisons

Qualitative and quantitative comparisons of ELISA to GC analysis indicate that ELISA may be positively biased relative to CG analysis when reporting environmental values. Results obtained from APPL for duplicate samples are summarized in Appendix 2, Table 8.2. Full laboratory reports from APPL are presented in Appendix 2.

Many of the samples did not have directly quantifiable comparisons, but most of those had qualitatively consistent comparisons. Thirty-four sample values analyzed by APPL were below the PQL's for the test. Duplicate samples analyzed by ELISA had 27 values below or only slightly greater than the PQLs of the GC method. One sample had an ELISA value nearly 6 times greater than the PQL of GC suggesting the possibility of contamination of a duplicate sometime after sampling.

Twenty-four sample values had quantifiable results above the PQL of the test. ELISA analysis for chlorpyrifos (n=9) averaged a relative percent difference (RPD) of 32% higher than the GC value. ELISA analysis for diazinon (n=14) averaged a difference of 57% higher than the GC value. The Log of the determined concentrations by both labs are compared in Figure 8.1.

Table 8.1 Quality Assurance/Quality Control Data.

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
11jun3			blank	m	d	nd	*				
12jul4			blank	m	d	nd	*				
13aug3			blank	m	c	nd	*				
13aug3			blank	m	c	nd	*				
14sep2			blank	m	c	nd	*				
14sep3			blank	m	d	nd	*				
15oct2			blank	m	c	nd	*				
15oct3			blank	m	d	nd	*				
1jul3			blank	w	d	nd	*				
1jul4			blank	m	c	nd	*				
1jul4			blank	m	d	nd	*				
5oct3			blank	m	c	nd	*				
5oct5			blank	m	d	nd					
5oct6			blank	m	d	nd					
6nov5			blank	m	c	nd	*				
6nov6			blank	m	d	nd	*				
6nov7			blank	m	d	nd	*				
7feb1			blank	w	c	nd	*				
7feb1			blank	w	d	nd	*				
7feb3			blank	m	c	nd	*				
7feb4			blank	m	c	nd	*				
7feb5			blank	m	c	nd	*				
7feb5			blank	m	d	nd	*				
7feb6			blank	m	d	nd	*				
8mar6			blank	m	c	nd					
10may1			cal	w	c						0.99
10may1			cal	w	d						0.96
10may2			cal	m	c						0.94
10may2			cal	w	d						0.96
10may3			cal	m	c						0.97
10may3			cal	m	d						0.99
10may4			cal	m	d						0.97
11jun1			cal	w	c						0.99
11jun1			cal	w	d						0.98
11jun2			cal	m	c						0.97
11jun2			cal	m	d						0.97
11jun3			cal	m	c						0.96
11jun3			cal	m	d						0.98
12jul1			cal	w	c						0.96
12jul1			cal	w	d						0.99
12jul2			cal	m	c						0.97
12jul2			cal	w	d						0.99
12jul3			cal	m	c						0.98
12jul3			cal	m	d						0.93
12jul4			cal	m	d						0.97
13aug1			cal	w	c						0.97
13aug1			cal	w	d						0.98
13aug2			cal	m	c						0.95
13aug2			cal	m	d						0.93
13aug3			cal	m	c						0.96
13aug3			cal	m	d						0.96

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
13aug4			cal	m	d						0.94
14sep1			cal	w	c						0.97
14sep1			cal	w	d						0.96
14sep2			cal	m	c						0.94
14sep2			cal	w	d						0.98
14sep3			cal	m	c						0.96
14sep3			cal	m	d						0.97
14sep4			cal	m	d						1.00
14sep5			cal	m	d						0.77
15oct1			cal	w	c						0.94
15oct1			cal	w	d						0.99
15oct2			cal	m	c						0.96
15oct2			cal	w	d						0.93
15oct2			cal	m	d						0.99
15oct3			cal	m	c						0.97
15oct3			cal	m	d						0.89
15oct4			cal	m	c						0.96
1jul1			cal	w	d						0.94
1jul2			cal	w	c						0.98
1jul2			cal	w	d						0.93
1jul3			cal	w	d						1.00
1jul4			cal	m	c						0.98
1jul4			cal	m	d						0.92
1jul5			cal	m	c						0.96
1jul5			cal	m	d						0.97
1jul6			cal	m	d						0.97
1jul7			cal	m	d						0.99
2aug1			cal	w	c						0.99
2aug1			cal	w	d						0.98
2aug2			cal	m	c						0.96
2aug2			cal	w	d						0.98
2aug3			cal	m	c						0.97
2aug3			cal	m	d						0.98
2aug4			cal	m	c						0.96
2aug4			cal	m	d						0.99
2aug5			cal	m	d						0.95
3sep1			cal	w	c						1.00
3sep1			cal	w	d						0.97
3sep2			cal	m	c						0.96
3sep2			cal	w	d						0.97
3sep3			cal	m	c						0.96
3sep3			cal	m	d						0.97
3sep4			cal	m	c						0.93
3sep4			cal	m	d						0.99
3sep5			cal	m	d						0.98
4sep1			cal	w	c						0.99
4sep1			cal	w	d						0.99
4sep2			cal	m	c						0.94
4sep2			cal	w	d						0.98
4sep3			cal	m	c						0.99
4sep3			cal	m	d						0.98

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
4sep4			cal	m	c						0.96
4sep4			cal	m	d						0.97
4sep5			cal	m	d						0.97
5oct1			cal	w	c						0.96
5oct1			cal	w	d						0.96
5oct2			cal	m	c						0.98
5oct2			cal	w	d						1.00
5oct3			cal	m	c						0.97
5oct3			cal	m	d						0.99
5oct4			cal	m	c						0.99
5oct4			cal	m	d						0.96
5oct5			cal	m	d						0.97
5oct6			cal	m	d						0.89
6nov1			cal	w	c						1.00
6nov1			cal	w	d						0.93
6nov2			cal	w	c						0.99
6nov2			cal	w	d						0.97
6nov3			cal	m	c						0.96
6nov3			cal	m	d						0.84
6nov4			cal	m	c						0.97
6nov4			cal	m	d						0.98
6nov5			cal	m	c						0.96
6nov5			cal	m	d						0.98
6nov6			cal	m	d						1.00
6nov7			cal	m	d						0.92
7feb1			cal	w	c						0.98
7feb1			cal	m	d						0.98
7feb2			cal	m	c						0.93
7feb2			cal	m	d						0.98
7feb3			cal	m	c						0.90
7feb3			cal	m	d						0.85
7feb4			cal	m	c						0.94
7feb4			cal	m	d						0.86
7feb5			cal	m	c						0.99
7feb5			cal	m	d						0.93
7feb6			cal	m	d						1.00
8mar1			cal	w	c						0.97
8mar1			cal	w	d						0.96
8mar2			cal	w	c						0.96
8mar2			cal	w	d						0.98
8mar3			cal	m	c						0.97
8mar3			cal	w	d						0.96
8mar4			cal	m	c						0.98
8mar4			cal	m	d						0.99
8mar5			cal	m	c						0.93
8mar5			cal	m	d						0.97
8mar6			cal	m	c						0.97
8mar6			cal	m	d						0.98
8mar7			cal	m	d						0.97
8mar8			cal	m	d						0.93
9apr1			cal	w	c						0.99

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
9apr1			cal	w	d						0.98
9apr2			cal	w	c						0.99
9apr2			cal	w	d						1.00
9apr3			cal	m	c						0.98
9apr3			cal	m	c						0.98
9apr4			cal	m	c						0.94
9apr4			cal	m	c						0.96
9apr5			cal	m	c						0.93
11jun3	51	ep1-rog	d	b	c	188923					
11jun3	227	ep1-rog	d	b	c	190844			1.0		
13aug2	257	sal-dav	d	ss	c	2572	*				
13aug2	260	sal-dav	d	ss	c	3211	*		22.1		
13aug3	260	sal-dav	d	ss	d	2417			134.8		
14sep2	4	ep1-rog	d	w	d	669			23.8		
1jul1	230	sal-dav	d	w	d	36			30.4		
1jul2	230	sal-dav	d	w	c	139					
1jul2	231	sal-dav	d	w	c	64			74.3		
2aug1	7	sal-mon	d	w	d	26	*		9.8		
2aug2	49	sal-mon	d	b	c	8524					
2aug3	49	sal-mon	d	b	d	8317			46.1		
2aug4	49	sal-mon	d	b	d	8110			89.1		
3sep1	230	bla-coo	d	w	c	48	*	24.9			
3sep1	230	bla-coo	d	w	d	461	*		5.2		
3sep2	202	bla-coo	d	b	c	34770		37.8			
3sep3	202	bla-coo	d	b	d	10122			14.3		
4sep1	22	bla-pum	d	w	c	48	*		14.2		
4sep1	22	bla-pum	d	w	d	470	*		9.7		
4sep2	36	bla-pum	d	b	c	3718					
4sep2	22	bla-pum	d	w	d	264			11.2		
5oct1	37	rec-jon	d	w	c	121			12.5		
5oct1	37	rec-jon	d	w	d	344			14.6		
5oct4	244	rec-jon	d	b	d	126572	*		1.2		
6nov1	111	sal-mon_c	d	w	c	85					
8mar1	70	rec-jon-a	d	w	c	83			8.8		
9apr1	62	ep1-rog	d	w	c	390			13.6		
9apr3	317	ep1-rog	d	b	c	14621					
9apr4	317	ep1-rog	d	b	d	275202					
9apr5	242	ep1-rog	d	b	d	45254			143.5		
11jun1	143	ep1-rog	fmb	w	c	nd	*				
11jun1	143	ep1-rog	fmb	w	d	nd	*				
11jun2	234	ep1-rog	fmb	ss	c	nd	*				
11jun2	234	ep1-rog	fmb	ss	d	nd	*				
12jul1	135		fmb	w	c	49	*				
12jul1	135		fmb	w	c	51	*				
12jul1	135		fmb	w	d	18	*				
12jul1	135		fmb	w	d	nd	*				
12jul2	243		fmb	ss	c	nd	*				
12jul2	243		fmb	ss	c	nd	*				
12jul3	243		fmb	ss	d	nd	*				
12jul3	243		fmb	ss	d	nd	*				
13aug1	38		fmb	w	d	nd	*				

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
13aug1	38		fmb	w	c	nd	*				
13aug2	228		fmb	ss	c	nd	*				
13aug3	228		fmb	ss	d	226	*				
14sep1	8		fmb	w	c	nd	*				
14sep1	8		fmb	w	d	23	*				
14sep2	21		fmb	ss	c	nd	*				
14sep2	21		fmb	ss	c	nd	*				
14sep2	8		fmb	w	d	21	*				
14sep3	21		fmb	ss	d	nd	*				
15oct1	17		fmb	w	c	nd	*				
15oct1	17		fmb	w	d	nd	*				
15oct2	15		fmb	ss	c	nd	*				
1jul1	218		fmb	w	d	21	*				
1jul2	218		fmb	w	c	58	*				
2aug2	34		fmb	ss	c	nd	*				
2aug2	34		fmb	ss	c	nd	*				
2aug3	34		fmb	ss	d	5066	*				
2aug4	34		fmb	ss	d	6612					
2aug4	34		fmb	ss	d	6765					
3sep1	221		fmb	b	c	51	*				
3sep1	228		fmb	w	c	nd	*				
3sep1	228		fmb	w	d	24	*				
3sep1	221		fmb	b	d	30					
3sep2	209		fmb	ss	c	nd	*				
3sep2	209		fmb	ss	c	nd	*				
3sep3	209		fmb	ss	d	1365					
4sep1	15		fmb	w	c	57	*				
4sep1	6		fmb	b	c	nd					
4sep1	15		fmb	w	d	35					
4sep1	6		fmb	b	d	52					
4sep2	39		fmb	ss	c	6781					
4sep2	39		fmb	ss	c	4996					
4sep4	39		fmb	ss	d	169778					
4sep4	39		fmb	ss	d	163737	*				
8mar2	140		fmb	w	c	nd	*				
8mar2	141		fmb	w	c	nd					
8mar3	140		fmb	w	d	nd	*				
8mar3	141		fmb	w	d	nd	*				
8mar5	246		fmb	ss	c	nd					
8mar5	291		fmb	ss	c	1076	*				
8mar6	246		fmb	ss	d	426					
8mar6	291		fmb	ss	d	457					
9apr2	69		fmb	w	c	nd	*				
9apr3	315		fmb	ss	c	nd	*				
9apr3	315		fmb	ss	d	nd	*				
10may1	111	ep1-rog	fmb,r	w	c	nd	*				
10may1	111	ep1-rog	fmb,r	w	c	nd	*	0.0			
10may1	111	ep1-rog	fmb,r	w	d	36					
10may1	111	ep1-rog	fmb,r	w	d	28	*	19.1			
10may2	274	ep1-rog	fmb,r	ss	c	nd	*				
10may2	274	ep1-rog	fmb,r	ss	c	nd	*	0.0			

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
10may2	111	ep1-rog	fmb,r	w	d	25					
10may3	274	ep1-rog	fmb,r	ss	d	377					
10may3	274	ep1-rog	fmb,r	ss	d	418		7.4			
15oct3	15		fmb,r	ss	d	50886	*				
15oct4	15		fmb,r	ss	d	1587	*				
15oct4	15		fmb,r	ss	d	6251	*				
15oct4	15		fmb,r	ss	d	nd	*				
15oct4	15		fmb,r	ss	d	2480	*	58.8			
7feb5	212		fmb,r	ss	d	497					
7feb5	212		fmb,r	ss	d	647					
9apr1	69		fmb,r	w	d	23	*				
9apr2	69		fmb,r	w	d	30					
9apr2	69		fmb,r	w	d	24	*	14.3			
6nov1	143		fmb-a	w	c	69					
6nov3	227		fmb-a	ss	d	nd	*				
6nov3	227		fmb-a	ss	c	nd	*				
6nov4	227		fmb-a	ss	d	412					
6nov1	143		fmb-a	w	d	nd	*				
2aug1	19		fmb-b	w	c	nd	*				
2aug1	19		fmb-b	w	d	66					
6nov2	138		fmb-c	w	c	47	*				
6nov2	138		fmb-c	w	d	nd	*				
6nov3	314		fmb-c	ss	d	418					
6nov3	314		fmb-c	ss	c	nd	*				
6nov4	314		fmb-c	ss	d	622		27.8			
5oct1	45	ols-pot	fmb-hose	w	c	64					
5oct1	45	ols-pot	fmb-hose	w	d	18	*				
5oct1	48	sal-mon	fmb	w	c	63					
5oct1	48	sal-mon	fmb	w	d	56					
7feb4	212		fmb,r	ss	c	nd					
7feb4	212		fmb,r	ss	c	nd	*				
2aug1	15		fmb	w	c	nd	*				
2aug1	15		fmb	w	d	38					
10may1			lab control	w	c	723					
10may1			lab control	w	d	364					
10may2			lab control	m	c	575					
10may3			lab control	m	c	464					
10may3			lab control	m	d	286					
11jun1			lab control	w	c	718					
11jun1			lab control	w	d	323					
11jun2			lab control	m	c	475					
11jun2			lab control	m	d	482					
11jun3			lab control	m	d	474					
12jul1			lab control	w	c	773					
12jul1			lab control	w	d	424					
12jul2			lab control	m	c	472					
12jul3			lab control	m	d	214					
12jul4			lab control	m	d	157					
13aug1			lab control	w	c	829					
13aug1			lab control	w	d	329					
13aug2			lab control	m	c	539					

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
13aug2			lab control	m	d	383					
13aug3			lab control	m	c	531					
13aug3			lab control	m	d	253					
13aug4			lab control	m	d	119					
14sep1			lab control	w	c	742					
14sep1			lab control	w	d	349					
14sep2			lab control	m	c	664					
14sep3			lab control	m	c	592					
14sep3			lab control	m	d	174					
14sep4			lab control	m	d	218					
15oct1			lab control	w	c	940					
15oct1			lab control	w	d	274					
15oct2			lab control	m	c	340					
15oct2			lab control	m	d	208					
15oct3			lab control	m	c	550					
1jul1			lab control	w	d	384					
1jul2			lab control	w	c	824					
1jul2			lab control	w	d	208					
1jul3			lab control	w	d	286					
1jul4			lab control	m	c	910					
2aug1			lab control	w	c	706					
2aug1			lab control	w	d	348					
2aug2			lab control	m	c	626					
2aug3			lab control	m	d	1976					
2aug4			lab control	m	d	322					
2aug5			lab control	m	d	22					
3sep1			lab control	w	c	711					
3sep1			lab control	w	d	366					
3sep2			lab control	m	c	621					
3sep3			lab control	m	d	173					
3sep4			lab control	m	d	233					
4sep1			lab control	w	c	814					
4sep1			lab control	w	d	359					
4sep2			lab control	m	c	639					
4sep3			lab control	m	d	459					
4sep4			lab control	m	d	311					
5oct1			lab control	w	c	669					
5oct1			lab control	w	d	361					
5oct2			lab control	m	c	740					
5oct3			lab control	m	c	546					
5oct3			lab control	m	d	232					
5oct5			lab control	m	d	386					
6nov1			lab control	w	c	854					
6nov1			lab control	w	d	214					
6nov2			lab control	w	c	1040					
6nov3			lab control	m	c	564					
6nov3			lab control	m	d	181					
6nov4			lab control	m	d	230					
6nov5			lab control	m	c	630					
6nov6			lab control	m	d	312					
6nov7			lab control	m	d	226					

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
7feb1			lab control	w	c	849					
7feb1			lab control	m	d	310					
7feb2			lab control	m	d	375					
7feb3			lab control	m	c	567					
7feb4			lab control	m	c	682					
7feb4			lab control	m	d	272					
7feb5			lab control	m	d	182					
8mar1			lab control	w	c	822					
8mar1			lab control	w	d	242					
8mar2			lab control	w	d	415					
8mar4			lab control	m	c	548					
8mar5			lab control	m	c	589					
8mar5			lab control	m	d	307					
8mar6			lab control	m	d	419					
8mar7			lab control	m	d	399					
8mar8			lab control	m	d	304					
9apr1			lab control	w	c	808					
9apr1			lab control	w	c	345					
9apr2			lab control	w	c	671					
9apr2			lab control	w	c	356					
9apr3			lab control	m	c	567					
9apr3			lab control	m	c	183					
9apr4			lab control	m	c	250					
9apr3	252	lab	lmb	m	c	nd	*				
9apr3	252	lab	lmb,r	m	d	620		20.7			
9apr4	252	lab	lmb,r	m	d	470					
9apr4	252	lab	lmb,r	m	d	416					
11jun2	208		lmb1	m	c	nd	*				
11jun2	208		lmb1	m	d	nd	*				
13aug2	262		lmb1	m	d	nd	*				
13aug3	262		lmb1	m	d	nd	*				
14sep2	281		lmb1	m	c	nd	*				
14sep2	281		lmb1	m	c	nd	*				
14sep3	281		lmb1	m	d	nd	*				
15oct2	13		lmb1	m	c	nd	*				
15oct3	13		lmb1	m	d	nd	*				
10may2	213		lmb1,r	m	c	nd	*				
10may2	213		lmb1,r	m	c	nd	*	0.0			
10may3	213		lmb1,r	m	d	nd	*				
10may3	213		lmb1,r	m	d	nd	*	0.0			
10may2	260		lmb2	m	c	nd	*				
10may3	260		lmb2	m	d	473					
11jun2	215		lmb2	m	c	nd	*				
11jun2	215		lmb2	m	d	nd	*				
13aug3	203		lmb2	m	d	nd	*				
14sep2	280		lmb2	m	c	nd	*				
14sep2	280		lmb2	m	c	nd	*				
14sep3	280		lmb2	m	d	169	*				
14sep3	280		lmb2	m	d	219	*				
15oct2	12		lmb2	m	c	nd	*				
13aug2	203		lmb2,r	m	c	nd	*				

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
13aug2	203		lmb2,r	m	c	nd	*	0.0			
15oct3	12		lmb2,r	m	d	2285					
15oct4	12		lmb2,r	m	d	nd	*				
15oct4	12		lmb2,r	m	d	nd	*	173.2			
11jun2	201		lmb3	m	c	nd	*				
11jun2	201		lmb3	m	d	nd	*				
6nov1	131		lmb-hose	w	c	62	*				
6nov1	131		lmb-hose	w	d	nd	*				
8mar2	5		lmb-hose	w	c	nd	*				
8mar2	5		lmb-hose	w	d	nd	*				
6nov5			blank	m	d	nd	*				
10may1	128	ep1-rog	r	w	d	509	*				
10may2	52	rec-jon	r	w	d	253					
10may2	52	rec-jon	r	w	d	66		82.8			
10may3	214	rec-jon	r	b	c	7061		36.3			
11jun3	256	ep1-rog	r	ss	d	5629786		28.3			
11jun3	317	rec-jon	r	b	d	93994					
11jun3	317	rec-jon	r	b	d	77933		13.2			
11jun3	241	rec-jon	r	ss	d	220820					
11jun3	241	rec-jon	r	ss	d	392831		39.6			
12jul1	37	ep1-rog	r	w	d	511	*				
12jul2	37	ep1-rog	r	w	d	178		68.4			
12jul3	268	ep1-rog	r	ss	c	298140	*				
12jul3	268	ep1-rog	r	ss	c	233805		17.1			
12jul3	225	rec-jon	r	b	c	68543					
12jul3	225	rec-jon	r	b	c	75085	*	6.4			
12jul4	214	ep1-rog	r	b	d	152995	*				
12jul4	214	ep1-rog	r	b	d	68187	*	54.2			
12jul4	268	ep1-rog	r	ss	d	5953177					
12jul4	268	ep1-rog	r	ss	d	3537133	*	36.0			
13aug2	28	rec-jon	r	ss	c	55457	*				
13aug2	52	rec-jon	r	w	d	334					
13aug2	52	rec-jon	r	w	d	244	*	22.1			
13aug3	258	ep1-rog	r	b	c	1419832					
13aug3	258	ep1-rog	r	b	c	1109985	*	17.3			
13aug3	242	ep1-rog	r	ss	c	1664363					
13aug3	242	ep1-rog	r	ss	c	1643919		0.9			
13aug3	28	rec-jon	r	ss	c	76768					
13aug3	28	rec-jon	r	ss	c	73751		16.8			
13aug4	213	rec-jon	r	b	d	22730					
13aug4	213	rec-jon	r	b	d	27600		13.7			
14sep3	13	ep1-rog	r	ss	c	19043746					
14sep3	13	ep1-rog	r	ss	c	20829926		6.3			
14sep3	24	rec-jon	r	b	c	133729					
14sep3	24	rec-jon	r	b	c	129860		2.1			
15oct2	106	ep1-rog	r	w	d	473					
15oct2	106	ep1-rog	r	w	d	199		57.6			
15oct2	118	rec-jon	r	w	d	453					
15oct2	118	rec-jon	r	w	d	291		30.7			
15oct4	11	ep1-rog	r	ss	c	3317045					
15oct4	11	ep1-rog	r	ss	c	3732207	*				

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
15oct4	11	ep1-rog	r	ss	c	3713585		6.5			
1jul1	231	sal-dav	r	w	d	67					
1jul1	231	sal-dav	r	w	d	31		51.3			
1jul1	232	bla-coo	r	w	d	75					
1jul1	232	bla-coo	r	w	d	68		6.4			
1jul2	228	sal-mon	r	w	c	68					
1jul2	228	sal-mon	r	w	c	69					
1jul2	228	sal-mon	r	w	c	75		5.3			
1jul2	232	bla-coo	r	w	c	68					
1jul2	232	bla-coo	r	w	c	58	*	11.0			
1jul2	227	rec-jon	r	w	d	335					
1jul2	227	rec-jon	r	w	d	211					
1jul2	227	rec-jon	r	w	d	199		30.3			
1jul3	221	rec-jon	r	w	d	26489	*				
1jul3	221	rec-jon	r	w	d	28540					
1jul3	221	rec-jon	r	w	d	54895					
1jul3	221	rec-jon	r	w	d	159016		93.0			
1jul4	209	ep1-rog	r	b	c	4096					
1jul4	209	ep1-rog	r	b	c	2924					
1jul4	209	ep1-rog	r	b	c	3586		16.6			
1jul4	215	sal-dav	r	b	c	45901					
1jul4	215	sal-dav	r	b	c	29195		31.5			
1jul4	216	bla-coo	r	b	c	44746	*				
1jul4	216	bla-coo	r	b	c	37846		11.8			
1jul4	202	sal-mon	r	b	d	1283					
1jul4	202	sal-mon	r	b	d	585	*	52.9			
1jul4	203	epl-epl	r	b	d	7603					
1jul4	203	epl-epl	r	b	d	2851					
1jul4	203	epl-epl	r	b	d	3463		55.7			
1jul4	207	mos-san	r	b	d	2820					
1jul4	207	mos-san	r	b	d	1360		49.4			
1jul4	212	rec-jon	r	b	d	3875					
1jul4	212	rec-jon	r	b	d	1681		55.8			
1jul4	215	sal-dav	r	b	d	34508	*				
1jul4	215	sal-dav	r	b	d	13806		60.6			
1jul4	216	bla-coo	r	b	d	11970					
1jul4	216	bla-coo	r	b	d	6108		45.9			
1jul7	208	ep1-rog	r	ss	d	535744659					
1jul7	208	ep1-rog	r	ss	d	717992060		20.6			
1jul7	201	sal-mon	r	ss	d	221646					
1jul7	201	sal-mon	r	ss	d	75250	*	69.7			
2aug1	22	sal-mon	r	w	c	53	*				
2aug1	22	sal-mon	r	w	c	48	*	6.1			
2aug1	22	sal-mon	r	w	d	31					
2aug1	22	sal-mon	r	w	d	26	*	11.6			
2aug2	43	sal-mon	r	b	c	19935					
2aug2	43	sal-mon	r	b	c	21587					
2aug2	43	sal-mon	r	b	c	24073					
2aug2	43	sal-mon	r	b	c	20102		8.9			
2aug2	6	ep1-rod	r	w	d	3519					
2aug2	6	ep1-rod	r	w	d	3692		3.4			

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
2aug3	43	sal-mon	r	b	d	5121					
2aug3	43	sal-mon	r	b	d	5284		2.2			
2aug4	43	sal-mon	r	b	d	3612					
2aug4	43	sal-mon	r	b	d	2619					
2aug4	43	sal-mon	r	b	d	3099		16.0			
2aug5	25	ep1-rod	r	b	d	244341					
2aug5	25	ep1-rod	r	b	d	258393					
2aug5	25	ep1-rod	r	b	d	302752		11.4			
3sep1	219	bla-coo	r	w	d	434					
3sep1	219	bla-coo	r	w	d	449	*				
3sep1	219	bla-coo	r	w	d	431		2.2			
3sep2	210	bla-coo	r	ss	c	23576	*				
3sep2	210	bla-coo	r	ss	c	23838	*	0.8			
3sep2	232	rec-jon	r	w	d	669					
3sep2	232	rec-jon	r	w	d	2571	*	83.0			
3sep2	223	bla-pum	r	w	d	940					
3sep2	223	bla-pum	r	w	d	2799		70.3			
3sep3	217	ep1-rog	r	b	c	177502					
3sep3	217	ep1-rog	r	b	c	136521	*	18.5			
3sep3	210	bla-coo	r	ss	d	113128					
3sep3	210	bla-coo	r	ss	d	123668		6.3			
3sep3	214	bla-coo	r	b	d	9260					
3sep3	214	bla-coo	r	b	d	8547					
3sep3	214	bla-coo	r	b	d	8509		4.8			
3sep3 (2a	52	bla-pum	r	ss	d	393947	*				
3sep3 (2a	52	bla-pum	r	ss	d	333535		11.7			
3sep4	211	ep1-rog	r	ss	c	77348539					
3sep4	211	ep1-rog	r	ss	c	73198896					
3sep4	211	ep1-rog	r	ss	c	51355360	*	20.7			
3sep4	214	bla-coo	r	b	c	410437					
3sep4	214	bla-coo	r	b	c	439770	*	4.9			
3sep4	203	bla-pum	r	ss	d	6736812					
3sep4	203	bla-pum	r	ss	d	7505961	*	7.6			
3sep4	217	ep1-rog	r	b	d	624702					
3sep4	217	ep1-rog	r	b	d	663940	*	4.3			
3sep4	31	rec-jon	r	b	d	346935	*				
3sep4	31	rec-jon	r	b	d	308191					
3sep4	31	rec-jon	r	b	d	10219038		157.6			
3sep4	206	sal-dav	r	ss	d	1243842					
3sep4	206	sal-dav	r	ss	d	2721479	*	52.7			
3sep4	29	ols-pot	r	ss	d	263747					
3sep4	29	ols-pot	r	ss	d	776874	*	69.7			
3sep5	211	ep1-rog	r	ss	d	713047471	*				
3sep5	211	ep1-rog	r	ss	d	698981271					
3sep5	211	ep1-rog	r	ss	d	631243012					
3sep5	211	ep1-rog	r	ss	d	680894990	*	5.2			
4sep1	100	bla-pum	r	w	c	60	*				
4sep1	100	bla-pum	r	w	c	61	*				
4sep1	100	bla-pum	r	w	c	47	*	14.0			
4sep1	100	bla-pum	r	w	d	394					
4sep1	100	bla-pum	r	w	d	453	*				

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
4sep1	100	bla-pum	r	w	d	434	*	7.1			
4sep2	47	bla-pum	r	ss	c	56088					
4sep2	47	bla-pum	r	ss	c	57551					
4sep2	47	bla-pum	r	ss	c	45309		12.6			
4sep2	226	ep1-rog	r	w	d	9581					
4sep2	226	ep1-rog	r	w	d	26078	*	65.4			
4sep2	100	bla-pum	r	w	d	318					
4sep2	100	bla-pum	r	w	d	272		11.0			
4sep3	47	bla-pum	r	ss	d	210325					
4sep3	47	bla-pum	r	ss	d	250792	*				
4sep3	47	bla-pum	r	ss	d	261790	*	11.2			
4sep4	200	ep1-rog	r	ss	c	34449686					
4sep4	200	ep1-rog	r	ss	c	38869359					
4sep4	200	ep1-rog	r	ss	c	29706917		13.3			
4sep4	46	mos-san	r	ss	d	3077911					
4sep4	46	mos-san	r	ss	d	10030444	*	75.0			
4sep4	35	sal-dav	r	ss	d	9800390					
4sep4	35	sal-dav	r	ss	d	7994627		14.4			
4sep4	212	epl-epl	r	ss	d	14551257					
4sep4	212	epl-epl	r	ss	d	15297550	*				
4sep4	212	epl-epl	r	ss	d	16417607		6.1			
4sep4	30	rec-jon	r	ss	d	792213					
4sep4	30	rec-jon	r	ss	d	1237152	*	31.0			
4sep4	215	ep1-rog	r	b	d	312180					
4sep4	215	ep1-rog	r	b	d	553438	*				
4sep4	215	ep1-rog	r	b	d	172376		55.7			
4sep5	200	ep1-rog	r	ss	d	451152771					
4sep5	200	ep1-rog	r	ss	d	598677608					
4sep5	200	ep1-rog	r	ss	d	1732269822		75.6			
5oct1	41	rec-jon	r	w	c	115					
5oct1	41	rec-jon	r	w	c	110					
5oct1	41	rec-jon	r	w	c	96		8.9			
5oct1	41	rec-jon	r	w	d	296					
5oct1	41	rec-jon	r	w	d	297					
5oct1	41	rec-jon	r	w	d	298		0.5			
5oct2	42	ep1-rog	r	w	d	1874					
5oct2	42	ep1-rog	r	w	d	2993					
5oct2	42	ep1-rog	r	w	d	15950	*	112.7			
5oct4	245	rec-jon	r	b	d	131132	*				
5oct4	245	rec-jon	r	b	d	129693	*				
5oct4	245	rec-jon	r	b	d	114236	*	7.5			
5oct5	247	rec-jon	r	ss	d	1547865	*				
5oct5	247	rec-jon	r	ss	d	1564269	*				
5oct5	247	rec-jon	r	ss	d	1422676	*	5.1			
5oct6	252	mos-san	r	ss	d	155427					
5oct6	252	mos-san	r	ss	d	129635		12.8			
5oct6	241	sal-dav	r	ss	d	206853					
5oct6	241	sal-dav	r	ss	d	218418		3.8			
5oct6	248	ep1-rog	r	ss	d	270207392					
5oct6	248	ep1-rog	r	ss	d	235968131					
5oct6	248	ep1-rog	r	ss	d	818463632					

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
5oct6	248	ep1-rog	r	ss	d	766773600					
5oct6	248	ep1-rog	r	ss	d	847725419		52.3			
6nov2	124	ep1-rog_a	r	w	d	3252					
6nov2	124	ep1-rog_a	r	w	d	2477	*	19.1			
6nov2	144	bla-coo_b	r	w	d	4190					
6nov2	144	bla-coo_b	r	w	d	4497		5.0			
6nov2	133	ep1-rog_b	r	w	d	2759					
6nov2	133	ep1-rog_b	r	w	d	3156		9.5			
6nov2	128	ep1-rog_c	r	w	d	5537	*				
6nov2	128	ep1-rog_c	r	w	d	3934		23.9			
6nov3	206	mos-san_a	r	ss	d	43627					
6nov3	234	rec-jon_a	r	ss	d	506879	*				
6nov3	232	sal-dav_a	r	ss	d	206296					
6nov3	316	bla-coo_b	r	ss	d	320975	*				
6nov3	315	ols-pot_b	r	ss	d	171705					
6nov3	312	mos-san_c	r	ss	d	174267					
6nov3	305	sal-mon_c	r	ss	d	325793					
6nov4	309	ep1-rog_b	r	ss	c	1671870					
6nov4	309	ep1-rog_b	r	ss	c	1864061		7.7			
6nov4	308	ep1-rog_c	r	ss	c	20330166					
6nov4	308	ep1-rog_c	r	ss	c	13298684	*	29.6			
6nov4	206	mos-san_a	r	ss	d	66805		29.7			
6nov4	234	rec-jon_a	r	ss	d	400744		16.5			
6nov4	232	sal-dav_a	r	ss	d	198323		2.8			
6nov4	316	bla-coo_b	r	ss	d	449140	*	23.5			
6nov4	315	ols-pot_b	r	ss	d	185454		5.4			
6nov4	312	mos-san_c	r	ss	d	151149		10.0			
6nov4	305	sal-mon_c	r	ss	d	412214		16.6			
6nov5	322	rec-jon_b1	r	ss	d	85335661					
6nov5	322	rec-jon_b1	r	ss	d	73512259		10.5			
6nov7	307	ep1-rog_c	r	b	d	69212					
6nov7	307	ep1-rog_c	r	b	d	88765		17.5			
6nov7	319	rec-jon_c	r	b	d	250362	*				
6nov7	319	rec-jon_c	r	b	d	172510		26.0			
7feb2	273	bla-pum-c	r	b	c	21476					
7feb2	225	ep1-rog-c	r	w	d	2341					
7feb2	225	ep1-rog-c	r	w	d	2885		14.7			
7feb2	39	rec-jon-c	r	w	d	976					
7feb2	39	rec-jon-c	r	w	d	2910		70.4			
7feb3	272	bla-pum-c	r	b	c	17286					
7feb3	272	bla-pum-c	r	b	c	16917					
7feb3	272	bla-pum-c	r	b	c	17286		1.2			
7feb3	273	bla-pum-c	r	b	c	18514					
7feb3	273	bla-pum-c	r	b	c	22854					
7feb3	273	bla-pum-c	r	b	c	19861					
7feb3	273	bla-pum-c	r	b	c	18715		9.2	16.7		
7feb3	257	bla-coo-a	r	b	d	7949					
7feb4	225	mos-san-a	r	ss	c	18565					
7feb4	225	mos-san-a	r	ss	c	18778		0.8			
7feb4	259	rec-jon-a	r	b	d	244819	*				
7feb4	259	rec-jon-a	r	b	d	84688	*	68.7			

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
7feb5	257	bla-coo-a	r	b	d	8194		2.1			
7feb6	265	ep1-rog-a	r	ss	d	76681645					
7feb6	265	ep1-rog-a	r	ss	d	207051894		65.0			
8mar2	131	bla-coo-b	r	w	d	3003					
8mar2	131	bla-coo-b	r	w	d	3128		2.9			
8mar2	142	ep1-rog-b	r	w	d	1660					
8mar2	142	ep1-rog-b	r	w	d	1907	*	9.8			
8mar2	11	rec-jon-b	r	w	d	826					
8mar2	11	rec-jon-b	r	w	d	1959	*	57.5			
8mar3	240	ols-pot-c	r	b	c	6301					
8mar4	240	ols-pot-c	r	b	c	7319					
8mar4	240	ols-pot-c	r	b	c	7294		8.3			
8mar4	240	ols-pot-c	r	b	d	3287					
8mar5	233	ols-pot-a	r	ss	c	21894					
8mar5	233	ols-pot-a	r	ss	c	25621		11.1			
8mar5	304	ep1-rog-a	r	b	d	1088988					
8mar5	304	ep1-rog-a	r	b	d	785570	*	22.9			
8mar5	285	rec-jon-a	r	b	d	125732					
8mar5	285	rec-jon-a	r	b	d	140417		7.8			
8mar5	217	ep1-rog-c	r	b	d	69477					
8mar5	217	ep1-rog-c	r	b	d	46176	*	28.5			
8mar5	240	ols-pot-c	r	b	d	1982					
8mar5	240	ols-pot-c	r	b	d	2866		24.6			
8mar5	204	rec-jon-c	r	b	d	32257					
8mar5	204	rec-jon-c	r	b	d	48651	*	28.7			
8mar6	232	bla-coo-b	r	ss	c	2115646	*				
8mar6	232	bla-coo-b	r	ss	c	3184516	*	28.5			
8mar6	248	ep1-rog-b	r	ss	c	13208876	*				
8mar6	248	ep1-rog-b	r	ss	c	10369706	*	17.0			
8mar6	213	rec-jon-b	r	ss	c	1142901					
8mar6	213	rec-jon-b	r	ss	c	1080987		3.9			
8mar6	233	ols-pot-a	r	ss	d	20916					
8mar6	233	ols-pot-a	r	ss	d	22675		5.7			
8mar7	326	ep1-rog-a	r	ss	d	9663113					
8mar7	326	ep1-rog-a	r	ss	d	17818567		42.0			
8mar7	232	bla-coo-b	r	ss	d	1001622					
8mar7	232	bla-coo-b	r	ss	d	218994					
8mar7	232	bla-coo-b	r	ss	d	1338851		67.3			
8mar7	248	ep1-rog-b	r	ss	d	5487238					
8mar7	248	ep1-rog-b	r	ss	d	6757046					
8mar7	248	ep1-rog-b	r	ss	d	7062121		3.1			
8mar7	213	rec-jon-b	r	ss	d	977866					
8mar7	213	rec-jon-b	r	ss	d	140102		106.0			
8mar7	320	ep1-rog-c	r	ss	d	10200262					
8mar7	320	ep1-rog-c	r	ss	d	22584534		53.4			
8mar7	312	sal-dav-c	r	ss	d	133123	*				
8mar7	312	sal-dav-c	r	ss	d	204436					
8mar8	312	sal-dav-c	r	ss	d	82532	*				
8mar8	312	sal-dav-c	r	ss	d	61988	*				
8mar8	312	sal-dav-c	r	ss	d	94285		48.7			
9apr4	268	ep1-rog	r	ss	d	2189656		15.0			

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
10may2	128	ep1-rog	r	w	d	350		26.2			
10may3	214	rec-jon	r	b	c	4176					
11jun3	256	ep1-rog	r	ss	d	3750323					
6nov1	144	bla-coo_b	r	w	c	1065	*				
6nov2	144	bla-coo_b	r	w	c	1219		9.5			
9apr4	226	ep1-rog	r	ss	d	1768597					
10may1	37	mos-san	r,d	w	c	97					
10may1	37	mos-san	r,d	w	c	98		0.7			
10may1	59	mos-san	r,d	w	c	92					
10may1	59	mos-san	r,d	w	c	84		6.4	10.9		
10may1	37	mos-san	r,d	w	d	83					
10may1	37	mos-san	r,d	w	d	81		1.5			
10may1	59	mos-san	r,d	w	d	80					
10may1	59	mos-san	r,d	w	d	75		4.3	5.8		
10may2	269	mos-san	r,d	b	c	4737					
10may2	269	mos-san	r,d	b	c	3936		13.1			
10may2	200	mos-san	r,d	b	c	3816					
10may2	200	mos-san	r,d	b	c	2945		18.2	24.8		
10may3	269	mos-san	r,d	b	d	2322					
10may3	269	mos-san	r,d	b	d	2699		10.6			
10may3	200	mos-san	r,d	b	d	988					
10may3	200	mos-san	r,d	b	d	786	*	16.1	95.6		
11jun1	98	ep1-rog	r,d	w	c	116					
11jun1	98	ep1-rog	r,d	w	c	116		0.3			
11jun1	57	ep1-rog	r,d	w	c	98					
11jun1	57	ep1-rog	r,d	w	c	108		6.5	11.9		
11jun1	98	ep1-rog	r,d	w	d	300					
11jun1	98	ep1-rog	r,d	w	d	308		1.8			
11jun1	57	ep1-rog	r,d	w	d	322					
11jun1	57	ep1-rog	r,d	w	d	302		4.5	2.6		
11jun3	51	ep1-rog	r,d	b	d	2035687					
11jun3	51	ep1-rog	r,d	b	d	2305615	*				
11jun3	51	ep1-rog	r,d	b	d	2455530					
11jun3	51	ep1-rog	r,d	b	d	2383917		8.0			
11jun3	227	ep1-rog	r,d	b	d	2467091			7.2		
12jul1	39	sal-mon	r,d	w	c	62					
12jul1	39	sal-mon	r,d	w	c	61		0.5			
12jul1	111	sal-mon	r,d	w	c	59					
12jul1	111	sal-mon	r,d	w	c	58	*	1.1	5.2		
12jul1	39	sal-mon	r,d	w	d	26					
12jul1	39	sal-mon	r,d	w	d	25	*	2.7			
12jul1	111	sal-mon	r,d	w	d	18	*				
12jul1	111	sal-mon	r,d	w	d	23	*	16.1	20.6		
12jul2	226	sal-mon	r,d	b	c	24445					
12jul2	226	sal-mon	r,d	b	c	25929		4.2			
12jul2	264	sal-mon	r,d	b	c	22766					
12jul2	264	sal-mon	r,d	b	c	21384		4.4	13.2		
12jul2	300	sal-mon	r,d	ss	c	nd	*				
12jul2	300	sal-mon	r,d	ss	c	23426	*	141.4			
12jul2	265	sal-mon	r,d	ss	c	40046					
12jul2	265	sal-mon	r,d	ss	c	25359	*	31.8	33.1		

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
12jul3	226	sal-mon	r,d	b	d	nd	*				
12jul3	226	sal-mon	r,d	b	d	nd	*	0.0			
12jul3	264	sal-mon	r,d	b	d	nd	*				
12jul3	264	sal-mon	r,d	b	d	nd	*	0.0	0.0		
12jul3	300	sal-mon	r,d	ss	d	54719					
12jul3	300	sal-mon	r,d	ss	d	65689		12.9			
12jul3	265	sal-mon	r,d	ss	d	431882	*				
12jul3	265	sal-mon	r,d	ss	d	247658		38.3	139.8		
13aug1	46	sal-dav	r,d	w	c	65					
13aug1	46	sal-dav	r,d	w	c	59					
13aug1	46	sal-dav	r,d	w	c	65		6.1			
13aug1	60	sal-dav	r,d	w	c	66					
13aug1	60	sal-dav	r,d	w	c	88		20.8	20.1		
13aug1	46	sal-dav	r,d	w	d	24					
13aug1	46	sal-dav	r,d	w	d	25					
13aug1	46	sal-dav	r,d	w	d	28		6.5			
13aug1	60	sal-dav	r,d	w	d	21	*				
13aug1	60	sal-dav	r,d	w	d	29		23.0	3.1		
13aug3	257	sal-dav	r,d	ss	d	7343					
13aug3	257	sal-dav	r,d	ss	d	17469		57.7			
14sep1	5	ep1-rog	r,d	w	c	619					
14sep1	5	ep1-rog	r,d	w	c	587					
14sep1	5	ep1-rog	r,d	w	c	575		3.9			
14sep1	4	ep1-rog	r,d	w	c	580					
14sep1	4	ep1-rog	r,d	w	c	453		17.4	13.9		
14sep2	5	ep1-rog	r,d	w	d	579					
14sep2	5	ep1-rog	r,d	w	d	474		14.1			
15oct1	108	epl-epl	r,d	w	c	47	*				
15oct1	108	epl-epl	r,d	w	c	46	*				
15oct1	108	epl-epl	r,d	w	c	65		20.6			
15oct1	113	epl-epl	r,d	w	c	53	*				
15oct1	113	epl-epl	r,d	w	c	45	*	11.4	7.9		
15oct1	108	epl-epl	r,d	w	d	36					
15oct1	108	epl-epl	r,d	w	d	39					
15oct1	108	epl-epl	r,d	w	d	45		11.2			
15oct1	113	epl-epl	r,d	w	d	145					
15oct1	113	epl-epl	r,d	w	d	174		13.2	119.6		
15oct2	2	epl-epl	r,d	b	c	nd	*				
15oct2	2	epl-epl	r,d	b	c	nd	*				
15oct2	2	epl-epl	r,d	b	c	nd	*	0.0			
15oct2	22	epl-epl	r,d	b	c	nd	*				
15oct2	22	epl-epl	r,d	b	c	4018		141.4	0.0		
15oct3	2	epl-epl	r,d	b	d	1223	*				
15oct3	2	epl-epl	r,d	b	d	1160	*				
15oct3	2	epl-epl	r,d	b	d	1122	*	4.4			
15oct3	22	epl-epl	r,d	b	d	1114	*				
15oct3	22	epl-epl	r,d	b	d	2126		44.1	32.4		
4sep2	54	bla-pum	r,d	b	c	2250	*		44.8		
4sep2	54	bla-pum	r,d	b	c	2466	*	6.5			
4sep3	36	bla-pum	r,d	b	d	2722			37.8		
4sep3	36	bla-pum	r,d	b	d	3288		13.3			

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
4sep3	54	bla-pum	r,d	b	d	1807					
4sep3	54	bla-pum	r,d	b	d	2056					
4sep3	54	bla-pum	r,d	b	d	2289		11.7			
6nov5	230	sal-dav_a	r,d	b	c	38475					
6nov5	230	sal-dav_a	r,d	b	c	31336		14.5			
6nov5	233	sal-dav_a	r,d	b	c	29567					
6nov5	233	sal-dav_a	r,d	b	c	27237					
6nov5	233	sal-dav_a	r,d	b	c	28146		4.1	20.8		
6nov6	233	sal-dav_a	r,d	b	d	54890	*				
6nov7	233	sal-dav_a	r,d	b	d	46213					
6nov7	233	sal-dav_a	r,d	b	d	45741					
6nov7	233	sal-dav_a	r,d	b	d	34311		18.6			
6nov7	230	sal-dav_a	r,d	b	d	47446					
6nov7	230	sal-dav_a	r,d	b	d	30824		30.0	14.6		
7feb1	156	bla-coo-a	r,d	w	c	57					
7feb1	156	bla-coo-a	r,d	w	c	56		0.2			
7feb1	56	bla-coo-a	r,d	w	c	77					
7feb1	56	bla-coo-a	r,d	w	c	76					
7feb1	56	bla-coo-a	r,d	w	c	61		12.6	23.1		
7feb2	156	bla-coo-a	r,d	w	d	2042	*				
7feb2	156	bla-coo-a	r,d	w	d	1997	*	1.6			
7feb2	56	bla-coo-a	r,d	w	d	1150					
7feb2	56	bla-coo-a	r,d	w	d	1170		1.2	54.1		
8mar1	61	rec-jon-a	r,d	w	c	98					
8mar1	61	rec-jon-a	r,d	w	c	84		11.4			
8mar2	61	rec-jon-a	r,d	w	d	203	*				
8mar2	70	rec-jon-a	r,d	w	d	307					
8mar3	61	rec-jon-a	r,d	w	d	208		1.6			
8mar3	70	rec-jon-a	r,d	w	d	271		8.7	33.9		
9apr1	39	ep1-rog	r,d	w	c	380					
9apr1	39	ep1-rog	r,d	w	c	420					
9apr2	39	ep1-rog	r,d	w	c	221		30.9			
9apr2	39	ep1-rog	r,d	w	d	2721					
9apr2	39	ep1-rog	r,d	w	d	3545		18.6			
9apr2	62	ep1-rog	r,d	w	d	3014					
9apr2	62	ep1-rog	r,d	w	d	2529		12.4	12.3		
9apr3	268	ep1-rog	r,d	ss	c	150548					
9apr3	226	ep1-rog	r,d	ss	c	251736	*				
9apr3	242	ep1-rog	r,d	b	c	14100					
9apr3	242	ep1-rog	r,d	b	c	12715					
9apr3	242	ep1-rog	r,d	b	c	13197		5.3	9.2		
9apr4	268	ep1-rog	r,d	ss	c	190773		16.7			
9apr4	226	ep1-rog	r,d	ss	c	258413		1.9	39.7		
6nov1	134	sal-mon_c	rd	w	c	86					
6nov2	134	sal-mon_c	rd	w	c	68		16.7	9.8		
10may1	37	mos-san	sp	w	c	239				79.8	
10may1	37	mos-san	sp	w	d	144				75.5	
10may2	269	mos-san	sp	b	c	10223				92.8	
10may3	269	mos-san	sp	b	d	5090				77.6	
11jun1	57	ep1-rog	sp	w	c	177				58.7	
11jun1	57	ep1-rog	sp	w	d	237				77.1	

Table 8.1 Quality Assurance/Quality Control Data
(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
11jun3	227	ep1-rog	sp	b	c	9347				47.7	
12jul1	39	sal-mon	sp	w	c	164				58.5	
12jul1	39	sal-mon	sp	w	d	99				61.0	
12jul2	300	sal-mon	sp	ss	c	197059				113.8	
12jul3	300	sal-mon	sp	ss	d	174528				136.4	
13aug2	260	sal-dav	sp	ss	c	22176				112.7	
13aug2	60	sal-dav	sp	w	d	98				60.0	
13aug3	260	sal-dav	sp	ss	d	8729				73.2	
14sep1	42	ols-pot	sp	w	c	204				67.4	
14sep1	42	ols-pot	sp	w	d	202				94.5	
14sep2	22	bla-coo	sp	ss	c	77446				148.6	
14sep3	22	bla-coo	sp	ss	d	42753				134.3	
15oct1	108	epl-epl	sp	w	c	144				52.0	
15oct1	108	epl-epl	sp	w	d	109				64.2	
15oct2	2	epl-epl	sp	b	c	10028				72.9	
15oct3	2	epl-epl	sp	b	d	6503				77.0	
1jul1	218	bla-coo	sp	w	d	104				65.1	
1jul2	228	sal-mon	sp	w	c	212				74.3	
1jul4	209	ep1-rog	sp	b	c	19010				235.1	
1jul4	203	epl-epl	sp	b	d	19314				416.3	
2aug1	22	sal-mon	sp	w	c	284				103.3	
2aug1	22	sal-mon	sp	w	d	67				41.0	
2aug2	43	sal-mon	sp	b	c	30187				95.3	
3sep1	219	bla-coo	sp	w	c	226				80.3	
3sep1	219	bla-coo	sp	w	d	287				77.7	
3sep2	210	bla-coo	sp	ss	c	142547				88.2	
3sep3	214	bla-coo	sp	b	d	10259				81.2	
4sep1	100	bla-pum	sp	w	c	237				85.7	
4sep1	100	bla-pum	sp	w	d	299				82.3	
4sep2	54	bla-pum	sp	b	c	11609				77.8	
4sep3	54	bla-pum	sp	b	d	20121				108.5	
5oct5	247	rec-jon	sp	ss	d	1321469	*				
6nov3	214	bla-pum_a	sp	ss	d	103821				77.2	
7feb1	56	bla-coo-a	sp	w	c	196				68.8	
7feb2	56	bla-coo-a	sp	w	d	132				18.1	
7feb3	273	bla-pum-c	sp	b	c	22006				104.9	
7feb4	225	mos-san-a	sp	ss	c	100927				110.9	
7feb5	225	mos-san-a	sp	ss	d	51678				161.4	
8mar1	61	rec-jon-a	sp	w	c	185				62.5	
8mar4	240	ols-pot-c	sp	b	c	13278				65.7	
8mar5	233	ols-pot-a	sp	ss	c	84301				98.8	
8mar5	240	ols-pot-c	sp	b	d	14168				127.1	
8mar6	233	ols-pot-a	sp	ss	d	58755				106.9	
9apr1	39	ep1-rog	sp	w	c	268				168.2	
9apr2	39	ep1-rog	sp	w	c	259				139.1	
9apr2	62	ep1-rog	sp	w	d	129				131.3	
9apr3	268	ep1-rog	sp	ss	c	118444				130.4	
9apr4	242	ep1-rog	sp	b	d	3187				122.7	
6nov2	134	sal-mon_c	sp	w	c	65				23.0	
2aug4	43	sal-mon	sp,r	b	d	11032				65.9	
2aug4	43	sal-mon	sp,r	b	d	7412		27.8			

Table 8.1 Quality Assurance/Quality Control Data

(Types: c, control; r, replicate; d, duplicate; sp, spike; fmb, field method blank; lmb, lab method blank. Matrix: w, water; m, methanol; b, benthic; ss, suspended sediment. Pesticide: c, chlorpyrifos; d, diazinon; ppt, parts per trillion; Flag: * value outside but within 10% of test range limits; CV, coefficient of variance; RPD, relative percent difference)

run#	sample #	site	type	matrix	pesticide	value (ppt)	flag	CV of reps (%)	RPD of dups	recovery of spikes (%)	R^2
5oct5	247	rec-jon	sp,r	ss	d	1287096	*	1.9		9.4	
6nov5	233	sal-dav_a	sp,r	b	c	42430					
6nov5	233	sal-dav_a	sp,r	b	c	45683		5.2		109.7	
6nov6	233	sal-dav_a	sp,r	b	d	51292	*				
6nov6	233	sal-dav_a	sp,r	b	d	43987	*	10.8		96.0	
6nov7	233	sal-dav_a	sp,r	b	d	124488					
6nov7	233	sal-dav_a	sp,r	b	d	131047		3.6		72.0	
8mar1	124	rec-jon-c	r,cd	w-unfiltere	c	180					
8mar2	124	rec-jon-c	r,cd	w-unfiltere	d	376					
8mar1	7	rec-jon-c	r,cd	w	c	181					
8mar2	7	rec-jon-c	r,cd	w	d	391					
9apr1	111	ep1-rog	r	w-unfiltere	c	299					
9apr1	111	ep1-rog	r	w-unfiltere	c	377		16.2			
9apr2	111	ep1-rog	r	w-unfiltere	d	2248					
9apr2	111	ep1-rog	r	w-unfiltere	d	2434		5.6			
5oct2	43	ep1-rog	r	w&ss	d	2188					
5oct2	43	ep1-rog	r	w&ss	d	2596					
5oct2	43	ep1-rog	r	w&ss	d	25077		131.6	35.7		
11jun1	146	ep1-rog	d,s	w-unfiltere	d	97					
11jun1	146	ep1-rog	d,s	w-unfiltere	c	351					

Table 8.2 Inter-Laboratory/Inter-Method Comparison Data.

(x, CCoWS value consistent with APPL; #, CCoWS value near EDL; nd, not determinable; *, see notes; C, chlorpyrifos; D, diazinon; w, water; b, benthic; RPD, relative percent difference)

run	site	Lab	C, water	RPD	C, benthic	RPD	D, water	RPD	D, benthic	RPD
DPRun1_Jul2002	sal-dav	CCoWS	102	x	37,548	-51	45	x	24,157	x
		APPL	<500		63,000		<500		<50,000	
DPRun2_Aug2002	sal-mon	CCoWS	50	#	20,735	x	37	x	3,947	x
		APPL	<50		<50,000		<50		<50,000	
DPRun3_Sep2002a	bla-coo	CCoWS	55	#	294,992	*	444	53	9,109	x
		APPL	<50		<50,000		290		<50,000	
DPRun4_Sep2002b	bla-pum	CCoWS	54	#	2,811	x	372	16	2,432	x
		APPL	<50		<50,000		320		<50,000	
DPRun5_Oct2002	rec-jon	CCoWS	111	94	147,715	39	309	23	103,097	53
		APPL	40		100,000		250		60,000	
DPRun6_Storm1	sal-mon-w	CCoWS	58	#	52,610	nd	<25	x	51,718	nd
	sal-dav-b	APPL	<50		<50,000		<50		<50,000	
DPRun7_Storm2	bla-coo-w	CCoWS	65	nd	19,114	x	1160	-35	10,095	x
	bla-pum-b	APPL	<50		<50,000		750		<50,000	
DPRun8_Storm3	rec-jon-w	CCoWS	75	61	17,701	x	247	66	4,577	x
	ols-pot-b	APPL	40		<50,000		410		<50,000	
DPRun9_Apr2003	ep1-rog	CCoWS	353	46	13,659	-114	2952	59	1,979,127	186
		APPL	220		50,000		1,600		70,000	
DPRun10_May2003	mos-san	CCoWS	84	nd	3,859	nd	80	0	1,699	nd
		APPL	<50		n/a		80		n/a	
DPRun11_Jun2003	ep1-rog	CCoWS	109	58	189,883	nd	308	25	2,329,568	179
		APPL	60		<50,000		240		130,000	
DPRun12_Jul2003	sal-mon	CCoWS	60	nd	23,631	x	23	x	non-detect	x
		APPL	<50		<50,000		<50		<50,000	
DPRun13_Aug2003	sal-dav	CCoWS	69	nd	23,309	x	25	-46	8,129	x
		APPL	<50		<50,000		40		<50,000	
DPRun14_Sep2003	epl-rog	CCoWS	563	52	1,358,554	99	574	-15	20,367,689	130
		APPL	330		460,000		670		4,300,000	
DPRun15_Oct2003	epl-epl	CCoWS	51	#	nd	x	88	98	1,349	x
		APPL	<50		<50,000		30		<50,000	
Average RPD				62		-7		24		137
					32				57	

Notes: 1) APPL labs used a higher detection limit for water samples on the first run (500, not 50)
2) *, duplicate sample #202 value = 34,770, consistent with APPL labs. Duplicate sample #214 replicates averaged approximately 425,000. 3) Averages based on quantifiable values only.

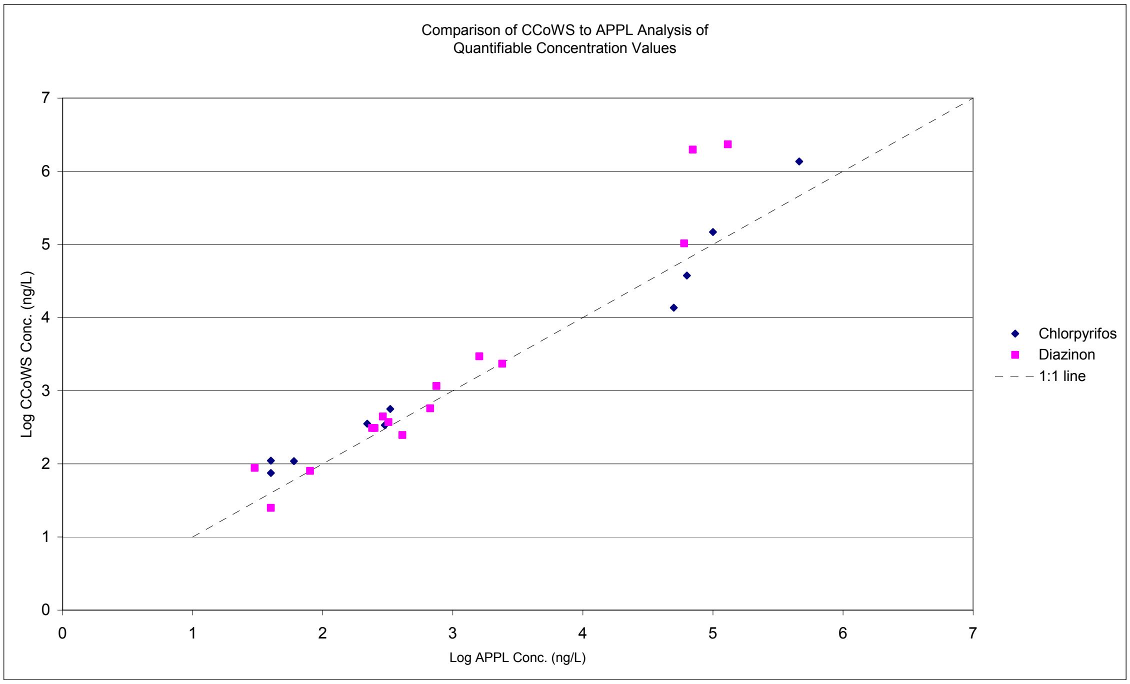


Figure 8.1 Comparison of CCoWS to APPL analysis of quantifiable concentration values.

Reports 1 – 15. Agricultural & Priority Pollutants Laboratories, Inc. 8141A analysis of QA/QC samples submitted for each monitoring run

Hardcopies submitted to DPR in prior draft reports. No web versions created.