PIPERONYL BUTOXIDE

Environmental Risk Assessment

Provided for SRRD

by

EFED's Piperonyl Butoxide RED Team:

William P. Eckel
Michael Davy
Richard Lee

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Executive Summary

- Acute risk to amphibians, freshwater invertebrates and freshwater fish from the many different agricultural uses of Piperonyl Butoxide (PBO).

- Chronic risk to freshwater invertebrates and freshwater fish is triggered from the many different agricultural uses of Piperonyl Butoxide (PBO).

- Chronic risk to birds and mammals is estimated from the many different agricultural uses of (PBO).

- Mosquito control usage triggers only listed species Levels of Concern for freshwater invertebrates, and amphibians.

- Federal endangered/threaten species (listed) Level of Concern is triggered for mammals, birds, amphibians, freshwater invertebrates, and freshwater fish.

- Avian reproductive study indicates PBO to be a candidate for endocrine disruptor testing.

- Uncertainty exists for chronic risk to chronic estuarine fish and invertebrates due to lack of data.

- Uncertainty exists for risk to freshwater fish reproduction due to lack of data.

- Uncertainty exist for risk to non-target terrestrial plants due to lack of data.

- PBO degrades rapidly (8.4-hour half-life) in the environment by photolysis in water, and is metabolized by soil microorganisms (half-life 14 days in one experiment). The estimated atmospheric half-life of PBO is 3.4 hours, based on the estimated reaction rate with hydroxyl radicals.

- PBO is moderately mobile in soil-water systems.

- Little volatilization from soil or water is expected, however PBO may enter the atmosphere as an aerosol as a result of spraying.

- There is no concern for risk to predators via consumption of contaminated fish.

- The major degradates PBO-alcohol, PBO-aldehyde, and PBO-acid are expected to be more soluble in water than the parent and therefore more mobile in soil-water systems.

- ECOTOX database from Duluth ORD has been analyzed for additional data for this risk assessment. Of the data reviewed, only one study showed an endpoint more sensitive than the data endpoint chosen for the risk assessment. That particular study was inadequate for RQ usage

in the risk assessment.

- The probit slope response relationship on the listed species Levels of Concern (0.05 for aquatic and 0.1 for terrestrial) show that the effect probability p(Z) ranges from 2.05E-12 (1 in 4.88 E+11chance for daphnid) to 3.4E-6 (1 in 294,000 chance for quail and rat) for listed species only. This does not mean that non-listed species are protected. For such species another probit slope analysis needs to be done using the non-listed species LOC of 0.5.

1. Problem Formulation

1.1. *Source and Exposure Characteristics.*

Piperonyl butoxide (PBO) is an insecticide synergist. Synergists are chemicals that lack pesticidal effects of their own but enhance the pesticidal properties of other chemicals. Piperonyl butoxide is used in combination with a wide variety of insecticides in ratios ranging from 3:1 to 20:1 by weight. It is usually formulated with natural pyrethrins or synthetic pyrethroids and is an ingredient in thousands of registered pest control products. It has numerous and varied commercial and residential applications, is available in a broad range of formulations, and is applied by wide variety of application methods. Commercial uses include pre- and post-harvest application to food and non-food agricultural crops, applications in food and non-food handling commercial and agricultural structures and outdoor premises, housing for veterinary and farm animals, and direct application to veterinary and farm animals. Piperonyl butoxide (PBO) currently has 70 tolerances (40 CFR 180.127) in/on various crop and livestock food commodities. Residentially, it is used to control insects both inside the home, and outside on gardens, lawns and ornamentals, patios, and other outdoor structures, and is directly applied to pets. As a synergist, it inhibits the mixed function oxidase system of insects and reduces the oxidative breakdown of other pesticides like pyrethrum and synthetic pyrethroids. Comprehensive information on use patterns and formulations is provided in the Piperonyl Butoxide Master Label which was submitted to the EPA by the Piperonyl Butoxide Task Force II. The risk assessments for piperonyl butoxide are based solely on the Master Label, since it only lists the uses that the Task Force II are supporting (C. Rodia, Use Closure Memo, 11/17/03). The Master Label for PBO (Feb. 5, 2003, 53 pp.) lists ten crop groups and a miscellaneous category of agricultural uses. These are listed in Table I below, along with the PRZM scenarios that are being used to represent them in this assessment.

Screening level estimate of piperonyl butoxide usage performed by HED's Biological and Economical Analysis Division (BEAD) indicates that 5,000 to 10,000 pounds of piperonyl butoxide are used annually in the U.S. for application to agricultural crops, with highest usage on potatoes (30% crop treated) and other uses at 5% or less. An estimated 100,000 to 200,000 pounds are used annually for non-crop uses.

BEAD did not provide a Quantitative Use Assessment for PBO in time for this assessment (C. Rodia, SRRD personal commun., 6/23/2004). The majority of PBO use is expected to be for non-agricultural uses.

Some agricultural usage information was obtained from the USDA Regional IPM Centers website www.ipmcenters.org/datasources/nass/output/NASS.cfm. . A copy of the data table is given in Appendix I. The USDA website reports the use of PBO in some years between 1990 and 2001 in the following states and crops: eggplant (NJ), tomatoes (NJ, MI), and fall potatoes (MI, NY, PA, ME, WI). In California, use was reported on head and "other" lettuce, spinach, cauliflower, and celery. The quantitative reliability of the data could not be assessed, however, the following information was given.

In California, PBO was used on 1 to 3% of cauliflower (1994) and celery (1994, 1996) acres, on 3 to 25% of combined head/other lettuce (even years 1992-2000), and 13 to 24% of fresh-market spinach acres (1992, 1994, 1996).

In New Jersey, PBO was used on eggplant (25 to 26% of acres in 1992, 1994), and on 21 to 25% of fresh-market tomato acres (1992, 1994). In Michigan, PBO was used on 28% of tomato acres in 1992.

Potatoes appear to be the most widespread agricultural use of PBO. The use of PBO on fall potatoes in Maine was 4 to 7% of acres (1993-4); 45 to 70% of acres in Michigan (1992-4); 22 to 41 % of acres in New York (1992-4); 1 to 75% of acres in Pennsylvania (1992-5, 1998); and 17 to 33% of acres in Wisconsin (1995, 1997-9, 2001).

The highest reported use rates for PBO were in New Jersey on eggplant (average 4.4 to 5.1 applications totaling 2.4 to 2.89 lb/acre/year) and on tomatoes (average 3.5 to 5.3 applications totaling 1.89 to 2.47 lb/acre/year). The highest use reported on potatoes was in New York (1994), with an average 2.8 applications totaling 2.24 lb/acre/year. In California lettuce, the highest reported use rate was 0.58 lb/acre/year from 1 to 2 applications.

It is most likely that PBO will enter the environment due to the agricultural and public health (mosquito control) uses. Non-target organisms are more likely to be exposed to PBO in their natural habitats due to these outdoor uses. Exposure analyses will focus on the use of PBO in post-crop emergence sprays to control insects. Both ground and aerial spray applications will be considered. The use of PBO in mosquito control will be examined with the EFED Interim Rice model, which estimates environmental concentrations from direct water applications.

Table I: PBO Registered Crop Groups and PRZM Scenarios to Represent Them

Crop Group	PRZM Scenario
1: Root and Tuber Vegetables (39 crops) 2: Leaves of Root and Tuber Vegetables (18 crops)	ID potato, ME potato, FL carrot, CA sugarbeet, MN sugarbeet
4: Leafy Vegetables (Except Brassica Vegetables) (31)	CA lettuce
5: Brassica (cole) Leafy Vegetables (16 crops)	FL cabbage
6: Legume Vegetables (succulent or dried) (43 crops) 7: Foliage of Legume Vegetables (7 crops)	MI beans, OR snapbeans
8: Fruiting Vegetables (except Cucurbits) (10crops)	FL peppers, FL tomato, CA tomato, PA tomato
9: Cucurbit Vegetables (17 crops)	FL cucumber
10: Citrus Fruits (14 crops)	CA citrus, FL citrus
13: Berries (9 crops)	OR berries

Miscellaneous (3 crops)	MS cotton, TX cotton, NC cotton FL turf, PA turf FL strawberries, CA grapes

Note: Number in parentheses after Crop Group name is number of crops listed on Master Label for that group.

PRZM (Pesticide Root Zone Model) is a computer model that estimates the amount of pesticide in run-off from agricultural fields (both dissolved and attached to sediment). It is linked to the EXAMS (Exposure Analysis Modeling System) model for estimation of pesticide concentrations in water bodies. These estimates will be used to derive Expected Environmental Concentrations (EEC) for the aquatic risk assessment.

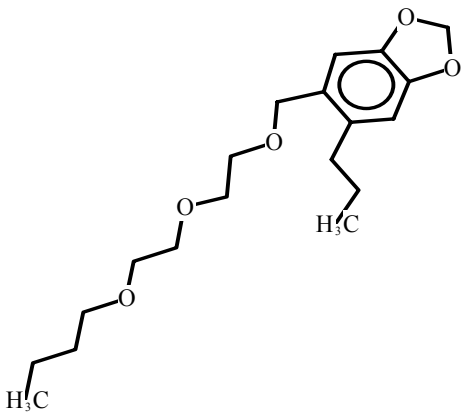


Figure 1. Structure of Piperonyl Butoxide

Piperonyl butoxide (PBO, Figure 1) is the common name for 5-2-(2-butoxyethoxy)ethoxymethyl-6-propyl-1,3-benzodioxole. The physical and chemical properties of PBO are given below.

Property	**Value**
Chemical Formula	$C_{19}H_{30}O_5$
Molecular weight	338.45 g/mol

Water Solubility	14.3 mg/L
Log Octanol-Water Partition Coefficient (Log K_{ow})	4.75
Melting Point	Liquid at 25°C
Vapor Pressure	5 x 10^{-13} mmHg @ 25°C (extrapolated from data at higher temperature – see Appendix B)
Henry's Law Constant	1.6 x 10^{-14} atm-m^3/mol (calculated as VP/solubility)

Subdivision N guideline studies for PBO indicate that it has the following environmental fate properties.

Guideline Test	**Value or Result**
Hydrolysis	Stable
Aqueous Photolysis	Parent half-life 8.4 hours at 25°C and pH 7 Total Toxic Residues (TTR) half-life 5.7 days
Soil Photolysis	Result uncertain due to rapid degradation of dark control
Aerobic Soil Metabolism	Parent half-life 14 days in sandy loam soil TTR half-life 24 days
Anaerobic Aquatic Metabolism	Stable for 181days in flooded sandy loam soil-water system at 25°C
Aerobic Aquatic Metabolism	Parent half-life 75 days TTR half-life 133 days
Adsorption-Desorption (Batch Equilibrium)	Adsorption Koc range 399 - 830 mL/g Desorption Koc range 390 - 1152 mL/g
Adsorption-Desorption (Column Leaching)	Aged Soil Column data invalid Unaged soil Column: Parent PBO leached only in sand soil

Hydroxyl Radical Reaction half-life	0.1 day (estimated by EPI-Suite)

Taken together, these data indicate that PBO will have a moderate tendency to move from soil to surface water, and little tendency to leach to ground water except in coarse-textured soils. In water bodies, it will be slowly metabolized (75-day half-life), or in shallow, clear waters, rapdily degraded by photolysis to PBO-alcohol, PBO-aldehyde, and PBO-acid (see Appendix A for structures). PBO reaching anaerobic sediments will tend to be stable, and available for desorption to the water column.

In soil, PBO metabolism appears to be relatively quick (parent half-life 14 days in one soil tested). PBO-acid is the main degradate formed in soil (17% at 30 days). While parent PBO is not expected to leach except in coarse soil, PBO-acid is expected to be more soluble (2000 ppm or more) and therefore more mobile and subject to leaching.

PBO will have very little tendency to partition from water to the atmosphere. If present in the air as a vapor or spray drift it is expected to reaction rapidly with hydroyl radicals. The major degradates PBO-alcohol, PBO-aldehyde, and PBO-acid are expected to have less tendency to partition from water to air, due to their much higher expected solubility in water.

Exposure to PBO from agricultural use will therefore take place mainly in soil and surface water, and from consumption of plants and other food items onto which it is sprayed.

1.2. *Exposure Pathways*.

Ground applications of PBO may result in residues at the use site that terrestrial organisms can ingest, inhale or touch (i.e., dermal exposure). Additionally, PBO may reach off-site terrestrial or aquatic systems through spray drift during application or from surface water run-off. Direct applications of PBO to water as a mosquito abatement result in exposure to aquatic organisms within the water column and to sediment dwellers from partitioning to the sediment. Indirect exposure through the food chain could occur in both the terrestrial and aquatic ecosystem, if uptake is faster than degradation (photolysis or metabolism in soil).

1.3. *Analysis Plan*.

EFED was directed by SRRD to assess the risks from PBO independently from any other active ingredient.

Risks to terrestrial and aquatic organisms will be assessed as described below. Applications of PBO were assumed to be at the maximum rate and frequency allowed on the Master Label (ten applications of 0.5 lb a.i./acre at 3-day intervals). Exposure to both parent PBO and its major degradates (PBO-alcohol, PBO-aldehyde, and PBO-acid) will be considered. The toxicity of the degradates will be considered equivalent to the parent.

1.3.a. *Terrestrial Organisms*. Onsite exposure of non-target birds and mammals to PBO via ingestion will be assessed by assuming 100% of their diet is obtained from onsite sources and using the Hoerger-Kenaga nomogram for estimating residues on plants, seeds, insects, and other food items. Offsite non-target bird and mammal exposures to plant and insect residues will not be quantitatively evaluated because onsite plant and insect residue levels will be higher than offsite residue levels. For the scenario considered, acute and chronic risk quotient (RQ) values will be calculated by dividing estimated exposure concentrations (EECs) by the toxicity endpoints for acute exposure (median lethal dose, LD_{50}) or chronic exposure (no-observed-adverse-effect-concentration, NOAEC), respectively. None of the studies reviewed for foliar dissipation were found to have sufficient data points to calculate half-life. Due to lack of foliar dissipation data, a default half-life of 35 days will be used. The RQ values will then be compared to standard Levels of Concern (LOCs).

1.3.b. *Aquatic Organisms.* A Total Toxic Residue approach was used for the aquatic assessment (including freshwater and estuarine habitats). The major degradates of PBO (PBO-alcohol, PBO-aldehyde, and PBO-acid) were included in estimates of PBO exposure by including their residues in calculations of half-life values from the relevant metabolism and fate studies (aerobic soil, aqueous photolysis, aerobic aquatic). Each of the three degradates retains the 1,3-benzodioxole (methylenedioxyphenyl) moiety, which is common to a number of related compounds with synergistic or piscicidal properties. There include Sesamex (Merck Index 10^{th} ed. monograph 8309), Sesamin (monograph 8310), Sesamolin (8311), Asarinin (837), Piperine (7347), and Justicidins (5110).

The three degradates are formed in a series of reactions (PBO, alcohol, aldehyde, acid). Only the alcohol and aldehyde appeared in the aqueous photolysis study, with maxima at 36 hours (55% and 12% of applied radiation, respectively). The acid was the only one of the three degradates detected in the aerobic soil metabolism study (max. 17% of applied at 30 days). All three were detected in the aerobic aquatic metabolism study, however, with maxima at 21 to 30 days.

EECs of PBO in an aquatic system due to run-off and spray drift from ground or aerial applications to the crops listed in Table 1 will be modeled using PRZM-EXAMS and AgDrift, respectively. All available PRZM scenarios representing agricultural use on Master Label were

used. These modeled exposure concentrations will then be divided by the LC_{50} and EC_{50} values for fish and aquatic invertebrates, to calculate acute RQs. Chronic RQ values will be calculated by dividing appropriate EEC values (21-day or 60-day average concentrations) from the PRZM-EXAMS by early-life stage NOEC values .

The AgDrift analysis will examine exposure from spray drift alone in the EFED standard farm pond and the standard wetland, to determine if spray drift exposure by itself (from the agricultural uses) is of concern. Modeled exposures to a pond or wetland adjacent to the treated area will be greater than the assumption of 1% used in the PRZM-EXAMS analysis.

Finally, the EFED Interim Rice Model will be used to assess the risk to aquatic organisms from a single application of PBO for mosquito abatement. The Interim Rice Model is used because it represents a 4-inch deep water body, similar to the wetlands described on the Master Label. It is intended to represent a conservative estimate of exposure from a single mosquito abatement application, but not multiple applications.

1.3.2. *Measures of Effects*

Assessment endpoints are defined as "explicit expressions of the actual environmental value that is to be protected." Defining an assessment endpoint involves two steps: 1) identifying the valued attributes of the environment that are considered to be at risk, and 2) operationally defining the assessment endpoint in terms of an ecological entity (i.e., a community of fish and aquatic invertebrates) and its attributes (i.e., survival and reproduction). Therefore, selection of the assessment endpoints is based on valued entities (i.e., ecological receptors), the ecosystems potentially at risk, the migration pathways of pesticides, and the routes by which ecological receptors are exposed to pesticide-related contamination. The selection of clearly defined assessment endpoints is important because they provide direction and boundaries in the risk assessment for addressing risk management issues of concern.

Ecosystems potentially at risk are expressed in terms of the selected assessment endpoints. The typical assessment endpoints for screening-level pesticide ecological risks are reduced survival, and impairment of reproduction and growth for both aquatic and terrestrial animal species. Aquatic animal species of potential concern include freshwater fish and invertebrates, estuarine/marine fish and invertebrates, and amphibians. Terrestrial animal species of potential concern include birds, mammals, beneficial insects, and earthworms. For both aquatic and terrestrial animal species, direct acute and direct chronic exposures are considered. In order to protect threatened and listed species, all assessment endpoints are measured at the individual level. Although all endpoints are measured at the individual level, they provide insight about risks at higher levels of biological organization (e.g., populations and communities). For example, pesticide effects on individual survivorship have important implications for both population rates of increase and habitat carrying capacity.

The ecological relevance of selecting the above-mentioned assessment endpoints is as follows: 1) complete exposure pathways exist for these receptors; 2) the receptors may be

potentially sensitive to pesticides in affected media and in residues on plants, seeds, and insects; and 3) the receptors could potentially inhabit areas where pesticides are applied, or areas where runoff and/or spray drift may impact the sites because suitable habitat is available.

Each assessment endpoint requires one or more "measures of effect," which are defined as changes in the attributes of an assessment endpoint itself or changes in a surrogate entity or attribute in response to exposure to a pesticide. Measurement endpoints for the screening-level risk assessment are based on a suite of registrant-submitted toxicity studies performed on a limited number of organisms in the following broad groupings:

- Birds (mallard duck and bobwhite quail) used as surrogate species for terrestrial-phase amphibians and reptiles,
- Mammals (laboratory rat),
- Freshwater Fish (bluegill sunfish and rainbow trout) used as a surrogate species for aquatic phase amphibians,
- Freshwater invertebrates (*Daphnia magna*),
- Estuarine/marine fish (sheepshead minnow),
- Estuarine/marine invertebrates Eastern oyster *(Crassostrea virginica*) and mysid shrimp (*Americamysis bahia*),

Within each of these very broad taxonomic groups, an acute and chronic endpoint is selected from the available test data, as the data sets allow.

1.3.3. *Assessment Endpoints*.

1.3.3.a. *Aquatic Organisms.*

Based on the available data and the ecosystems believed to be at risk, the assessment endpoint is survival and reproduction of individuals and communities of fish and aquatic invertebrates. The acute measurement endpoints for fish are rainbow trout, sheepshead minnow, and bluegill sunfish acute LC_{50}. The acute measurement endpoints for aquatic invertebrates are water flea , eastern oyster, and mysid shrimp acute EC_{50}. The chronic measurement endpoints for fish are embryo larval survival at hatch and growth of the larva, including length and wet weight and, for aquatic invertebrates, mobility and reproduction. The stressors in these experiments are assumed to be exposure to PBO and its major degradates, PBO-alcohol, PBO-aldehyde, and PBO-acid.

1.3.3.b. *Terrestrial Organisms.*

Based on the available data and the ecosystems believed to be at risk, the assessment endpoint is abundance (i.e., survival, reproduction, and growth) of individuals and populations of birds and mammals. The acute measurement endpoints are the bobwhite quail and mallard duck acute oral LD_{50} and short-term dietary LC_{50}. The laboratory rat LD_{50} is the

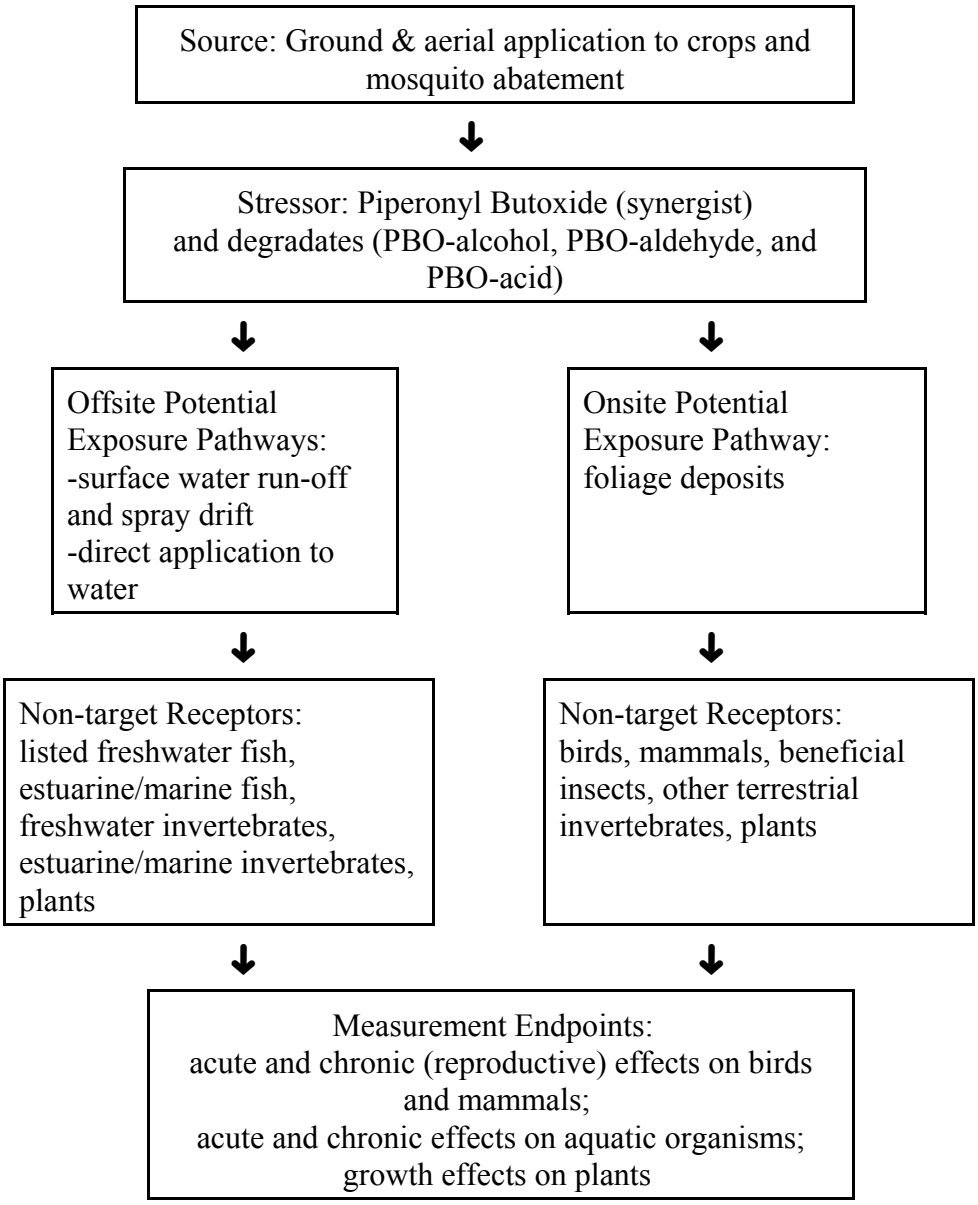
acute measurement endpoint for mammals. The avian chronic measurement endpoints include adult body weight and food consumption, number of eggs laid, number of eggs cracked, and eggshell thickness. The mammalian chronic measurement endpoints include pup survival and decreased weight and decreased weight gain in mother or pup. The stressors in these experiments are assumed to be exposure to PBO and its major degradates, PBO-alcohol, PBO-aldehyde, and PBO-acid.

1.3.4. *Conceptual Model*.

The conceptual model (Figure 2) diagrams the relationships between PBO and its degradates and the ecological entities potentially exposed. It should be noted that these entities are likely exposed to other chemical and environmental stressors (e.g., habitat loss) as well, but only the direct effects of the pesticide are considered in this assessment. Based on the foregoing discussion, the conceptual model for exposure of non-target fish and invertebrates involves application of PBO to a terrestrial site (crop) resulting in spray drift or run-off to the aquatic ecosystem, or direct application to water as a mosquito abatement. The non-target organisms are then exposed to PBO or its degradates in the water column. Exposure to the stressor in sufficient concentration may result in effects to populations and as a result, effects to ecosystems.

Exposure of birds and mammals in terrestrial environments to PBO and its degradates is expected to be via consumption of spray-contaminated food items (foliage, seeds, insects, etc.). Exposed birds may be at risk of reduced adult body weight and food consumption, reduced number of eggs laid, increased number of eggs cracked, and reduced eggshell thickness

Figure 2. Conceptual Model for Ground and Aerial Applications of PBO to Crops and Mosquito Abatement



1.3.5 *Risk Quotient and Levels of Concern*

Risk characterization integrates exposure and ecotoxicity data to evaluate the likelihood of adverse effects. For ecological effects, the Agency accomplishes this integration using the quotient risk method. Risk quotients (RQs) are calculated by dividing exposure estimates by acute and chronic ecotoxicity values.

RQ = EXPOSURE / TOXICITY

RQs are then compared to the Office of Pesticide Program's levels of concern (LOCs) to assess potential risk to non-target organisms and the need to consider regulatory action. Calculation of an RQ that exceeds the LOC indicates that a particular pesticide use poses a presumed risk to non-target organisms. LOCs currently address the following categories of presumed risk:

- **acute** - potential for acute risk is high and regulatory action beyond restricted use classification may be warranted
- **acute restricted** - the potential for acute risk is high, but may be mitigated through restricted use classification
- **acute listed species** - threatened and listed species may be adversely affected
- **chronic risk** - the potential for chronic risk is high and regulatory action may be warranted.

The ecotoxicity values used in the acute and chronic risk quotients are endpoints derived from required laboratory toxicity studies. Ecotoxicity endpoints derived from short-term laboratory studies that assess acute effects are:

- LC_{50} - fish and birds
- LD_{50} - birds and mammals
- EC_{50} - aquatic plants and aquatic invertebrates
- EC_{25} - terrestrial plants

The NOAEC (No Observable Adverse Effect Concentration) is the endpoint used to assess chronic effects. **Table 2** gives formulas for calculating RQs and LOCs for various risk presumptions.

Table 2. Formulas for RQ calculations and LOC used for risk assessment.

Risk Presumption	RQ	LOC
Terrestrial Animals		
Acute Risk	EEC[1]/LC_{50}	0.5
Acute Restricted Use	EEC/LC_{50}	0.2
Acute Listed Species	EEC/LC_{50}	0.1
Chronic Risk	EEC/NOAEC	1.0
Aquatic Animals		
Acute Risk	EEC[1]/LC_{50}	0.5
Acute Restricted Use	EEC/LC_{50}	0.1
Acute Listed Species	EEC/LC_{50}	0.05
Chronic Risk	EEC/NOAEC	1.0
Terrestrial plants and plants inhabiting semi-aquatic habitats		
Acute Risk	EEC/EC_{25}	1.0
Acute Listed Species	EEC/NOAEC or EC_{05}	1.0
Aquatic Plants		
Acute Risk	EEC/EC_{50}	1.0
Acute Listed Species	EEC/NOAEC or EC_{05}	1.0

[1] abbreviation for estimated environmental concentration

1.4 Risk Hypothesis

Exposure at lethal concentrations to aquatic organisms in water column is expected to cause death. Sub-lethal concentrations in water column may result in reproductive impairment to aquatic organisms. Exposure at lethal concentrations on wildlife food items is expected to cause death. Sub-lethal concentrations to wildlife from contaminated food items may cause reproductive impairment.

2. Exposure and Effects Analysis

2.1. *Measures of Exposure.* The following sections describe the quantitative assessment of exposure for terrestrial and aquatic organisms.

2.1.1. *Terrestrial Measure of Exposure Profile (Food Residues).*

Hoerger and Kenaga (1973), as modified by Fletcher *et al.* (1994), empirically derived residue concentrations on avian and mammalian dietary food items immediately following application of any pesticide at 1 pound of active ingredient per acre (lb ai/A). These EECs are given in Table 3.

Table 3. Estimated Environmental Concentrations (EECs) on Avian and Mammalian Food Items for a 1 lb ai/A Application.

Food Item	EEC (ppm) Predicted Maximum Residue	EEC (ppm) Predicted Mean Residue
Short grass	240	85
Tall grass	110	36
Broad-leaved/forage plants, and small insects	135	45
Fruits, pods, seeds, and large insects	15	7

Terrestrial exposure was modeled with the T-REX v.1.1 model, which automates Hoerger-Kenaga nomogram exposure and RQ calculations. It was assumed that PBO was applied ten times at the maximum use rate (0.5 lb/acre). Ten applications at 3-day intervals were modeled. The default assumption for the decay rate on foliage (35-day half-life) was used. Table 4 gives the predicted maximum residues of PBO that are expected to occur on selected avian or mammalian dietary food items.

Table 4. Maximum Estimated Environmental Concentrations (EECs) on Avian and Mammalian Food Items for PBO Application at the Maximum Use Rate and Frequency (T-REX v.1.1).

No. of applications	Short grass (ppm)	Tall grass (ppm)	Broad-leaved/forage plants, small insects (ppm)	Fruits/pods/seeds/large insects (ppm)
0.5 lb/acre, 10 x @ 3 days	932	427	524	58

2.1.2. *Aquatic Measure of Exposure Analysis.*

Exposure was modeled in three ways. Exposure due to terrestrial application (crops) was assessed using the standard farm pond scenario in the PRZM-EXAMS models. The scenarios in Table I were used to represent the numerous crop groups for which PBO is registered. All PRZM-EXAMS exposure analyses were done at maximum application rates and frequency.

The EFED Interim Rice Model was used to calculate acute exposure due to direct application to water for the mosquito abatement use. Finally, the AgDrift model was used to calculate exposures in the EFED standard farm pond and standard wetland due to spray drift alone, from the terrestrial application (crops). The Interim Rice model and AgDrift analyses were performed for single applications.

2.1.2.a. *Physicochemical Properties and Environmental Fate Assessment*.

Piperonyl butoxide ("PBO," $C_{19}H_{30}O_5$, molecular weight 338.45) is a liquid at room temperature, and boils at 180°C (1 mmHg). Its solubility in water is 14.3 mg/L, and the log octanol-water partition coefficient is 4.75. Its calculated vapor pressure is 5.0E-13 mmHg at 25 °C, and the calculated Henry's Law constant is 1.558 E-14 atm-m^3/mole (see Appendix B).

Piperonyl butoxide degrades rapidly (8.4-hour half-life) in the environment by photolysis in water, and is metabolized by soil microorganisms (half-life 14 days in one experiment). Other tested routes of degradation are very slow (hydrolysis, aerobic and anaerobic aqueous metabolism) or have questionable rates due to experimental difficulties (soil photodegradation). The estimated atmospheric half-life of PBO is 3.4 hours, based on the estimated reaction rate with hydroxyl radicals (SRC PhysProp databse).

PBO is moderately mobile in soil-water systems, with Koc values of 399 to 830. Little volatilization from soil or water is expected, however PBO may enter the atmosphere as an aerosol as a result of spraying. A flow-through fish bioaccumulation study in bluegill sunfish produced bioaccumulation factors of 260x, 91x, and 380x for whole fish, edible tissue, and non-edible tissue, respectively. Based on this study, there is little concern for exposure via consumption of contaminated fish to ecological organisms. PBO will have very little tendency to partition from water to the atmosphere. If present in the air as a vapor or spray drift it is expected to reaction rapidly with hydroyl radicals.

The major degradates PBO-alcohol, PBO-aldehyde, and PBO-acid are expected to be more soluble in water than the parent and therefore more mobile in soil-water systems, based on their lower molecular weights and hydrophilic moieties. The reported solubility of piperonal, which differs from PBO-aldehyde by lacking the propyl side chain, is 1 part in 500 parts water (Merck Index 10th Ed., 1983, monograph 7350), or 2000 parts per million. Piperonylic acid (monograph 7352) which differs from PBO-acid by lacking the propyl side chain is "slightly" soluble in water (Appendix A).

2.1.2.b. *Surface Water Measure of Exposure from Terrestrial Application*.

The following input parameters (Table 5) were used for the linked PRZM and EXAMS models. The values were selected in accordance with the EFED Input Parameter Guidance dated February 28, 2002. The scenarios listed in Table I were chosen to represent use on the various crop groups for which PBO is registered. The standard farm pond scenario was used. Calculated half-lives reflect combined residues of parent PBO and its major degradates PBO-alcohol, PBO-aldehyde, and PBO-acid, expressed as PBO equivalents (Appendix B).

Table 5. PRZM-EXAMS Input Parameters

Input Parameter	**Value**	**Reference/ Comment**
Application Rate	0.5 lb/acre (0.56 kg/hectare), ten times, at 3-day intervals	Master Label (02/05/2003)
Application type	Aerial spray (5% drift) or ground spray (1% drift) Unincorporated	Master Label (02/05/2003)
Laboratory Soil Metabolism Half-life	73 days (3 x single value of 24.2 days for Total Toxic Residues: parent, PBO-alcohol, PBO-aldehyde, PBO-acid)	MRID 438064-01 as amended 5/17/2004
Laboratory Aerobic Aquatic Metabolism Half-life	133 days for Total Toxic Residues	MRID 438034-01 as amended 5/17/2004
Laboratory Hydrolysis Half-life (pH 7)	stable	MRID 435956-01
Laboratory Aqueous Photolysis Half-life	5.07 days (for Total Toxic Residues)	MRID 436372-01 as amended 5/17/2004
Soil-Water Partitioning Coefficient (Koc)	399 (lowest non-sand Koc)	MRID 436738-01
Solubility	143 ppm (parent)	10 x actual solubility as per EFED Input Parameter Gudiance (Feb. 2002)
Chemical Application Method (CAM)	2 (linear foliar based on crop canopy), incorporation depth 0 (zero) cm	consistent with post-emergent spraying
Molecular Weight	338.45 amu	from formula
Henry's Law constant	1.56E-14 atm-m3/mol	calculated from vapor pressure and solubility
Vapor Pressure	5E-13 torr	calculated (see Appendix B)
FILTRA, UPTKF, PLVKRT, PLDKRT	0 (default value)	no data

FEXTRC	0.5 (default value)	no data
Date of First Application	Approx two weeks after crop emergence date in PRZM scenario	consistent with post-emergent application

The results of the PRZM-EXAMS modeling are given in Tables 6a and 6b. These water-column concentrations will be used as the measures of exposure for aquatic organisms such as fish and invertebrates (Appendix H) for both freshwater and estuarine systems. The ten applications occur over the first 30 days of the simulation. EECs are average over the period beginning with the first application on day 1.

Table 6a. PRZM-EXAMS Results (EECs) for Farm Pond Scenario (in ppb)

1-in-10 Year return Frequency Aquatic EECs: Ten Aerial Applications at Maximum Rate (0.5 lb/acre) and Minimum Interval (3 days)

Scenario (first application date)	**Peak**	**96-hour**	**21-day**	**60-day**	**90-day**	**Yearly**
CA citrus (Jan. 15)	30.4	30.1	28.8	25.9	24.2	15.3
CA lettuce (Feb 24)	107.	106.	102.	93.6	86.2	51.6
CA grapes (Feb 15)	22.1	21.8	20.9	19.0	17.8	11.0
CA sugarbeets (Feb 15)	34.2	33.7	32.0	28.6	26.9	16.9
CA tomato (Mar 15)	25.0	24.7	23.2	21.7	20.5	13.3
FL cabbage (Oct 31)	73.0	72.3	69.6	55.2	51.7	34.8
FL citrus (Feb 28)	57.8	57.1	53.7	49.6	47.4	34.0
FL cucumber (Oct 24)	85.5	84.1	79.1	66.1	60.4	38.8
FL pepper (Sep 15)	160.	158.	153.	142.	129.	71.1
FL strawberry (Oct 15)	104.	102.	97.4	90.3	75.0	53.6

FL tomato (Jan 24)	86.5	84.5	79.5	72.4	71.2	43.5
FL turf (Feb 15)	39.8	39.2	36.7	33.2	31.0	18.9
ID potato (May 24)	29.7	29.3	27.8	26.1	24.8	19.1
ME potato (Jun 13)	89.1	88.3	86.6	84.2	82.5	70.6
MI beans (Jun 19)	132.	131.	126.	123.	120.	96.2
MN sugarbeet (May 25)	77.6	76.9	74.3	66.9	63.4	52.0
MS cotton (Jun 15)	131.	130.	127.	124.	121.	79.9
NC cotton (Jun 15)	98.1	96.5	93.1	87.2	84.3	65.2
OR berries (Apr 21)	27.9	27.5	26.4	23.8	22.3	16.4
OR snbeans (Jun 25)	77.2	76.8	75.4	73.0	72.2	58.7
PA tomato (Apr 29)	72.0	71.0	66.9	60.1	56.5	40.3
PA turf (Apr 15)	39.6	39.1	36.9	34.4	32.2	23.8
TX cotton (May 9)	101.	98.1	93.3	84.0	80.2	46.0

Table 6b.
1-in-10-Year Return Frequency Aquatic EECs: Ten Ground Applications at Maximum Rate (0.5 lb/acre) and Minimum Interval (3 days)

Scenario	**Peak**	**96-hour**	**21-day**	**60-day**	**90-day**	**Yearly**
CA citrus	17.9	17.8	17.4	15.6	14.6	8.9
CA lettuce	103.	101.	97.9	88.7	81.6	47.8
CA grapes	8.4	8.3	7.9	7.1	6.7	4.2
CA sugarbeets	21.1	20.8	19.5	17.2	16.2	10.2
CA tomato	13.2	13.0	12.1	10.7	10.0	6.6

FL cabbage	65.5	64.8	62.3	48.4	45.3	29.9
FL citrus	48.3	47.6	45.1	42.2	40.2	29.7
FL cucumber	77.7	76.3	71.6	60.5	54.2	33.4
FL pepper	159.	158.	152.	140.	126.	68.1
FL strawberry	96.1	94.5	90.2	83.4	69.3	49.2
FL tomato	81.7	79.8	73.8	66.5	64.6	39.5
FL turf	29.3	28.8	26.8	24.2	23.1	13.3
ID potato	13.4	13.2	12.9	11.6	10.8	8.3
ME potato	73.8	73.2	71.6	70.3	69.2	59.0
MI beans	119.	118.	113.	110.	107.	85.6
MN sugarbeet	64.3	63.2	59.6	55.0	52.8	41.9
MS cotton	130.	129.	127.	123.	119.	76.5
NC cotton	88.5	87.3	84.3	79.3	76.8	59.7
OR berries	10.7	10.6	10.1	9.0	8.3	6.4
OR snbeans	69.4	69.1	67.9	65.4	63.8	49.9
PA tomato	58.1	57.3	54.0	48.6	45.9	32.0
PA turf	25.5	25.1	24.0	22.2	20.8	14.5
TX cotton	92.8	90.7	85.7	76.8	73.8	41.7

2.1.2.c. *Surface Water Measure of Exposure from Mosquito Abatement.*

The EFED interim standard Rice Paddy Model (10/29/2002) was used as a measure of exposure for the mosquito abatement application. The standard Rice Paddy Model represents the exposure concentration in a four-inch deep water body at the time of application, and accounts for partitioning to sediment, but not dissipation. Thus it represents a conservative measure of exposure. The Master Label indicates that the application rate of PBO for mosquito abatement applications is up to 0.08 lb/acre (0.0896 kg/hectare) for *Aedes taeirorhynchus* and other difficult species. No maximum number of applications is given. The minimum soil-water distribution coefficient (Kd = 0.98) measured for PBO was used, to provide maximum partitioning to the water phase, and thus a conservative measure of exposure in the water column.

The Rice Paddy EEC is based on a calculation for a one-hectare rice paddy with four inches (10 cm) of water, and a one-centimeter deep sediment interaction zone:

$$EEC = (10^9 M_T)*(V_T + m_{sed}*K_d)^{-1} \quad \text{(Eq. 1)}$$

where M_T is the mass of pesticide applied, V_T is the volume of water (1,067,000 liters/ha), m_{sed} is the mass of the sediment (130,000 kg/ha), K_d is the soil-water partitioning coefficient, and 10^9 is a unit conversion factor to give the result in parts-per-billion.

With inputs of M_T = 0.0896 kg a.i./hectare, and K_d = 0.98, the Rice Paddy EEC for a single application is 75 ppb.

2.1.2.d. *Surface Water Measure of Exposure from Spray Drift alone.*

Ground Application

The AgDrift model was used to calculate aquatic exposures in the EPA standard pond and standard wetland, from spray drift due to agricultural use (single application only). A *ground* spray Tier 1 aquatic assessment was performed, assuming high boom application with ASAE very fine to fine spray, 90th percentile drift, and a zero-foot buffer, at an application rate of 0.5 lb a.i./acre. AgDrift calculated that 6.16% of the applied mass would reach the pond or wetland, resulting in an initial average concentration of 1.7 ppb in the pond, and 23 ppb in the wetland.

Aerial Application

Tier 1 *aerial* analysis (assuming ASAE fine to very fine spray and a zero-foot buffer) indicated that the concentrations in the pond and wetland would be 6.8 ppb and 90.6 ppb, respectively.

2.2. *Exposure Profile.*

2.2.1 *Aquatic*

The PRZM-EXAMS models were used to simulate farm pond EECs. The peak EECs ranged from 22.1 ppb (CA grapes) to 160 ppb (FL peppers) for aerial application. For ground application, the peak EECs ranged from 8.4 ppb (CA grapes) to 159 ppb (FL peppers). The highest peak EECs were in Florida (peppers, strawberry), MI beans, cotton (MS, TX), and CA lettuce, all of which were above 100 ppb for aerial application. The highest 21-day average and 60-day average exposures were parallel to the highest peak exposures, with some still above 100 ppb from aerial exposure (CA lettuce, FL pepper, MI beans, MS and NC cotton).

The EFED standard Rice Paddy Model was used for predicting surface water exposure from mosquito abatement application. The acute EEC was 75 ppb.

The spray drift-only analysis for the standard farm pond yielded a lower modeled concentration in the EFED standard 6-foot deep pond (1.7 to 6.8 ppb) than the PRZM-EXAMS calculation, since it does not include run-off exposure. However, the wetland exposure (in a 6-inch deep water body) is higher (23 to 91 ppb) due to the smaller water volume. The EFED standard wetland represents the EEC in shallow water bodies (swamps, marshes, etc) exposed only to spray drift from a single application at 0.5 lb/acre.

2.2.2 *Terrestrial*

Terrestrial exposure was modeled with the T-REX v.1.1 model, which automates Hoerger-Kenaga nomogram exposure and RQ calculations. It was assumed that PBO was applied ten times at the maximum use rate (0.5 lb/acre) with 3-day intervals. In the absence of foliage residue data, the default assumption for the decay rate on foliage (35-day half-life) was used. The maximum EEC on food items available for wildlife ranges from 58 ppm to 932 ppm. The Hoerger-Kenaga nomogram also has mean values for residues on food items. The mean EEC on food items available for wildlife ranges from 17 ppm to 330 ppm.

2.3. *Ecological Response Analysis.*

In screening-level ecological risk assessments, effects characterization describes the types of effects a pesticide can produce in an organism. This characterization is based on registrant-submitted studies that describe acute and chronic effects toxicity information for various aquatic and terrestrial animals and plants. In addition, other sources of information, including reviews of the open literature and the Ecological Incident Information System (EIIS), are conducted to further refine the characterization of potential ecological effects.

Appendix C summarizes the results of the registrant-submitted toxicity studies used to characterize effects for this risk assessment. Toxicity testing reported in this section does not represent all species of birds, mammals, or aquatic organisms. Only a few surrogate species for both freshwater fish and birds are used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, acute studies are usually limited to Norway or New Zealand rat or the house mouse. Estuarine/marine testing is usually limited to a crustacean, a mollusk, and a fish. Also, neither reptile nor amphibian tests are required. The risk assessment assumes that avian and reptilian toxicities are similar. However, Amphibian toxicity studies were submitted and reviewed. The endpoint is below.

Table 7. Acute PBO Toxicities used in Risk Assessment to Fish, Daphnids, and Birds, and Acute and Chronic Toxicity to Mammals

Table 7A. Acute Toxicity Data for Aquatic Freshwater and Estuarine/ Marine Organisms

Species (test duration)	LC_{50} (ppm)	Reference
Freshwater Fish		
Rainbow trout (96 hr.)	1.9	MRID 40098001
Freshwater Invertebrates		
Daphnia magna	0.51	MRID 42540301
Estuarine/Marine Fish		
Sheepshead minnow	3.94	MRID 42540304
Estuarine/Marine Invertebrates		

Shrimp (Mysid opsis bahai)	0.49	MRID 43901801
Amphibians		
Western chorus frog tadpole *Pseudacris triseriata* (96-hour)	0.210	MRID 40098001

Table 7B. Chronic Toxicity Data for Freshwater and Estuarine/Marine Fish and Invertebrates

Species (test duration)	NOEC/LOEC (ppm)	Reference
Freshwater Invertebrates		
Daphnia magna (21-day life cycle)	0.030 / 0.047	MRID 43311301
Freshwater Fish		
Fathead minnow (*Pimephales promelas*)	0.04 / 0.11	MRID 43300301

Table 7C. Acute Toxicity to Terrestrial Species

Species (Test Duration)	Effect level	Reference
Birds		
Northern Bobwhite Quail	LD_{50} > 2250 mg a.i./kg bw (no mortalities at highest dose) NOEC = 486 mg a.i./kg bw	MRID 41969008
Northern Bobwhite Quail and Mallard Duck	Dietary LC_{50} > 5620 ppm (no mortalities) NOEC = 1000 ppm (toxicosis)	MRID 41969006
Insects		
Honey Bee	LD_{50}> 25 µg/bee; NOAEC = 25 µg/bee	MRID 41969009
Mammals		
Laboratory Rat	LD_{50} = 4570 mg/kg bw	MRID 41969001

Table 7D. Chronic Toxicity to Terrestrial Species

Species	Effect level	Reference
Birds		
Mallard Duck	NOEC = 300 ppm LOEC = 1200 ppm (adult and hatchling body weight and food consumption, number of eggs laid, number of eggs cracked, and eggshell thickness)	MRID 43876302
Mammals		
Laboratory rat	Maternal NOAEC = 1000 ppm (89 mg/kg bw) Maternal LOAEC = 5000 ppm (469 mg/kg) Offspring NOAEC = 1000 ppm (89 mg/kg bw) Offspring LOAEC = 5000 ppm (469 mg/kg)	MRID 00161118

2.4. *Stressor-Response Profile*

2.4.1 *Fish and Invertebrates.*

Freshwater fish. Aquatic toxicity data (LC_{50} = 1.8 to 12.2 ppm) suggest that PBO is moderately toxic to freshwater fish on an acute basis. The toxicity endpoint value that will be used for Risk Quotients (RQ) for freshwater fish is 1.9 ppm (rainbow trout) and not the 1.8 ppm (rainbow trout) (both references to Mayer, 1986, MRID 40098001). The 1.8 ppm value was tested in hard water (272 ppm $CaCO_3$) which would not make the study a core classification but supplemental classification. The 1.9 ppm tox value is from a core study. The confidence interval for the LC_{50} = 1.9 ppm study is 1.0 - 3.5 ppm.

Chronic data from early life stage of fish (fathead minnow) suggest that aquatic environments having more than 0.04 ppm PBO may adversely affect reproductive capacity of freshwater fish. The LOEC = 0.11 ppm. The affected endpoint measured is embryo survival at hatch and growth larval (total length and wet weight).

Freshwater invertebrates. Aquatic toxicity data suggest that PBO ranges from moderately toxic (LC_{50} = 12.0 ppm) to highly toxic (LC_{50} = 0.51 ppm) to freshwater invertebrates on an acute basis. The species selected for RQ calculation is *Daphnia magna* with LC_{50} = 0.51 ppm (C.I. = 0.430 - 0.627).

Chronic data from life cycle study of *Daphnia magna* suggest that aquatic environments having more than 0.030 ppm PBO may adversely affect reproduction of freshwater invertebrates. The LOEC = 0.047 ppm.

Estuarine fish. Aquatic toxicity data suggest that PBO is moderately toxic (LC_{50} = 3.94 ppm) to sheepshead minnow on an acute basis. The confidence interval is 2.97 - 5.24. There are no chronic data available for estuarine fish.

Estuarine invertebrate. Mysid shrimp study (core) suggest that PBO is highly toxic to estuarine invertebrates (LC_{50} = 0.49 ppm). The 95% confidence interval is 0.41 and 0.61, and the slope of the concentration response curve is 4.7. The maximum toxicant concentration is 0.12 ppm. The No Observed Adverse Effect Concentration is 0.085 ppm. An oyster study showing a more sensitive toxicity is supplemental since the only control in this study had a solvent concentration equal to that of the highest test concentration. It is not known whether the solvent exerted any effects on the oysters since no dilution control was included in the study design. Therefore, the EC_{50} toxicity value in the study may be either over-estimated or under-estimated. The EC_{50} = 0.23 ppm (C.I. 0.197 - 0.264). The probit slope is 1.89 (C.I. 1.58 - 2.20). Therefore, it was decided to use the core shrimp study to represent estuarine invertebrates in the risk assessment since the shrimp study provides less uncertainty than the oyster study.

There are no chronic data available for estuarine invertebrates .

2.4.2 Terrestrial Animals

Birds. Avian toxicity data suggest that PBO is practically nontoxic on an acute basis. There were no mortalities observed at the highest concentration tested for acute oral (2250 mg/kg bw) and for the subacute dietary studies (5620 ppm). NOAEC levels were based on toxic symptoms observed. Therefore, no attempt will be made to calculate RQ from the acute toxicity data since an assumption is made that there will be minimal adverse acute effects to birds.

Chronic avian toxicity data from avian reproduction study suggest that avian food items containing more than 300 ppm PBO residues may adversely affect avian reproduction. The endpoints measured for reproductive effects in birds above 300 ppm (LOAEC = 1200 ppm) are adult and hatchling body weight and food consumption, number of eggs laid, number of eggs cracked, and eggshell thickness.

Mammals. Mammalian toxicity data suggest that PBO is practically nontoxic on an acute basis. Mortalities were observed at higher concentrations. Therefore, RQ will be calculated based on the toxicity data provided (LD_{50} = 4570 mg/ kg bw).

Chronic mammalian toxicity data from a 2-generation rat reproductive study suggest mammalian food items containing more than 1000 ppm (NOAEC = 89 mg/kg bw) PBO residues may adversely affect mammalian reproduction. The endpoints measured for reproductive effects in mammals are decreased body weight gain (12%) in the mother and decreased body weight gain in pups (12%). The LOAEC = 5000 ppm (469 mg/kg bw).

Beneficial insects. Honey bee (*Apis mellifera*) toxicity data suggests that PBO is practically nontoxic to honey bee on an acute oral basis. The $LD_{50} > 25$ µg/bee. Due to the uncertainty of estimating environmental exposure to the honey bee, there will be no attempt to calculate an RQ. The toxicity data will be used for labeling purposes (Appendix C).

2.5 Incident Data Review

Under FIFRA, Section 6(a)2, registrants must report to EPA any reports of adverse incidents that they may receive. According to the Ecological Incident Information System (EIIS) database summarizing 6(a)2 incident reports, for PBO, there are three terrestrial animals alleged incidents (bee, butterflies, and birds), seven alleged plant incidents (mostly ornamental flowers) and one alleged aquatic organisms incident (fish and invertebrates). They are all applied as co-formulated sprays or mix-tanked mist blower with pyrethrins, pyrethroids or rotenone.

The incident reports are summarized below:

2.5.1 Aquatic organisms incidents

After spray of SCOURGE ® (18% resmethrin, 54% PBO) in the mosquito control program, hundreds of dead baby flounders, flukes, grass shrimps and mud crabs were found. However, the

incident was considered as potential misuse since aerial application was made near a water's edge. Master label does not have buffer zone (I012536-001).

2.5.2 Terrestrial animals incidents

One incident involves 1000 to 10,000 butterflies (mostly Monarchs) after spraying Biomist (containing piperonyl butoxide plus permethrin) for mosquito abatement. This is the only case of all reported incidents that had chemical confirmation. Mortality is more likely attributed to insecticides rather than synergist (I011527-001). Another incident report (I012515-004) involves alleged apiary damage (bee kills) due to spray of Biomist ®. In one alleged incident (I009311-001), several mortalities of swan and geese were reported after spray of Prentox Prenfish Toxicant (rotenone plus PBO).

2.5.3 Phytotoxicity incidents

a). The insecticide Biomist ® (30+30 ULV), for mosquito control, allegedly damaged native unknown tropical plant exhibiting burn spot, yellowing leaves, and defoliation. It was mentioned that plants may have been suffering from chronic nutrient deficiency (I012515-002).

b).After spraying of Tomato and Vegetable Insect Killer, which contains Pyrethrin I and PBO, observations were made of deaths of 12 out of 14 roses, a few snapdragons, about dozen of sunflowers, and several other flowers in the flower gardens. Being a synergist, EFED does not require phytotoxicity data, but the registrant settled the claim for $ 80 (I009262-001).

c). Pyrenone Crop Spray ® (pyrethrin plus PBO) allegedly damaged 10,000 peppers in the greenhouse (I007155 - 181).

d). Application of Rose Pride Rose and Flower insect killer (pyrethrin + PBO) alleged to have caused dead roses (I008693-047), dead ornamental trees (I010017-017), dead unknown plants, magnitude and location also unknown (I008693-046), and damaged 6 or 7 roses, turned brown (I009916-023) .

2.6 Summary of Incidents - EFED can not attribute any of the incidents to PBO by itself since as an insecticide synergist, it is never used by itself but always with another insecticide. However, the incidents do show that PBO in conjunction with an insecticide has the potential to cause adverse effects to aquatic ecosystems and among beneficial insect populations.

3. Risk Characterization

3.1 *Risk Estimation*.

3.1.1. *Terrestrial Ecosystems*.

Since PBO is practically non-toxic to birds and no mortality was observed at the highest concentrations, no RQ calculation is necessary. The Agency's Level of Concern (LOC) is not exceeded for acute risk to birds.

Chronic risk quotients for birds (as represented by mallard duck and bobwhite quail) are given in Table 8a. The EEC are based on an application rate of 0.5 lb ai/A applied ten times during a season at 3-day intervals between applications. All of the calculations can be found in Appendix D.

Table 8a. Chronic Risk Quotients for Birds

Diets	Maximum Kenaga		Mean Kenaga	
	EEC	RQ	EEC	RQ
Short grass	932	**3.1**	330	**1.1**
Tall grass	427	**1.4**	140	0.5
Broadleaf plants/sm insects	524	**1.8**	17	0.6
Fruits/pod/lg insects	58	<1	27	0.1

RQs in Bold indicate that the Agency's LOC for chronic risk is exceeded.

Acute risk quotients for mammals (Dose based RQ) are given in Table 8b. The EECs (maximums) are from Table 8a. All of the RQs using mean Kenaga EEC values are below the LOC for listed species. Only the maximum EECs were used in Table 8b.

Table 8b. Acute Risk Quotients for Mammals

Diets	15-gram mammal	35-gram mammal	1000-gram mammal
Short grass	<0.1	<0.1	<0.1
Tall grass	<0.1	<0.1	<0.1
Broadleaf plants/sm insects	<0.1	<0.1	<0.1
Fruits/pod/lg insects	<0.1	<0.1	<0.1

LOC for listed species = 0.1

Chronic risk quotients for mammals (dose-based RQ) are given in Table 8c (Maximum Kenaga EEC) and 8d (Mean Kenaga EEC). The EECs are from Table 8a.

Table 8c. Chronic Risk Quotients for Mammals from Maximum Kenaga EEC

Diets	15-gram mammal	35-gram mammal	1000-gram mammal
Short grass	4.5*	3.9*	2.0*
Tall grass	2.1*	1.8*	<1.0
Broadleaf plants/sm insects	2.6*	2.2*	1.2*
Fruits/pod/lg insects	<1.0	<1.0	<1.0

* indicate that the Agency's LOC for chronic risk is exceeded.

Table 8d. Chronic Risk Quotients for Mammals from Mean Kenaga EEC

Diets	15-gram mammal	35-gram mammal	1000-gram mammal
Short grass	1.6*	1.4*	<1.0
Tall grass	<1.0	<1.0	<1.0
Broadleaf plants/sm insects	<1.0	<1.0	<1.0
Fruits/pod/lg insects	<1.0	<1.0	<1.0

* indicate that the Agency's LOC for chronic risk is exceeded.

3.1.2. *Aquatic Ecosystems*.

The following acute and chronic risk quotients were calculated.

Table 9a Acute RQ for freshwater organisms for Ten Aerial Applications at Maximum Rate and Minimum Interval

Scenario	Freshwater Invertebrate LC_{50} = 510 ppb	Freshwater Fish LC_{50} = 1900 ppb	Freshwater Amphibian LC_{50} = 210 ppb	Estuarine Invertebrate LC_{50} = 490 ppb	Estuarine Fish LC_{50} = 3940 ppb
CA citrus	0.06 *	< 0.05	0.14 **	0.06 *	< 0.05
CA lettuce	0.21 **	0.056 *	0.51 ***	0.22 **	< 0.05
CA grapes	< 0.05	< 0.05	0.11 **	< 0.05	< 0.05
CA sugar-beets	0.07 *	< 0.05	0.16 **	0.07 *	< 0.05
CA tomato	< 0.05	< 0.05	0.12 **	0.05 *	< 0.05
FL cabbage	0.14 **	< 0.05	0.35 **	0.15 **	< 0.05
FL citrus	0.11 **	< 0.05	0.28 **	0.12 **	< 0.05
FL cucumber	0.17 **	< 0.05	0.41 **	0.17 **	< 0.05

FL pepper	0.31 **	0.08 *	0.76 ***	0.33 **	< 0.05
FL strawberry	0.20 **	0.055 *	0.50 ***	0.21 **	< 0.05
FL tomato	0.17 **	< 0.05	0.41 **	0.18 **	< 0.05
FL turf	0.08 *	< 0.05	0.19 **	0.08 *	< 0.05
ID potato	0.06 *	< 0.05	0.14 **	0.06 *	< 0.05
ME potato	0.17 **	< 0.05	0.42 **	0.18 **	< 0.05
MI beans	0.26 **	0.07 *	0.63 ***	0.27 **	< 0.05
MN sugarbeet	0.15 **	< 0.05	0.37 **	0.16 **	< 0.05
MS cotton	0.26 **	0.07 *	0.62 ***	0.27 **	< 0.05
NC cotton	0.19 **	0.052 *	0.47 **	0.20 **	< 0.05
OR berries	0.054 *	< 0.05	0.13 **	0.06 *	< 0.05
OR snbeans	0.15 **	< 0.05	0.37 **	0.16 **	< 0.05
PA tomato	0.14 **	< 0.05	0.34 **	0.15 **	< 0.05
PA turf	0.08 *	< 0.05	0.19 **	0.08 *	< 0.05
TX cotton	0.20 **	0.053 *	0.48 **	0.21 **	< 0.05

Key: * Exceeds Acute Listed Species LOC (RQ = 0.05)
** Exceeds Acute Restricted Use LOC (RQ = 0.1)
*** Exceeds Acute High Risk LOC (RQ = 0.5)

Table 9b. Acute RQ for Freshwater Organisms for Ten Ground Applications at Maximum Rate and Minimum Intervals

Scenario	Freshwater Invertebrate LC_{50} = 510 ppb	Freshwater Fish LC_{50} = 1900 ppb	Freshwater Amphibian LC_{50} = 210 ppb	Estuarine Invertebrate LC_{50} = 490 ppb	Estuarine Fish LC_{50} = 3940 ppb
CA citrus	< 0.05	< 0.05	0.085 *	< 0.05	< 0.05
CA lettuce	0.20 **	0.054 *	0.49 **	0.21 **	< 0.05
CA grapes	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
CA sugarbeets	< 0.05	< 0.05	0.10 **	< 0.05	< 0.05
CA tomato	< 0.05	< 0.05	0.063 *	< 0.05	< 0.05
FL cabbage	0.13 **	< 0.05	0.31 **	0.13 **	< 0.05
FL citrus	0.095 *	< 0.05	0.23 **	0.10 **	< 0.05

FL cucumber	0.15 **	< 0.05	0.37 **	0.16 **	< 0.05
FL pepper	0.31 **	0.084 *	0.76 ***	0.32 **	< 0.05
FL strawberry	0.19 **	0.051 *	0.46 **	0.20 **	< 0.05
FL tomato	0.16 **	< 0.05	0.39 **	0.17 **	< 0.05
FL turf	0.057 *	< 0.05	0.14 **	0.06 *	< 0.05
ID potato	< 0.05	< 0.05	0.064 *	< 0.05	< 0.05
ME potato	0.14 **	< 0.05	0.35 **	0.15 **	< 0.05
MI beans	0.23 **	0.063 *	0.57 ***	0.24 **	< 0.05
MN sugarbeet	0.13 **	< 0.05	0.31 **	0.13 **	< 0.05
MS cotton	0.25 **	0.068 *	0.62 ***	0.27 **	< 0.05
NC cotton	0.17 **	< 0.05	0.42 **	0.18 **	< 0.05
OR berries	< 0.05	< 0.05	0.051 *	< 0.05	< 0.05
OR snbeans	0.14 **	< 0.05	0.33 **	0.14 **	< 0.05
PA tomato	0.11 **	< 0.05	0.28 **	0.12 **	< 0.05
PA turf	0.050 *	< 0.05	0.12 **	0.05 *	< 0.05
TX cotton	0.18 **	< 0.05	0.44 **	0.19 **	< 0.05

Key: * Exceeds Acute Listed Species LOC (RQ = 0.05)
** Exceeds Acute Restricted Use LOC (RQ = 0.1)
*** Exceeds Acute High Risk LOC (RQ = 0.5)

Table 9C. Chronic RQ for Freshwater Organisms for Ten Aerial Applications at Maximum Rate and Minimum Interval

Scenario	Freshwater Invertebrate 21-day NOEC = 30 ppb	Freshwater Fish NOEC = 40 ppb (calc vs 60-d)
CA citrus	< 1	< 1
CA lettuce	3.4 *	2.3 *
CA grapes	< 1	< 1
CA sugarbeets	1.1 *	< 1
CA tomato	< 1	< 1
FL cabbage	2.3 *	1.4 *
FL citrus	1.8 *	1.2 *

FL cucumber	2.6 *	1.7 *
FL pepper	5.1 *	3.6 *
FL strawberry	3.2 *	2.3 *
FL tomato	2.7 *	1.8 *
FL turf	1.2 *	< 1
ID potato	< 1	< 1
ME potato	2.9 *	2.1 *
MI beans	4.2 *	3.1 *
MN sugarbeet	2.5 *	1.7 *
MS cotton	4.2 *	3.1 *
NC cotton	3.1 *	2.2 *
OR berries	< 1	< 1
OR snbeans	2.5 *	1.8 *
PA tomato	2.2 *	1.5 *
PA turf	1.2 *	< 1
TX cotton	3.1 *	2.1 *

Key: * Exceeds Chronic Level of Concern (RQ = 1)

Table 9D: Chronic RQ for freshwater organisms for Ten Ground Applications at Maximum Rate and Minimum Interval

Scenario	Freshwater Invertebrate 21-day NOEC = 30 ppb (*Daphnia magna*)	Freshwater Fish NOEC = 40 ppb (calc vs 60-d) (Fathead minnow)
CA citrus	< 1	< 1
CA lettuce	3.3 *	2.2 *
CA grapes	< 1	< 1
CA sugarbeets	< 1	< 1
CA tomato	< 1	< 1
FL cabbage	2.1 *	1.2 *
FL citrus	1.5 *	1.1 *
FL cucumber	2.4 *	1.5 *
FL pepper	5.1 *	3.5 *

FL strawberry	3.0 *	2.1 *
FL tomato	2.5 *	1.7 *
FL turf	< 1	< 1
ID potato	< 1	< 1
ME potato	2.4 *	1.8 *
MI beans	3.8 *	2.8 *
MN sugarbeet	2.0 *	1.4 *
MS cotton	4.2 *	3.1 *
NC cotton	2.8 *	2.0 *
OR berries	< 1	< 1
OR snbeans	2.3 *	1.6 *
PA tomato	1.8 *	1.2 *
PA turf	< 1	< 1
TX cotton	2.9 *	1.9 *

Key: * Exceeds Chronic Level of Concern (RQ = 1)

Table 9E Acute RQ for Mosquito Abatement and Drift Exposure Scenarios

Scenario	Freshwater Invertebrate LC_{50} = 510 ppb	Freshwater Fish LC_{50} = 1900 ppb	Freshwater Amphibian LC_{50} = 210 ppb	Estuarine Invertebrate LC_{50} = 490 ppb	Estuarine Fish LC_{50} = 2340 ppb
Mosquito abatement (Interim Rice model) EEC = 75 ppb	0.15 **	< 0.05	0.36 **	0.15 **	< 0.05
AgDrift Ground Spray (Pond) EEC = 1.7 ppb	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AgDrift Ground Spray (Wetland) EEC= 23 ppb	< 0.05	< 0.05	0.11 **	< 0.05	< 0.05
AgDrift Aerial Spray (Pond) EEC = 6.8 ppb	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

AgDrift Aerial Spray (Wetland) EEC = 90.6 ppb	0.18 **	0.05 *	0.43 **	0.18 **	< 0.05

Key: * Exceeds Acute Listed Species LOC (RQ = 0.05)
** Exceeds Acute Restricted Use LOC (RQ = 0.1)
*** Exceeds Acute High Risk LOC (RQ = 0.5)

3.2. *Risk Description*.

3.2.1 *General description*

Piperonyl butoxide is a synergist for pyrethrin and pyrethroid insecticides. It is often used in combination with another synergist, MGK-264. This enables the same degree of insect pest control to be achieved with a lower application rate of the synergized insecticide.

Because PBO is never used alone, its adverse effects must be considered in light of the other active ingredients used. Generally speaking, PBO is less toxic to the species of concern for pyrethrins and pyrethroids (aquatic invertebrates). However, the effect of PBO (blocking de-toxifying enzymes in invertebrates) makes a given dose of pyrethrin/pyrethroid more toxic. This synergistic effect, by the same token, allows less pyrethrin/pyrethroid to be used to achieve a desired level of insect pest control. Thus, should the PBO and pyrethrin/pyrethroid become separated by fate processes (such as their widely different solubilities), then the lower amount of pyrethrin/pyrethroid used may cause fewer adverse effects. If, however, invertebrates are exposed to both active ingredients (PBO and pyrethrin/pyrethroid) simultaneously, then there is a potential for greater adverse effects than if exposure was to the pyrethrin/pyrethroid alone.

The risks deemed to be of concern in this assessment include acute toxicity (death, or immobilization followed by predation) in freshwater fish, invertebrates and amphibians, estuarine invertebrates and fish; and chronic effects, including reproductive effects in birds, mammals, and freshwater fish and invertebrates. The specific LOC exceedences are listed below.

3.2.1.1 Mammals

Using the **maximum Kenaga residue EEC**, there are no mammalian Listed Species acute LOC exceedances. Chronic LOCs are exceeded for all mammal weight classes except for those animals that only consume the fruit/pods/large insects food category. The range of chronic RQs is from 4.5 to 1.8 .

Using the **mean Kenaga residue EEC**, there are no mammalian Listed Species acute LOC exceedances. Chronic LOCs are exceeded for only 15-gram and 35-gram mammal weight classes that only consume short grass food category. The range of chronic RQs is from 1.6 to 1.4.

3.2.1.2 Birds

Using the **maximum Kenaga residue EEC**, there are no avian Listed Species acute LOC exceedances. Chronic LOCs are exceeded for those birds that only consume all plant food item groups except the fruit/pods/large insects food category. The range of Chronic RQs is from 3.1 to 1.4.

Using the **mean Kenaga residue EEC**, there are no avian Listed Species acute LOC exceedances. Chronic LOCs are exceeded for only birds that consume short grass food category. The Chronic RQs is 1.1

3.2.1.3 Freshwater Invertebrates

Acute risk. Twenty-three PRZM scenarios were modeled to determine EECs. RQ values for aerial spraying exceeded the Listed Species LOC (RQ = 0.05) was exceeded in 21 PRZM scenarios for aerial spraying. Fifteen PRZM scenarios also exceeded the Restricted Use LOC (RQ = 0.1). No acute risk LOC was exceeded. For ground spraying, 17 freshwater invertebrates Listed Species LOC (RQ = 0.05) were exceeded. Fourteen PRZM scenarios also exceeded the Restricted Use LOC (RQ = 0.1). No acute risk LOC was exceeded. Two mosquito use (Interim Rice model) or AgDrift scenarios exceeded any Listed Species and restricted use LOCs. The maximum range of RQ is from 0.31 to <0.05.

Chronic Risk. The chronic risk LOC (RQ = 1) was exceeded for 18 PRZM scenarios (aerial spray) and 15 scenarios (ground spray). The maximum range of RQ is from 5.1 to <1.0.

3.2.1.4 Freshwater Fish

Acute Risk. The freshwater fish Listed Species LOC (RQ = 0.05) was exceeded in 6 PRZM scenarios for aerial spraying. There are no PRZM scenarios exceeded the Restricted Use LOC (RQ = 0.1). For ground spraying, 5 freshwater fish Listed Species LOC (RQ = 0.05) were exceeded. There are no PRZM scenarios exceeded the Restricted Use LOC (RQ = 0.1). There is no mosquito use (Interim Rice model) or AgDrift scenarios exceeded for any Listed Species LOCs. The maximum range of RQ is from 0.08 to <0.05.

Chronic Risk. The Chronic Risk LOC (RQ = 1) was exceeded for 15 of 23 PRZM scenarios, for both aerial and ground spraying. The maximum range of RQ is from 3.6 to <1.0.

3.2.1.5 Amphibians

Acute Risk. For aerial spraying, all 23 PRZM scenarios exceed the amphibian Listed Species LOC (RQ = 0.05). Of these, 18 exceeded the Restricted use LOC (RQ = 0.1) and 5 exceeded the Acute Risk LOC (RQ = 0.5).

For ground spraying, 22 of 23 PRZM scenarios exceeded the Listed Species LOC (RQ = 0.05).

Of these, 15 exceeded the Restricted Use LOC (RQ = 0.1) and 3 exceeded the Acute Risk LOC (RQ= 0.5).

Three mosquito use (Interim Rice model) or AgDrift scenarios exceeded any Listed Species and restricted use LOCs.

The maximum range of RQ is from 0.76 to 1.1.

3.2.1.6 Estuarine/Marine Invertebrates

Acute Risk. For aerial spraying, 22 of the 23 PRZM scenarios exceed the estuarine/marine invertebrate Listed Species LOC (RQ = 0.05). Of these, 15 exceed the Restricted Use LOC (RQ = 0.1) and none exceed the Acute Risk LOC (RQ = 0.5).

For ground spraying, 17 of the 23 PRZM scenarios exceeded the Listed Species LOC (RQ = 0.05). Of these, 15 exceeded the Restricted Use LOC (RQ = 0.1) and none exceeded the Acute Risk LOC (RQ = 0.5).

Two mosquito use (Interim Rice model) or AgDrift scenarios exceeded any Listed Species and restricted use LOCs.

The maximum range of RQ is from 0.33 to <0.05.

3.2.1.7 Estuarine Fish

Acute Risk. No Listed Species LOC (RQ = 0.05) was exceeded for both aerial and ground spraying. No LOCs were exceeded for the mosquito use or AgDrift scenarios.

3.2.2 Alternative Application Scenarios

A question of what if one application input was changed, what would the RQs be like. EFED decided to change one of the three application inputs (rate of application, interval days, or number of applications per year) for exposure in order to access the difference in RQ. Below are tables showing such changes.

3.2.2.1 Terrestrial Scenarios

There are four scenarios - the maximum labeled application, only the application rate was reduced to 0.25 lb ai/A from 0.5 lb ai/A, only the interval between application was changed from three days to 6 days, and only the number of applications per year was changed from 10 applications to 5 applications per year. Since there was no acute LOC exceedances, only the chronic RQ was calculated using T-REX model v.1.1.

Table 10a **Mammalian Chronic Risk Quotients under alternative application inputs**

	Maximum Labeled Application			Application rate of 0.25 lb ai/A			Interval of 6 days			5 applications per year		
	EEC	RQ		EEC	RQ		EEC	RQ		EEC	RQ	
Diets		15 g	35 g		15 g	35 g		15 g	35 g		15 g	35 g
Short grass	932	4.5*	3.9*	466	2.3*	1.9*	745	3.6*	3.1*	535	2.6*	2.2*
Tall grass	427	2.1*	1.8*	214	1.0*	<1.0	341	1.7*	1.4*	245	1.2*	1.0*
Broadleaf plants, small insects	524	2.6*	2.2*	262	1.3*	1.1*	419	2.0*	1.8*	301	1.5*	1.3*
Fruits/pod/lg insects	58	<1.0	<1.0	29	<1.0	<1.0	47	<1.0	<1.0	33	<1.0	<1.0

Table 10b **Avian Chronic Risk Quotients under alternative application inputs**

	max. applic.		applic rate 0.25 lb ai/A		interval of 6 days		5 applic/yr	
Diets	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
Short grass	932	3.9*	466	1.6*	745	2.5*	535	1.8*
Tall grass	427	1.8*	214	<1	341	1.1*	245	<1
Broadleaf plants/sm insects	524	2.2*	262	<1	419	1.4*	301	1.0*
Fruits/pod/lg insects	58	<1	29	<1	47	<1	33	<1

Asterisks indicate that the Agency's LOC for chronic risk is exceeded.

3.2.2.2 Aquatic Scenarios

There are 8 scenarios - the maximum labeled application, only the interval was changed from 3 days to 6 days, only the interval was changed from 3 days to 10 days, only the one application rate at 0.5 lb ai/A, zero percent drift was put into the PRZM-EXAMS model, application rate was reduced to 0.25 lb ai/A from 0.5 lb ai/A, and only the number of applications per year was changed from 10 applications to 5 applications per year.

Table 10c Aquatic Acute RQ with different application input scenarios

Use site = FL Pepper		Freshwater Invertebrate LC_{50} = 510 ppb	Freshwater Fish LC_{50} = 1900 ppb	Freshwater Amphibian LC_{50} = 210 ppb	Estuarine Invertebrate LC_{50} = 490 ppb	Estuarine Fish LC_{50} = 3940 ppb
Scenarios	EEC[1]	RQ	RQ	RQ	RQ	RQ
max residues	160	0.31 **	0.08 *	0.76 ***	0.33 **	< 0.05
6 day interval	154	0.30 **	0.08 *	0.73 ***	0.31 **	< 0.05
10 day interval	110	0.22 **	0.06 *	0.52 ***	0.22 **	< 0.05
1 application	14.8	< 0.05	< 0.05	0.07 *	< 0.05	< 0.05
No drift	151	0.30 **	0.08 *	0.72 ***	0.31 **	< 0.05
0.25 lb ai/A application rate	79.9	0.16 **	< 0.05	0.38 **	0.16 **	< 0.05
5 applications	89.4	0.18 **	< 0.05	0.43 **	0.18 **	< 0.05

1 EEC used was peak EEC value in ppb

Key: * Exceeds Acute Listed Species LOC (RQ = 0.05)
** Exceeds Acute Restricted Use LOC (RQ = 0.1)
*** Exceeds Acute Risk LOC (RQ = 0.5)

Table 10d Aquatic Chronic RQ with different application input scenarios

Use site = FL Pepper	Freshwater Invertebrate NOEC = 30 ppb		Freshwater Fish NOEC = 40 ppb	
Scenarios	EEC[1]	RQ	EEC[2]	RQ
max residues	153	5.1 *	142	3.6 *
6 day interval	140	4.7*	120	3.5*
10 day interval	104	3.5*	90.6	2.3*
1 application	13.5	<1	12.2	<1
No drift	144	4.8*	132	3.3*
0.25 lb ai/A application rate	76.3	2.5*	71	1.8*
5 applications	82.0	2.7*	70.1	1.8*

1 EEC used was 21-day EEC value in ppb

2 EEC used was 60-day EEC value in ppb

* Asterisks indicate that the Agency's LOC for chronic risk is exceeded.

A sensitivity analysis was conducted with the scenario that produced the highest EECs (Florida peppers with aerial application). The EEC appears to be proportional to both the application rate (lb/acre) and the number of applications. A decrease from 0.5 lb/acre to 0.25 lb/acre decreased the EEC by about half. Similarly, a decrease in number of application from 10 to 5 decreased the EEC by about half.

An increase in the application interval from 3 to 6 days had little effect on the EEC, but the longer time averages dropped somewhat (21-day average from 153 ppb to 140, and 60-day average from 142 ppb to 120). An increase to ten-day application intervals reduced the 21-day average EEC to 104 ppb, and the 6-day average to 90.5 ppb. The relatively small changes in time-averaged concentrations versus changed application intervals are likely due to the large number of applications allowed (10).

3.2.3 *Summaries of Literature Sources*

3.2.3.1 Insecticides Antagonized by Piperonyl Butoxide

Table 10. Insecticides Antagonized by Piperonyl Butoxide

Chemical (Class) CAS RN	Metabol-ically activated?	Antagon-ism observed?	Organism(s)	Reference
Azinphos-methyl (OP)	Yes	Yes	*Hyalella azteca* *Chironomus tentans*	Ankley & Collyard (1995)
		No	*Lumbriculus variegatus*	Ankley & Collyard (1995)
Carbofuran (carbamate)	unknown	No	*Ceriodaphnia dubia*	Bailey *et al.* (1995)
Chlorfenvinphos (OP) 470-90-6	No	No	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
Chlorpyrifos (OP)	Yes	Yes	*Hyalella azteca* *Chironomus tentans*	Ankley & Collyard (1995)
		Yes	*Ceriodaphnia dubia*	Bailey *et al.* (1995)
		No	*Lumbriculus variegatus*	Ankley & Collyard (1995)
Diazinon (OP) 333-41-5	Yes	Yes	*Hyalella azteca* *Chironomus tentans*	Ankley & Collyard (1995)
		No	*Lumbriculus variegatus*	Ankley & Collyard (1995)
		Yes	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
		Yes	*Ceriodaphnia dubia*	Bailey *et al.* (1995)
		Yes	*Penaeus japonicus*	Kobayashi *et al.* (1993a, 1993b)
Dichlorvos (OP) 62-73-7	No	No	*Hyalella azteca* *Chironomus tentans* *Lumbriculus variegatus*	Ankley & Collyard (1995)
		No	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
		No	*Penaeus japonicus*	Kobayashi *et al.* (1993a, 1993b)

Chemical (Class) CAS RN	Metabol-ically activated?	Antagon-ism observed?	Organism(s)	Reference
Dioxabenzophos (OP) 3811-49-2	Yes	Yes	*Penaeus japonicus*	Kobayashi *et al.* (1993a, 1993b)
Fenitrothion (OP) 122-14-5	Yes	Yes	*Penaeus japonicus* *Penaeus paucidens*	Kobayashi *et al.* (1993a, 1993b)
Malathion (OP) 121-75-5	Yes	Yes	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
		Yes	Kuruma prawn *(Penaeus japonicus)*	Kobayashi *et al.* (1993a, 1993b)
		Yes	*Oreochromis niloticus*	Pathiratne & George (1998)
Mevinphos (OP) 7786-34-7	No	No	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
Methyl parathion (OP) 298-00-0	Yes	Yes	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
Parathion (OP) 56-38-2	Yes	Yes	*Ceriodaphnia dubia* *Daphnia magna* *Daphnia pulex*	Ankley *et al.* (1991)
Phenthoate (OP) 2597-03-7	Yes	Yes	*Penaeus japonicus*	Kobayashi *et al.* (1993a, 1993b)

3.2.3.2 *Antagonistic Effects with Organophosphorous Insecticides*

Table 10 lists 12 organophosphate (OP) insecticides and one carbamate insecticide that have been tested for PBO antagonism, that is, whether they are made less toxic by simultaneous exposure to PBO.

Nine OP insecticides (azinphos-methyl, chlorpyrifos, diazinon, dioxabenzophos, fenitrothion, malathion, methyl parathion, parathion, and phenthoate) that require metabolic activation (for example, oxidation of a -P=S thion group to a -P=O oxon group by cytochrome

P450) do exhibit antagonism with PBO, except in insensitive species (*L. variegatus*).

The remaining three OP insecticides (chlorfenvinphos, dichlorvos, mevinphos) do not require metabolic activation, and do not exhibit antagonism with PBO.

PBO's mechanism of action, blocking the action of mixed-function oxidase (MFO) enzymes such as cytochrome P450, synergizes insecticides that are metabolized to less toxic forms by such enzymes, by keeping them in their toxic form. By the same mechanism, PBO blocks the action of (antagonizes) OP insecticides that require activation by MFO enzymes to their more-toxic forms (*e.g.*, OP oxons).

Thus, the presence of PBO in a water body may either increase or decrease the toxicity of a mixture of insecticides, depending on which ones are present. PBO increases the toxicity of pyrethroids/pyrethrins, decreases the toxicity of OP insecticides that require metabolic activation, and has no effect on OP insecticides that do not require activation.

3.2.3.3 *Synergistic Effects with Pyrethroid Insecticides*

Paul and Simonin (1995) studied the toxicity of resmethrin, with and without PBO synergist, on brook trout and brown trout. They concluded that PBO increases the toxicity of resmethrin to these fish following short exposures (6 hours). The endpoint considered was "intoxication" (inability to maintain equilibrium in flowing water) rather than death, although the authors noted that such loss of coordination could lead to increased predation. No differences in toxicity between synergized and non-synergized resmethrin were detected with longer exposures (24 hours or longer). The increase in toxicity in the 6-hour exposure was attributed to the fish's reduced ability to metabolize resmethrin, due to the enzyme-blocking action of PBO.

Rebach (1999) studied the acute toxicity of permethrin and PBO in hybrid striped bass. A 1:1 mixture of the two active ingredients had a 96-hour LC_{50} of 16.1 ppb (95% C.I. 15.1 to 17.2 ppb). The acute toxicity (96-hour LC_{50}) of technical permethrin alone is 0.79 to 13.5 ppb in Bluegill sunfish, 2.1 to 9.8 ppb in Rainbow trout, 17.0 ppb in Coho salmon, 3.0 ppb in Atlantic salmon, 3.2 to 3.9 ppb in Brook trout, 2.9 to 5.7 ppb in Fathead minnow, 5.4 to 7.2 ppb in Channel catfish, and 15.0 ppb in Carp (M. Rexrode, EFED, pers. commun. 10/20/04). Because the LC_{50} of the 1:1 mixture of permethrin/PBO in striped bass is very similar to these values, it appears that PBO does not increase the toxicity of permethrin to fish.

Because the LC_{50} of PBO is in the ppm range (a factor of 1000 higher than permethrin), it appears that any mortality of fish due to simultaneous exposure is due to permethrin rather than PBO.

3.2.3.4 Effects on Enzyme Activity in Fish

Several studies have examined the induction of enzyme activity in fish by PBO. Erickson *et al.* (1988) found that PBO induced cytochrome P450-dependent monooxygenase

activity in hepatic microsomes of rainbow trout after static exposure to 1 ppm for 24 hours. Grosvik *et al.* (1996) found increased cytochrome P4501A (CYP1A) activity in the liver after intraperitoneal injection in Atlantic salmon. Pathiratne and George (1998) however, did not find evidence that PBO antagonism of malathion activity in Nile tilapia fish was associated with cytochrome P450 (CYP1, CYP2B or CYP3A) activity.

3.2.4. *Endocrine Disruption.*

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) *"may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate."* Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was scientific bases for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP). When the appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, PBO may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

In the available toxicity studies on piperonyl butoxide, an avian reproduction study shows that PBO may cause decreases in adult and hatchling body weight and food consumption, number of eggs laid, and eggshell thickness. In addition, PBO may cause increases in number of eggs cracked.

3.2.5 Organisms at Risk

3.2.5.1 Aquatic Animals

In the aquatic ecosystem, the group of organisms most at risk from exposure to PBO is amphibians, followed by freshwater invertebrates and estuarine invertebrates. There appears to be greater risk to aquatic organisms from aerial application than ground application. However, the difference of risk between aerial application and ground application is not very great. Acute risk RQ is no higher than 0.76 for any aquatic organism. Freshwater and estuarine fish seem to have the least amount of risk from exposure to PBO only listed species LOC exceeded for freshwater fish.

The highest calculated exposures (EECs > 100 ppb for aerial application) were for the following crop scenarios: CA lettuce, FL peppers and strawberries, MI beans, and MS and TX cotton.

These scenarios represent the following crop categories from the Master Label, as shown in Table I. CA lettuce represents crop group 4, Leafy Vegetables. MI beans represents crop groups 6 and 7, Legume Vegetables and Foliage of Legume Vegetables. FL peppers represent crop group 8, Fruiting Vegetables, except Cucurbits. The remaining scenarios (FL strawberry and MS and TX cotton) are from the Master Labels's Miscellaneous category.

The next highest group of exposures (EECs 50 to 99 ppb) includes ME potatoes and MN sugarbeets (crop groups 1 and 2, Root and Tuber Vegetables and Leaves of Root and Tuber Vegetables), FL cabbage (crop group 5, Brassica vegetables), OR snap beans (again representing crop groups 6 and 7, like MI beans), FL and PA tomatoes (crop group 8, like FL pepper), FL cucumbers (crop group 9, Cucurbit vegetables), FL citrus (crop group 10, Citrus fruits), and NC cotton (Miscellaneous).

The only crop group that did not have an EEC above 50 ppb was 13 (Berries, a category of nine crops represented only by OR berries).

The greater concern seems to be in chronic risk to aquatic organisms. The chronic RQ are no higher than 5.1. Freshwater invertebrates (RQ = 5.1) are more at risk than freshwater fish (RQ = 3.6). There are no data available to ascertain chronic risk to estuarine species.

3.2.5.2 Terrestrial Animals

There is no acute risk to terrestrial animals including listed species. Chronic risk has been identified to birds and mammals. Chronic RQ to mammals range from 4.5 to 1.8 using maximum EEC. Chronic risk to birds range from 3.1 to 1.4. Using the mean Kenaga EEC, the RQ drops almost drastically with a range of 1.6 to 1.4 and on only two food item groups for only very small mammals. The avian RQ drops to 1.1 for only short grass diet.

3.2.6 Description of Assumptions, Uncertainties, Strengths, and Limitations

3.2.6.1 Fate and Exposure

Limitations in fate data available for this assessment create uncertainties in the conclusions. For example, there were only single studies for aerobic soil metabolism, and anaerobic aqueous metabolism, so variability in the degradation rate of PBO in different soils and water-sediment systems could not be addressed. Likewise, the result of the soil photolysis experiment was ambiguous, so the importance of this fate process is not well understood. Aqueous photolysis appears to be a dominant process, from the point of view of its relatively large reaction rate constant, but the important of photolysis in murky or deeper waters is likely smaller.

Volatilization from soil surfaces was not considered in the PRZM-EXAMS modeling, due to pending corrections to the volatilization routines in PRZM version 3.12 beta. The Henry's Law

constant of parent PBO was used in the PRZM-EXAMS modeling, which likely overestimates the volatilization of the major degradates (PBO-alcohol, PBO-aldehyde, and PBO-acid) in EXAMS, since they are more water-soluble than the parent. The vapor pressure of the parent PBO at 25°C had to be estimated from data at higher temperatures in order to calculate the Henry's Constant. See Appendix B for details.

The usual assumptions in the aquatic and estuarine-marine exposure assessment apply, and result in a conservative estimate of exposure. These include yearly use for 30 years at the maximum label rate and minimum application interval; the assumption of use in 100% of the watershed; and the assumption of constant water volume in the standard farm pond. These last assumptions may not represent estuarine systems that are subject to tidal flushing very well.

A default half-life of 35 days on foliage was used in the terrestrial assessment (Hoerger-Kenaga nomogram analysis). The relatively quick aqueous photolysis of PBO (total residues half-life of 5 days) suggests that 35 days may be too conservative.

3.2.6.2 Slope Probit Analysis

It should be noted that the estimate of the probability of affecting an individual non-target organism, for example with an aquatic invertebrate, is based on an assumption of a probit dose-response relationship with a mean estimated slope of 5.33 for piperonyl butoxide but that probit slope data for the piperonyl butoxide toxicity test ranged from 3.24 to 7.42. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates and the range of reported slopes increases the uncertainty. To explore possible bounds to such estimates, the upper and lower values (3.24 and 7.42) for the range of slope estimates from avian tests were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. At a slope of 3.24, there is a one in 1.25×10^5 probability of an individual being killed, and for a slope of 7.42, a one in 1×10^{16} probability of an individual being killed. In addition to noting the relatively large uncertainty bounds around the probabilities, care should be employed in interpreting these probabilities beyond their intended purpose as an indication of a margin of safety, or lack there of, for the listed species risk estimates based on the quotient model.

3.2.6.3 Location of Wildlife Species

For screening terrestrial risk assessments for listed species, a generic bird or mammal is assumed to occupy either the treated field or adjacent areas receiving pesticide at a rate commensurate with the treatment rate on the field. Spray drift model predictions suggest that this assumption leads to an overestimation of exposure to species that do not occupy the treated field. For screening risk assessment purposes, the actual habitat requirements of any particular terrestrial species are not considered, and it assumed that species occupy, exclusively and permanently, the treated area being modeled. This assumption leads to a maximum level of exposure in the risk characterization.

Terrestrial EECs are based on the peak value from the Hoerger-Kenaga nomogram (1973), as modified by Fletcher et al. (1994). The residues from the Hoerger-Kenaga nomogram are estimated immediately after application. The peak maximum value is the upper limit value and may be conservative. PBO is applied to plants throughout the season when large amounts of foliage are present. The LOC for avian reproductive impairment is exceeded for PBO application and, based on this timing information, it is apparent that wildlife will be present in the fields during the period of application.

A variety of avian populations are nested in cotton, potato, and *Brassica* fields among many other various fields. The application of PBO is expected to be outside and within the reproductive period of time. Therefore, it is assumed that avian exposure will occur during the reproductive period.

Small mammals also inhabit cotton, potato, alfalfa, and *Brassica* fields among many other various fields. Mammals may be exposed to PBO through food items in heavily vegetated fields, as well as around transitional areas around the fields that may receive PBO from spray drift. There are several small mammals such as mice that breed throughout the summer. These mammals will also be exposed to PBO contaminated food items during their breeding and gestation period.

3.2.6.4 Routes of Exposure

Screening-level risk assessments for spray applications of pesticides consider dietary exposure alone. Other routes of exposure, not considered in this assessment, are discussed below:

- Incidental soil ingestion exposure - This risk assessment does not consider incidental soil ingestion. Available data suggest that up to 15% of the diet can consist of incidentally ingested soil depending on the species and feeding strategy (Beyer et al., 1994).

- Inhalation exposure - The screening risk assessment does not consider inhalation exposure. Such exposure may occur through three potential sources: (1) spray material in droplet form at the time of application (2) vapor phase pesticide volatilizing from treated surfaces, and (3) airborne particulate (soil, vegetative material, and pesticide dusts).

- Dermal Exposure - The screening assessment does not consider dermal exposure, except as it is indirectly included in calculations of RQs based on lethal doses per unit of pesticide treated area. Dermal exposure may occur through three potential sources: (1) direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, (2) incidental contact with contaminated vegetation, or (3) contact with contaminated water or soil.

- Drinking Water Exposure - Drinking water exposure of terrestrial organisms to a

pesticide active ingredient may be the result of consumption of surface water or consumption of the pesticide in dew or other water on the surfaces of treated vegetation. For pesticide active ingredients with a potential to dissolve in runoff, puddles on the treated field may contain the chemical.

3.2.6.5 Residue Levels Selection

As discussed earlier in the exposure section of this document, the Agency relies on the work of Fletcher et al. (1994) for setting the assumed pesticide residues in wildlife dietary items. The Agency believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify. It is important to note that the field measurement efforts used to develop the Fletcher estimates of exposure involve highly varied sampling techniques. It is entirely possible that much of these data reflect residues averaged over entire above ground plants in the case of grass and forage sampling. Depending upon a specific wildlife species' foraging habits, whole aboveground plant samples may either underestimate or overestimate actual exposure.

3.2.6.6 Dietary Intake - Differences Between Laboratory and Field Conditions

The acute and chronic characterization of risk rely on comparisons of wildlife dietary residues with LC_{50} or NOAEC values expressed in concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed.

On gross energy content alone, direct comparison of a laboratory dietary concentration-based effects threshold to a fresh-weight pesticide residue estimate would result in an underestimation of field exposure by food consumption by a factor of 1.25 - 2.5 for most food items. Only for seeds would the direct comparison of dietary threshold to residue estimate lead to an overestimate of exposure.

Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods do not account for a potentially important aspect of food requirements. Depending upon species and dietary matrix, bird assimilation of wild diet energy ranges from 23 - 80%, and mammal's assimilation ranges from 41 - 85% (U.S. Environmental Protection Agency, 1993). If it is assumed that laboratory chow is formulated to maximize assimilative efficiency (e.g., a value of 85%), a potential for underestimation of exposure may exist by assuming that consumption of food in the wild is comparable with consumption during laboratory testing. In the screening process, exposure may be underestimated because metabolic rates are not related to food consumption.

Finally, the screening procedure does not account for situations where the feeding rate may be

above or below requirements to meet free living metabolic requirements. Gorging behavior is a possibility under some specific wildlife scenarios (e.g., bird migration) where the food intake rate may be greatly increased. Kirkwood (1983) has suggested that an upper-bound limit to this behavior might be the typical intake rate multiplied by a factor of 5.

3.2.6.7 Terrestrial residue distribution from Fletcher et. al.

There are some uncertainty in using the Fletcher et al modifications to Hoerger and Kenaga nomogram for residues on wildlife food items. The estimated residues (ppm) may not be representative of 50th percentile of the underlying data distributions for the feed item categories.

Distributions were fitted to mean and standard deviation parameters for 8 food item categories from Fletcher et al. (1994). The distributions were assumed to be log normal. Crystal Ball Pro software was used to create a frequency report for each fitted distribution by establishing an assumption cell for each food item category. A Crystal Ball Pro forcast cell was linked to each of the assumption cells. Crystal Ball Pro randomly resampled each of the distributions using Monte Carlo techniques and this sampling routine was terminated when mean standard errors fell below 0.01.

The Mean and Upper bound 1 lb ai/acre residue assumptions used for OPP terrestrial wildlife risk assessment were then compared with the summary statistics for the distributions as well as the generated icosatiles from each of the food item distributions. The results of the Crystal Ball distributions normalized the log-normal. The results indicate that the estimated mean is similar to the actual mean as determined by Crystal Ball simulation forecast.

Food item	mean (1)	estimated mean for risk assessment (2)	percentile range of estimated mean (1)	estimated upper bound for risk assessment (2)	percentile range of estimated upper bound (1)
short grass	84.4	85	60 - 65	240	95 - 100
long grass	35.48	36	65 - 70	110	95 - 100
leaves, leafy crops	34.23	45	75 - 80	135	95 - 100
forage (legumes)	45.54	45	65 - 70	135	95 - 100
pods and seeds	3.98	7	85 - 90	15	95 - 100
fruit	5.6	7	75 - 80	15	95 - 100
woody fruit	6.58	7	70 - 75	15	95 - 100

herbaceous fruit	3.65	7	85 - 90	15	95 - 100

(1) From Crystal Ball Simulation
(2) Fletcher et al modifications to Hoerger and Kenaga nomogram for residues on wildlife food items

3.2.6.8 Data gaps

There are uncertainties in this risk assessment due to data gaps in the toxicity and exposure profile. These data gaps are described below.

The exposure of birds and mammals would be better understood if data on the dissipation of total foliar residues (guideline 132-1a) were submitted. Due to lack of these data, a default half-life of 35 days on foliage has been assumed. A measured foliar dissipation rate, if shorter than 35 days, might remove the presumption of chronic risk to birds and mammals.

72-4 Life-cycle estuarine invertebrate using shrimp - There are no shrimp chronic studies. There are chronic LOC exceedances to freshwater invertebrates. The acute shrimp results are similar to the freshwater daphnid studies. It is expected that the chronic shrimp may be similar to the chronic freshwater invertebrate studies.

72-5 Full Life Cycle Fish (freshwater) - This study has been requested by EFED before. A memo dated November 28, 1994 to Alan Dixon in the Registration Division, OPP, pertained to waver request for fish full life cycle. This request was based on Piscicide use. EFED stated at the time that the request for fish full life cycle study was based on PBO use in a great variety of products that are applied directly to water as well as many agricultural uses. EFED believes that chronic toxicity data to fish beyond that found in the fish early life stage study is necessary. NOAEC for the early life stage of fish is 40 ppb. The single application of mosquito adulticide will provide up to 75 ppb in water. Runoff from cotton fields may contribute up to 127 ppb to EEC. Since the early life study of fish only shows the chronic effects to the fish, EFED believes that it becomes important that reproductive effects to fish be known.

122-1 Tier I Terrestrial Plant Study. - Alleged field incidents reported under section 6(a)(2) indicate that PBO with pyrethrin or pyrethroid insecticides may cause plant mortality. Since this is an area of great uncertainty due to lack of data, Tier I terrestrial plant studies (Vegetative Vigor) would be needed to decrease this uncertainty.

3.3. *Listed Species*

3.3.1. *Introduction*

Section 7 of the Endangered Species Act, 16 U.S.C. Section 1536(a)(2), requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) for marine and anadromous listed species, or the United States Fish and Wildlife Services (FWS) for listed

wildlife and freshwater organisms, if they are proposing an "action" that may affect listed species or their designated habitat. Each federal agency is required under the Act to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. To jeopardize the continued existence of a listed species means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species." 50 C.F.R. § 402.02.

To facilitate compliance with the requirements of the Endangered Species Act subsection (a)(2) the Environmental Protection Agency, Office of Pesticide Programs has established procedures to evaluate whether a proposed registration action may directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of any listed species (U.S. EPA 2004). After the Agency's screening-level risk assessment is performed, if any of the Agency's Listed Species LOC Criteria are exceeded for either direct or indirect effects, a determination is made to identify if any listed or **candidate** species may co-occur in the area of the proposed pesticide use. If determined that listed or candidate species may be present in the proposed use areas, further biological assessment is undertaken. The extent to which listed species may be at risk then determines the need for the development of a more comprehensive consultation package as required by the Endangered Species Act.

3.3.1.1 Federal Action

The federal action addressed herein is the proposed re-registration of pesticide products that contain the active ingredient piperonyl butoxide. Crops for which piperonyl butoxide uses are proposed for re-registration are identified in Section 1.1. Use areas for this pesticide encompasses most of the United States and its territories.

3.3.1.2 Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. At the initial screening-level, the risk assessment considers broadly described taxonomic groups and so conservatively assumes that listed species within those broad groups are collocated with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated site and aquatic organisms are assumed to be located in a surface water body adjacent to the treated site. The assessment also assumes that the listed species are located within an assumed area which has the relatively highest potential exposure to the pesticide, and that exposures are likely to decrease with distance from the treatment area. Section 1.1 of this risk assessment presents the pesticide use sites that are used to establish initial collocation of species with treatment areas.

3.3.1.3 No Effect and Potential for May Effect Determination

If the assumptions associated with the screening-level action area result in RQs that are below the listed species LOCs, a "no effect" determination conclusion is made with respect to listed species in that taxa, and no further refinement of the action area is necessary. Furthermore, RQs below the listed species LOCs for a given taxonomic group indicate no concern for indirect effects upon listed species that depend upon the taxonomic group covered by the RQ as a resource. However, in situations where the screening assumptions lead to RQs in excess of the listed species LOCs for a given taxonomic group, a potential for a "may affect" conclusion exists and may be associated with direct effects on listed species belonging to that taxonomic group or may extend to indirect effects upon listed species that depend upon that taxonomic group as a resource. In such cases, additional information on the biology of listed species, the locations of these species, and the locations of use sites could be considered to determine the extent to which screening assumptions regarding an action area apply to a particular listed organism. These subsequent refinement steps could consider how this information would impact the action area for a particular listed organism and may potentially include areas of exposure that are downwind and downstream of the pesticide use site.

The following sections present the initial screen for a “no effect” or “potential for a may effect” determination for listed species as a result of the proposed piperonyl butoxide re-registration action. Included in the screen is a preliminary evaluation to determine if any listed or candidate species occur in the proposed action areas. Section 3.1 identifies direct effect concerns, by taxa, triggered by exceeding listed LOCs in the screeninglevel risk assessment with an evaluation of the potential probability of individual effects for exposures that may occur at the established listed species LOC. Data on exposure and effects collected under field conditions are evaluated to make determinations on the predictive utility of the direct effect screening assessment findings to listed species. Additionally, the results of a screen for indirect effects to listed species, using direct effect LOCs for each taxonomic group, are presented and evaluated. Section 3.3 provides the current state-of-the art screening-level risk assessment for critical habitat, which consists of a listing of potential biological features that, if they are constituent elements of one or more critical habitats, would be of potential concern. A preliminary analysis of the co-occurrence of listed species and the action area is presented in Section 3.3.

3.3.2 EPA’s ECOTOX Database Analysis

Under the agreement and understanding with USFWS, EPA will conduct a literature search in the ECOTOX database for sensitive endpoints that could be used in assessing potential adverse effects to listed species.

No useable data on the effects of piperonyl butoxide to plants was identified either in the data submitted in support of registration or in the literature search conducted through ECOTOX. Data from EPA’s Duluth ECOTOX database show some toxicity values that may be more sensitive than data submitted in support of registration of PBO:

Hilscherova, K. et. al. 2003, *Oxidative stress in laboratory-incubated double-crested*

cormorant eggs collected from the Great Lakes, Archives of Environmental Contamination and Toxicology, 45:4, pp:533-546.

Blakenship, A.L. et. al. 2003. *Mechanisms of TCDD-induced abnormalities and embryo lethality in white leghorn chickens,* Comparative Biochemistry and Physiology. Toxicology and Pharmacology: CBP . Vol.136:1 pp. 47-62. September 2003.

Data from these studies were not used since PBO was injected into test eggs. An environmental route has not been established so that data can be useful for ecological risk assessments.

The following study was also evaluated:

Tanaka, T., et. al. 1994. *Developmental toxicity evaluation of piperonyl butoxide in CD-1 mice.* Toxicology Letters. vol. 71:2 pp. 123-129. April, 1994.

Data from this study were not used in the risk assessment because pregnant mice were dosed by gavage. No LD_{50} was generated. The study only found NOAEL at around 1710 mg/kg/bw-day.

3.3.2 *Taxonomic Groups of Listed Species Potentially at Risk*

Assessment endpoints, exposure pathways, and the conceptual model addressing proposed piperonyl butoxide re-registration uses, and the associated exposure and effects analyses conducted for the piperonyl butoxide screening-level risk assessment are in Sections 1.0 and 2.0 The assessment endpoints used in the screening-level risk assessment include those defined operationally as reduced survival and reproductive impairment for both aquatic and terrestrial animal species from both direct acute and direct chronic exposures. These assessment endpoints address the standard set forth in the Endangered Species Act requiring federal agencies to ensure that any action they authorize does not reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species. Risk estimates, RQs, integrating exposure and effects are calculated for broad based taxa groups for the screening-level risk assessment are presented in Section 3.1.

Both acute listed species and chronic risk LOCs are considered in the following screening-level risk assessment to identify direct and indirect effects to taxa of listed species. This section identifies direct effect concerns, by taxa, triggered by exceeding listed LOCs in the screening-level risk assessment with an evaluation of the potential probability of individual effects for exposures that may occur at the established listed species LOC. Data on exposure and effects collected under field conditions are evaluated to make determinations on the predictive utility of the direct effect screening assessment findings to listed species. Additionally, the results of a screen for indirect effects to listed species, using direct effect acute and chronic LOCs for each taxonomic group, is presented and evaluated.

3.3.2.1. Listed Aquatic Animal Species

The preliminary risk assessment for listed species indicates that piperonyl butoxide exceeds the listed species LOCs for the following combinations of analyzed crop groups (per Master Label for PBO, February 5, 2003) and application method:

- Use of PBO on the following PRZM crop scenarios indicate an exceedance of the listed species LOC for freshwater fish:
    - Groups 1 & 2 - Roots and Tubers (39 crops) and Leaves of Roots and Tubers (18 crops), - ground and aerial, chronic LOC only (ME potato, MN sugarbeet only)
    - Group 4 - Leafy Vegetables (31 crops) - ground and aerial, acute and chronic LOC (represented only by CA lettuce)
    - Group 5 - Brassica Vegetables (16 crops) - ground and aerial, chronic LOC only (represented only by FL cabbage)
    - Groups 6 & 7 - Legume Vegetables (43 crops) and Foliage of Legumes (7 crops) - ground and aerial, acute and chronic LOC
    - Group 8 - Fruiting vegetables (except Cucurbits)(10 crops) - ground and aerial, acute and chronic LOC
    - Group 9 - Cucurbit Vegetables (17 crops) - aerial and ground, chronic LOC only

(represented only by FL cucumber)
Group 10 - Citrus Fruits (14 crops) - ground and aerial, chronic LOC only.
Miscellaneous (4 crops) - ground and aerial, acute and chronic LOC (cotton and strawberries only).

- Use of PBO on the following crop scenarios indicate an exceedance of the listed species LOC for listed freshwater invertebrates, listed freshwater amphibians, and listed estuarine/marine invertebrates:

  Freshwater Invertebrates: all Groups, aerial and ground, acute and chronic LOC, except group 13 (OR berries), aerial acute LOC only.

  Amphibians: all groups, acute LOC only.

  Estuarine Invertebrates: all Groups, aerial and ground, acute LOC, except Group 13 (OR berries), acute aerial only.

- Use of piperonyl butoxide did not indicate an exceedance of the listed species LOC for listed estuarine fish. Only acute RQ values were calculated, due to a lack of chronic data.

3.3.2.2. *Listed Terrestrial Animals*

- Piperonyl butoxide applied at an application rate of 0.5 lb ai/A and ten times during a season at 3-day intervals between applications will have residues on mammalian food items. There are no LOC exceedances for acute risk to birds and mammals. The Agency's LOC for specific weight class of listed mammals feeding on specific food items as indicated in the tables 12b:

Table 12b Chronic Risk Quotients for Mammals from Maximum Kenaga EEC

Diets	15-gram mammal	35-gram mammal	1000-gram mammal
Short grass	4.5*	3.9*	2.0*
Tall grass	2.1*	1.8*	<1.0
Broadleaf plants/sm insects	2.6*	2.2*	1.2*
Fruits/pod/lg insects	<1.0	<1.0	<1.0

* indicate that the Agency's LOC for chronic risk is exceeded.

Table 8d. Chronic Risk Quotients for Mammals from Mean Kenaga EEC

Diets	15-gram mammal	35-gram mammal	1000-gram mammal
Short grass	1.6*	1.4*	<1.0
Tall grass	<1.0	<1.0	<1.0

Broadleaf plants/sm insects	<1.0	<1.0	<1.0
Fruits/pod/lg insects	<1.0	<1.0	<1.0

* indicate that the Agency's LOC for chronic risk is exceeded.

- Piperonyl butoxide applied at an application rate of 0.5 lb ai/A and ten times during a season at 3-day intervals between applications will have residues on mammalian food items. The Agency's LOC for listed birds feeding on specific food items as indicated in table 12c:

Table 12c Chronic Risk Quotients for Birds

Diets	Maximum Kenaga		Mean Kenaga	
	EEC	RQ	EEC	RQ
Short grass	932	**3.1**	330	**1.1**
Tall grass	427	**1.4**	140	0.5
Broadleaf plants/sm insects	524	**1.8**	17	0.6
Fruits/pod/lg insects	58	0.2	27	0.1

RQs in Bold indicate that the Agency's LOC for chronic risk is exceeded.

3.3.2.3 Listed Species Summary

Table 12d Listed Species in which PBO triggers LOC for Listed Species

Group of Organism	Number of Species	Number of States
Amphibian	16	9
Bird	56	47
Clam	65	27
Crustacean	19	12
Fish	100	38
Mammals	61	48
Reptile	28	26
Snail	28	12

3.3.3. *Probit Slope Response Relationship on the Listed Species Levels of Concern*

The Agency uses the probit dose-response relationship as a tool for providing additional information on the listed animal species acute levels of concern (LOC). The acute listed species

LOCs of 0.1 and 0.05 are used for terrestrial and aquatic animals, respectively. As part of the risk characterization, an interpretation of acute LOCs for listed species is discussed. This interpretation is presented in terms of the chance of an individual event (i.e., mortality or immobilization) should exposure at the estimated environmental concentration actually occur for a species with sensitivity to piperonyl butoxide chemicals on par with the acute toxicity endpoint selected for RQ calculation. To accomplish this interpretation, the Agency uses the slope of the dose-response relationship available from the toxicity study used to establish the acute toxicity measurement endpoints for each taxonomic group. The individual effects probability associated with the LOCs is based on the mean estimate of the slope and an assumption of a probit dose- response relationship. In addition to a single effects probability estimate based on the mean, upper and lower estimates of the effects probability are also provided to account for variance in the slope. The upper and lower bounds of the effects probability are based on available information on the 95% confidence interval of the slope. A statement regarding the confidence in the applicability of the assumed probit dose-response relationship for predicting individual event probabilities is also included. Studies with good probit fit characteristics (i.e., statistically appropriate for the data set) are associated with a high degree of confidence. Conversely, a low degree of confidence is associated with data from studies that do not statistically support a probit dose-response relationship. In addition, confidence in the data set may be reduced by high variance in the slope (i.e., large 95% confidence intervals), despite good probit fit characteristics.

Individual effect probabilities are calculated based on an Excel spreadsheet tool IECV1.1 (Individual Effect Chance Model Version 1.1) developed by Ed Odenkirchen of the U.S. EPA, OPP, Environmental Fate and Effects Division (June 22, 2004). The model allows for such calculations by entering the mean slope estimate (and the 95% confidence bounds of that estimate) as the slope parameter for the spreadsheet. In addition, the LOC (0.1 for terrestrial animals and 0.05 for aquatic animals) is entered as the desired threshold. The following is the summary of screening assessment of listed terrestrial and aquatic species Levels Of Concern using probit slope relationship.

Table 13a. Probit Dose Slope Relationships

Listed Listed Species	Bobwhite quail	Rat	Rainbow trout
Acute Tox. End Point LC_{50}	2250 mg/kg**	4570 mg/kgbw	1.9 ppm
Probit X^2value	-	-	-
Mean Slope	4.5*	4.5*	4.5*
Slope Confid. Interval	-	-	-
Effect probability p (Z)	3.40E-06	3.40E-06	2.40E-09
Chance of Individual effect (1/p)	2.94E+05	2.94E+05	4.17E+08

* default value, ** practically nontoxic without mortality

Table 13b

Listed Listed Species	Daphnid	Sheepshead minnow	Shrimp
Acute Tox. End Point LC_{50}	0.51 ppm	3.94 ppm	0.49ppm
Probit X^2value	0.996	-	-
Mean Slope	5.33	4.5*	4.7
Slope Confid. Interval	3.24 - 7.42	-	-
Effect probability p (Z)	2.05E-12	2.40E-09	4.85E-10
Chance of Individual effect (1/p)	4.88E+11	4.17E+08	2.06E+09

* default value

The results show chance of individual effect is minimal. The effect probability p(Z) ranges from 2.05E-12 (1 in 4.88 E+11chance for daphnid) to 3.4E-6 (1 in 294,000 chance for quail and rat). When the slope value is unavailable, a default value of 4.5 is assigned in the case of quails, rats, bees, rainbow trout, and sheepshead minnow. Furthermore, if they share the same LOC values (0.05 or 0.1) they will have the same effect probability and hence the chance of individual effect. Generally, the species with the higher slope value, such as daphnid, their probability to exceed LOC is less.

3.3.3.2 Terrestrial listed species (quail, rat, and beneficial insects)

Based on an assumption of a probit dose-response relationship with a mean estimated slope of **default 4.5**, the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.1** the acute toxic endpoint for **those terrestrial organisms is 2250 mg/kg, 4750 mg/kg bw, and 25 ug/bee** for quail, rat, and bee, respectively. As discussed above, they share default slope value of 4.5 and LOC value of 0.1; therefore, they possess the same effect probability and chance of individual effect.

It is also recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate were needed to calculate upper and lower estimates of the effects probability associated with the listed species LOC, but no information is available.

3.3.3.1 Aquatic Animals

Freshwater invertebrates (daphnid)
Based on an assumption of a probit dose-response relationship with a mean estimated slope of **5.33** the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.05** the acute toxic endpoint for **freshwater invertebrate** is **0.51 ppm**. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate **3.24 to 7.42** were used to calculate upper and lower estimates of the effects probability p(z) associated with the listed species LOC. These values are

1.25E-5 to 1.00 E-16 (or 1.25E-3 % to 1.00E-14 % chance).

Although the Agency has assumed a probit dose-response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do statistically support a probit dose-response relationship **0.996** and so the confidence in estimated event probabilities based on this dose-response relationship and the listed species LOC is very high.

Estuarine invertebrate (Shrimp)
Based on an assumption of a probit dose response relationship with a mean estimated slope of **(4.7)**, the corresponding estimated chance of individual mortality associated with the listed species LOC of (0.05) the acute toxic endpoint for (estuarine invertebrates) is **2.06E+09**. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate (which is currently in review) would be used to calculate upper and lower estimates of the effects probability associated with the listed species LOC.

Freshwater and estuarine fish (rainbow trout and sheepshead minnow)
Based on an assumption of a probit dose-response relationship with a mean estimated slope of **default 4.5**, the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.05** the acute toxic endpoint for **these aquatic organisms are 1.97 ppm and 3.94 ppm** for rainbow trout and sheepshead minnow, respectively. As discussed above, they share default slope value of 4.5 and LOC value of 0.1; therefore, they share the same effect provability and chance of individual effect.

It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate were need to calculate upper and lower estimates of the effects probability associated with the listed species LOC, but no information is available.

Based on the above available results, Chi-Sq p-values range from 0.157 to 0.996. These values are greater than critical alpha value of 0.05; therefore, fitting of the probit slope regression line is acceptable and the confidence in estimated event probability with these listed species LOC is relatively high.

3.3.4. *Indirect Effect Analyses*

The Agency acknowledges that pesticides have the potential to exert indirect effects upon the listed organisms by, for example, perturbing forage or prey availability, altering the extent of nesting habitat, creating gaps in the food chain, etc.

In conducting a screen for indirect effects, direct effect LOCs for each taxonomic group are used to make inferences concerning the potential for indirect effects upon listed species that rely upon

non-listed organisms in these taxonomic groups as resources critical to their life cycle.

Because screening-level acute RQs for freshwater fish, freshwater invertebrates, estuarine/marine invertebrates, and mammals exceed the listed species acute LOCs, the Agency uses the dose-response relationship from the toxicity study used for calculating the RQ to estimate the probability of acute effects associated with an exposure equivalent to the EEC. This information serves as a guide to establish the need for, and extent of, additional analysis that may be performed using Services-provided "species profiles", as well as evaluations of the geographical and temporal nature of the exposure to ascertain if a "not likely to adversely affect" determination can be made. The degree to which additional analyses are performed is commensurate with the predicted probability of adverse effects from the comparison of the dose response information with the EECs. The greater the probability that exposures will produce effects on a taxa, the greater the concern for potential indirect effects for listed species dependent upon that taxa, and therefore, the more intensive the analysis on the potential listed species of concern, their locations relative to the use site, and information regarding the use scenario (e.g., timing, frequency, and geographical extent of pesticide application).

Indirect effects to aquatic animals may result from 1) reduction in sensitive plants that serve as food items for some species of aquatic organisms, 2) loss of sensitive aquatic emergent plants that provide shade alters the temperature of the water inhabited by the sensitive organisms, and/or 3) reduction of aquatic invertebrate populations from direct or chronic effects, thus, limiting the amount of food items for larger aquatic animals.

Indirect effects to terrestrial animals may result from reduced food items to animals, behavior modifications from reduced or a modified habitat, and from alterations of habitats. Alterations of habitats can affect the reproductive capacity of some terrestrial animals.

3.3.5. *Critical Habitats*

In the evaluation of pesticide effects on designated critical habitat, consideration is given to the physical and biological features (constituent elements) of a critical habitat identified by the U.S Fish and Wildlife and National Marine Fisheries Services as essential to the conservation of a listed species and which may require special management considerations or protection. The evaluation of impacts for a screening level pesticide risk assessment focuses on the biological features that are constituent elements and is accomplished using the screening-level taxonomic analysis (risk quotients, RQs) and listed species levels of concern (LOCs) that are used to evaluate direct and indirect effects to listed organisms.

The screening-level risk assessment has identified potential concerns for indirect effects on listed species for those organisms dependant upon aquatic organisms, birds, amphibians, reptiles, and insects. In light of the potential for indirect effects, the next step for EPA and the Service(s) is to identify which listed species and critical habitat are potentially implicated. Analytically, the identification of such species and critical habitat can occur in either of two ways. First, the agencies could determine whether the action area overlaps critical habitat or the occupied range

of any listed species. If so, EPA would examine whether the pesticide's potential impacts on non-listed species would affect the listed species indirectly or directly affect a constituent element of the critical habitat. Alternatively, the agencies could determine which listed species depend on biological resources, or have constituent elements that fall into, the taxa that may be directly or indirectly impacted by the pesticide. Then EPA would determine whether use of the pesticide overlaps the critical habitat or the occupied range of those listed species. At present, the information reviewed by EPA does not permit use of either analytical approach to make a definitive identification of species that are potentially impacted indirectly or critical habitats that are potentially impacted directly by the use of the pesticide. EPA and the Service(s) are working together to conduct the necessary analysis.

This screening-level risk assessment for critical habitat provides a listing of potential biological features that, if they are constituent elements of one or more critical habitats, would be of potential concern. These correspond to the taxa identified above as being of potential concern for indirect effects and include aquatic organisms, birds, amphibians, reptiles, and insects. This list should serve as an initial step in problem formulation for further assessment of critical habitat impacts outlined above, should additional work be necessary

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Appendix A. Environmental Fate Data Requirements Summary

Hydrolysis (161-2)

Uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at a concentration of 1.1-1.2 mg/L, was hydrolytically stable in sterile pH 5, 7, and 9 aqueous buffer solutions incubated in darkness at 25 ± 1.5°C for up to 30 days. Data for the parent are reported as fractions of the total radioactivity recovered from individual analyses. Following the incubation period, >97% of the recovered radioactivity was present as parent compound in the pH 5, 7, and 9 test systems. MRID 43595601

Photodegradation in Water (161-2)

Uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at a nominal concentration of 8.6 ppm, degraded with a registrant-calculated half-life of 8.4 hours (r^2 = 0.99) of continuous sunlight exposure in sterilized pH 7 aqueous buffer solution which was irradiated under natural sunlight for up to 168 hours (equivalent to 84 hours of sunlight) while maintained at 25 ± 1°C. In contrast, the parent compound was stable in the dark control solution. MRID 43637201

Photodegradation in Soil (161-3)

Nonradiolabeled plus uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at a nominal application rate of 100 µg/cm^2 (equivalent to 10 kg a.i./ha), degraded with registrant-calculated half-life of 0.8 days (reviewer-calculated r^2 = 0.86; based on 0-3 day data; equivalent to 2.1 days of natural sunlight) on sandy loam soil adjusted to 75% of 0.33 bar moisture content and incubated at 25 ± 1°C for up to 15 days while continuously irradiated with a xenon arc lamp. In contrast, in the dark control soil, the parent degraded with a registrant-calculated half-life of 1.3 days (reviewer-calculated r^2 = 0.92; based on 0-3 day data). The reviewer-calculated photolytic half-life was 2.1 days. However, the very rapid degradation observed in both the irradiated and dark control samples may preclude a definitive determination of whether photodegradation was a significant factor in the degradation of the compound. MRID 43720801

Aerobic Soil Metabolism (162-1)

Uniformly phenyl ring-labeled piperonyl butoxide, at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life (reported as a DT_{50}; determined using nonlinear regression) of 14 days (r^2 = 1.0; 0- to 210- day data) in sandy loam soil adjusted to 75% of 0.33 bar moisture content and incubated in darkness at 25 ± 1°C for up to 285 days. MRID 43806401

Anaerobic Soil Metabolism (162-2)

Anaerobic Aquatic Metabolism (162-3)

Uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at a nominal application rate of 10.2

µg/g soil, was stable in anaerobic flooded sandy loam soil that was incubated in darkness at 25 ± 2°C for up to 181 days. MRID 43836501

Aerobic Aquatic Metabolism (162-4)

Uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life (reported as a DT_{50}) of 213 days ($r^2 = 0.97$) in flooded soil that was incubated in darkness at 25 ± 1°C for up to 30 days. However, the calculated half-life was beyond the scope of the observed data; the parent was present in the total soil/water system at 72.0% of the applied radioactivity at 30 days posttreatment. In addition, the data may not accurately depict the metabolism of the parent under aerobic aquatic conditions because a 20-day pre-incubation period was used, during which the soil was flooded (prior to treatment with pesticide). MRID 43803401

Adsorption/Desorption (163-1)

Batch Equilibrium. Uniformly phenyl ring-labeled [^{14}C]piperonyl butoxide, at nominal concentrations of 0.4, 2.0, 3.0, and 4.0 mg/L, was studied in sand, sandy loam, clay loam, and silt loam soil:solution slurries (1:10, w:v) that were equilibrated for 24 hours at 25 ± 1 °C in darkness. Freundlich K_{ads} values were 8.4 for the sandy loam soil, 0.98 for the sand soil (0.2% o.m.), 12.0 (non-Freundlich) for the clay loam soil, and 29.9 for the silt loam soil (3.6% o.m.); corresponding K_{oc} values were 399, 490, 708, and 830 mL/g. Respective 1/N values were 0.67, 0.90, 1.6, and 0.84 for adsorption. The reported K_{ads} value calculated for the clay loam was based only on data obtained from 0.4, 2.0, and 3.0 mg/L treatment levels; the use of three data points does not allow for the calculation of a Freundlich K. Freundlich K_{des} values determined following a single 24-hour equilibration period were 8.2 for the sandy loam soil, 16.8 for the clay loam soil, and 41.5 for the silt loam soil; corresponding K_{oc} values were 390, 989, and 1152 mL/g. Respective 1/N values were 0.63, 1.3, and 0.87 for desorption. A Freundlich K_{des} value was not reported for the sand soil. The reviewer-calculated coefficients of determination (r^2) for the relationships K_{ads} *vs.* organic matter, K_{ads} *vs.* soil pH, and K_{ads} *vs.* clay content were 0.89, 0.003, and 0.40, respectively. MRID 43673801

Soil Column Leaching. The **aged** soil column study was invalid for the sandy loam soil due to experimental variability. This part of the study did not meet Subdivision N Guidelines because the column was aged for longer than one half-life before leaching.

The studies of **unaged** column leaching in sand, clay loam, sandy loam, and silt loam soils were scientifically valid, but K_d values could not be calculated due to limited movement of the parent compound. PBO (parent) was mobile only in the sand soil (K_d = 0.42 mL/g). MRID 43673802

Summary of Degradation Pathways

This section summarizes maxiumum levels of degradates found in the environmental fate studies for piperonyl butoxide (PBO). These data are taken from the Photodegradation in Water (MRID 43637201), Photodegradation on Soil (43720801), Aerobic Soil Metabolism (43806401), Aerobic Aquatic Metabolism (43803401), and Anaerobic Aquatic Metabolism (43836501) studies.

Structures and names of the degradates identified in these studies are provided below in Figures I, II, and III.

The first side-chain degradate (Butyl Carbitol) is the other product formed when PBO is cleaved to form PBO-alcohol (p. 3 of attachment). This compound is "used as a marker for the degree of photodegradation...of PBO." (C.A.J. Harbach et al., *Photolytic Degradation of Piperonyl Butoxide*, chapt. 6 in Piperonyl Butoxide The Insecticide Synergist, D.G. Jones, ed. Academic Press, 1998). Its initial concentration should therefore be the same as PBO-alcohol. The other two side-chain degradates are also formed by ether cleavage.

Table 1. Maximum Concentrations of PBO Degradates

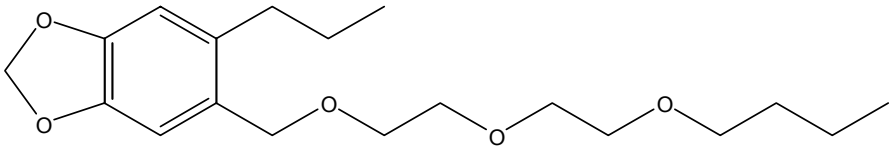
Degradate Name	Photodeg / Water	Photodeg/ Soil (a)	Aerobic Soil	Aerobic Aquatic	Anaerobic Aquatic
Application Rate	8.6 ppm	100 µg/cm^2 ≡10 kg/ha	10 ppm	10 ppm	10.2 ppm
PBO-alcohol	4.7 ppm @ 36 hr	4.41 kg/ha @ 3 days	--	(water) 0.38 ppm @ 30 days (sed) 0.075 ppm @ 30 days	(w) ≤0.04 ppm (s) ≤0.10 ppm
PBO-aldehyde	1.0 ppm @ 36 hr	0.76 kg/ha @ 6 days	--	(w) 0.18 ppm @ 30 days (s) 0.09 ppm @ 21-30 days	(w) ≤0.12 ppm (s) --
PBO-acid	--	0.98 kg/ha @ 10 days	1.7 ppm @ 30 days	(w) 0.34 ppm @ 30 days (s) 0.15 ppm @ 30 days	(w) ≤0.15 ppm (s) ≤0.10 ppm
PBO-alcohol dimer	–	0.48 kg/ha @3 days	–	–	--
PBO prop-1-one	--		0.3 ppm @ 30 days	--	--
PBO prop-1-one benzaldehyde	--		0.58 ppm @ 7 days	--	--
"M8"	--		0.89 ppm @ 30 days	--	--

Notes: (a) Data from the Photodegradation on Soil study are provided to show qualitative similarity to the Photodegradation in Water study. The half-lives from the former study are

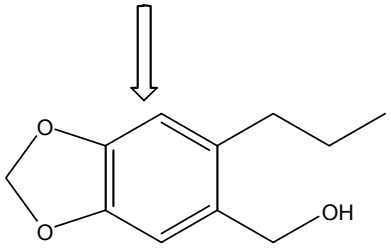
questionable, therefore the timing of maximum degradate concentration is also questionable.

Figure I

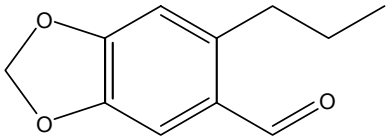
Piperonyl Butoxide Degradation: Pathway 1
Side-Chain Cleavage and Oxidation



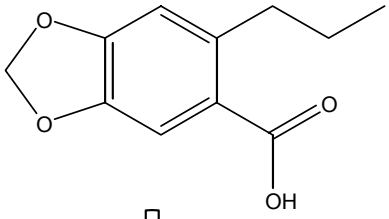
Piperonyl butoxide



PBO-alcohol
hydroxymethyl dihydrosafrol
MDPB-alcohol
3,4-methylene-6-propylbenzyl alcohol



PBO-aldehyde
dihydrosafrol aldehyde
MDPB-aldehyde
3,4-methylene-6-propylbenzaldehyde



PBO-acid
MDPB-acid
3,4-methylene-6-propylbenzoic acid

CO_2

Figure II

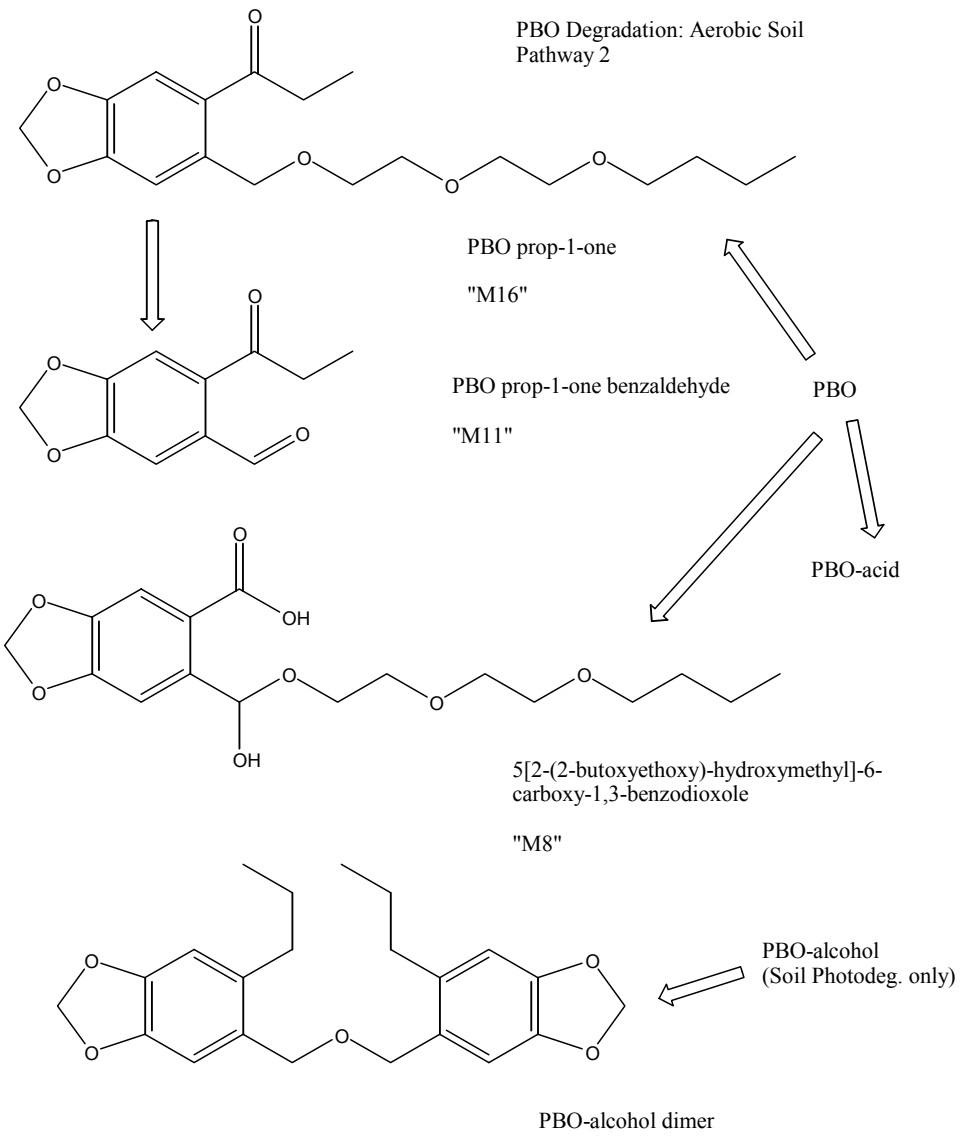
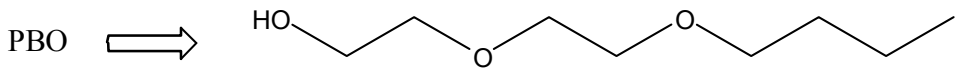
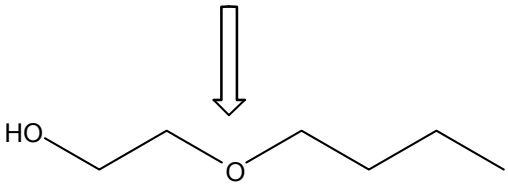

PBO Degradation: Aerobic Soil
Pathway 2
PBO prop-1-one
"M16"
PBO prop-1-one benzaldehyde
"M11"
PBO
PBO-acid
5[2-(2-butoxyethoxy)-hydroxymethyl]-6-carboxy-1,3-benzodioxole
"M8"
PBO-alcohol
(Soil Photodeg. only)
PBO-alcohol dimer

Figure III

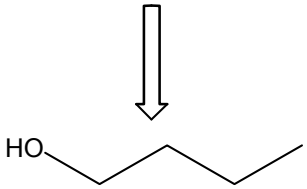
Piperonyl Butoxide Degradation: Glycol Ether Side-Chain
from Pathway 1



2-(2-butoxy ethoxy) ethanol
Butyl Carbitol



2-butoxy ethanol
Butyl Cellosolve



butyl alcohol
Propyl Carbinol

Appendix B. Calculation of Modeling Parameters for PRZM-EXAMS

Vapor Pressure

The vapor pressure of piperonyl butoxide has been reported as shown below.

Pressure (mmHg)	Temperature (K)	Reference
2	468	Piperonyl Butoxide: the Insecticide Synergist. DG Jones, ed. Academic Press, 1998, p. 56
1	453	
0.0004 bar (0.3 mmHg)	428	NIST Chemistry Webbook: http://webbook.nist.gov/chemistry/
1.59E-7	333	Material Safety Data Sheet, Prentox Piperonyl Butoxide Technical. Prentiss Inc. Floral Park, NY. 4 pp.
< 1E-7	298	

The pressure-temperature data from 333K to 468K were regressed using SigmaPlot, with the result:

$$\ln P = - 49.5439 + 53573(1/T) - 1.408E+7\ (1/T)^2 \quad R^2 = 0.99992 \qquad \text{(eq. 1)}$$

This equation predicts that the vapor pressure at 298K (25°C) is 5.0E-13 mmHg, which agrees with the reported pressure of less than 1E-7 mmHg.

Henry's Law Constant (HLC)

The HLC at 25°C was calculated as the vapor pressure calculated above (5.0E-13 mmHg or 6.58 E-15 atm) divided by the solubility (14.3 mg/L or 4.225E-5 mole/liter with a molecular weight of 338.45 g/mole).

The result of this calculation is 1.558 E-14 atm-m^3/mole.

Diffusion Coefficient in Air (Da)

Da was calculated from the molecular mass (338.45 amu) by the method given in Schwarzenbach, Gschwend & Imboden, Environmental Organic Chemistry, Wiley-Interscience, New York, 1993, p. 197 ff).

$$Da = 1.55 / (\text{molecular mass})^{0.65} \quad \text{(eq. 2)}$$

The result of this calculation is 0.0352 cm^2/sec, or 4.07E-7 cm^2/day.

Enthalpy of Vaporization

ΔHvap was calculated from the slope of a plot of the pressure-temperature data (natural log pressure in mmHg versus inverse temperature in K) shown in the Table above. This is a graphical representation of the Clausius-Clayperon equation. The resulting slope is equal to ΔHvap/R, where R is the universal gas constant. The result is ΔHvap = 18.8 kcal/mole, which is close to the default value of 20 kcal/mole in PRZM.

Appendix C. Summary of Ecotoxicity Data

1. Ecological Toxicity Data

a. Toxicity to Terrestrial Animals

i. Birds, Acute and Subacute

An acute oral toxicity study using the technical grade of the active ingredient (TGAI) is required to establish the toxicity of PBO to birds. The preferred test species is either mallard duck (a waterfowl) or bobwhite quail (an upland gamebird). Results of this test are tabulated below.

Avian Acute Oral Toxicity

Species	% ai	LD_{50} (mg/kg)	Toxicity Category	MRID No. Author/Year	Study Classification[1]
Northern bobwhite quail *(Colinus virginianus)*	90.78	> 2250[2]	practically non-toxic	419690-08 Campbell, 1991	core

1 Core (study satisfies guideline). Supplemental (study is scientifically sound, but does not satisfy guideline)
2 No mortalities at the maximum dose.

Since the LD_{50}'s are greater than 2250 mg/kg, PBO is practically non- toxic to avian species on an acute oral basis.

Two subacute dietary studies using the TGAI are required to establish the toxicity of PBO to birds. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Avian Subacute Dietary Toxicity

Species	% ai	5-Day LC_{50} (ppm)[1]	Toxicity Category	MRID No. Author/Year	Study Classification
Northern bobwhite quail *(Colinus virginianus)*	90.78	> 5620 [2]	practically nontoxic	419690-06 Grimes 1991	core
Mallard duck *(Anas platyrhynchos)*		> 5620 [2]	practically nontoxic	419690-07 Grimes 1991	core

1 Test organisms observed an additional three days while on untreated feed.
2 No mortalities at the maximum dose.

Since the LC_{50}'s are greater than 5620 ppm, PBO is practically non- toxic to avian species on a subacute dietary basis.

ii. Birds, Chronic

Avian reproduction studies using the TGAI were required for PBO because the following conditions were met: (1) birds may be subject to repeated or continuous exposure to the pesticide, especially preceding or during the breeding season, (2) the pesticide is stable in the environment to the extent that potentially toxic amounts may persist in animal feed, (3) the pesticide is stored or accumulated in plant or animal tissues, and/or, (4) information derived from mammalian reproduction studies indicates reproduction in terrestrial vertebrates may be adversely affected by the anticipated use of the product. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Species	NOEC	Results	MRID No. Author/Year	Study Classification
Northern Bobwhite Quail	NOEC = 300 ppm LOEC = 1500 ppm	male body weight	438763-01 Rodgers 1995	core
Mallard Duck	NOEC = 300 ppm LOEC = 1200 ppm	Eggs laid, eggs laid per female, percentage of eggs cracked, eggshell thickness, viable embryos, live 3-week embryos, 14-day survivors, normal hatchlings, food consumption, hatchling and adult body weights	438763-02 Rodgers 1995	core

iii. Mammals, Acute and Chronic

Wild mammal testing is required on a case-by-case basis, depending on the results of lower tier laboratory mammalian studies, intended use pattern and pertinent environmental fate characteristics. In most cases, rat or mouse toxicity values obtained from the Agency's Health Effects Division (HED) substitute for wild mammal testing. These toxicity values are reported below.

Mammalian Toxicity

Species/ Study Duration	% ai	Test Type	Toxicity Value	Affected Endpoints	MRID No.
laboratory rat *(Rattus norvegicus)*	tech	Acute oral	LD_{50} = 4570 mg/kg (m) LD_{50} = 7220 mg/kg (f)	mortality	41969001
laboratory rat *(Rattus norvegicus)*	89.5	Acute oral	male LD_{50} = 4700 mg/kg bw female LD_{50} = 4100 mg/kg bw	mortality	246018
Laboratory rat *(Rattus norvegicus)*	(1)	Acute oral	LD_{50} > 5000 mg/kg bw	mortality	242853
Laboratory rat *(Rattus norvegicus)*	90.78	Developmental toxicity	(Maternal) NOAEL = 200 mg/kg/d LOAEL = 500 mg/kg/d	reduced body weight gain and food consumption during days 6-9 of treatment. Also increased incidence of urogenital red discharge and perinasal encrustation	42380801
New Zealand white rabbit	100	Developmental toxicity	(Maternal) NOAEL = 50 mg/kg/d LOAEL = 100 mg/kg/d	decrease body weight gain	00157157
Laboratory rat *(Rattus norvegicus)*	Tech.	2-generation reproduction	Reproductive NOAEC > 5000 ppm (469 mg/kg) Maternal NOAEC = 1000 ppm (89 mg/kg bw) Maternal LOAEC = 5000 ppm (469 mg/kg) Offspring NOAEC = 1000 ppm (89 mg/kg bw) Offspring LOAEC = 5000 ppm (469 mg/kg)	decreased body weight gain (12%) decreased body weight gain in pups (12%)	00161118
Laboratory rat *(Rattus norvegicus)*	80	2-generation reproduction	Reproductive NOAEC = 1000 ppm Reproductive LOAEC = 10,000 ppm	body weight decreased. (at 25,000 ppm - liver effects)	(2)

(1) formulated product of Piperonyl Butoxide (Registration No. 4816-353)
(2) Tox. Appl. Pharm. 47:353 (1979). Study is classified as supplemental due to too few animals tested and too few observations

iv. Insects

A honey bee acute contact study using the TGAI was required for Piperonyl Butoxide because its widespread use on agricultural will result in honey bee exposure. Results of this test are tabulated below.

Species	% ai	LD_{50}	Toxicity Category	MRID No. Author/Year	Study Classification
Honey Bee	90.78	≥25 µg/bee	practically nontoxic	419690-09 Lynn 1991	core

Piperonyl Butoxide is practically non-toxic to honey bees.

b. Toxicity to Freshwater Aquatic Animals

i. Freshwater Fish, Acute

Two freshwater fish toxicity studies using the TGAI are required to establish the toxicity of PBO to fish. The preferred test species are rainbow trout (a coldwater fish) and bluegill sunfish (a warmwater fish). Results of these tests are tabulated below.

Freshwater Fish Acute Toxicity

Species/ (Flow-through or Static)	% ai	96-hour LC_{50} (ppm)	Toxicity Category	MRID No. Author/Year	Study Classification
Rainbow trout *(Oncorhynchus mykiss)* flow-thru	90.78	6.1	moderately toxic	42540303 Holmes 1992	core
Bluegill sunfish *(Lepomis macrochirus)* Flow-thru	90.78	5.37	moderately toxic	42540302 Holmes 1992	core
Rainbow trout *(Oncorhynchus mykiss)* static	100	3.4	moderately toxic	40098001 Mayer, 1986	core
Bluegill sunfish *(Lepomis macrochirus)* static	100	4.2	moderately toxic	40098001 Mayer, 1986	core
Rainbow trout *(Oncorhynchus mykiss)* static	100	1.8	moderately toxic	40098001 Mayer, 1986	supplemental (1)
Rainbow trout *(Oncorhynchus mykiss)* static	100	1.9	moderately toxic	40098001 Mayer, 1986	core
Bluegill sunfish *(Lepomis macrochirus)* static	100	4.2	moderately toxic	40098001 Mayer, 1986	core
Bluegill sunfish *(Lepomis macrochirus)* static	100	9.7	moderately toxic	40098001 Mayer, 1986	supplemental (2)
Rainbow trout *(Oncorhynchus mykiss*)	tech.	2.82	moderately toxic	40991205 Bills, 1985	supplemental (3)
Goldfish	tech	5.32	moderately toxic	40991205 Bills, 1985	supplemental (3)
Common Carp	tech	4.22	moderately toxic	40991205 Bills, 1985	supplemental (3)

Freshwater Fish Acute Toxicity

Species/ (Flow-through or Static)	% ai	96-hour LC_{50} (ppm)	Toxicity Category	MRID No. Author/Year	Study Classification
Fathead minnow	tech	6.2	moderately toxic	40991205 Bills, 1985	supplemental (3)
White sucker	tech	6.95	moderately toxic	40991205 Bills, 1985	supplemental (3)
Channel catfish	tech	6.4	moderately toxic	40991205 Bills, 1985	supplemental (3)
Black bullhead	tech	5.65	moderately toxic	40991205 Bills, 1985	supplemental (3)
Green sunfish	tech	12.2	moderately toxic	40991205 Bills, 1985	supplemental (3)
Bluegill sunfish	tech	4.0	moderately toxic	40991205 Bills, 1985	supplemental (3)
Yellow perch	tech	6.9	moderately toxic	40991205 Bills, 1985	supplemental (3)

1 Supplemental because it was tested in hard water, 272 ppm CaCO3.
2 Supplemental because it was tested in 12 °C.
3 Supplemental due to lack of raw data. This study was prepared by U.S. Fish and Wildlife Service.

On an acute toxicity basis, PBO is moderately toxic to freshwater fish on an acute basis.

ii. Freshwater Fish, Chronic

A freshwater fish early life-stage test using the TGAI was required for PBO because the end-use product is expected to be transported to water from the intended use site, and the following conditions are met: (1) the pesticide is intended for use such that its presence in water is likely to be continuous or recurrent regardless of toxicity, (2) any aquatic acute LC_{50} or EC_{50} is less than 1 mg/L, and (3) studies of other birds and small mammals indicate the reproductive physiology of fish may be affected. The preferred test species is rainbow trout. Results of this test are tabulated below.

Species	% ai	Toxicity value	Affected endpoints	MRID No. Author/Year	Study Classification
Fathead Minnow (*Pimephales promelas*)	92.4	NOAEC = 0.04 ppm LOAEC = 0.11 ppm	embryo survival at hatch and growth larval (total length and wet weight)	433003-01 Machado, 1994	core

iii. Freshwater Invertebrates, Acute

A freshwater aquatic invertebrate toxicity test using the TGAI is required to establish the toxicity of PBO to aquatic invertebrates. The preferred test species is *Daphnia magna*. Results of this test are tabulated below.

Species	% ai	48-hour EC_{50}	Toxicity Category	MRID No. Author/Year	Study Classification
Asellus	100	12.0	Moderately toxic	40094602 Johnson, 1980	supplemental (1)
Daphnia magna (flow-thru)	90.78	0.51 ppm (measured)	highly toxic	42540301 Holmes, 1992	core

1 Tested in hard water, 272 ppm CaCO3. Supplemental due to species tested is not preferred species.

PBO ranges from moderately toxic to highly toxic for aquatic invertebrates on an acute basis.

iv. Freshwater Invertebrate, Chronic

A freshwater aquatic invertebrate life-cycle test using the TGAI was required for PBO since the end-use product may be applied directly to water or is expected to be transported to water from the intended use site, and the following conditions are met: (1) the pesticide is intended for use such that its presence in water is likely to be continuous or recurrent regardless of toxicity, (2) any aquatic acute LC_{50} or EC_{50} is less than 1 mg/L, or, (3) the EEC in water is equal to or greater than 0.01 of any acute EC_{50} or LC_{50} value, or, (4) the actual or estimated environmental concentration in water resulting from use is less than 0.01 of any aquatic acute EC_{50} or LC_{50} value and any of the following conditions exist: studies of other organisms indicate the reproductive physiology of invertebrates may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (i.e., half-life greater than 4 days). The preferred test species is *Daphnia magna*. Results of this test are tabulated below.

Table 21-day Life-Cycle Toxicity to Freshwater Invertebrates

Species	% ai	Toxicity value	Endpoints Affected	MRID No. Author/Year	Study Classification
Waterflea *(Daphnia magna)* Flow-thru	92.43	NOAEC = 0.030 ppm ai LOAEC = 0.047 ppm ai	reproduction	43311301 Putt 1994	core

v. Amphibians

Although amphibian testing is not required under FIFRA, toxicity data was also collected on amphibians. The results are tabulated below**.**

Table Toxicity to Amphibians

Species	% ai	Toxicity value LC_{50} (ppm)	MRID No. Author/Year	Study Classification
Fowler's toad (*Bufo woodhousii*)	tech.	1.0 (96 hr.)	(1)	supplemental
Western Chorus frog (*Pseudacris triseriata*)	100	0.210 (96 hr.)	40098001 Mayer, 1986	supplemental

1 Sanders, H.O. 1970. Pesticide Toxicities to Tadpoles of the Western Chorus Frog *Psuedacris triseriata* and Fowler's Toad *Bufo woodhousii***.** Copeia 2:246-251.

v. Toxicity to Estuarine and Marine Animals

Acute toxicity testing with estuarine/marine invertebrates and fish using the TGAI was required for PBO because the end-use product is expected to reach this environment because of its use in coastal counties. The preferred test species is sheepshead minnow for fish and mysid shrimp and eastern oyster for invertebrates.

Species	% ai	96-hour EC_{50}	Toxicity Category	MRID No. Author/Year	Study Classification
Mysid Shrimp (Mysidopsis bahia) flow-thru	90.78	0.49	Highly toxic	43901801 Roberts, 1995	core
Eastern Oyster (*Crassostrea virginica*) flow-thru shell deposition	90.78	0.23 mg ai/L	highly toxic	425403-05 Holmes, 1992	supplemental (1)
Sheepshead minnow (*Cyrinodon variegatus*) flow-thru	90.78	3.94 mg ai/L	moderately toxic	42540304 Holmes, 1992	core

Upper Bound Kenaga Residues For RQ Calculation

Chemical Name:	**PBO**	
Use	0	
Formulation	0	
Application Rate	**0.5**	lbs a.i./acre
Half-life	**35**	days
Application Interval	**3**	days
Maximum # Apps./Year	**10**	
Length of Simulation	**1**	year
Concentration of Concern	**300.00**	(ppm)
Name of Concentration of Concern	**Avian chronic NOAEC**	

Endpoints

Avian	**Bobwhite quail LD50 (mg/kg-bw)**	**0**
	Bobwhite quail LD50 (mg/kg-bw)	**0**
	Bobwhite quail NOAEL (mg/kg-bw)	**0**
	Bobwhite quail NOAEC (mg/kg-bw)	**300**
Mammals	**LD50 (mg/kg-bw)**	**4570**
	LC50 (mg/kg-diet)	**0**
	NOAEL (mg/kg-bw)	**89**
	NOAEC (mg/kg-diet)	**1780**

EECs (ppm)	**Kenaga Values**
Short Grass	**931.91**
Tall Grass	**427.13**
Broadleaf plants/sm Insects	**524.20**
Fruits/pods/seeds/lg insects	**58.24**

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	0
Mid	100	65	0
Large	1000	29	0

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	1062	606	270
Tall Grass	487	278	124
Broadleaf plants/sm Insects	598	341	152
Fruits/pods/lg insects	66	38	17

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	3.11
Tall Grass	#DIV/0!	1.42
Broadleaf plants/sm Insects	#DIV/0!	1.75
Fruits/pods/lg insects	#DIV/0!	0.19

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	885	615	140			
Tall Grass	406	282	64			
Broadleaf plants/sm Insects	498	346	79			
Fruits/pods/seeds/lg insects	55	38	9	12	9	2

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.09	4.53	0.08	3.89	0.04	2.04
Tall Grass	0.04	2.07	0.03	1.78	0.02	0.94
Broadleaf plants/sm insects	0.05	2.55	0.04	2.19	0.02	1.15
Fruits/pods/lg insects	0.01	0.28	0.00	0.24	0.00	0.13
Seeds (granivore)	0.00	0.06	0.00	0.06	0.00	0.03

Dietary-based RQs (EEC/LC50	Mammal RQs		

or NOAEC)						
	Acute	Chronic				
Short Grass	#DIV/0!	0.52				
Tall Grass	#DIV/0!	0.24				
Broadleaf plants/sm insects	#DIV/0!	0.29				
Fruits/pods/seeds/lg insects	#DIV/0!	0.03				

Upper Bound Kenaga Residues For RQ Calculation

Acute and Chronic RQs are based on the Upper Bound Kenaga Residues.

The maximum single day residue estimation is used for both the acute and reproduction RQs.

Chemical Name:	**PBO**	
Use	0	
Formulation	0	
Application Rate	**0.5**	lbs a.i./acre
Half-life	**35**	days
Application Interval	**3**	days
Maximum # Apps./Year	**10**	
Length of Simulation	**1**	year
Concentration of Concern	**300.00**	(ppm)
Name of Concentration of Concern	**Avian chronic NOAEC**	

Endpoints

Avian	**Bobwhite quail LD50 (mg/kg-bw)**	**0**
	Bobwhite quail LD50 (mg/kg-bw)	**0**
	Bobwhite quail NOAEL (mg/kg-bw)	**0**
	Bobwhite quail NOAEC (mg/kg-bw)	**300**
Mammals	**LD50 (mg/kg-bw)**	**4570**
	LC50 (mg/kg-diet)	**0**
	NOAEL (mg/kg-bw)	**89**
	NOAEC (mg/kg-diet)	**1780**

EECs (ppm)	**Kenaga Values**
Short Grass	**931.91**
Tall Grass	**427.13**
Broadleaf plants/sm Insects	**524.20**
Fruits/pods/seeds/lg insects	**58.24**

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	0
Mid	100	65	0
Large	1000	29	0

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	1062	606	270
Tall Grass	487	278	124
Broadleaf plants/sm Insects	598	341	152
Fruits/pods/lg insects	66	38	17

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	3.11
Tall Grass	#DIV/0!	1.42
Broadleaf plants/sm Insects	#DIV/0!	1.75
Fruits/pods/lg insects	#DIV/0!	0.19

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	885	615	140			
Tall Grass	406	282	64			
Broadleaf plants/sm Insects	498	346	79			
Fruits/pods/seeds/lg insects	55	38	9	12	9	2

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.09	4.53	0.08	3.89	0.04	2.04
Tall Grass	0.04	2.07	0.03	1.78	0.02	0.94
Broadleaf plants/sm insects	0.05	2.55	0.04	2.19	0.02	1.15
Fruits/pods/lg insects	0.01	0.28	0.00	0.24	0.00	0.13
Seeds (granivore)	0.00	0.06	0.00	0.06	0.00	0.03

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				

Short Grass	**#DIV/0!**	**0.52**				
Tall Grass	**#DIV/0!**	**0.24**				
Broadleaf plants/sm insects	**#DIV/0!**	**0.29**				
Fruits/pods/seeds/lg insects	**#DIV/0!**	**0.03**				

Upper Bound Kenaga Residues For RQ Calculation (Number of applications = 5)

Acute and Chronic RQs are based on the Upper Bound Kenaga Residues

The maximum single day residue estimation is used for
both the acute and reproduction RQs.

Chemical Name:	**PBO**	
Use	0	
Formulation	0	
Application Rate	**0.5**	lbs a.i./acre
Half-life	**35**	days
Application Interval	**3**	days
Maximum # Apps./Year	**5**	
Length of Simulation	**1**	year
Concentration of Concern	**300.00**	(ppm)
Name of Concentration of Concern	**Avian chronic NOAEC**	

Endpoints

Avian	**Bobwhite quail LD50 (mg/kg-bw)**	**0**
	Bobwhite quail LD50 (mg/kg-bw)	**0**
	Bobwhite quail NOAEL (mg/kg-bw)	**0**
	Bobwhite quail NOAEC (mg/kg-bw)	**300**
Mammals	**LD50 (mg/kg-bw)**	**4570**
	LC50 (mg/kg-diet)	**0**
	NOAEL (mg/kg-bw)	**89**
	NOAEC (mg/kg-diet)	**1780**

EECs (ppm)	**Kenaga Values**
Short Grass	**534.66**
Tall Grass	**245.05**
Broadleaf plants/sm Insects	**300.75**
Fruits/pods/seeds/lg insects	**33.42**

Avian Results

Avian	**Body**	**% body**	**Adjusted**

Class	Weight	wgt consumed	LD50
Small	20	114	0
Mid	100	65	0
Large	1000	29	0

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	610	348	155
Tall Grass	279	159	71
Broadleaf plants/sm Insects	343	195	87
Fruits/pods/lg insects	38	22	10

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	1.78
Tall Grass	#DIV/0!	0.82
Broadleaf plants/sm Insects	#DIV/0!	1.00
Fruits/pods/lg insects	#DIV/0!	0.11

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	508	353	80			
Tall Grass	233	162	37			
Broadleaf plants/sm Insects	286	198	45			
Fruits/pods/seeds/lg insects	32	22	5	7	5	1

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.05	2.60	0.04	2.23	0.02	1.17
Tall Grass	0.02	1.19	0.02	1.02	0.01	0.54
Broadleaf plants/sm insects	0.03	1.46	0.02	1.25	0.01	0.66
Fruits/pods/lg insects	0.00	0.16	0.00	0.14	0.00	0.07
Seeds (granivore)	0.00	0.04	0.00	0.03	0.00	0.01

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs	
	Acute	Chronic
Short Grass	#DIV/0!	0.30
Tall Grass	#DIV/0!	0.14
Broadleaf plants/sm insects	#DIV/0!	0.17
Fruits/pods/seeds/lg insects	#DIV/0!	0.02

Mean Kenaga Residue Values on 5 applications per year

Mean Kenaga Residues

Chemical Name:	PBO	
Use	0	
Formulation	0	
Application Rate	0.5	lbs a.i./acre
Half-life	35	days
Application Interval	3	days
Maximum # Apps./Year	5	
Length of Simulation	1	year
Concentration of Concern	300.00	(ppm)
Name of Concentration of Concern	Avian chronic NOAEC	

Endpoints

Avian	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail NOAEL (mg/kg-bw)	0
	Bobwhite quail NOAEC (mg/kg-bw)	300
Mammals	LD50 (mg/kg-bw)	4570
	LC50 (mg/kg-diet)	0
	NOAEL (mg/kg-bw)	89
	NOAEC (mg/kg-diet)	1780

EECs (ppm)	Kenaga Values
Short Grass	189.36
Tall Grass	80.20
Broadleaf plants/sm Insects	100.25
Fruits/pods/seeds/lg insects	15.59

Avian Results

	Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
	Small	20	114	0
	Mid	100	65	0
	Large	1000	29	0
EEC equivalent	Avian Classes and Body Weights			

dose (mg/kg-bw)	small 20 g	mid 100 g	large 1000 g
Short Grass	216	123	55
Tall Grass	91	52	23
Broadleaf plants/sm Insects	114	65	29
Fruits/pods/lg insects	18	10	5

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	0.63
Tall Grass	#DIV/0!	0.27
Broadleaf plants/sm Insects	#DIV/0!	0.33
Fruits/pods/lg insects	#DIV/0!	0.05

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	180	125	28			
Tall Grass	76	53	12			
Broadleaf plants/sm Insects	95	66	15			
Fruits/pods/seeds/lg insects	15	10	2	3	2	0

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.02	0.92	0.02	0.79	0.01	0.41
Tall Grass	0.01	0.39	0.01	0.33	0.00	0.18
Broadleaf plants/sm insects	0.01	0.49	0.01	0.42	0.00	0.22
Fruits/pods/lg insects	0.00	0.08	0.00	0.07	0.00	0.03
Seeds (granivore)	0.00	0.02	0.00	0.01	0.00	0.01

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				
Short Grass	#DIV/0!	0.11				
Tall Grass	#DIV/0!	0.05				
Broadleaf plants/sm insects	#DIV/0!	0.06				
Fruits/pods/seeds/lg insects	#DIV/0!	0.01				

Application Rate Reduced to 0.25 lb ai/A. All other Parameters constant with other inputs.

Upper Bound Kenaga Residues For RQ Calculation (applic. rate = 0.25 lb ai/A)

Chemical Name:	PBO		
Use	0		
Formulation	0		
Application Rate	0.25	lbs a.i./acre	
Half-life	35	days	
Application Interval	3	days	
Maximum # Apps./Year	10		
Length of Simulation	1	year	
Concentration of Concern	300.00	(ppm)	
Name of Concentration of Concern	Avian chronic NOAEC		
Endpoints			
Avian	Bobwhite quail LD50 (mg/kg-bw)		0
	Bobwhite quail LD50 (mg/kg-bw)		0
	Bobwhite quail NOAEL (mg/kg-bw)		0
	Bobwhite quail NOAEC (mg/kg-bw)		300
Mammals	LD50 (mg/kg-bw)		4570
	LC50 (mg/kg-diet)		0
	NOAEL (mg/kg-bw)		89
	NOAEC (mg/kg-diet)		1780
EECs (ppm)	Kenaga		

	Values
Short Grass	465.96
Tall Grass	213.56
Broadleaf plants/sm Insects	262.10
Fruits/pods/seeds/lg insects	29.12

Avian Results

Avian Class	Body Weight	% body wgt consumed
Small	20	114
Mid	100	65
Large	1000	29

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	531	303	135
Tall Grass	243	139	62
Broadleaf plants/sm Insects	299	170	76
Fruits/pods/lg insects	33	19	8

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs

	Acute	Chronic
Short Grass	#DIV/0!	1.55
Tall Grass	#DIV/0!	0.71
Broadleaf plants/sm Insects	#DIV/0!	0.87
Fruits/pods/lg insects	#DIV/0!	0.10

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	443	308	70			
Tall Grass	203	141	32			
Broadleaf plants/sm Insects	249	173	39			
Fruits/pods/seeds/lg insects	28	19	4	6	4	1

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.04	2.26	0.04	1.94	0.02	1.02
Tall Grass	0.02	1.04	0.02	0.89	0.01	0.47
Broadleaf plants/sm insects	0.02	1.27	0.02	1.09	0.01	0.57
Fruits/pods/lg insects	0.00	0.14	0.00	0.12	0.00	0.06
Seeds (granivore)	0.00	0.03	0.00	0.03	0.00	0.01

Dietary-based	Mammal RQs					

RQs (EEC/LC50 or NOAEC)						
	Acute	Chronic				
Short Grass	#DIV/0!	0.26				
Tall Grass	#DIV/0!	0.12				
Broadleaf plants/sm insects	#DIV/0!	0.15				
Fruits/pods/seeds/lg insects	#DIV/0!	0.02				

Mean Kenaga Residues — **Application Rate of 0.25 lb ai/A**

Chemical Name:	PBO	
Use	0	
Formulation	0	
Application Rate	0.25	lbs a.i./acre
Half-life	35	days
Application Interval	3	days
Maximum # Apps./Year	10	
Length of Simulation	1	year
Concentration of Concern	300.00	(ppm)
Name of Concentration of Concern	Avian chronic NOAEC	

Endpoints

Avian	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail NOAEL (mg/kg-bw)	0
	Bobwhite quail NOAEC (mg/kg-bw)	300
Mammals	LD50 (mg/kg-bw)	4570
	LC50 (mg/kg-diet)	0
	NOAEL (mg/kg-bw)	89
	NOAEC (mg/kg-diet)	1780

EECs (ppm)	Kenaga Values
Short Grass	165.03
Tall Grass	69.89
Broadleaf plants/sm insects	87.37
Fruits/pods/seeds/lg insects	13.59

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	0
Mid	100	65	0

Large	1000	29	0

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	188	107	48
Tall Grass	80	45	20
Broadleaf plants/sm Insects	100	57	25
Fruits/pods/lg insects	15	9	4

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	0.55
Tall Grass	#DIV/0!	0.23
Broadleaf plants/sm Insects	#DIV/0!	0.29
Fruits/pods/lg insects	#DIV/0!	0.05

PBO 0 Mean Kenaga Residues

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
	15	95	10044	196

Herbivores/ insectivores	35	66	8127	158
	1000	15	3515	68
Grainvores	15	21	10044	196
	35	15	8127	158
	1000	3	3515	68

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	157	109	25			
Tall Grass	66	46	10			
Broadleaf plants/sm Insects	83	58	13			
Fruits/pods/seeds/lg insects	13	9	2	3	2	0

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.02	0.80	0.01	0.69	0.01	0.36
Tall Grass	0.01	0.34	0.01	0.29	0.00	0.15
Broadleaf plants/sm insects	0.01	0.42	0.01	0.36	0.00	0.19
Fruits/pods/lg insects	0.00	0.07	0.00	0.06	0.00	0.03
Seeds (granivore)	0.00	0.01	0.00	0.01	0.00	0.01

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				
Short Grass	#DIV/0!	0.09				
Tall Grass	#DIV/0!	0.04				
Broadleaf plants/sm insects	#DIV/0!	0.05				
Fruits/pods/seeds/lg insects	#DIV/0!	0.01				

Interval Increased to 6 days. All other Parameters constant with other inputs.

Upper Bound Kenaga Residues For RQ Calculation (Interval = 6 days)

Chemical Name:	PBO	
Use	0	
Formulation	0	
Application Rate	0.5	lbs a.i./acre
Half-life	35	days
Application Interval	6	days
Maximum # Apps./Year	10	
Length of Simulation	1	year
Concentration of Concern	300.00	(ppm)
Name of Concentration of Concern	Avian chronic NOAEC	

Endpoints

Avian	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail NOAEL (mg/kg-bw)	0
	Bobwhite quail NOAEC (mg/kg-bw)	300
Mammals	LD50 (mg/kg-bw)	4570
	LC50 (mg/kg-diet)	0
	NOAEL (mg/kg-bw)	89
	NOAEC (mg/kg-diet)	1780

EECs (ppm)	Kenaga Values
Short Grass	744.66
Tall Grass	341.30
Broadleaf plants/sm Insects	418.87
Fruits/pods/seeds/lg insects	46.54

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	0

Mid	100	65	0
Large	1000	29	0

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	849	484	216
Tall Grass	389	222	99
Broadleaf plants/sm Insects	478	272	121
Fruits/pods/lg insects	53	30	13

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	2.48
Tall Grass	#DIV/0!	1.14
Broadleaf plants/sm Insects	#DIV/0!	1.40
Fruits/pods/lg insects	#DIV/0!	0.16

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
	15	95	10044	196
Herbivores/	35	66	8127	158
insectivores	1000	15	3515	68
	15	21	10044	196

Grainvores	35 1000	15 3	8127 3515	158 68	

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	707	491	112			
Tall Grass	324	225	51			
Broadleaf plants/sm Insects	398	276	63			
Fruits/pods/seeds/lg insects	44	31	7	10	7	1

Dose-based RQs (daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.07	3.62	0.06	3.11	0.03	1.63
Tall Grass	0.03	1.66	0.03	1.42	0.01	0.75
Broadleaf plants/sm insects	0.04	2.03	0.03	1.75	0.02	0.92
Fruits/pods/lg insects	0.00	0.23	0.00	0.19	0.00	0.10
Seeds (granivore)	0.00	0.05	0.00	0.04	0.00	0.02

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				
Short Grass	#DIV/0!	0.42				
Tall Grass	#DIV/0!	0.19				
Broadleaf plants/sm insects	#DIV/0!	0.24				
Fruits/pods/seeds/lg insects	#DIV/0!	0.03				

Mean Kenaga Residues (interval = 6 days)

Chemical Name:	PBO

Use	0		
Formulation	0		
Application Rate	0.5	lbs	a.i./acre
Half-life	35	days	
Application Interval	6	days	
Maximum # Apps./Year	10		
Length of Simulation	1	year	
Concentration of Concern	300.00	(ppm)	
Name of Concentration of Concern	Avian chronic NOAEC		

Endpoints

Avian	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail LD50 (mg/kg-bw)	0
	Bobwhite quail NOAEL (mg/kg-bw)	0
	Bobwhite quail NOAEC (mg/kg-bw)	300
Mammals	LD50 (mg/kg-bw)	4570
	LC50 (mg/kg-diet)	0
	NOAEL (mg/kg-bw)	89
	NOAEC (mg/kg-diet)	1780

EECs (ppm)	Kenaga Values
Short Grass	263.73
Tall Grass	111.70
Broadleaf plants/sm Insects	139.62
Fruits/pods/seeds/lg insects	21.72

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	0
Mid	100	65	0
Large	1000	29	0

EEC equivalent dose	Avian Classes and Body Weights	

(mg/kg-bw)	small 20 g	mid 100 g	large 1000 g
Short Grass	301	171	76
Tall Grass	127	73	32
Broadleaf plants/sm Insects	159	91	40
Fruits/pods/lg insects	25	14	6

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	#DIV/0!	#DIV/0!	#DIV/0!
Tall Grass	#DIV/0!	#DIV/0!	#DIV/0!
Broadleaf plants/sm insects	#DIV/0!	#DIV/0!	#DIV/0!
Fruits/pods/lg insects	#DIV/0!	#DIV/0!	#DIV/0!

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	#DIV/0!	0.88
Tall Grass	#DIV/0!	0.37
Broadleaf plants/sm Insects	#DIV/0!	0.47
Fruits/pods/lg insects	#DIV/0!	0.07

PBO 0 Mean Kenaga Residues

Mammalian Results

Mammalian Class	Body Weight	% body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	10044	196
	35	66	8127	158
	1000	15	3515	68
	15	21	10044	196

	Grainvores	35 1000	15 3	8127 3515	158 68	

EEC equivalent dose (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	251	174	40			
Tall Grass	106	74	17			
Broadleaf plants/sm Insects	133	92	21			
Fruits/pods/seeds/lg insects	21	14	3	5	3	1

Dose-based RQs(daily dose/LD50 or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.02	1.28	0.02	1.10	0.01	0.58
Tall Grass	0.01	0.54	0.01	0.47	0.00	0.24
Broadleaf plants/sm insects	0.01	0.68	0.01	0.58	0.01	0.31
Fruits/pods/lg insects	0.00	0.11	0.00	0.09	0.00	0.05
Seeds (granivore)	0.00	0.02	0.00	0.02	0.00	0.01

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				
Short Grass	#DIV/0!	0.15				
Tall Grass	#DIV/0!	0.06				
Broadleaf plants/sm insects	#DIV/0!	0.08				
Fruits/pods/seeds/lg insects	#DIV/0!	0.01				

Upper Bound and Mean Kenaga Residue and RQ

This spreadsheet-based model calculates the decay of a chemical applied to foliar surfaces for single or multiple applications. It uses the same principle as the batch code models FATE and TERREEC that calculate terrestrial exposure concentration estimates on plant surfaces following pesticide application. A first order decay assumption is used to determine the concentration at each day after initial application based on the concentration resulting from the initial and additional applications. The decay is calculated from the first order rate equation:

$$C_0 = C_i e^{-kt}$$

or in log form:

$$\ln(C_i) = kT - \ln(C_0)$$

Where

C_0 = concentration at time T = day zero.

C_i = concentration, in parts per million (PPM), present initially (on day zero) on the surfaces. C_i is calculated by multiplying the application rate, in pounds active ingredient per acre, by 240 for short grass, 110 for tall grass, and 135 for broad-leafed plants/small insects and 15 for fruits/pods/large insects based on the Kenaga nomogram (Hoerger and Kenaga, 1972) as modified by Fletcher (1994). For maximum concentrations, additional applications are converted from pounds active ingredient per acre to PPM on the plant surface and the additional mass added to the mass of the chemical still present on the surfaces on the day of application.

k = If the foliar dissipation data submitted to EFED are found scientifically valid and statistically robust for a specific pesticide, the 90% upper confidence limit of the mean half-lives should be used. When scientifically valid, statistically robust data are not available, EFED recommends the using a default half-life value of 35 days. The use of the 35-day half-life is based on the highest reported value (36.9 days), as reported by Willis and McDowell (Pesticide persistence on foliage, Environ. Contam. Toxicol, 100:23-73, 1987).

t = time, in days, since the start of the simulation. The initial application is on day 0. The simulation is designed to run for 365 days.

The spreadsheet calculates the pesticide residue concentrations on each type of surface on a daily interval for one year. The maximum concentration during the year is calculated for both maximum and mean residues.

The calculated residue concentrations are used to calculate Avian and Mammalian risk quotient (RQ) values. The maximum calculated concentration is divided by user input values for acute and chronic endpoints to give RQs for each type of plant surface.

Dosed- based RQ

In both worksheets, dose-based RQs are calculated using a body weight-adjusted LD50 and consumption-weighted equivalent dose. The scaling factors (USEPA, 1993) used in the consumption-weighted (EECs) are:

Avian consumption

$$F = \frac{0.648 * BW^{0.651}}{(1-W)}$$

Mammal consumption

$$F = \frac{0.621 * BW^{0.564}}{(1-W)}$$

These consumption-weighted EECs (i.e., EEC equivalent dose) are sorted by food source and body size. There is a corresponding table for birds and mammals.

The LD50 values entered on the input form are adjusted for animal class (20, 100 and 1000 g birds and 15, 35, and 1000 g mammals) using the following equations:

Avian LD_{50}

$$\text{Adj. } LD_{50} = LD_{50} \left(\frac{AW}{TW}\right)^{(1.15 - 1)}$$

Mammal LD_{50}

$$\text{Adj. } LD_{50} = LD_{50} \left(\frac{AW}{TW}\right)^{(0.25)}$$

The dose-based RQs are calculated by dividing the daily dose (EEC equivalent dose) by the adjusted LD50 for each food category and animal class.

For dietary-based RQs, the Kenaga EEC is divided by the LC50 (acute RQ) or the NOAEC (chronic RQ).

References

Fletcher, J.S., J.E. Nellesson and T. G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain(Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ. Tox. and Chem. 13(9):1383-1391

Hoerger, F. and E.E. Kenaga. 1972. Pesticide residues on plants: correlation of respresentative dada as a basis for estimation of their magnitude in the environment. IN: F. Coulston and F. Corte, eds., Environmental Quality and Safety: Chemistry, Toxicology and Technology. Vol 1. Georg Theime Publishers, Stuttgart, Germany. pp. 9-28

Mineau, P., B.T. Collins, A. Baril. 1996. On the use of scaling factors to improve interspecies extrapolation to acute toxicity in birds. Reg. Toxicol. Pharmacol. 24:24-29

USEPA. 1993. Wildlife Exposure Factors Handbook. Volume I of II. EPA/600/R-93/187a. Office of Research and Development, Washington, D. C. 20460.

Willis and McDowell. 1987. Pesticide persistence on foliage. Environ. Contam. Toxicol. 100:23-73

Appendix E. Environmental Fate Data Requirements for Piperonyl Butoxide

Guideline #		Data Requirement	Is Data Requirement Satisfied?	MRID #'s	Study Classification
161-1	835.2120	Hydrolysis	Yes	42010005 42374101 43595601	Unacceptable Unacceptable Supplemental, upgradeable to Acceptable
161-2	835.2240	Photodegradation in Water	Yes	42010006 42374102 42606302 43637201	Unacceptable Unacceptable Unacceptable Upgradeable to Acceptable
161-3	835.2410	Photodegradation on Soil	Yes	42010004 42490201 42606301 42927601 43720801	Unacceptable Unacceptable Unacceptable Unacceptable Supplemental
161-4	835.2370	Photodegradation in Air	Waived 02/04/1991	–	--
162-1	835.4100	Aerobic Soil Metabolism	Yes	42029401 42490202 43806401	Unacceptable Unacceptable Acceptable
162-2	835.4200	Anaerobic Soil Metabolism	Waived	42010003 42374103	Unacceptable Unacceptable

162-3	835.4400	Anaerobic Aquatic Metabolism	Yes	42010001 42374104 43836501	Unacceptable Unacceptable Supplemental
162-4	835.4300	Aerobic Aquatic Metabolism	Yes	42010002 42374015 43803401	Unacceptable Unacceptable Upgradeable to Acceptable
163-1	835.1240 835.1230	Leaching-Adsorption/ Desorption	Yes	41820301 42490203 42526301 43673801 43673802	Upgradeable Upgradeable Upgradeable Acceptable Supplemental (aged column study is invalid)
163-2	835.1410	Laboratory Volatility	Waived 02/04/1991	–	--
163-3	835.8100	Field Volatility	Waived 02/04/1991	–	--
164-1	835.6100	Terrestrial Field Dissipation	Waiver request: MRID 43834801	42010004 42927601 42745501 42900401	Unacceptable Unacceptable Unacceptable Unacceptable
164-2	835.6200	Aquatic Field Dissipation	Waiver request: MRID 43834802	43125701	Unacceptable
164-3	835.6300	Forestry Dissipation	Reserved	–	--
164-4	835.6400	Combination Products and Tank Mixes Dissipation	Reserved	–	--

165-4	850.1730	Accumulation in Fish	Yes	42404401 42538803	Acceptable Acceptable
165-5	850.1950	Accumulation-aquatic non-target	Reserved	–	--
166-1	835.7100	Ground Water-small prospective	Reserved	–	--
201-1	840.1100	Droplet Size Spectrum	Reserved	–	--
202-1	840.1200	Drift Field Evaluation	Reserved	–	--

Appendix F. Ecological Data Requirements for Piperonyl Butoxide

Table A2. Status of ecological effect data needs for Piperonyl Butoxide

Guideline #	Data Requirement	Are Data Adequate for Risk Assessment?	MRID #'s	Study Classification
71-1a	Bobwhite Quail Acute Oral		419690-08	Core
71-1b	Mallard Duck Acute Oral			
71-2a	Bobwhite Quail Subacute Dietary		419690-06	Core
71-2b	Mallard Duck Subacute Dietary		419690-07	core
71-3	Wild Mammal Toxicity			
71-4a	Bobwhite Quail Reproduction		438763-01	Core
71-4b	Mallard Duck Reproduction		438763-02	Core
71-5a	Simulated Terrestrial Field Study			
71-5b	Actual Terrestrial Field Study			
72-1a	Freshwater Fish (Bluegill Sunfish) Acute		42540302	core
72-1b	Freshwater Fish Acute			
72-1c	Freshwater Fish (Rainbow Trout) Acute		42540303	core
72-1d	Freshwater Fish Acute			
72-2a	Freshwater Invertebrate (Waterflea) Acute		42540301	core
72-2b	Freshwater Invertebrate (Waterflea) Acute			

Guideline #	Data Requirement	Are Data Adequate for Risk Assessment?	MRID #'s	Study Classification
72-3a	Estuarine/Marine Fish (Sheepshead Minnow) Acute		42540304	core
72-3b	Estuarine/Marine Invertebrate (Eastern Oyster) Acute		425403-05	Supplemental
72-3c	Estuarine/Marine Invertebrate (Mysid Shrimp) Acute		43901801	core
72-4a	Freshwater Fish Early Life Stage (Fathead Minnow)		433003-01	Core
72-4b	Freshwater Invertebrate Life Cycle (Waterflea)		43311301	core
72-4c	Estuarine/Marine Invertebrate Life Cycle (Mysid Shrimp)			
72-4	Estuarine/Marine Fish Early life Stage			
72-5	Freshwater Fish Life Cycle		Waiver requested 1994 denied now outstanding	
72-6	Aquatic Organism Accumulation			
72-7a	Simulated Aquatic Field Study			
72-7b	Actual Aquatic Field Study			
122-1a	Seed Germination/ Seedling Emergence (Tier I)			
122-1b	Vegetative Vigor (Tier I)			
122-2	Aquatic Plant Growth (Tier I)			
122-2	Aquatic Plant algal Toxicity (Tier I)			
123-1a	Seed Germination/ Seedling Emergence (Tier II)			

Guideline #	Data Requirement	Are Data Adequate for Risk Assessment?	MRID #'s	Study Classification
123-1b	Vegetative Vigor (Tier II)			
123-2	Aquatic Plant Growth (Tier II)			
124-1	Terrestrial Field Study			
124-2	Aquatic Field Study			
141-1	Honey Bee Acute Contact		419690-09	Core
141-2	Honey Bee Residue on Foliage			
141-5	Field Test for Pollinators			

DR = Data required; ND = No data to evaluate; NS = No data submitted.

Appendix G Listed Species Listing

Summary of Listed Species

Group of Organism	Number of Species	Number of States
Amphibian	16	9
Bird	56	47
Clam	65	27
Crustacean	19	12
Fish	100	38
Mammals	61	48
Reptile	28	26
Snail	28	12

Appendix H Results of PRZM-EXAMS Modeling

Key: "stored as" gives state and crop (PRZM scenario). 'G' after crop name indicates ground spray; no letter indicates aerial spray.

stored as CAcitrus.out
Chemical: PBO
PRZM environment: CAcitrusC.txt modified Satday, 12 October 2002 at 16:31:50
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w23155.dvf modified Wedday, 3 July 2002 at 09:04:20
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	12.37	12.14	11.4	10.16	9.415	5.421		
1962	28.65	28.21	26.63	24.35	22.52	13.28		
1963	31.42	30.91	29.03	26.08	24.44	15.5		
1964	21.3	21.05	20.22	18.77	17.84	11.62		
1965	19.82	19.57	18.66	17.76	17.2	11.35		
1966	21.35	21.07	20.18	18.42	17.29	10.83		
1967	19	18.75	17.96	16.54	15.75	10.03		
1968	17.59	17.34	16.52	15.11	14.29	8.931		
1969	17.35	17.13	16.66	15.67	14.81	9.113		
1970	19.79	19.49	18.43	16.55	15.52	9.47		
1971	17.83	17.59	16.81	15.41	14.52	9.191		
1972	17.38	17.13	16.33	14.87	13.95	9.004		
1973	18.94	18.67	17.8	16.45	15.59	9.56		
1974	20.81	20.51	19.4	17.52	16.92	10.65		
1975	18.85	18.59	17.75	16.27	15.36	9.567		
1976	17.32	17.07	16.27	14.89	14.03	8.699		
1977	16.9	16.65	15.84	14.86	14.37	9.171		
1978	84.89	83.73	78.11	67.78	62.09	33.94		
1979	30.58	30.31	29.42	27.78	26.63	17.44		
1980	21.28	21.02	20.19	18.8	17.88	11.69		
1981	19.08	18.82	17.99	16.58	15.68	9.697		
1982	17.64	17.39	16.56	15.27	14.47	8.96		
1983	21.66	21.35	20.4	18.81	17.77	11.03		
1984	18.33	18.1	17.31	15.92	15.04	9.503		
1985	17.57	17.33	16.54	15.2	14.31	9.07		
1986	17.62	17.38	16.59	15.4	14.58	9.262		
1987	17.56	17.33	16.55	15.19	14.28	9.06		
1988	17.61	17.36	16.56	15.14	14.29	9.08		
1989	17.41	17.18	16.41	15.01	14.08	8.804		
1990	17.21	16.98	16.22	14.84	13.94	8.689		
0.1	30.387	30.1	28.79	25.907	24.248	15.278		

Average of yearly averages:

10.9204

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAcitrus
Metfile: w23155.dvf
PRZM scenario: CAcitrusC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	14.3	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	15-01	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single

app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAcitrusG.out
Chemical: PBO
PRZM environment: CAcitrusC.txt modified Satday, 12 October 2002 at 16:31:50
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w23155.dvf modified Wedday, 3 July 2002 at 09:04:20
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	2.473	2.428	2.279	2.032	1.883	1.084		
1962	17.63	17.32	16.17	14.5	13.37	7.462		
1963	19.12	18.79	17.58	15.75	14.76	9.059		
1964	7.794	7.73	7.537	7.179	6.924	4.741		
1965	8.489	8.367	7.908	7.161	6.654	4.372		
1966	7.667	7.568	7.323	6.649	6.2	3.91		
1967	5.358	5.298	5.111	4.776	4.604	3.04		
1968	4.073	4.021	3.851	3.561	3.455	2.25		
1969	4.999	4.93	4.657	4.174	3.945	2.449		
1970	6.66	6.55	6.173	5.457	5.053	3.058		
1971	4.644	4.591	4.421	4.107	3.902	2.625		
1972	3.93	3.879	3.714	3.409	3.212	2.423		
1973	5.617	5.538	5.332	5.021	4.854	3.019		
1974	9.779	9.608	8.971	7.871	7.204	4.237		
1975	5.695	5.627	5.431	5.019	4.755	3.052		
1976	4.066	4.015	3.849	3.557	3.373	2.157		
1977	5.233	5.159	4.846	4.275	3.935	2.705		
1978	75.09	73.79	68.44	58.99	53.84	28.58		
1979	17.93	17.84	17.62	17.14	16.81	11.34		
1980	8.31	8.245	8.051	7.724	7.475	5.164		
1981	5.771	5.706	5.514	5.18	4.959	3.183		
1982	4.4	4.344	4.141	3.958	3.819	2.453		
1983	8.464	8.335	8.169	7.564	7.076	4.266		

1984	4.777	4.726	4.559	4.256	4.057	2.655
1985	3.932	3.883	3.721	3.442	3.257	2.148
1986	3.969	3.921	3.74	3.651	3.504	2.284
1987	3.792	3.744	3.585	3.305	3.118	2.071
1988	3.943	3.891	3.722	3.425	3.284	2.209
1989	3.803	3.754	3.595	3.298	3.098	1.955
1990	3.55	3.504	3.35	3.073	2.891	1.811

0.1 17.9 17.788 17.439 15.625 14.621 8.8993

Average of yearly averages:

4.39206666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAcitrusG
Metfile: w23155.dvf
PRZM scenario: CAcitrusC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	15-01	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.

Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAgrapes.out
Chemical: PBO
PRZM environment: CAgrapesC.txt modified Satday, 12 October 2002 at 16:36:14
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	12.32	12.1	11.36	10.07	9.299	5.112		
1962	15.56	15.33	14.57	13.15	12.26	7.474		
1963	16.95	16.73	16.1	14.86	13.98	8.848		
1964	17.66	17.42	16.63	15.22	14.32	9.18		
1965	22.36	22.02	20.9	18.67	17.37	10.92		
1966	18.91	18.65	17.82	16.27	15.24	9.796		
1967	18.71	18.46	17.62	16.23	15.29	9.666		
1968	17.78	17.54	16.73	15.27	14.33	9.125		
1969	26.89	26.49	25.46	23.6	22.13	13.31		
1970	21.76	21.47	20.56	19	17.85	11.47		
1971	19.05	18.8	17.98	16.62	15.75	10.28		
1972	18.2	17.94	17.08	15.61	14.66	9.424		
1973	18.14	17.9	17.4	15.98	14.97	9.43		
1974	17.85	17.6	16.82	15.42	14.48	9.118		
1975	17.64	17.4	16.63	15.28	14.37	9.18		

1976	17.74	17.49	16.7	15.32	14.39	9.333
1977	17.94	17.73	16.94	15.42	14.47	9.136
1978	19.05	18.76	17.87	16.47	15.4	9.515
1979	18.02	17.76	16.94	15.46	14.47	9.011
1980	22.19	21.87	20.92	19.07	17.88	10.98
1981	18.67	18.42	17.9	16.42	15.41	9.606
1982	19.06	18.87	17.94	16.36	15.33	9.722
1983	19.63	19.36	18.57	17.09	16.05	10.02
1984	17.82	17.56	16.73	15.27	14.3	8.819
1985	17.22	16.98	16.19	14.68	13.7	8.398
1986	19.33	19.03	17.94	16.17	15.05	9.142
1987	18.33	18.07	17.24	15.64	14.56	9.07
1988	17.46	17.2	16.38	15.05	14.17	8.891
1989	18.08	17.81	17.05	15.54	14.5	8.996
1990	17.47	17.21	16.39	14.92	14	8.804

0.1 22.147 21.83 20.866 18.967 17.802 10.974

Average of yearly averages:

9.39253333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAgrapes
Metfile: w93193.dvf
PRZM scenario: CAgrapesC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt	338.45	g/mol		
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol		
Vapor Pressure	vapr	5e-13	torr		
Solubility	sol	143	mg/L		
Kd	Kd		mg/L		
Koc	Koc	399	mg/L		
Photolysis half-life	kdp	5.07	days	Half-life	
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife	
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife	
Aerobic Soil Metabolism	asm	73	days	Halfife	
Hydrolysis: pH 5	0	days	Half-life		
Hydrolysis: pH 7	0	days	Half-life		
Hydrolysis: pH 9	0	days	Half-life		
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	0.56	kg/ha		
Application Efficiency:	APPEFF	0.95	fraction		

Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 15-02 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAgrapesG.out
Chemical: PBO
PRZM environment: CAgrapesC.txt modified Satday, 12 October 2002 at 16:36:14
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	2.465	2.42	2.272	2.014	1.86	1.025		
1962	3.131	3.084	2.941	2.659	2.48	1.514		
1963	3.843	3.792	3.692	3.439	3.237	2.038		
1964	3.712	3.664	3.505	3.218	3.033	1.977		
1965	8.496	8.356	7.893	6.924	6.347	3.702		

1966	4.775	4.719	4.541	4.203	3.97	2.694
1967	4.768	4.705	4.501	4.161	3.923	2.533
1968	3.938	3.886	3.718	3.413	3.215	2.098
1969	13.56	13.39	13.19	12.05	11.15	6.297
1970	7.92	7.827	7.615	7.123	6.704	4.473
1971	5.152	5.096	4.917	4.687	4.52	3.149
1972	4.261	4.204	4.023	3.715	3.509	2.371
1973	4.471	4.416	4.201	3.888	3.654	2.335
1974	3.863	3.812	3.669	3.414	3.215	2.063
1975	3.671	3.624	3.468	3.195	3.009	1.944
1976	3.608	3.56	3.401	3.123	2.936	1.944
1977	3.7	3.673	3.524	3.214	3.019	1.92
1978	5.265	5.18	4.968	4.667	4.353	2.587
1979	4.235	4.179	4.001	3.681	3.462	2.2
1980	8.782	8.648	8.431	7.632	7.195	4.216
1981	5.324	5.264	5.045	4.695	4.443	2.915
1982	5.492	5.426	5.199	4.68	4.357	2.781
1983	5.75	5.673	5.527	5.166	4.852	2.991
1984	4.125	4.071	3.896	3.593	3.382	2.166
1985	3.679	3.63	3.47	3.16	2.956	1.848
1986	6.101	5.994	5.593	4.918	4.529	2.638
1987	4.88	4.812	4.631	4.224	3.924	2.478
1988	3.96	3.905	3.731	3.538	3.389	2.192
1989	4.467	4.401	4.298	3.995	3.736	2.305
1990	3.802	3.75	3.582	3.304	3.144	2.083

0.1 8.4384 8.3031 7.8652 7.1031 6.6683 4.1646

Average of yearly averages:

2.58256666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAgrapesG
Metfile: w93193.dvf
PRZM scenario: CAgrapesC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life

Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 15-02 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAlettuce.out
Chemical: PBO
PRZM environment: CAlettuceC.txt modified Monday, 8 November 2004 at 11:06:34

EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13958.dvf modified Wedday, 3 July 2002 at 09:06:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	76.48	74.58	68.12	59.07	53.12	25.55		
1962	54.83	54.09	51.23	49.48	48.88	33.81		
1963	134	131	120	103	94.07	51.77		
1964	69.83	68.59	63.88	57.64	55.88	43.03		
1965	76.11	74.77	70.84	62.1	56.57	38.31		
1966	74.46	73.19	70.44	62.47	57.07	37.45		
1967	58.19	57.18	54.32	51.92	48.43	32.29		
1968	55.02	54.14	52.45	47.55	44.89	31.42		
1969	80.27	78.82	74.09	66.34	61.26	37.57		
1970	103	102	98.79	86.78	78.1	47.39		
1971	53.3	52.64	50.06	47.06	46.91	38.61		
1972	102	99.68	97.61	84.9	76.7	45.62		
1973	59.36	58.66	55.87	53.09	50.55	35.54		
1974	59.51	58.44	54.56	49.3	47.73	32.03		
1975	107	106	98.38	93.92	86.56	49.58		
1976	98.79	97.84	92.54	82.26	76.58	50.01		
1977	99.37	98.17	93.95	82.42	74.94	47.32		
1978	84.45	82.85	78.51	74.09	69.91	45.14		
1979	59.8	59.02	57.15	54.17	53.45	37.05		
1980	133	131	121	111	103	56.46		
1981	107	105	102	90.85	82.73	55.33		
1982	85.64	84.21	79.29	75.27	69.56	46.29		
1983	91.25	89.86	85.34	77.43	74.47	47.31		
1984	52.42	51.77	50.69	46.24	44.9	32.75		
1985	45.03	44.38	42.53	40.39	38.92	26.87		
1986	94.8	93	88.43	78.44	71.06	39.6		
1987	73.4	71.96	69.12	60.27	54.58	38.54		
1988	79.18	78.24	75.03	69.09	67.5	42.89		
1989	55.74	54.84	52.73	50.11	48.5	32.92		
1990	76.26	74.71	69.43	62.56	57.06	35.9		

0.1 107 105.9 101.679 93.613 86.177 51.594
Average of yearly averages:

40.4783333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAlettuce
Metfile: w13958.dvf

PRZM scenario: CAlettuceC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	24-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			
UPTKF	0			
Record 18:	PLVKRT	0		
PLDKRT	0			

FEXTRC 0.5

Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAlettuceG.out
Chemical: PBO
PRZM environment: CAlettuceC.txt modified Monday, 8 November 2004 at 11:06:34
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13958.dvf modified Wedday, 3 July 2002 at 09:06:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	74.54	72.62	66.07	57.12	51.15	22.66		
1962	49.06	48.23	46.2	43.58	42.41	29.65		
1963	128	125	114	97.8	89.23	48.03		
1964	65.3	64.1	59.55	51.54	50.25	38.73		
1965	70.04	68.75	64.97	56.5	51.39	33.53		
1966	66.74	65.55	63.24	55.94	51.03	32.49		
1967	50.02	49.13	46.74	44.6	41.76	27.32		
1968	47.82	47.02	45.38	40.82	37.75	26.14		
1969	71.54	70.2	65.93	59.1	53.99	32.55		
1970	98.36	96.92	93.75	82.18	73.76	42.75		
1971	47.38	46.56	43.38	40.38	40.17	33.79		
1972	95.97	94.39	92.37	80.11	72.21	41.24		
1973	50.43	49.84	47.49	44.21	42.27	30.49		
1974	52.31	51.33	47.78	42.01	39.9	26.92		
1975	102	101	93.81	88.84	81.86	45.02		
1976	91.51	90.67	85.73	76.1	70.21	45.39		
1977	92.03	90.85	86.75	75.96	68.96	42.66		
1978	77.61	76.09	72.15	68.61	63.78	40.62		
1979	50.27	49.62	46.96	45.47	45.25	32.01		
1980	126	123	114	105	97.42	52.43		
1981	103	101	98.35	87.22	79.02	51.34		
1982	79.75	78.38	73.72	69.39	64.18	41.99		
1983	81.74	80.49	76.3	69.54	67.37	42.84		
1984	42.07	41.71	40.52	36.74	36.29	27.82		
1985	33.86	33.39	31.71	30.95	30.39	21.74		
1986	89.72	87.86	83.2	73.34	66.33	35.06		
1987	68.18	66.78	63.94	55.53	50.03	33.8		
1988	70.6	69.51	65.47	60.62	59.9	38.36		
1989	48.94	48.13	45.99	43.1	40.86	28.05		
1990	69.4	67.93	62.99	56.53	51.56	31.23		

0.1 102.9 101 97.896 88.678 81.576 47.766

Average of yearly averages:

35.8883333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAlettuceG
Metfile: w13958.dvf
PRZM scenario: CAlettuceC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	24-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.

Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAsugarbeet.out
Chemical: PBO
PRZM environment: CAsugarbeetC.txt modified Thuday, 29 May 2003 at 15:17:54
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	12.32	12.1	11.36	10.09	9.34	5.17		
1962	15.8	15.57	15.05	13.69	12.78	7.836		
1963	20.81	20.53	19.95	18.71	17.61	11.07		
1964	19.15	18.91	18.11	16.66	15.72	10.33		
1965	34.5	33.92	32.14	28.57	26.31	15.81		
1966	22.09	21.82	20.95	19.31	18.19	12.21		
1967	24.43	24.1	23.08	21.73	20.47	13.07		
1968	21.39	21.19	20.28	18.78	17.69	11.53		
1969	42.2	41.56	40.36	38.1	35.75	21.13		
1970	31.4	31	29.96	27.82	26.12	17.02		
1971	23.48	23.2	22.28	21.18	20.39	13.92		
1972	20.34	20.06	19.17	17.66	16.65	11.14		
1973	24.86	24.56	23.29	21.24	19.93	12.52		
1974	20.38	20.11	19.52	18.42	17.38	11.18		
1975	19.81	19.55	18.65	17.15	16.14	10.45		
1976	18.69	18.45	17.64	16.22	15.26	10.13		
1977	18.68	18.54	17.77	16.22	15.27	9.773		
1978	25.64	25.23	24.21	23.47	22.07	13.22		
1979	22.43	22.12	21.26	19.69	18.51	11.72		
1980	34.99	34.46	33.39	30.06	27.98	16.89		
1981	25.12	24.81	23.61	21.8	20.57	13.2		

1982	28.87	28.5	27.66	25.51	23.67	14.79
1983	31.96	31.53	30.81	28.57	26.96	16.64
1984	21.63	21.35	20.47	18.93	17.85	11.55
1985	19.01	18.76	18.01	16.41	15.36	9.658
1986	30.57	30.04	28.05	24.78	22.82	13.36
1987	23.14	22.82	22	20.12	18.79	12.02
1988	20.91	20.71	19.82	18.74	18.28	11.92
1989	26.54	26.17	24.63	23.12	21.75	13.4
1990	20.24	19.97	19.11	17.61	16.7	11.27

0.1 34.246 33.681 32.007 28.57 26.895 16.865

Average of yearly averages:

12.4642333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAsugarbeet
Metfile: w93193.dvf
PRZM scenario: CAsugarbeetC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	15-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.

Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAsugarbeetG.out
Chemical: PBO
PRZM environment: CAsugarbeetC.txt modified Thuday, 29 May 2003 at 15:17:54
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	2.465	2.42	2.272	2.037	1.902	1.086		
1962	3.781	3.727	3.513	3.224	3.023	1.892		
1963	8.907	8.766	8.437	7.806	7.32	4.351		
1964	5.269	5.215	5.044	4.722	4.502	3.173		
1965	21.28	21.01	19.62	17.26	15.79	8.802		
1966	8.089	8.019	7.818	7.402	7.087	5.208		
1967	10.73	10.59	10.22	10.04	9.506	6.085		
1968	7.815	7.718	7.507	7.135	6.736	4.603		
1969	30.87	30.39	29.44	27.16	25.34	14.44		
1970	18.1	17.95	17.64	16.33	15.33	10.26		

1971	10.75	10.64	10.21	9.539	9.377	6.941
1972	6.489	6.421	6.223	5.86	5.605	4.158
1973	11.66	11.52	10.89	9.629	8.871	5.553
1974	7.321	7.272	7.014	6.543	6.255	4.213
1975	5.935	5.864	5.614	5.15	4.859	3.271
1976	4.607	4.552	4.377	4.067	3.839	2.775
1977	4.621	4.566	4.391	4.045	3.852	2.584
1978	13.32	13.12	12.67	11.96	11.32	6.448
1979	8.828	8.724	8.501	8.108	7.705	5.02
1980	22.78	22.53	21.53	19.04	17.67	10.38
1981	12.16	12.03	11.49	10.44	9.838	6.656
1982	16.32	16.08	15.5	14.45	13.41	8.06
1983	19.56	19.29	18.45	17.12	16.23	9.887
1984	8.093	8.02	7.817	7.427	7.135	5.014
1985	5.539	5.48	5.365	4.959	4.689	3.16
1986	17.81	17.47	16.2	14.01	12.79	7.036
1987	9.89	9.768	9.63	8.888	8.375	5.551
1988	10.54	10.41	9.949	8.802	8.126	5.353
1989	14.37	14.15	13.26	11.89	11.3	6.891
1990	6.993	6.908	6.514	6.104	6.027	4.65

0.1 21.108 20.838 19.503 17.246 16.186 10.2227

Average of yearly averages:

5.78336666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAsugarbeetG
Metfile: w93193.dvf
PRZM scenario: CAsugarbeetC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life

Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 15-02 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAtomato.out
Chemical: PBO
PRZM environment: CAtomatoC.txt modified Satday, 12 October 2002 at 16:38:04
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly

1961	12.32	12.07	11.34	10.05	9.199	4.903
1962	16.7	16.42	15.53	14.03	13.05	8.156
1963	23.72	23.38	22.76	20.86	19.48	12.06
1964	19.76	19.49	18.62	17.07	16.01	10.89
1965	21.24	20.93	19.87	18.02	16.83	11.12
1966	19.02	18.72	17.79	16.16	15.06	10.12
1967	31.41	30.96	29.33	25.78	23.94	14.67
1968	22.03	21.72	20.77	19.01	17.76	12.62
1969	29.77	29.33	28.24	25.18	23.19	15.05
1970	21.74	21.47	20.59	18.88	17.68	12.29
1971	23.89	23.57	22.33	20.69	19.52	13.14
1972	19.83	19.55	18.67	17.04	16.01	11
1973	20.04	19.75	18.84	17.15	15.97	10.85
1974	20.99	20.69	19.76	18.04	16.78	11.17
1975	20	19.74	18.91	17.31	16.18	10.93
1976	19.98	19.7	18.84	17.2	16.08	11.43
1977	20.45	20.14	19.19	17.67	16.61	11
1978	23.61	23.26	22.27	20.23	18.67	11.7
1979	19.43	19.15	18.24	16.59	15.44	9.998
1980	18.42	18.14	17.27	15.72	14.69	9.434
1981	20.24	19.92	19.33	17.67	16.44	10.18
1982	22.71	22.36	21.26	19.3	17.86	11.58
1983	25.16	24.78	23.24	21.8	20.66	13.29
1984	19.83	19.56	18.67	16.96	15.78	10.32
1985	18.51	18.21	17.27	15.65	14.54	9.714
1986	20.12	19.81	18.88	17.17	15.97	10.25
1987	20.48	20.16	19.2	17.86	16.94	11.37
1988	21.03	20.74	19.99	18.21	17.01	10.73
1989	20.69	20.35	19.37	17.77	16.63	10.63
1990	19.32	19.04	18.38	17.6	17.15	11.34

0.1 25.033 24.659 23.192 21.706 20.546 13.275

Average of yearly averages:

11.0645

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAtomato
Metfile: w93193.dvf
PRZM scenario: CAtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	

Henry's Law Const. henry 1.56e-14 atm-m^3/mol
Vapor Pressure vapr 5e-13 torr
Solubility sol 143 mg/L
Kd Kd mg/L
Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 15-03 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as CAtomatoG.out
Chemical: PBO
PRZM environment: CAtomatoC.txt modified Satday, 12 October 2002 at 16:38:04
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	2.604	2.572	2.453	2.15	1.975	1.19		
1962	4.519	4.451	4.255	3.903	3.665	2.553		
1963	11.09	10.93	10.73	9.883	9.252	5.665		
1964	6.019	5.955	5.762	5.395	5.13	4.027		
1965	7.484	7.382	7.025	6.339	5.938	4.158		
1966	5.325	5.262	5.024	4.505	4.243	3.277		
1967	18.79	18.49	17.39	15.06	13.66	8.001		
1968	8.492	8.395	8.183	7.581	7.15	6.001		
1969	16.59	16.4	15.76	13.93	12.8	8.373		
1970	8.024	7.951	7.748	7.313	6.976	5.59		
1971	10.97	10.83	10.28	9.363	8.787	6.373		
1972	6.093	6.026	5.831	5.444	5.24	4.226		
1973	6.2	6.127	5.925	5.513	5.198	4.087		
1974	7.3	7.208	6.996	6.474	6.024	4.475		
1975	6.216	6.155	5.966	5.583	5.293	4.052		
1976	6.53	6.436	6.08	5.563	5.322	4.399		
1977	6.548	6.467	6.256	5.921	5.675	4.133		
1978	10.15	10.01	9.691	8.823	8.116	5.111		
1979	5.88	5.809	5.609	5.205	4.889	3.483		
1980	4.957	4.894	4.703	4.352	4.108	2.875		
1981	7.23	7.125	6.789	6.384	6.028	3.799		
1982	9.366	9.223	8.794	8.018	7.392	5.013		
1983	13.4	13.18	12.3	10.74	10.05	6.677		
1984	6.354	6.286	6.09	5.679	5.366	3.995		
1985	5.248	5.177	4.977	4.596	4.327	3.51		
1986	6.98	6.889	6.676	6.243	5.899	4.045		
1987	8.074	7.957	7.509	6.972	6.845	5.145		
1988	8.617	8.51	8.06	7.255	6.686	4.353		
1989	7.425	7.308	7.112	6.72	6.349	4.255		
1990	9.658	9.501	8.82	7.572	7.221	4.979		
0.1	13.169	12.955	12.143	10.6543	9.9702	6.6466		

Average of yearly averages: 4.594

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAtomatoG
Metfile: w93193.dvf
PRZM scenario: CAtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5		0	days	Half-life
Hydrolysis: pH 7		0	days	Half-life
Hydrolysis: pH 9		0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	15-03	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			

UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcabbage.out
Chemical: PBO
PRZM environment: FLcabbageC.txt modified Satday, 12 October 2002 at 16:39:00
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	45.5	44.54	31.1	16.73	11.18	2.757		
1962	40.94	40.22	37.51	32.91	30.56	19.97		
1963	62.63	61.73	60.73	50.96	36.96	21.45		
1964	62.88	62.09	59.14	55.25	52.7	36.1		
1965	48.49	47.94	46	42.44	40.38	27.6		
1966	37.33	36.93	35.91	33.64	32.51	22.36		
1967	27.42	27	25.4	21.17	20.31	15.67		
1968	30.84	30.36	29.33	25.59	20.01	16.19		
1969	85.53	84	78.8	46.69	35.22	25.56		
1970	73.7	72.99	70.39	64.62	60.84	38.76		
1971	42.36	41.82	39.88	36.36	34.3	24.69		
1972	35.42	34.92	31.47	25.59	24.02	18.76		
1973	34.93	34.46	32.32	29.33	27.73	19.94		
1974	36.49	35.91	31.33	28.13	26.41	18.64		
1975	32.59	32.12	30.36	27.48	25.74	17.1		
1976	19.56	19.29	18.44	16.23	14.6	12.68		
1977	28.44	28	27.24	21.65	19.47	14.55		
1978	28.06	27.62	23.65	22.98	22.13	15.55		
1979	36.95	36.41	34.8	32.29	31.12	20.89		
1980	32.53	31.97	30.15	24.39	19.52	15.61		
1981	55.11	54.2	38.25	34.47	32.07	22.82		
1982	52.89	52.05	50.16	45.86	43.13	28.15		
1983	55.2	54.31	51.13	33.18	29.65	23.4		
1984	52.02	51.32	48.77	44.34	41.72	27		
1985	27.38	26.9	25.92	24.09	19.77	16.19		
1986	32.58	31.99	29.94	23.15	22.94	18.01		
1987	33.52	32.96	30.95	27.43	26.37	19.67		
1988	82.25	81	77	54.85	39.97	24.36		

1989 67.09 66.09 62.4 57.44 53.93 35.52
1990 42.08 41.56 39.56 36.44 34.53 22.74

0.1 73.039 72.3 69.591 55.21 51.743 34.783
Average of yearly averages:
21.4229

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcabbage
Metfile: w12842.dvf
PRZM scenario: FLcabbageC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	31-10	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.

Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcabbageG.out
Chemical: PBO
PRZM environment: FLcabbageC.txt modified Satday, 12 October 2002 at 16:39:00
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	39.18	38.31	24.31	10.06	6.711	1.655		
1962	35.21	34.55	32.1	27.97	25.92	15.89		
1963	57.26	56.59	52.96	42.86	30.66	16.1		
1964	55.7	54.96	52.24	48.57	46.25	30.94		
1965	40.18	39.71	38.1	35.15	33.48	22.04		
1966	29.37	29.02	28.26	26.16	25.07	16.43		
1967	16.65	16.38	15.46	14.1	13.19	9.543		
1968	19.65	19.41	18.86	15.98	12.36	9.975		
1969	76.86	75.43	70.55	37.95	28.37	19.6		
1970	66.14	65.49	63.07	57.76	54.29	33.38		
1971	35.26	34.77	32.99	29.86	28.11	18.94		
1972	26.07	25.69	21.97	18.73	17.65	13.08		
1973	25.92	25.55	22.96	21.69	20.48	14.27		
1974	26.92	26.45	23.11	20.64	19.34	13.08		
1975	23.81	23.45	22.07	19.89	18.59	11.53		
1976	10.51	10.39	9.836	8.694	8.189	6.74		
1977	17.1	16.84	16.54	12.17	11.55	8.434		
1978	18.9	18.57	14.95	14.66	14.21	9.445		

1979	28.93	28.46	27.1	24.99	23.99	15.24
1980	20.95	20.58	19.34	15.1	11.9	9.738
1981	46.6	45.77	31.29	27.9	25.82	17
1982	44.58	43.81	42.27	38.61	36.29	22.68
1983	45.94	45.16	42.21	24.69	23.35	17.79
1984	43.79	43.17	40.9	37.04	34.79	21.46
1985	16.96	16.83	16.36	15.18	12.18	10.43
1986	21.64	21.24	19.85	16.38	15.62	12.37
1987	22.19	21.94	20.98	19.97	19.32	14.13
1988	74.2	72.73	68.24	46.99	33.8	18.87
1989	59.81	58.9	55.52	51.19	48.02	30.71
1990	33.66	33.23	31.62	29.24	27.79	17.47

0.1 65.507 64.831 62.315 48.412 45.254 29.907

Average of yearly averages:

15.9653333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcabbageG
Metfile: w12842.dvf
PRZM scenario: FLcabbageC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt	338.45	g/mol		
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol		
Vapor Pressure	vapr	5e-13	torr		
Solubility	sol	143	mg/L		
Kd	Kd		mg/L		
Koc	Koc	399	mg/L		
Photolysis half-life	kdp	5.07	days	Half-life	
Aerobic Aquatic Metabolism		kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	0	days	Halfife
Aerobic Soil Metabolism		asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:		DEPI	0	cm	
Application Rate:		TAPP	0.56	kg/ha	
Application Efficiency:		APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond		
Application Date	Date	31-10	dd/mm or dd/mmm or dd-mm or dd-mmm		

Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcitrus.out
Chemical: PBO
PRZM environment: FLcitrusC.txt modified Satday, 12 October 2002 at 16:39:50
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	18.57	18.21	16.86	16.22	15.48	9.085		
1962	33.43	32.82	31.3	27.52	25.45	15.2		
1963	22.19	21.85	20.84	18.95	17.67	14.22		
1964	52.07	51.03	46.86	44.92	42.43	25.8		
1965	29.77	29.28	28.41	26.17	24.42	20		
1966	32.42	31.96	30.11	26.9	25.08	19.32		
1967	23.36	23.05	22.04	20.14	18.93	15.69		

1968	25.53	25.09	23.46	22.51	21.09	16.01
1969	46.85	46	44.55	41.17	37.98	25.94
1970	40.26	39.67	37.46	33.45	33.04	23.2
1971	51.78	50.72	46.76	39.98	36.46	23.94
1972	28.35	27.94	26.51	24.69	23.85	19.12
1973	57.86	57.16	53.79	46.57	42.15	24.4
1974	36.07	35.43	33.09	29.08	27.27	21.55
1975	28.61	28.08	27.01	24.46	22.88	17.93
1976	45.66	45.04	42.32	37.53	34.3	21.75
1977	25.43	25.08	24.07	22.16	20.85	15.3
1978	23.31	22.92	21.99	20.56	20.43	14.03
1979	144	142	130	110	97.35	48.61
1980	57.07	56.29	53.27	49.97	47.79	34.77
1981	37.06	36.42	35.41	31.9	31.21	24.14
1982	31.02	30.58	29.19	27.04	26.95	20.03
1983	55.59	54.59	52.61	46.45	44.36	27.39
1984	31.83	31.31	29.24	26.3	26.11	19.95
1985	32.22	31.57	29.21	26.1	24.14	18.8
1986	47.94	47.3	46.46	41.53	38.4	22.95
1987	87.58	85.84	79.26	68.89	62.9	35.41
1988	38.02	37.53	36.44	34.08	32.43	23.76
1989	23.84	23.51	22.51	20.64	19.33	15.26
1990	27.38	26.88	24.99	22	20.57	13.86

0.1 57.781 57.073 53.738 49.63 47.447 34.032

Average of yearly averages:

21.5805

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcitrus
Metfile: w12842.dvf
PRZM scenario: FLcitrusC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife

Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 28-02 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcitrusG.out
Chemical: PBO
PRZM environment: FLcitrusC.txt modified Satday, 12 October 2002 at 16:39:50
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30

Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	10.76	10.54	9.731	9.262	8.878	5.7		
1962	22.79	22.5	21.4	18.9	17.46	10.56		
1963	15.42	15.12	14.58	13.33	12.33	9.021		
1964	44.03	43.13	39.79	36.55	34.87	20.94		
1965	23.59	23.18	22.47	20.74	19.3	14.79		
1966	25.97	25.49	23.92	21.28	19.74	13.98		
1967	15.35	15.11	14.33	13.51	12.95	10.28		
1968	18.5	18.13	16.98	16.53	15.5	10.5		
1969	39.89	39.36	38.02	35.14	32.4	20.78		
1970	28.49	28.22	27.15	24.05	24.54	18.03		
1971	44.82	43.83	40.18	34.05	30.94	18.89		
1972	21.66	21.27	19.81	18.56	17.4	14.03		
1973	48	47.13	44.06	38.06	34.4	19.56		
1974	30.91	30.31	28.05	24.32	22.35	16.7		
1975	23.17	22.7	21.76	19.36	18.04	13.04		
1976	38.92	38.39	36	31.85	29.02	16.89		
1977	13.41	13.28	13.1	12.71	12.77	10.07		
1978	16.08	15.78	14.85	13.51	12.68	8.735		
1979	141	139	127	106	94.38	44.85		
1980	48.35	47.7	45.22	42.71	40.55	30.44		
1981	31.07	30.51	29.47	26.48	24.47	19.19		
1982	24.29	23.94	22.85	21.14	19.71	14.92		
1983	44.75	43.93	42.74	37.9	36.67	22.57		
1984	24.81	24.36	22.65	20.39	19.06	14.84		
1985	26.54	25.96	23.82	21.18	19.53	13.85		
1986	39.8	39.18	36.97	32.62	30.23	18.17		
1987	78.66	77.06	71	61.61	56.26	31.11		
1988	27.06	26.82	26.11	24.74	23.87	18.89		
1989	15.42	15.19	14.69	13.51	12.47	10.2		
1990	16.21	15.92	14.8	13.11	12.44	8.857		
0.1	48.315	47.643	45.104	42.245	40.162	29.653		

Average of yearly averages:

16.6794333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcitrusG
Metfile: w12842.dvf
PRZM scenario: FLcitrusC.txt
EXAMS environment file: pond298.exv

Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	28-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			
UPTKF	0			
Record 18:	PLVKRT	0		
PLDKRT	0			
FEXTRC	0.5			
Flag for Index Res. Run	IR	Pond		

Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcucumber.out
Chemical: PBO
PRZM environment: FLcucumberC.txt modified Satday, 12 October 2002 at 16:40:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	50.29	49.23	33.75	18.47	12.58	3.102		
1962	45.49	44.68	41.66	36.57	33.89	22.07		
1963	89.87	88.34	84.26	68.47	48.9	24.54		
1964	75.81	74.91	71.54	67.45	64.06	43.24		
1965	51.72	51.16	49.27	45.71	43.51	29.95		
1966	40.58	40.14	39.01	36.59	35.3	24.28		
1967	32.97	32.43	30.42	22.29	21.02	16.62		
1968	39.52	38.87	37.89	32.46	25.08	19.39		
1969	86.43	84.93	79.87	51.31	38.82	27.74		
1970	74.69	73.97	71.4	65.5	61.68	39.56		
1971	42.46	41.93	40.04	36.57	34.47	24.96		
1972	37.34	36.85	33.38	29.21	25.96	20.36		
1973	38.12	37.62	34.46	31.05	29.37	21.67		
1974	44.03	43.3	36.72	30.83	28.94	20.67		
1975	39.17	38.59	36.42	33.03	30.95	21.03		
1976	21.74	21.45	20.53	18.87	18.09	14.94		
1977	28.88	28.46	27.94	23.34	21.36	15.96		
1978	31.2	30.73	24.47	23.52	22.58	16.58		
1979	41.99	41.38	39.56	36.59	35.02	23.36		
1980	37.38	36.75	35.66	29.22	22.58	17.84		
1981	61.93	60.89	39.09	35.44	33.08	24.2		
1982	59.39	58.43	56.37	51.48	48.27	31.51		
1983	57.21	56.32	53.34	36.84	33.68	26.45		
1984	54.9	54.19	51.58	46.97	44.15	28.69		
1985	42.72	42.08	41.67	38.38	29.06	18.76		
1986	37.65	37.22	36.1	33.45	32.43	24.29		
1987	38.4	37.79	36.36	33.33	30.94	23.44		
1988	101	98.72	91.78	65.26	47.51	27.83		
1989	77.51	76.38	72.15	66.18	62.08	40.67		
1990	44.44	43.91	41.89	38.61	36.56	24.21		

0.1 85.538 84.075 79.098 66.112 60.402 38.755

Average of yearly averages:

23.9304

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcucumber
Metfile: w12842.dvf
PRZM scenario: FLcucumberC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	24-10	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single

app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLcucumberG.out
Chemical: PBO
PRZM environment: FLcucumberC.txt modified Satday, 12 October 2002 at 16:40:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	44.65	43.66	27.54	11.35	7.621	1.879		
1962	40.33	39.57	36.76	32.04	29.61	18.04		
1963	83.4	82.02	76.17	60.61	42.59	19.3		
1964	69.53	68.67	65.48	61.45	58.35	38.37		
1965	43.97	43.49	41.88	38.86	37.01	24.49		
1966	33.08	32.69	31.79	29.34	28.26	18.44		
1967	23.03	22.62	21.09	15	14.07	10.53		
1968	29.19	28.73	27.26	22.65	17.33	13.31		
1969	78.43	77.01	72.21	42.29	31.63	21.87		
1970	67.61	66.94	64.52	59.01	55.46	34.23		
1971	35.62	35.14	33.4	30.28	28.47	19.22		
1972	28.58	28.2	24.47	21.14	19.87	14.74		
1973	29.75	29.33	25.62	23.78	22.46	16.07		
1974	35.32	34.69	27.97	23.77	22.26	15.2		
1975	31.12	30.62	28.76	25.98	24.28	15.63		
1976	12.21	12.08	11.52	10.91	10.82	9.1		
1977	18.27	18	17.75	14.57	13.77	9.899		
1978	22.66	22.27	15.92	15.54	14.95	10.53		
1979	34.58	34.02	32.41	29.64	28.35	17.83		
1980	26.78	26.31	25.06	19.67	15.11	12.07		
1981	54.18	53.2	32.43	29.14	27.07	18.45		
1982	51.79	50.89	49.12	44.77	41.92	26.18		
1983	48.62	47.82	45.03	29.3	27.64	20.98		

1984	47.24	46.59	44.22	40.09	37.6	23.22
1985	36.59	36.19	33.97	29.64	22.08	13.11
1986	29.64	29.29	28.48	26.4	25.78	18.94
1987	27.92	27.65	26.52	25.39	24.39	18.08
1988	92.62	90.52	84.09	57.38	41.18	22.5
1989	71.13	70.06	66.08	60.61	56.79	36.09
1990	36.56	36.13	34.45	31.82	30.18	19

0.1	77.7	76.315	71.597	60.45	54.173	33.425

Average of yearly averages:

18.5766

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcucumberG
Metfile: w12842.dvf
PRZM scenario: FLcucumberC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:		DEPI	0	cm
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:		APPEFF	0.99	fraction
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	24-10	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single

app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLpepper.out
Chemical: PBO
PRZM environment: FLpeppersC.txt modified Satday, 12 October 2002 at 16:41:28
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12844.dvf modified Wedday, 3 July 2002 at 09:04:30
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	33.31	32.53	29.86	26.83	23.57	6.084		
1962	50.25	49.56	48.74	46.21	43.14	20.55		
1963	136	133	127	114	105	42.64		
1964	177	173	163	146	130	71.42		
1965	269	263	251	221	190	96.32		
1966	161	160	155	144	137	98.14		
1967	111	109	104	96.28	88.88	60.35		
1968	147	144	135	125	117	64.46		
1969	110	108	104	95.44	91.37	68.26		
1970	77.01	76.49	74.43	70.31	67.27	49.11		
1971	58.72	57.64	54	47.5	43.14	29.81		
1972	130	127	116	93.16	69.39	34.84		

1973	79.51	78.53	75.03	68.77	64.75	49.57
1974	105	103	99.76	87.96	80.28	42.71
1975	67.91	66.98	65.9	62.65	59.57	44.8
1976	73.35	72.09	67.34	62.19	57.24	37.25
1977	53.31	52.75	50.16	46.88	44.53	34.92
1978	70.14	69.44	65.73	60	57.02	34.53
1979	83.33	81.57	75.18	66.11	61.38	39.03
1980	50.43	50.02	48.42	45.55	43.54	34.41
1981	84.36	82.75	76.75	66.14	56.95	31.53
1982	104	102	97.14	86.31	78.21	45.98
1983	94.23	92.51	88.03	80.83	77.71	52.93
1984	116	114	107	92.46	82.28	51.62
1985	86.53	85.68	82.4	76.08	71.8	53.77
1986	76.42	75.53	71.03	62.29	54.35	38.52
1987	121	120	112	106	98.22	47.5
1988	81.85	81.12	78.22	72.77	69.19	53.59
1989	58.44	57.38	55.23	50.07	46.29	36.09
1990	69.75	68.58	66.94	62.07	57.46	33.43

0.1	159.6	158.4	153	142.1	128.7	71.104

Average of yearly averages:

46.8054666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLpepper
Metfile: w12844.dvf
PRZM scenario: FLpeppersC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life

Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 15-09 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLpepperG.out
Chemical: PBO
PRZM environment: FLpeppersC.txt modified Satday, 12 October 2002 at 16:41:28
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12844.dvf modified Wedday, 3 July 2002 at 09:04:30

Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	26.55	25.91	23.71	20.93	17.53	4.422		
1962	45.08	44.1	42.42	39.09	36.36	16.7		
1963	130	127	121	109	100	38.79		
1964	172	169	158	142	127	68.49		
1965	269	262	251	221	188	94.51		
1966	161	160	154	143	136	96.3		
1967	105	104	97.42	90.14	83.18	56.86		
1968	141	138	129	120	112	61.02		
1969	104	102	97.89	89.78	85.63	64.89		
1970	72.69	72.2	70.25	66.35	63.48	45.01		
1971	51.28	50.3	46.94	41	35.7	25.06		
1972	126	123	112	89.03	63.37	30.63		
1973	76.08	75.11	71.67	65.55	61.64	46.02		
1974	98.58	96.36	92.76	81.81	74.52	38.83		
1975	61.36	60.58	58.65	55.43	52.96	40.94		
1976	66.27	65.09	60.7	55.07	50.24	32.88		
1977	46.75	46.23	44.63	42.07	39.94	30.33		
1978	63.39	62.65	59.35	53.57	50.09	29.95		
1979	75.05	73.45	67.66	59.35	54.68	34.72		
1980	45.34	44.97	43.51	40.92	39.1	29.9		
1981	78.04	76.5	70.75	60.44	50.04	26.9		
1982	99.01	97.42	91.94	81.71	72.42	42.1		
1983	87.18	85.6	81.66	74.35	71.71	49.36		
1984	113	111	103	87.94	76.46	47.87		
1985	83.06	82.22	78.99	72.8	68.64	50.2		
1986	68.51	67.59	63.75	56.03	47.68	34.4		
1987	117	115	108	101	93.25	43.82		
1988	78.28	77.57	74.76	69.5	66.05	50.08		
1989	50.14	49.24	46.55	42.68	40.27	31.98		
1990	64.52	63.18	59.54	54.95	51.01	29.24		
0.1 159	157.8	151.5	139.8	125.5	68.13			

Average of yearly averages:

43.0734

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLpepperG
Metfile: w12844.dvf

PRZM scenario: FLpeppersC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5		0	days	Half-life
Hydrolysis: pH 7		0	days	Half-life
Hydrolysis: pH 9		0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	15-09	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			

UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLstrawberry.out
Chemical: PBO
PRZM environment: FLstrawberryC.txt modified Thuday, 23 September 2004 at 07:50:23
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	79.61	77.88	74.14	66.16	47.8	11.79		
1962	66.35	65.35	63.66	59.6	48.6	37.66		
1963	121	119	115	98.94	75.32	44.34		
1964	92.3	91.35	87.76	81.82	77.12	58.47		
1965	88.16	86.87	84.79	79.43	65.16	51.21		
1966	90.38	88.93	86.81	79.51	63.86	49.93		
1967	95.42	93.82	91.45	82.41	66.62	50.21		
1968	101	98.93	96.61	88.62	72.69	53.53		
1969	86.62	85.33	83.33	75.45	69.47	53.75		
1970	74	72.97	71.12	66.29	61.58	47.3		
1971	70.55	69.77	68.04	62.38	52.7	41.92		
1972	94.17	92.55	89.67	82.44	65.54	42.33		
1973	99.65	97.86	95.05	87.76	69.24	50.54		
1974	98.71	97.04	94.83	86.75	69.39	51.79		
1975	106	105	102	93.97	75.25	53.08		
1976	83.71	82.94	79.96	74.24	70.24	52.73		
1977	87.13	85.66	82.62	75.25	61.03	46.36		
1978	90.53	88.9	86.81	80.15	64.82	48.15		
1979	86.87	85.45	83.14	76.41	62.43	48.52		
1980	84.57	83.19	80.71	73.3	59.07	46.77		
1981	90.46	88.96	87.18	80.8	65.14	47.91		
1982	85.83	84.33	82.49	75.61	61.85	48.85		
1983	78.8	77.55	74.23	68.78	58.45	46.25		
1984	82.56	81.19	78.02	70.78	56.61	44.2		

1985	103	101	96.92	89.81	69.98	46.06
1986	96.53	94.68	91.82	84.34	69.15	53.3
1987	104	102	97.49	90.36	72.68	52.86
1988	97.2	95.5	90.42	81.74	67.83	53.6
1989	85.9	84.69	82.11	75.43	62.58	48.77
1990	69.31	68.55	65.62	60.15	56.68	36.86

0.1 103.9 101.9 97.433 90.305 74.994 53.593

Average of yearly averages:

47.3013333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLstrawberry
Metfile: w12842.dvf
PRZM scenario: FLstrawberryC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:		DEPI	0	cm
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:		APPEFF	0.95	fraction
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	15-10	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.

Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLstrawberryG.out
Chemical: PBO
PRZM environment: FLstrawberryC.txt modified Thuday, 23 September 2004 at 07:50:23
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	73.19	71.58	68.4	60.88	43.67	10.77		
1962	57.73	56.87	55.78	51.98	43.95	34.26		
1963	114	112	108	92.28	69.56	39.94		
1964	86.76	85.85	82.43	76.29	72.31	54.26		
1965	79.54	78.39	76.16	71.69	58.69	46.65		
1966	82.28	81	78.93	71.73	57.3	45.18		
1967	86.65	85.25	83.42	74.79	60.2	45.56		

1968	91.47	89.99	88.37	81.07	66.36	48.91
1969	77.86	76.69	74.98	67.35	63.96	48.99
1970	65.36	64.48	62.79	58.41	55.7	42.32
1971	62.13	61.46	59.75	54.09	46.75	36.92
1972	86.08	84.58	81.8	75.13	59.36	37.65
1973	92	90.33	87.52	80.75	63.26	46.18
1974	90.89	89.34	87.33	79.67	63.43	47.64
1975	99.18	97.49	95.01	87.33	69.67	49.04
1976	78.17	77.44	74.64	69.27	65.52	48.5
1977	78.29	76.96	74.1	67.44	54.49	41.6
1978	82.12	80.68	79.08	72.76	58.58	43.45
1979	78.92	77.62	75.39	68.88	56.15	44.07
1980	75.84	74.59	72.39	65.51	53.75	42.24
1981	81.36	80.07	78.94	73.13	58.69	43.18
1982	77.54	76.23	74.64	68	56.05	44.27
1983	70.05	68.93	66.15	60.74	53.1	41.62
1984	73.45	72.22	69.42	62.87	49.95	39.41
1985	94.97	93.09	89.81	83.07	64.19	41.58
1986	88.66	86.96	84.21	77.48	63.4	49.21
1987	96.27	94.61	90.28	83.46	66.89	48.78
1988	89.7	88.12	83.42	74.47	62.9	49.37
1989	77.84	76.76	74.27	67.94	57.65	44.54
1990	63.02	62.32	59.64	54.65	51.48	32.19

0.1 96.14 94.458 90.233 83.421 69.293 49.193

Average of yearly averages:

42.9426666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLstrawberryG
Metfile: w12842.dvf
PRZM scenario: FLstrawberryC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	

Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 15-10 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLtomato.out
Chemical: PBO
PRZM environment: FLtomatoC.txt modified Satday, 12 October 2002 at 16:44:04
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12844.dvf modified Wedday, 3 July 2002 at 09:04:30
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	41.81	40.9	38.07	34.11	31.02	16.56		
1962	57.6	56.46	53.07	47.25	43.39	25.55		
1963	36.61	36.01	33.8	29.53	26.93	20.24		
1964	44.24	43.77	42.87	39.38	38.06	24.98		
1965	39.06	38.57	36.13	31.71	29.47	19.27		
1966	129	127	117	102	92.2	49.97		
1967	75.04	73.82	68.98	65.3	61.56	39.46		
1968	52.87	52.11	49.13	44.3	41.29	26.96		
1969	56.19	55.25	52.25	46.91	43.82	27.53		
1970	103	102	97.07	88.37	80.46	45.25		
1971	42.23	41.69	39.08	34.75	32.48	25.65		
1972	39.22	38.62	37.48	35.95	34.07	22.78		
1973	30.79	30.33	28.68	27.12	25.92	17.16		
1974	44.89	43.96	40.52	35.57	32.59	19.94		
1975	21.63	21.3	20.34	18.62	17.47	12.84		
1976	69.72	68.21	65.53	56.4	51.35	28.61		
1977	55.64	54.52	51.78	47.49	43.18	27.19		
1978	31.94	31.57	31.03	29.43	27.85	18.44		
1979	86.63	84.64	77.56	65.76	58.77	31.69		
1980	81.75	80.26	74.69	66.87	61.66	37.7		
1981	61.85	60.96	57.07	52.17	48.03	29.26		
1982	79.83	78.36	72.68	67.35	62.36	36.15		
1983	68.45	67.3	63.66	58.85	55.13	32.85		
1984	84.97	83.53	79.73	72.92	72.13	43.96		
1985	67.83	66.59	61.9	59.39	55.44	34.74		
1986	50.23	49.61	48.24	44.95	41.79	26.71		
1987	68.39	67.1	64.6	58.71	54.05	30.93		
1988	43.12	42.45	41.06	37.92	36.51	23.68		
1989	40.59	39.98	37.56	32.33	29.37	19.8		
1990	33.45	32.82	30.48	26.8	25.01	16.04		

0.1 86.464 84.529 79.513 72.363 71.153 43.51

Average of yearly averages:

27.7296666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLtomato
Metfile: w12844.dvf
PRZM scenario: FLtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	24-01	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single

app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLtomatoG.out
Chemical: PBO
PRZM environment: FLtomatoC.txt modified Satday, 12 October 2002 at 16:44:04
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12844.dvf modified Wedday, 3 July 2002 at 09:04:30
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	36.62	35.78	32.68	29.32	26.63	13.28		
1962	51.08	50.01	46.97	41.79	38.3	21.41		
1963	30.66	30.09	28.12	24.33	22.07	15.46		
1964	36.01	35.57	34.01	30.48	29.85	20.24		
1965	28.3	28	26.3	23.08	21.2	14.36		
1966	122	120	110	95.81	86.8	46.21		
1967	65.48	64.43	60.22	57.88	54.85	35.24		
1968	42.37	41.78	39.45	35.77	33.34	22.04		
1969	47.02	46.21	43.69	39.32	36.83	22.59		
1970	96.99	95.77	90.72	82.63	75.16	41.17		
1971	36.67	36.16	33.77	29.9	27.5	20.86		
1972	32.65	32.12	31.31	29.69	27.66	18.08		
1973	20.89	20.56	19.37	18.11	17.67	12.26		
1974	36.44	35.64	32.68	28.63	26.18	15.18		
1975	12.19	11.99	11.44	10.24	9.551	7.758		
1976	60.96	59.61	57.36	49.22	44.62	24.03		
1977	50.6	49.52	46.97	42.94	38.9	22.5		
1978	21.3	21.07	20.55	19.85	19.02	13.34		

1979	82.07	80.09	73.08	61.51	54.73	27.17
1980	73.21	71.86	66.82	59.57	54.97	33.42
1981	51.74	51.03	47.62	43.99	40.57	24.72
1982	73.92	72.51	67.05	61.54	56.75	32.09
1983	59.4	58.4	55.35	50.89	47.83	28.53
1984	78.63	77.26	73.83	67.1	65.46	40
1985	60.61	59.46	55.3	53.51	50.03	30.47
1986	42.74	42.23	40.33	37.87	35.04	22.12
1987	60.92	59.72	57.06	52.06	47.92	26.56
1988	34.38	33.84	32.98	30.34	29.12	18.97
1989	34.08	33.5	31.33	26.7	24.11	15.09
1990	22.77	22.35	20.76	18.38	17.26	11.26

0.1 81.726 79.807 73.755 66.544 64.589 39.524

Average of yearly averages:

23.2136

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLtomatoG
Metfile: w12844.dvf
PRZM scenario: FLtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt	338.45	g/mol		
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol		
Vapor Pressure	vapr	5e-13	torr		
Solubility	sol	143	mg/L		
Kd	Kd		mg/L		
Koc	Koc	399	mg/L		
Photolysis half-life	kdp	5.07	days	Half-life	
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife	
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife	
Aerobic Soil Metabolism	asm	73	days	Halfife	
Hydrolysis: pH 5	0	days	Half-life		
Hydrolysis: pH 7	0	days	Half-life		
Hydrolysis: pH 9	0	days	Half-life		
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	0.56	kg/ha		
Application Efficiency:	APPEFF	0.99	fraction		

Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 24-01 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLturf.out
Chemical: PBO
PRZM environment: FLturfC.txt modified Monday, 16 June 2003 at 14:48:06
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12834.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	12.13	11.87	11.06	9.736	9.027	5.493

1962	**15.41**	**15.16**	**14.35**	**12.9**	**11.96**	**8.702**
1963	**17.72**	**17.44**	**16.53**	**14.93**	**14.29**	**10.47**
1964	**23.18**	**22.78**	**21.8**	**19.37**	**18.85**	**12.59**
1965	**20.15**	**19.85**	**18.85**	**17.1**	**15.98**	**11.78**
1966	**30.35**	**29.82**	**27.83**	**26.23**	**25.08**	**16.62**
1967	**21.71**	**21.41**	**20.46**	**18.73**	**17.56**	**14.36**
1968	**23.38**	**22.97**	**21.7**	**19.17**	**17.76**	**14.01**
1969	**20.74**	**20.47**	**19.62**	**17.97**	**17.48**	**12.44**
1970	**22.34**	**21.98**	**20.99**	**19.89**	**18.56**	**11.55**
1971	**24.26**	**23.84**	**22.3**	**20.13**	**19.03**	**12.81**
1972	**45.43**	**44.53**	**41.08**	**35.5**	**32.49**	**19.35**
1973	**23.06**	**22.73**	**21.82**	**21.05**	**20**	**13.36**
1974	**25.41**	**24.97**	**23.3**	**20.56**	**19.22**	**12.54**
1975	**19.78**	**19.49**	**18.44**	**17.48**	**16.73**	**11.02**
1976	**43.66**	**42.77**	**39.49**	**35.03**	**32.23**	**18.92**
1977	**23.62**	**23.29**	**22.32**	**20.53**	**19.31**	**13.93**
1978	**32.53**	**31.94**	**29.71**	**26.28**	**24.63**	**16.53**
1979	**33.68**	**33.13**	**32.04**	**28.58**	**27.88**	**17.81**
1980	**21.81**	**21.51**	**20.57**	**19.82**	**19.01**	**12.81**
1981	**24.54**	**24.2**	**23.68**	**21.93**	**20.58**	**13.02**
1982	**33.89**	**33.33**	**31.15**	**27.41**	**25.64**	**16.18**
1983	**39.85**	**39.18**	**36.78**	**33.25**	**30.65**	**18.65**
1984	**39.49**	**38.9**	**36.38**	**32.68**	**31**	**20.32**
1985	**23.27**	**22.95**	**22.33**	**21.52**	**20.6**	**14**
1986	**19.22**	**18.94**	**18.06**	**16.48**	**15.42**	**10.55**
1987	**28.68**	**28.19**	**26.32**	**23.18**	**21.48**	**13.17**
1988	**23.03**	**22.68**	**21.65**	**19.41**	**18.03**	**11.49**
1989	**17.85**	**17.56**	**16.66**	**15.33**	**14.97**	**9.741**
1990	**25.53**	**25.08**	**24.02**	**21.99**	**20.37**	**11.81**

0.1 39.814 39.152 36.74 33.193 30.965 18.893

Average of yearly averages:

13.5342

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLturf
Metfile: w12834.dvf
PRZM scenario: FLturfC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	**Variable Name**	**Value**	**Units**	**Comments**

Molecular weight mwt 338.45 g/mol
Henry's Law Const. henry 1.56e-14 atm-m^3/mol
Vapor Pressure vapr 5e-13 torr
Solubility sol 143 mg/L
Kd Kd mg/L
Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 15-02 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5

Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as FLturfG.out
Chemical: PBO
PRZM environment: FLturfC.txt modified Monday, 16 June 2003 at 14:48:06
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12834.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	3.334	3.269	3.097	2.707	2.471	1.664		
1962	6.784	6.648	6.153	5.87	5.431	3.404		
1963	8.551	8.387	7.833	7.129	6.841	4.777		
1964	14.7	14.41	13.64	11.76	10.73	6.812		
1965	10.2	10.02	9.36	8.269	7.628	5.822		
1966	20.15	19.79	18.44	17.59	17.11	10.74		
1967	13.93	13.67	12.76	11.86	11.31	8.474		
1968	16.36	16.03	14.99	13.04	11.83	8.058		
1969	10.22	10.05	9.75	9.06	8.38	6.405		
1970	11.05	10.86	10.16	9.413	8.938	5.7		
1971	13.86	13.59	12.6	11.47	10.85	6.959		
1972	35.62	34.86	31.95	27.35	24.94	13.85		
1973	12.11	11.97	11.56	10.77	10.46	7.638		
1974	14.32	14.05	13.05	11.32	10.53	6.86		
1975	9.917	9.753	9.229	8.086	7.553	5.261		
1976	34.46	33.69	30.86	27.29	25.04	13.39		
1977	11.03	10.92	10.71	10.23	9.977	8.213		
1978	23.48	23.01	21.23	18.76	17.72	10.99		
1979	22.48	22.22	21.19	18.75	18.93	12.39		
1980	10.81	10.72	10.23	9.729	9.473	7.097		
1981	12.87	12.69	12.1	11.75	11.11	7.245		
1982	24.3	23.88	22.19	19.15	17.49	10.52		
1983	28.25	27.75	25.88	23.59	21.76	12.9		
1984	29.39	28.94	26.94	24.23	23.2	14.6		
1985	13.16	13	12.37	11.34	11.03	8.294		
1986	6.645	6.576	6.377	5.986	5.705	4.714		
1987	17.98	17.64	16.34	14.13	12.85	7.388		
1988	10.52	10.39	10.04	8.968	8.349	5.6		

1989 7.551 7.416 6.936 6.046 5.512 3.964
1990 14.08 13.86 13.54 12.15 11.11 6.238

0.1 29.276 28.821 26.834 24.166 23.056 13.341
Average of yearly averages:
7.86556666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLturfG
Metfile: w12834.dvf
PRZM scenario: FLturfC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	15-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single

app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as IDpotato.out
Chemical: PBO
PRZM environment: IDpotatoC.txt modified Satday, 12 October 2002 at 17:00:44
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24156.dvf modified Wedday, 3 July 2002 at 09:04:38
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	12.37	12.21	11.61	11.36	11.09	5.653		
1962	19.86	19.57	18.65	17.13	16.54	12.27		
1963	24.39	24.07	23.1	21.01	19.66	14.29		
1964	28.08	27.69	26.49	23.58	21.98	16.19		
1965	29.71	29.31	27.63	26.25	25.04	18.88		
1966	26.67	26.35	25.38	23.37	22.07	18.26		
1967	29.26	28.88	27.82	24.98	23.31	17.64		
1968	26.42	26.09	25.11	23.06	22.14	17.84		
1969	30.94	30.54	29.49	26.69	24.86	19.02		
1970	30.62	30.21	29.15	26.62	24.78	19.13		
1971	26.29	25.98	25.02	23.13	21.84	18.38		
1972	25.75	25.44	24.48	22.62	22.23	18.59		

1973	27.23	26.88	25.88	24.38	23.33	19.03
1974	25.9	25.55	24.55	22.62	21.4	17.81
1975	25.14	24.83	23.87	21.88	20.64	16.71
1976	24.03	23.73	22.79	20.91	19.75	16.14
1977	24.46	24.11	23.11	21.19	19.94	15.78
1978	22.98	22.69	21.74	19.94	18.79	14.79
1979	23.24	22.95	22.01	20.37	19.33	15.17
1980	23.64	23.35	22.54	20.85	19.76	15.59
1981	24.03	23.73	22.78	20.94	19.7	15.71
1982	23.56	23.26	22.32	20.62	19.72	15.79
1983	28.3	27.92	26.9	24.74	23.42	17.78
1984	27.64	27.4	26.19	25.22	24.61	19.55
1985	28.7	28.33	27.07	25.04	23.72	19.49
1986	25.57	25.22	24.24	22.45	21.24	17.55
1987	23.86	23.54	22.58	21.34	20.45	16.34
1988	23.26	22.92	21.93	20.01	18.8	15.17
1989	23.26	22.96	22	20.11	18.92	14.97
1990	24.43	24.1	23.11	21.07	19.79	14.98

0.1 29.665 29.267 27.801 26.147 24.763 19.12

Average of yearly averages:

16.4831

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: IDpotato
Metfile: w24156.dvf
PRZM scenario: IDpotatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life

Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 24-05 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as IDpotatoG.out
Chemical: PBO
PRZM environment: IDpotatoC.txt modified Satday, 12 October 2002 at 17:00:44
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30

Metfile: w24156.dvf modified Wedday, 3 July 2002 at 09:04:38
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	7.769	7.667	7.327	6.965	6.782	2.421		
1962	7.682	7.586	7.216	6.6	6.487	5.751		
1963	9.47	9.354	9.101	8.346	7.805	5.923		
1964	12.01	11.89	11.35	10.02	9.259	6.671		
1965	14.61	14.38	13.53	12.77	12.14	8.602		
1966	9.456	9.37	9.152	8.873	8.764	7.656		
1967	11.96	11.84	11.47	10.18	9.397	6.972		
1968	9.106	9.004	8.794	8.181	8.133	7.049		
1969	13.38	13.26	12.97	11.57	10.69	7.981		
1970	13.25	13.13	12.97	11.67	10.79	8.269		
1971	8.582	8.503	8.288	7.825	7.589	7.307		
1972	10.94	10.78	10.16	9.287	8.868	7.408		
1973	10.78	10.63	10.06	9.384	9.207	7.929		
1974	8.402	8.31	8.094	7.639	7.487	6.855		
1975	7.387	7.313	7.105	6.638	6.338	5.72		
1976	6.424	6.371	6.166	5.822	5.658	5.141		
1977	7.071	6.978	6.764	6.236	5.891	4.962		
1978	5.694	5.629	5.432	5.034	4.775	4.078		
1979	5.58	5.517	5.324	5.029	4.841	4.033		
1980	5.915	5.833	5.627	5.329	5.113	4.265		
1981	6.008	5.941	5.743	5.336	5.055	4.406		
1982	5.68	5.615	5.421	5.179	5.13	4.494		
1983	10.41	10.28	10.04	9.274	8.972	6.435		
1984	13.69	13.52	12.73	11.47	10.82	8.288		
1985	11.62	11.47	10.86	9.825	9.362	8.233		
1986	7.989	7.902	7.684	7.268	7.035	6.407		
1987	7.636	7.536	7.156	6.519	6.375	5.438		
1988	6.19	6.111	5.9	5.472	5.183	4.689		
1989	6.231	6.16	5.957	5.526	5.239	4.541		
1990	7.33	7.229	7.019	6.371	5.994	4.483		
0.1	13.367	13.247	12.946	11.56	10.78	8.2654		

Average of yearly averages:

6.08023333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: IDpotatoG

Metfile: w24156.dvf
PRZM scenario: IDpotatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	24-05	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		

IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MEpotato.out
Chemical: PBO
PRZM environment: MEpotatoC.txt modified Satday, 12 October 2002 at 17:03:32
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14607.dvf modified Wedday, 3 July 2002 at 09:05:36
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	23.36	23.08	22.19	21.41	20.86	9.624		
1962	60.07	59.35	57.42	53.65	51.79	32.73		
1963	54.37	53.95	53.52	52.06	51.39	46.14		
1964	58.57	58.01	56.52	53.46	51.96	47.41		
1965	51.15	50.86	49.62	48.1	47.43	45.06		
1966	44.27	43.86	43	41.22	40.39	38.59		
1967	58.06	57.41	55.12	52.56	52.46	42.79		
1968	63.25	62.68	61.45	58.82	56.67	49.74		
1969	65.04	64.56	62.75	60.1	59.51	53.17		
1970	64.04	63.61	62.02	59.34	58.09	53.67		
1971	56.61	56.12	55.04	53.83	53.34	49.63		
1972	59.89	59.42	57.62	55.71	54.7	47.27		
1973	75.08	74.38	71.67	66.93	64.31	53.79		
1974	57.32	56.83	55.88	55.16	54.69	51.49		
1975	53.96	53.44	52.06	50.02	48.79	45.04		
1976	75.08	74.33	71.58	68.96	67.61	52.33		
1977	75.07	74.32	73.04	69.97	68.65	60.93		
1978	83.46	82.65	80.54	75.54	73.04	63.06		
1979	65.52	65.07	64.03	62.49	61.9	59.11		
1980	65.62	65.03	62.89	59.93	58.31	53.9		
1981	101	99.35	94.49	87.23	84.06	61.7		
1982	89.08	88.29	86.75	84.52	82.89	73.28		
1983	92	91.21	88.89	86.88	84.37	74.7		
1984	88.88	88.15	85.36	81.25	78.62	71.42		

1985	72.47	71.81	69.87	66.63	64.68	61.29
1986	64.14	63.61	61.85	60.73	59.7	55.1
1987	59.7	59.2	57.92	56.57	55.2	51.64
1988	52.09	51.59	50.6	49.8	49.34	46.71
1989	62.54	62.09	59.59	56.02	54.07	45.87
1990	69.5	68.84	67.05	63.4	62.58	53.69

0.1 89.06 88.276 86.611 84.193 82.463 70.584

Average of yearly averages:

51.6958

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MEpotato
Metfile: w14607.dvf
PRZM scenario: MEpotatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	13-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single

app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MEpotatoG.out
Chemical: PBO
PRZM environment: MEpotatoC.txt modified Satday, 12 October 2002 at 17:03:32
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14607.dvf modified Wedday, 3 July 2002 at 09:05:36
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	18.26	18.01	17.24	16.18	15.79	6.527		
1962	49.26	48.68	46.86	44.2	42.9	26.29		
1963	43.72	43.44	42.99	42.05	41.48	37.51		
1964	42.61	42.37	41.29	39.58	38.83	37.19		
1965	38.05	37.99	37.74	37.21	36.84	33.61		
1966	30.51	30.48	30.33	30.02	29.65	26.64		
1967	41.81	41.49	40.66	39.58	39.08	30.65		

1968	47.7	47.34	46.38	44.2	42.71	37.6
1969	51.91	51.48	49.91	47.57	46.61	40.9
1970	52.03	51.63	50.18	47.75	46.6	41.5
1971	43.73	43.66	43.38	42.8	42.4	37.3
1972	46.15	45.75	44.22	42.5	41.75	34.58
1973	57.35	56.88	54.65	51.37	49.57	41.29
1974	44.6	44.54	44.26	43.69	43.32	38.85
1975	37.29	36.96	35.81	34.25	33.78	32.18
1976	60.47	59.85	57.58	54.85	53.9	39.89
1977	59.93	59.31	58.65	56.51	55.65	48.76
1978	65.86	65.44	64.05	60.59	58.9	51.02
1979	52.37	52.04	51.78	51.26	50.8	47.05
1980	48.62	48.22	46.84	44.43	43.53	41.65
1981	87.84	86.52	82.01	75.25	72.32	49.63
1982	73.96	73.33	71.8	70.76	69.76	61.6
1983	77.64	76.99	74.43	72.79	71.03	63.16
1984	72.17	71.65	69.52	66.07	64.24	59.85
1985	55.21	54.77	54.54	54.04	53.66	49.29
1986	49.74	49.31	47.91	46.73	45.91	42.58
1987	42.54	42.23	41.67	41.17	40.83	38.8
1988	37.22	37.18	36.98	36.62	36.32	33.75
1989	47.63	47.25	45.22	42.43	40.87	33.05
1990	53.33	52.85	51.51	50.18	49.7	41.27

0.1 73.781 73.162 71.572 70.291 69.208 58.967

Average of yearly averages:

40.1322333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MEpotatoG
Metfile: w14607.dvf
PRZM scenario: MEpotatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	

Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 13-06 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MIbeans.out
Chemical: PBO
PRZM environment: MIbeansC.txt modified Monday, 10 May 2004 at 06:24:24
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14607.dvf modified Wedday, 3 July 2002 at 09:05:36
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	37.42	36.89	35.87	35.04	33.82	14.99		
1962	85.42	84.26	80.78	77.14	74.81	47.76		
1963	76.21	75.56	74.92	72.57	71.15	63.81		
1964	70.86	70.23	69.07	67.75	66.76	62.74		
1965	71.36	70.94	68.76	67.58	66.32	60.83		
1966	62.05	61.48	60.08	57.38	56.67	54.22		
1967	75.59	75	73.47	72.03	71.93	59.08		
1968	97.34	96.39	93.93	88.51	84.95	70.22		
1969	95.33	94.59	91.8	88.29	87.23	76.65		
1970	94.6	93.98	91.68	87.95	86.22	78.43		
1971	81.33	81.22	80.75	79.75	79.03	73.29		
1972	87.39	86.67	83.94	80.97	79.29	68.91		
1973	91.01	90.32	88.57	84.43	81.82	72.35		
1974	72.3	72.2	71.78	70.88	70.25	66.29		
1975	78.2	77.33	74.58	70.73	68.95	61.07		
1976	112	111	106	102	99.27	74.32		
1977	105	104	102	98.13	95.87	84.83		
1978	106	105	103	98.79	96.19	84.52		
1979	93.95	93.24	91.43	87.14	85.56	80.06		
1980	92.77	91.86	88.98	83.68	81.72	75.34		
1981	149	147	139	128	123	87.68		
1982	137	136	133	129	126	107		
1983	134	133	128	125	122	108		
1984	117	116	112	105	103	97.16		
1985	94.98	94.11	92.75	88.43	85.48	81		
1986	93.45	92.58	89.85	88.26	86.48	75.52		
1987	83.65	82.89	80.23	76.62	76.08	72.59		
1988	75.95	75.29	73.42	72.29	70.9	66.48		
1989	94.92	94.21	90.25	85.08	82	67.47		
1990	97.64	96.57	93.97	89.55	88.22	75.81		
0.1	132.3	131.3	126.4	123	120.1	96.212		

Average of yearly averages:

72.2806666666666

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MIbeans
Metfile: w14607.dvf
PRZM scenario: MIbeansC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	19-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single

app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MIbeansG.out
Chemical: PBO
PRZM environment: MIbeansC.txt modified Monday, 10 May 2004 at 06:24:24
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14607.dvf modified Wedday, 3 July 2002 at 09:05:36
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	32.27	31.86	30.58	30.14	29.13	12.19		
1962	75.11	74.1	71.2	68.29	66.56	41.97		
1963	65.88	65.41	64.97	63.16	61.88	55.9		
1964	56.79	56.71	56.4	55.72	55.21	53.12		
1965	55.93	55.54	54.38	53.53	53.07	49.98		
1966	47.82	47.77	47.54	47.03	46.44	42.87		
1967	63.22	62.71	61.33	60.13	59.06	47.54		
1968	82.75	81.93	79.72	74.7	71.78	58.86		
1969	83.13	82.45	79.88	76.02	74.85	65.3		
1970	83.58	82.99	80.81	77.16	75.58	67.21		
1971	71.06	70.96	70.53	69.62	68.97	61.87		
1972	74.45	73.79	71.29	68.48	67.07	57.05		
1973	75.86	75.14	72.41	69.43	67.6	60.54		
1974	61.11	61.02	60.65	59.87	59.33	54.18		
1975	61.94	61.26	59.13	56	54.68	48.78		
1976	98.77	97.59	93.39	88.8	86.69	62.71		
1977	90.68	89.78	88.86	85.48	83.68	73.58		

1978	89.91	89.02	87.73	84.51	82.71	73.29
1979	81.64	80.99	79.47	75.62	73.75	68.79
1980	76.23	75.52	73.45	69.54	68.09	63.92
1981	137	135	128	118	113	76.61
1982	124	122	120	116	114	96.77
1983	121	120	115	112	109	97.8
1984	101	100	96.98	94.57	93.78	86.6
1985	79.21	78.54	76.91	75.35	74.8	69.74
1986	79.87	79.11	76.62	74.9	73.42	63.79
1987	66.87	66.3	65.24	64.44	63.87	60.55
1988	61.88	61.33	59.85	58.42	57.22	54.28
1989	80.91	80.25	76.77	72.37	69.67	55.48
1990	82.05	81.17	79.1	75.95	75.32	64.24

0.1 119	118	113.198	110.257	107.478	85.601

Average of yearly averages: 61.517

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MIbeansG
Metfile: w14607.dvf
PRZM scenario: MIbeansC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	

Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 19-06 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MNsugarbeet.out
Chemical: PBO
PRZM environment: MNsugarbeetC.txt modified Satday, 12 October 2002 at 17:05:10
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14914.dvf modified Wedday, 3 July 2002 at 09:05:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	15.26	15.09	14.55	13.57	13.3	7.137

1962	**44.59**	**43.88**	**41.44**	**37.42**	**35**	**21.85**
1963	**42.76**	**42.14**	**39.83**	**36.19**	**34.29**	**28.39**
1964	**77.25**	**76.23**	**71.71**	**62.14**	**58.8**	**40.41**
1965	**48.53**	**48.07**	**47.3**	**46.59**	**45.6**	**41.64**
1966	**42.61**	**42.39**	**41.39**	**40.04**	**40.01**	**36.44**
1967	**40.84**	**40.43**	**39.35**	**37.01**	**35.32**	**31.19**
1968	**34.91**	**34.5**	**33.97**	**32.36**	**30.9**	**26.34**
1969	**63.5**	**62.43**	**58.72**	**52.93**	**49.51**	**34.03**
1970	**52.63**	**51.96**	**50.33**	**45.73**	**43.37**	**39.73**
1971	**44.49**	**44.02**	**43.56**	**41.94**	**40.38**	**37.71**
1972	**39.63**	**39.21**	**38**	**37.02**	**36.52**	**33.33**
1973	**36.1**	**35.7**	**34.71**	**34.16**	**33.49**	**30.36**
1974	**63.85**	**62.95**	**59.57**	**56.25**	**53.91**	**38.38**
1975	**114**	**113**	**105**	**92.75**	**86.78**	**59.85**
1976	**63**	**62.94**	**62.66**	**62**	**61.48**	**52.14**
1977	**82.52**	**81.09**	**75.77**	**67.44**	**63.65**	**48.7**
1978	**77.65**	**76.94**	**74.56**	**68.74**	**65.52**	**53.09**
1979	**65.12**	**64.29**	**61.61**	**59.8**	**57.8**	**50.41**
1980	**50.22**	**49.73**	**48.66**	**47**	**46.23**	**44.54**
1981	**47.13**	**46.58**	**44.53**	**43.42**	**42.14**	**38.21**
1982	**40.66**	**40.23**	**38.41**	**37.41**	**35.98**	**32.95**
1983	**50.96**	**50.2**	**48.11**	**45.12**	**42.97**	**35.22**
1984	**59.41**	**58.76**	**58.13**	**52.84**	**49.09**	**39.52**
1985	**54.11**	**53.42**	**51.64**	**48.37**	**47.4**	**41.62**
1986	**59.38**	**58.74**	**57.06**	**54.08**	**51.73**	**42.3**
1987	**47.97**	**47.33**	**45.01**	**42.38**	**41.85**	**38.46**
1988	**38.83**	**38.32**	**37.18**	**34.67**	**33.72**	**32.9**
1989	**39.27**	**38.92**	**37.84**	**35.71**	**34.92**	**32.15**
1990	**56.45**	**55.75**	**53.39**	**47.67**	**44.7**	**35.17**

0.1 77.61 76.869 74.275 66.91 63.433 51.967

Average of yearly averages:

37.4722333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MNsugarbeet
Metfile: w14914.dvf
PRZM scenario: MNsugarbeetC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	**Variable Name**	**Value**	**Units**	**Comments**

Molecular weight mwt 338.45 g/mol
Henry's Law Const. henry 1.56e-14 atm-m^3/mol
Vapor Pressure vapr 5e-13 torr
Solubility sol 143 mg/L
Kd Kd mg/L
Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 25-05 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5

Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MNsugarbeetG.out
Chemical: PBO
PRZM environment: MNsugarbeetC.txt modified Satday, 12 October 2002 at 17:05:10
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14914.dvf modified Wedday, 3 July 2002 at 09:05:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	10.47	10.32	9.854	9.057	8.663	3.911		
1962	33.78	33.23	31.43	28.4	26.59	15.57		
1963	33.22	32.68	30.72	27.62	26.02	20.45		
1964	64.43	63.3	58.89	50.72	48.17	31.93		
1965	35.8	35.71	35.54	35.14	34.83	32.04		
1966	29.94	29.64	29.04	27.98	27.32	25.94		
1967	23.66	23.63	23.52	23.27	23.08	20.04		
1968	18	17.81	17.34	16.81	16.24	14.87		
1969	49.83	48.9	45.34	40.53	37.7	22.8		
1970	37.16	36.77	35.36	33.33	32.47	28.83		
1971	30	29.96	29.76	29.36	29.08	26.81		
1972	25.44	25.17	24.56	24.16	23.94	22.22		
1973	21.95	21.81	21.25	20.79	20.35	19.18		
1974	52.24	51.41	48.32	44.65	42.75	27.46		
1975	100	99.03	92.19	80.31	75.16	49.78		
1976	54.15	54.09	53.85	53.27	52.83	42.06		
1977	68.84	67.59	62.93	55.7	52.47	38.62		
1978	63.44	62.64	59.64	55.23	52.95	43.05		
1979	52.13	51.45	49.31	46.52	44.97	40.13		
1980	38.84	38.52	37.74	37.31	36.98	34.08		
1981	32.64	32.27	31.71	31.35	30.96	27.57		
1982	25.67	25.49	24.78	23.81	23.2	21.96		
1983	36.78	36.19	34.12	31.91	30.52	24.24		
1984	45.46	44.97	43.01	38.4	35.55	28.83		
1985	40.19	39.66	38.51	36.16	34.68	30.92		
1986	43.16	42.76	41.2	39.91	38.47	31.43		
1987	34.48	34.01	32.27	30.6	29.87	27.73		
1988	26.85	26.59	25.74	24.39	24.16	22.55		

1989 28.83 28.52 27.56 25.72 24.84 21.87
1990 40.44 39.98 38.08 33.93 31.57 24.83

0.1 64.331 63.234 59.565 55.034 52.794 41.867
Average of yearly averages:
27.3900333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MNsugarbeetG
Metfile: w14914.dvf
PRZM scenario: MNsugarbeetC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	25-05	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single

app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MScotton.out
Chemical: PBO
PRZM environment: MScottonC.txt modified Wedday, 22 January 2003 at 11:52:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w03940.dvf modified Wedday, 3 July 2002 at 09:05:46
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	121	119	113	105	98.87	43.03		
1962	70.08	69.85	68.89	66.42	64.43	50.03		
1963	84.93	83.68	78.13	66.47	60.36	40.47		
1964	100	98.35	94.02	89.27	86.89	57.63		
1965	77.64	76.39	71.85	67.4	65.75	57.15		
1966	62.55	61.82	58.22	52.38	49.49	43.9		
1967	87.01	85.67	83.08	78.93	77.66	52.62		
1968	64.42	64.22	63.43	61.63	60.12	47.21		
1969	39.62	38.98	36.59	34.09	33.21	29.62		
1970	71.65	70.72	68.99	65.73	63.75	37.56		
1971	60.74	59.71	57.11	52.18	50.58	45.49		
1972	38.32	38.19	37.64	36.44	35.44	29.16		

1973	41.94	41.22	39.69	36.8	35.97	25.27
1974	36.02	35.48	34.16	32.7	31.57	27.88
1975	111	109	102	89.58	82.22	44.43
1976	101	100	97.22	90.48	87.95	64.14
1977	72.87	72.7	72.05	70.01	67.94	56.9
1978	46.91	46.11	44.01	43.16	42.25	36.41
1979	240	236	229	211	197	95.78
1980	132	131	129	126	123	88.89
1981	94.31	93.26	89.09	77.4	72.04	55.14
1982	180	176	164	148	138	80.91
1983	97.56	97.28	96.1	93.37	91.03	71.1
1984	56.37	55.47	52.67	51.03	48.84	44.25
1985	111	108	100	89.28	84.06	52.22
1986	64.86	63.75	62.35	60.28	58.52	49.78
1987	40.42	39.78	38.88	37.85	36.73	32.88
1988	63.07	62.36	59.97	57.98	56.57	37.39
1989	60.07	59.08	56.88	50.8	48.1	43
1990	37.98	37.84	37.25	35.87	34.77	29.16

0.1	130.9	129.8	127.4	123.9	120.587	79.929

Average of yearly averages: 48.98

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MScotton
Metfile: w03940.dvf
PRZM scenario: MScottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life

Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 15-06 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as MScottonG.out
Chemical: PBO
PRZM environment: MScottonC.txt modified Wedday, 22 January 2003 at 11:52:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w03940.dvf modified Wedday, 3 July 2002 at 09:05:46

Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	118	116	110	102	96.41	41.86		
1962	69.11	68.87	67.92	65.46	63.44	46.73		
1963	76.98	75.53	69.63	59.16	53.72	35.97		
1964	95.03	93.22	88.57	82.88	82.23	53.5		
1965	72.63	71.41	67.03	64.59	62.99	52.75		
1966	54.74	54.14	50.97	45.85	43.73	38.66		
1967	80.9	79.63	77.36	72.09	70.89	47.51		
1968	60.36	60.17	59.42	57.69	56.25	41.8		
1969	31.49	30.96	29	27.78	27.15	23.68		
1970	67.6	66.68	64.9	61.52	59.35	32.09		
1971	51.75	50.89	49.41	47.47	46.08	40.44		
1972	33.88	33.76	33.26	32.18	31.29	23.63		
1973	35.73	35.06	33.44	31.05	30.52	19.6		
1974	28.68	28.22	27.61	26.33	25.37	22.28		
1975	104	102	95.15	83.77	76.77	39.29		
1976	97.08	95.95	92.8	86.36	83.08	59.75		
1977	69.41	69.25	68.62	66.65	64.67	52.26		
1978	40.09	40.03	39.74	38.96	38.14	31.02		
1979	237	233	226	209	195	92.78		
1980	131	130	129	125	122	85.74		
1981	87.99	86.86	80.95	69.98	65.32	50.74		
1982	176	173	161	144	135	77.55		
1983	95.64	95.36	94.18	91.48	89.18	67.2		
1984	48.36	47.94	47.45	46.15	44.93	39.12		
1985	105	103	95.14	84.71	79.73	47.46		
1986	59.94	59.72	58.85	56.86	55.19	45.03		
1987	34.55	34.46	34.09	33.16	32.32	27.43		
1988	58.43	57.72	55.4	53.63	52.02	32.12		
1989	49.15	48.39	46.77	44.09	42.77	37.88		
1990	33.23	33.1	32.58	31.35	30.38	23.48		
0.1	129.7	128.6	127.1	122.7	119.441	76.515		

Average of yearly averages:

44.3116666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MScottonG
Metfile: w03940.dvf

PRZM scenario: MScottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5		0	days	Half-life
Hydrolysis: pH 7		0	days	Half-life
Hydrolysis: pH 9		0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	15-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			

UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as NCcotton.out
Chemical: PBO
PRZM environment: NCcottonC.txt modified Satday, 12 October 2002 at 17:12:02
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13722.dvf modified Wedday, 3 July 2002 at 09:05:50
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	32.91	32.43	30.99	27.77	26.12	11.98		
1962	76.41	75.06	72.96	66.11	62.59	38.31		
1963	50.51	50.08	49.21	48.04	46.93	42.66		
1964	68.46	67.85	65.72	63.49	61.94	47.21		
1965	82.8	81.64	77.65	75.17	71.95	55.94		
1966	84.42	83.16	78.62	73.52	71.19	56.78		
1967	78.71	77.71	74.57	71.38	71.47	58.83		
1968	81.19	80.34	76.47	70.62	67.55	57.03		
1969	88.48	87.16	84.1	79.58	77.58	59.96		
1970	84.63	83.47	80.91	78.94	75.57	61.6		
1971	75.67	75.08	72.84	71.5	70.77	59.34		
1972	96.89	96.09	92.5	87.57	84.98	65.09		
1973	110	109	106	105	100	74.77		
1974	85.32	84.16	79.81	75.76	72.92	65.24		
1975	116	114	107	94.35	89.12	65.71		
1976	74.03	73.04	69.36	66.85	65.26	57.65		
1977	72.92	71.94	68.73	65.24	63.97	54.88		
1978	85.1	83.8	78.93	71.33	67.06	55.49		
1979	83.25	82.08	78.22	75.14	75.13	57.95		
1980	73.43	72.77	72.38	67.14	65.25	57.7		
1981	80.56	79.52	78.41	74.86	73.63	57.57		
1982	62.99	62.9	62.33	60.8	59.38	52.34		
1983	45.46	45.34	44.85	43.86	42.96	37.95		
1984	98.21	96.5	93.19	83.51	77.96	50.29		

1985	76.79	76.15	72.22	69.41	65.83	54.64
1986	94.95	93.37	89.52	80.35	75.88	56.53
1987	75.73	74.66	71.26	66.85	64.03	54.63
1988	64.39	63.6	61.87	59.15	57.99	49.88
1989	70.27	69.27	65.72	61.27	60.2	50.03
1990	50.07	49.89	49.14	47.49	46.2	40.15

0.1 98.078 96.459 93.121 87.164 84.278 65.225

Average of yearly averages:

53.6043333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: NCcotton
Metfile: w13722.dvf
PRZM scenario: NCcottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	15-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single

app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as NCcottonG.out
Chemical: PBO
PRZM environment: NCcottonC.txt modified Satday, 12 October 2002 at 17:12:02
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13722.dvf modified Wedday, 3 July 2002 at 09:05:50
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	27.9	27.5	26.31	23.4	21.85	9.421		
1962	66.95	65.99	64.55	58.99	55.95	33.96		
1963	45.89	45.75	45.22	44.13	43.1	37.13		
1964	62.76	62.15	60.03	57.67	56.01	41.29		
1965	74.01	72.99	69.28	66.06	63.66	50.1		
1966	76.69	75.53	71.32	66.81	64.67	50.96		
1967	71.53	70.61	67.76	64.15	63.06	53.06		
1968	69.78	69.14	65.96	61.66	59.39	51.12		

1969	80.04	78.83	76.2	72.38	70.87	54.09
1970	74.63	73.63	71.63	69.96	67.4	55.62
1971	67.38	66.59	65.15	63.77	62.92	53.32
1972	88.15	87.32	84.33	79.68	77.47	59.38
1973	103	102	97.51	96.39	92.99	69.47
1974	76.84	75.81	71.9	68.7	66.2	59.68
1975	107	105	98.09	86.44	81.89	60.08
1976	67.75	66.81	63.28	61	59.57	51.88
1977	66.41	65.48	62.49	59.38	58.31	48.92
1978	74.46	73.37	69.27	63.04	59.45	49.68
1979	75.63	74.73	71.97	69.13	68.02	52.24
1980	66.54	65.83	63.22	57.93	56.85	52.07
1981	72.94	72.13	71.09	68.36	66.29	52.02
1982	58.29	58.21	57.67	56.22	54.9	46.44
1983	40.05	39.94	39.5	38.62	37.82	31.48
1984	88.37	86.82	84.07	75.57	70.49	44.26
1985	67.24	66.48	63.24	61.57	58.55	48.81
1986	88.53	87.01	83.48	74.65	70.25	50.98
1987	69.89	68.87	65.46	61.18	58.55	49.08
1988	57.83	57.09	55.42	53.13	52.09	44.07
1989	62.31	61.4	58.23	54.47	52.77	44.11
1990	44.76	44.59	43.91	42.42	41.27	33.94

0.1	88.514	87.289	84.304	79.269	76.81	59.65

Average of yearly averages:

47.9553666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: NCcottonG
Metfile: w13722.dvf
PRZM scenario: NCcottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life

Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 15-06 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as ORberry.out
Chemical: PBO

PRZM environment: ORberriesC.txt modified Satday, 12 October 2002 at 17:17:16
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	12.73	12.51	11.76	10.43	9.644	5.071		
1962	18.13	17.88	17.08	15.6	14.65	9.769		
1963	29.13	28.71	27.66	25.48	23.89	15.74		
1964	24.63	24.37	23.5	21.92	20.83	16.13		
1965	23.6	23.35	22.5	21.05	19.99	15.27		
1966	23.11	22.85	21.98	20.4	19.35	14.71		
1967	22.78	22.52	21.66	20.03	18.93	14.14		
1968	22.14	22.03	21.31	19.86	18.83	14.24		
1969	22.62	22.34	21.44	20.38	19.75	15.39		
1970	23.93	23.66	22.78	21.12	20	15.37		
1971	23.28	23.02	22.18	20.74	19.76	15.28		
1972	27.53	27.17	26	23.65	22.27	16.39		
1973	24.15	23.88	22.99	21.41	20.32	15.69		
1974	23.34	23.08	22.24	20.64	19.57	14.89		
1975	23.09	22.82	21.96	20.42	19.37	14.7		
1976	22.8	22.54	21.69	20.19	19.18	14.46		
1977	22.69	22.43	21.61	19.97	18.92	14.14		
1978	27.89	27.52	26.44	23.86	22.26	15.73		
1979	24.28	24	23.09	21.44	20.29	15.98		
1980	24.04	23.78	22.93	21.57	20.55	15.75		
1981	23.37	23.1	22.24	21.67	20.74	15.76		
1982	23.79	23.52	22.64	20.98	19.89	15.2		
1983	22.77	22.49	21.61	20.09	19.1	14.49		
1984	23.44	23.16	22.29	21.29	20.36	15.03		
1985	28.17	27.89	26.51	24.1	23.05	17.05		
1986	25.22	24.95	24.05	22.36	21.3	16.5		
1987	23.38	23.11	22.22	20.57	20.32	16.19		
1988	24.53	24.27	23.41	21.84	20.74	15.91		
1989	23.1	22.83	21.96	20.36	19.3	14.76		
1990	23.07	22.8	22.04	20.46	19.35	14.47		

0.1 27.854 27.485 26.396 23.839 22.269 16.37

Average of yearly averages:

14.8066666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: ORberry
Metfile: w24232.dvf
PRZM scenario: ORberriesC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	21-04	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single

app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as ORberryG.out
Chemical: PBO
PRZM environment: ORberriesC.txt modified Satday, 12 October 2002 at 17:17:16
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	2.859	2.809	2.647	2.361	2.209	1.199		
1962	4.818	4.754	4.564	4.206	3.967	2.708		
1963	14.6	14.42	14.07	12.6	11.69	7.072		
1964	8.469	8.402	8.205	7.811	7.523	6.485		
1965	6.784	6.725	6.538	6.289	6.057	5.085		
1966	6.107	6.047	5.86	5.509	5.265	4.358		
1967	5.638	5.58	5.396	5.043	4.796	3.88		
1968	5.601	5.537	5.393	5.111	4.87	3.987		
1969	7.413	7.312	6.921	6.26	5.977	4.949		
1970	6.755	6.693	6.502	6.12	5.847	4.915		
1971	5.921	5.864	5.681	5.434	5.257	4.621		
1972	10.34	10.2	9.745	8.75	8.136	5.789		
1973	6.887	6.823	6.631	6.268	6.005	5.055		
1974	5.916	5.86	5.68	5.328	5.087	4.216		
1975	5.79	5.731	5.545	5.207	4.969	4.044		
1976	5.374	5.319	5.141	4.824	4.603	3.637		
1977	5.155	5.1	4.922	4.545	4.313	3.321		
1978	10.75	10.63	10.18	8.995	8.293	5.208		
1979	7.088	7.016	6.815	6.402	6.085	5.49		

1980	6.909	6.848	6.66	6.478	6.261	5.225
1981	7.913	7.817	7.487	6.803	6.485	5.201
1982	6.527	6.466	6.275	5.898	5.637	4.66
1983	5.695	5.633	5.443	5.118	4.915	4.011
1984	7.023	6.944	6.628	6.273	6.109	4.542
1985	13.04	12.84	12.09	10.62	9.803	6.572
1986	8.097	8.027	7.828	7.41	7.149	6.055
1987	9.986	9.84	9.283	8.279	7.752	5.924
1988	7.604	7.541	7.35	6.987	6.709	5.662
1989	6.142	6.083	5.895	5.536	5.291	4.426
1990	6.069	6.009	5.894	5.535	5.274	4.175

0.1 10.709 10.587 10.1365 8.9705 8.2773 6.442

Average of yearly averages:

4.74906666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: ORberryG
Metfile: w24232.dvf
PRZM scenario: ORberriesC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	

Application Date Date 21-04 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as ORsnbeans.out
Chemical: PBO
PRZM environment: ORsnbeansC.txt modified Satday, 12 October 2002 at 17:20:58
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	21.07	20.89	19.95	18.02	16.01	6.538		
1962	43.05	42.59	41.16	40.36	39.11	23.08		

1963	**52.3**	**51.95**	**50.65**	**48.71**	**44.68**	**35.72**
1964	**47.84**	**47.67**	**46.72**	**43.97**	**42.56**	**39.28**
1965	**49.86**	**49.45**	**48.48**	**46.01**	**42.44**	**39.37**
1966	**49.29**	**49.09**	**48.36**	**45.51**	**43.19**	**39.92**
1967	**54.06**	**53.83**	**52.69**	**50.37**	**47.62**	**40.63**
1968	**61.95**	**61.67**	**60.6**	**58.34**	**57.51**	**47.7**
1969	**85.49**	**84.85**	**82.51**	**80.25**	**79.52**	**55.57**
1970	**77.34**	**76.99**	**75.72**	**72.99**	**71.06**	**63.53**
1971	**76.37**	**75.57**	**73.01**	**72.64**	**72.3**	**62.12**
1972	**68.03**	**67.8**	**66.91**	**65.01**	**63.56**	**56.86**
1973	**64.07**	**63.79**	**62.81**	**59.94**	**57.66**	**53.07**
1974	**60.76**	**60.39**	**59.14**	**55.86**	**53.35**	**48.78**
1975	**55.77**	**55.56**	**54.54**	**52.52**	**51.18**	**46.29**
1976	**46.74**	**46.57**	**45.9**	**44.49**	**43.52**	**39.11**
1977	**41.09**	**40.93**	**40.54**	**39.09**	**37.71**	**33.16**
1978	**40.21**	**39.89**	**38.67**	**37.36**	**37.35**	**34.99**
1979	**61.97**	**61.59**	**60.28**	**58.71**	**55.56**	**39.84**
1980	**59.16**	**58.76**	**57.01**	**51.82**	**50.56**	**45.98**
1981	**81.57**	**80.91**	**79.4**	**76.59**	**75.57**	**53.93**
1982	**73.71**	**73.39**	**72.09**	**69.51**	**67.73**	**58.9**
1983	**57.79**	**57.6**	**56.74**	**54.81**	**53.43**	**50.11**
1984	**68.17**	**67.78**	**66.7**	**64.67**	**59.69**	**47.6**
1985	**60.77**	**60.51**	**59.47**	**57.44**	**56.04**	**50.1**
1986	**53.46**	**53.24**	**52.26**	**50.32**	**48.79**	**45.33**
1987	**66.88**	**66.21**	**63.92**	**57.72**	**54.33**	**47.39**
1988	**60.35**	**60.04**	**59.42**	**57.25**	**55.63**	**49.43**
1989	**55.61**	**55.37**	**54.58**	**52.7**	**51.43**	**46.31**
1990	**51.46**	**51.32**	**50.64**	**49.22**	**47.96**	**43.27**

0.1 77.243 76.848 75.449 72.955 72.176 58.696

Average of yearly averages:

44.7969333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: ORsnbeans
Metfile: w24232.dvf
PRZM scenario: ORsnbeansC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	**Variable Name**	**Value**	**Units**	**Comments**
Molecular weight	**mwt**	**338.45**	**g/mol**	

Henry's Law Const. henry 1.56e-14 atm-m^3/mol
Vapor Pressure vapr 5e-13 torr
Solubility sol 143 mg/L
Kd Kd mg/L
Koc Koc 399 mg/L
Photolysis half-life kdp 5.07 days Half-life
Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 25-06 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond

Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as ORsnbeansG.out
Chemical: PBO
PRZM environment: ORsnbeansC.txt modified Satday, 12 October 2002 at 17:20:58
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	16.86	16.69	15.71	13.54	11.27	3.565		
1962	36.16	35.83	34.88	33.69	32.45	17.02		
1963	44.66	44.33	43	41.15	36.7	28.1		
1964	39.57	39.4	38.39	36.54	35.57	30.68		
1965	40.93	40.54	39.65	37.18	34.6	30.22		
1966	40.57	40.38	39.71	36.55	35.11	30.59		
1967	45.82	45.59	44.49	41.87	38.79	31.44		
1968	52.7	52.43	51.45	49.47	48.38	38.82		
1969	77.44	76.81	74.51	72.18	71.38	46.67		
1970	69.79	69.45	68.23	65.65	63.84	54.92		
1971	65.99	65.49	64.25	63.44	63.05	53.3		
1972	59.96	59.74	58.92	57.18	55.86	47.86		
1973	55.19	54.92	54.01	51.15	49.73	43.88		
1974	52.07	51.72	50.52	47.08	45.22	39.44		
1975	47.4	47.2	46.25	44.38	43.17	36.88		
1976	37.83	37.68	37.09	35.86	35.03	29.26		
1977	31.71	31.56	31.11	29.44	27.71	23.09		
1978	30.1	29.97	29.42	28.24	27.43	25.2		
1979	52.92	52.55	51.3	49.88	46.54	30.21		
1980	50.82	50.43	48.53	43.67	42.54	36.63		
1981	73.63	72.98	71.54	68.66	67.33	44.93		
1982	66.08	65.77	64.5	62.05	60.38	50.11		
1983	49.49	49.31	48.53	46.78	45.54	41.02		
1984	59.61	59.22	58.22	56.26	50.81	38.42		
1985	52.57	52.31	51.32	49.43	48.16	40.93		
1986	44.61	44.39	43.44	41.36	40.02	35.99		
1987	56.48	56.08	54.7	46.11	42.66	38.29		
1988	52.39	52.08	51.53	49.5	48.01	40.49		
1989	47.51	47.28	46.56	44.81	43.65	37.19		

1990 43.13 42.99 42.31 41.06 39.95 34.1

0.1 69.419 69.082 67.857 65.429 63.761 49.885

Average of yearly averages:

35.9748333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: ORsnbeansG
Metfile: w24232.dvf
PRZM scenario: ORsnbeansC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	25-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.

Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as PAtomato.out
Chemical: PBO
PRZM environment: PAtomatoC.txt modified Satday, 12 October 2002 at 17:26:12
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14737.dvf modified Wedday, 3 July 2002 at 09:06:12
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	23.37	22.91	21.56	19.23	17.67	9.073		
1962	34.09	33.49	31.27	27.88	26.66	18.87		
1963	28.21	27.91	26.9	24.93	23.75	20.21		
1964	30.49	30.08	28.53	27.37	26.37	20.48		
1965	27.38	27.02	26.31	24.55	23.26	19.01		
1966	26.79	26.55	25.57	23.5	22.15	18.19		
1967	57.73	56.68	54.16	49.32	45.93	29.97		
1968	69.09	68.15	64.19	56.95	52.57	37.8		
1969	41.49	41	39.29	37.48	37.39	33.11		
1970	37.43	37.05	35.96	33.88	32.81	27.72		
1971	42.19	41.78	40.01	37.07	35.3	26.94		
1972	76.71	75.64	70.88	65.83	61.79	39.84		
1973	65.66	64.73	61.19	58.85	56.04	43.71		

1974	52.83	52.24	50.71	49.64	47.93	39.22
1975	48.08	47.62	46.35	42.96	41.21	33.66
1976	35.1	34.77	33.68	32.18	30.82	27.14
1977	35.38	34.92	33.19	30.95	29.91	24.27
1978	44.9	44.3	42.53	39.4	37.25	26.9
1979	56.92	56.15	53.42	47.91	45.48	32.3
1980	39.65	39.18	38.6	36.49	34.46	27.88
1981	43.07	42.69	41.73	39.74	37.56	27.07
1982	66.24	65.25	61.68	57.51	53.98	36.27
1983	44.08	43.66	42.28	40.71	38.97	32.33
1984	81.84	80.59	74.91	66.93	61.87	40.35
1985	50.96	50.5	49.08	47.47	45.97	37.67
1986	47.81	47.21	45.88	42.2	39.97	32.26
1987	36.52	36.05	34.78	33.31	32.65	27.69
1988	64.72	64.03	62.03	54.59	51.18	34.37
1989	58.27	57.48	55.82	53.57	50.95	37.8
1990	72.34	71.32	67.22	60.2	56.59	40.87

0.1 72.015 71.003 66.917 60.065 56.535 40.299

Average of yearly averages:

30.0991

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: PAtomato
Metfile: w14737.dvf
PRZM scenario: PAtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life

Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.95 fraction
Spray Drift DRFT 0.05 fraction of application rate applied to pond
Application Date Date 29-04 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as PAtomatoG.out
Chemical: PBO
PRZM environment: PAtomatoC.txt modified Satday, 12 October 2002 at 17:26:12
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14737.dvf modified Wedday, 3 July 2002 at 09:06:12

Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	18.05	17.64	16.21	14.4	13.12	5.695		
1962	23.91	23.47	21.81	19.43	18.8	12.81		
1963	13.74	13.64	13.58	13.45	13.28	12.46		
1964	17.45	17.21	16.3	15.19	14.44	11.92		
1965	12.43	12.29	11.75	11.08	10.7	10		
1966	10.71	10.62	10.25	9.961	9.775	8.95		
1967	45.08	44.18	42.3	38.57	35.78	20.85		
1968	54.58	53.81	50.61	44.69	41.14	28.88		
1969	31.12	30.72	29.29	26.73	25.53	24.06		
1970	21.23	21.09	20.86	20.6	20.38	18.4		
1971	26.68	26.49	25.63	23.32	22.5	17.63		
1972	65.11	64.15	59.88	54.34	51.14	31.12		
1973	54.24	53.44	50.46	46.83	45	35.24		
1974	39.88	39.45	38.56	36.72	35.9	30.63		
1975	34.43	34	33.12	30.89	29.3	24.85		
1976	21.26	21.04	20.2	19.97	19.65	18.18		
1977	21.2	20.93	19.91	18.5	17.67	15.15		
1978	29.48	29.22	28.08	26.15	24.93	17.88		
1979	42.05	41.73	39.4	35.34	33.87	23.53		
1980	25	24.75	24.01	23.22	22.23	19.16		
1981	28.78	28.53	27.88	26.93	25.63	18.4		
1982	53.94	53.09	49.87	45.66	42.99	27.6		
1983	30.13	29.79	28.65	27.56	26.7	23.68		
1984	68.32	67.23	62.32	55.81	51.47	32.13		
1985	38.44	38.13	36.57	34.94	34.35	29.43		
1986	33.06	32.79	31.8	29.65	28.32	23.65		
1987	23.82	23.51	22.9	22.08	21.34	18.89		
1988	52.08	51.4	48.48	42.25	39.83	25.89		
1989	45.06	44.45	42.82	41.05	39.24	29.36		
1990	58.49	57.64	54.33	48.75	46.02	32.62		

0.1 58.099 57.257 53.958 48.558 45.918 32.029

Average of yearly averages:

21.6348333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: PAtomatoG
Metfile: w14737.dvf

PRZM scenario: PAtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5		0	days	Half-life
Hydrolysis: pH 7		0	days	Half-life
Hydrolysis: pH 9		0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	29-04	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single app.
Interval 9	interval	3	days	Set to 0 or delete line for single app.
Record 17:	FILTRA	0		
IPSCND	1			

UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as PAturf.out
Chemical: PBO
PRZM environment: PAturfC.txt modified Satday, 12 October 2002 at 17:27:02
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14737.dvf modified Wedday, 3 July 2002 at 09:06:12
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	14.42	14.16	13.65	12.2	11.28	6.775		
1962	22.6	22.24	20.88	18.68	18.21	13.26		
1963	23.27	22.98	22.08	20.39	19.21	14.7		
1964	24.86	24.52	23.54	21.81	20.56	15.01		
1965	22.97	22.65	21.71	20	18.84	14.1		
1966	22.47	22.19	21.32	19.62	18.41	13.66		
1967	32.14	31.62	29.99	27.04	26.2	18.71		
1968	39.56	39.06	36.9	33.73	32.25	23.13		
1969	29.31	28.97	27.99	26.11	24.8	20.8		
1970	27.47	27.16	26.2	24.41	23.14	18.17		
1971	28.41	28.06	26.87	24.81	23.39	17.49		
1972	39.09	38.53	36.26	34.42	32.23	22.42		
1973	34.67	34.2	32.4	31.46	30.63	23.9		
1974	36.81	36.34	34.56	31.7	29.96	22.83		
1975	28.57	28.23	27.25	26.08	24.98	19.6		
1976	25.39	25.1	24.18	22.43	21.19	17.07		
1977	24.66	24.34	23.38	21.91	20.81	15.91		
1978	31.4	31.02	29.4	26.11	24.4	17.3		
1979	32.67	32.22	30.56	27.38	26.06	19.12		
1980	27.34	27	25.85	23.95	22.6	17.02		
1981	30.18	29.75	28.54	25.63	23.89	16.99		
1982	34.35	33.87	32.13	30.28	28.48	20.68		
1983	28.76	28.44	27.54	25.88	24.74	19.05		
1984	39.52	38.96	36.4	32.61	30.72	21.32		
1985	34.53	34.06	33	30.66	28.89	21.47		

1986	30.26	29.88	28.64	27.07	25.71	19.68
1987	25.93	25.62	24.67	23.05	22.18	17.54
1988	48.4	47.6	44.52	38.78	35.52	23.22
1989	40.59	40.08	38.75	35.81	33.55	24.62
1990	39.33	38.83	36.59	32.98	31.55	23.89

0.1 39.556 39.05 36.869 34.351 32.248 23.823

Average of yearly averages:

18.6478333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: PAturf
Metfile: w14737.dvf
PRZM scenario: PAturfC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	15-04	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.

Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as PAturfG.out
Chemical: PBO
PRZM environment: PAturfC.txt modified Satday, 12 October 2002 at 17:27:02
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14737.dvf modified Wedday, 3 July 2002 at 09:06:12
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	9.071	8.873	8.313	7.328	6.681	3.096		
1962	12.81	12.58	11.7	10.37	9.907	6.832		
1963	8.489	8.413	8.207	7.777	7.447	6.626		
1964	9.205	9.092	8.891	8.38	7.987	6.151		
1965	6.796	6.72	6.515	6.112	5.822	4.838		
1966	5.887	5.826	5.637	5.258	4.971	4.165		
1967	19.24	18.87	17.81	15.88	14.68	9.037		
1968	25.01	24.66	23.16	20.5	18.96	13.51		

1969	14.13	13.95	13.27	12.13	11.79	11.18
1970	10.69	10.6	10.38	9.918	9.592	8.403
1971	11.79	11.64	11.24	10.54	9.95	7.718
1972	26.74	26.29	24.5	22.37	20.97	12.91
1973	22.65	22.31	20.94	19.05	18.37	14.52
1974	20.83	20.57	19.58	18.22	17.19	13.49
1975	13.09	12.95	12.51	11.94	11.71	10.14
1976	9.573	9.491	9.031	8.362	8.045	7.632
1977	8.235	8.146	7.912	7.742	7.526	6.398
1978	15.39	15.22	14.39	12.66	11.71	7.832
1979	17.9	17.62	16.58	14.72	13.84	9.739
1980	11.07	10.95	10.52	9.928	9.495	7.79
1981	14.66	14.44	13.68	12.35	11.43	7.846
1982	21.64	21.29	19.97	18.1	17.11	11.32
1983	12.41	12.31	12.12	11.75	11.58	9.773
1984	25.46	25.05	23.23	20.39	18.8	12.21
1985	19.23	19.03	18.51	17.25	16.38	12.5
1986	15.45	15.26	14.52	13.37	12.91	10.51
1987	10.22	10.1	9.602	9.209	9.112	8.272
1988	33.83	33.2	30.81	26.47	24.11	14.21
1989	25.37	25.05	24.01	22.39	21.04	15.56
1990	25.35	25	23.46	20.97	19.73	14.85

0.1	25.451	25.05	23.955	22.23	20.846	14.489

Average of yearly averages:

9.63526666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: PAturfG
Metfile: w14737.dvf
PRZM scenario: PAturfC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life

Aerobic Aquatic Metabolism kbacw 133 days Halfife
Anaerobic Aquatic Metabolism kbacs 0 days Halfife
Aerobic Soil Metabolism asm 73 days Halfife
Hydrolysis: pH 5 0 days Half-life
Hydrolysis: pH 7 0 days Half-life
Hydrolysis: pH 9 0 days Half-life
Method: CAM 2 integer See PRZM manual
Incorporation Depth: DEPI 0 cm
Application Rate: TAPP 0.56 kg/ha
Application Efficiency: APPEFF 0.99 fraction
Spray Drift DRFT 0.01 fraction of application rate applied to pond
Application Date Date 15-04 dd/mm or dd/mmm or dd-mm or dd-mmm
Interval 1 interval 3 days Set to 0 or delete line for single app.
Interval 2 interval 3 days Set to 0 or delete line for single app.
Interval 3 interval 3 days Set to 0 or delete line for single app.
Interval 4 interval 3 days Set to 0 or delete line for single app.
Interval 5 interval 3 days Set to 0 or delete line for single app.
Interval 6 interval 3 days Set to 0 or delete line for single app.
Interval 7 interval 3 days Set to 0 or delete line for single app.
Interval 8 interval 3 days Set to 0 or delete line for single app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as TXcotton.out

Chemical: PBO
PRZM environment: TXcottonC.txt modified Satday, 12 October 2002 at 17:29:08
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13958.dvf modified Wedday, 3 July 2002 at 09:06:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	80.78	78.68	71.36	61.73	55.09	23.95		
1962	80.31	78.62	74.42	64.85	58.44	36.87		
1963	34.43	33.87	31.98	30.54	29.35	24.19		
1964	138	135	121	98.44	86.77	42.9		
1965	78.48	77.63	75.23	68.13	62.13	45.57		
1966	42.05	41.57	38.92	35.6	34.19	31.54		
1967	36.34	35.64	34.37	31.05	28.74	23.82		
1968	49.6	48.63	44.99	42	40.51	27.14		
1969	38.81	38.25	36.23	33.13	32.53	26.01		
1970	79.04	78.23	74.6	65.15	59.28	35.7		
1971	41.96	41.58	38.99	34.44	34.08	28.19		
1972	53.45	52.28	47.94	41.56	37.84	26.07		
1973	48.78	47.79	45.28	42.93	39.48	27.07		
1974	49.18	48.18	44.58	40.69	37.87	27.97		
1975	97.05	94.97	90.19	84.31	78.9	46.03		
1976	67.03	65.82	63.8	57.05	53.34	40.72		
1977	35.74	35.17	34.1	32.08	31.14	26.26		
1978	58.18	56.83	51.82	44.67	41.5	26.27		
1979	96.26	94.34	89.85	79.14	80.38	48.6		
1980	48.11	47.45	46.57	45.15	43.89	35.75		
1981	164	162	150	126	115	60.48		
1982	65.89	65.1	64.55	62	57.56	44.99		
1983	58.45	57.34	53.76	48.31	45.53	31.87		
1984	31.48	31.06	29.1	26.42	24.54	20.56		
1985	65.5	64	59.01	52.26	47.34	27.02		
1986	40.6	39.93	38.14	34.86	31.94	24.46		
1987	101	98.42	93.61	81.39	73.3	39.18		
1988	52.78	52.11	49.16	43.16	40	30.49		
1989	54.81	53.65	49.65	43.07	40.31	26.58		
1990	37.69	36.91	33.97	31.28	29.62	22.21		

0.1 100.605 98.075 93.268 84.018 80.232 45.984

Average of yearly averages:

32.6153333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: TXcotton
Metfile: w13958.dvf
PRZM scenario: TXcottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.05	fraction of application rate applied to pond	
Application Date	Date	09-05	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	3	days	Set to 0 or delete line for single app.
Interval 2	interval	3	days	Set to 0 or delete line for single app.
Interval 3	interval	3	days	Set to 0 or delete line for single app.
Interval 4	interval	3	days	Set to 0 or delete line for single app.
Interval 5	interval	3	days	Set to 0 or delete line for single app.
Interval 6	interval	3	days	Set to 0 or delete line for single app.
Interval 7	interval	3	days	Set to 0 or delete line for single app.
Interval 8	interval	3	days	Set to 0 or delete line for single

app.
Interval 9 interval 3 days Set to 0 or delete line for single app.
Record 17: FILTRA 0
IPSCND 1
UPTKF 0
Record 18: PLVKRT 0
PLDKRT 0
FEXTRC 0.5
Flag for Index Res. Run IR Pond
Flag for runoff calc. RUNOFF none none, monthly or total(average of entire run)

stored as TXcottonG.out
Chemical: PBO
PRZM environment: TXcottonC.txt modified Satday, 12 October 2002 at 17:29:08
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w13958.dvf modified Wedday, 3 July 2002 at 09:06:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day		60 Day		90 Day	Yearly
1961	75.63	73.64	66.63	57.75	51.51	21.78		
1962	72.24	70.72	66.58	58.34	52.63	33.39		
1963	28.58	28.53	28.3	27.6	26.81	19.74		
1964	133	129	116	93.83	82.47	39.02		
1965	70.6	70.02	68.01	60.59	55.16	41.55		
1966	36.49	36.04	33.62	32.1	31.27	26.76		
1967	25.54	25.27	23.92	21.96	20.49	18.81		
1968	41.97	41.12	37.93	33.12	32.51	22.04		
1969	33.78	33.28	31.05	28.41	26.55	20.93		
1970	71.61	70.37	65.71	57.27	51.94	31.04		
1971	36.21	35.91	33.57	29.42	27.69	23.36		
1972	44.12	43.14	39.48	34.29	31.23	21.18		
1973	40.74	39.89	36.72	35.05	32.34	22.01		
1974	43.77	42.82	39.43	35.94	33.32	23.01		
1975	88.56	87.13	82.39	77.04	72.36	41.67		
1976	59.66	58.57	56.48	50.7	46.51	36.09		
1977	29.57	29.51	29.25	28.44	27.61	21.11		
1978	47.66	46.54	42.38	36.13	33.9	21.4		
1979	91.94	90.06	85.4	74.84	73.95	44.47		

1980	44.39	44.26	43.71	42.39	41.21	31.31
1981	159	157	145	122	111	57.15
1982	59.76	59.07	57.62	54.45	50.59	41.09
1983	47.93	47.04	44.13	39.74	37.78	27.22
1984	20.69	20.65	20.45	19.85	19.25	15.49
1985	57.33	55.97	51.55	44.66	40.55	22.25
1986	29.8	29.35	28.15	26.07	23.96	19.64
1987	92.95	90.78	85.72	74.42	67.03	34.86
1988	42.37	41.94	39.25	34.53	32.1	25.84
1989	45.4	44.43	41.04	34.73	32.6	21.87
1990	27.49	26.97	25.09	23	22.2	17.41

0.1 92.849 90.708 85.688 76.82 73.791 41.658

Average of yearly averages:

28.1163333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: TXcottonG
Metfile: w13958.dvf
PRZM scenario: TXcottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: PBO

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	338.45	g/mol	
Henry's Law Const.	henry	1.56e-14	atm-m^3/mol	
Vapor Pressure	vapr	5e-13	torr	
Solubility	sol	143	mg/L	
Kd	Kd		mg/L	
Koc	Koc	399	mg/L	
Photolysis half-life	kdp	5.07	days	Half-life
Aerobic Aquatic Metabolism	kbacw	133	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	0	days	Halfife
Aerobic Soil Metabolism	asm	73	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	0.56	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	

Application Date	**Date**	**09-05**	**dd/mm or dd/mmm or dd-mm or dd-mmm**	
Interval 1	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 2	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 3	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 4	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 5	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 6	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 7	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 8	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Interval 9	**interval**	**3**	**days**	**Set to 0 or delete line for single app.**
Record 17:	**FILTRA**	**0**		
IPSCND	**1**			
UPTKF	**0**			
Record 18:	**PLVKRT**	**0**		
PLDKRT	**0**			
FEXTRC	**0.5**			
Flag for Index Res. Run		**IR**	**Pond**	
Flag for runoff calc.	**RUNOFF**		**none**	**none, monthly or total(average of entire run)**

Appendix I. Agricultural Usage Information from USDA Regional IPM Centers

(www.ipmcenters.org/datasources/nass/output/NASS.cfm)

crop	state	year	% treated acres	no. appl	ai per yr lb/ac	ai per appl lb/ac
All Veg. Crops	Arizona	1990	1	0	0	0
Cauliflower	California	1994	1	1.2	0.42	0.36
Celery	California	1994	2	1.1	0.37	0.34
Celery	California	1996	3	1.2	0.37	0.31
Eggplant	New Jersey	1992	25	5.1	2.89	0.57
Eggplant	New Jersey	1994	26	4.4	2.4	0.55
Fall Potatoes	Michigan	1992	45	2.3	1	0.44
Fall Potatoes	New York	1992	41	1	0.34	0.32
Fall Potatoes	Pennsylvania	1992	46	1.8	0.94	0.52
Fall Potatoes	Maine	1993	4	1.5	0.6	0.4
Fall Potatoes	Michigan	1993	48	2.8	1.39	0.5
Fall Potatoes	New York	1993	36	1.8	0.74	0.42
Fall Potatoes	Pennsylvania	1993	51	2.3	1.11	0.48
Fall Potatoes	Maine	1994	7	1	0.4	0.4
Fall Potatoes	Michigan	1994	70	2.9	1.6	0.56
Fall Potatoes	New York	1994	22	2.8	2.24	0.79
Fall Potatoes	Pennsylvania	1994	75	2.3	1.12	0.5
Fall Potatoes	Wisconsin	1995	17	1	0.21	0.2
Fall Potatoes	Pennsylvania	1995	7	1.3	0.64	0.51

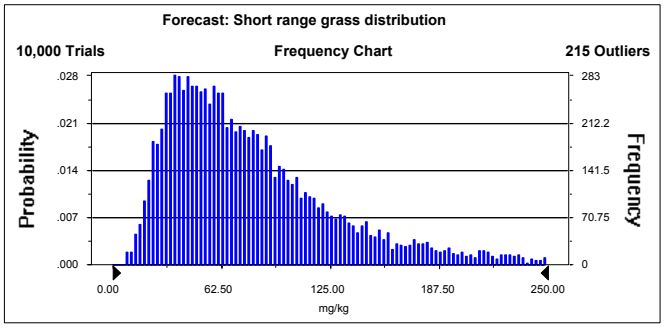
crop	state	year	% treated acres	no. appl	ai per yr lb/ac	ai per appl lb/ac
Fall Potatoes	Wisconsin	1997	23	1.2	0.38	0.33
Fall Potatoes	Pennsylvania	1998	1	1.1	0.56	0.51
Fall Potatoes	Wisconsin	1998	33	1.6	0.5	0.3
Fall Potatoes	Wisconsin	1999	30	1.8	0.72	0.39
Fall Potatoes	Wisconsin	2001	22	1.3	0.51	0.39
crop	state	year	% treated acres	no. appl	ai per yr lb/ac	ai per appl lb/ac
Head Lettuce	California	1992	4	1.2	0.34	0.28
Head Lettuce	California	1994	12	1.1	0.29	0.27
Head Lettuce	California	1996	5	1.1	0.36	0.32
Head Lettuce	California	1998	3	1	0.47	0.44
Head Lettuce	California	2000	3	1.1	0.58	0.53
Lettuce, Other	California	1992	12	1.4	0.46	0.33
Lettuce, Other	California	1994	13	1.2	0.35	0.29
Lettuce, Other	California	1996	12	1	0.27	0.26
Lettuce, Other	California	2000	4	1	0.08	0.08
Spinach, FM	California	1992	13	1.1	0.28	0.25
Spinach, FM	California	1994	20	1.2	0.3	0.26
Spinach, FM	California	1996	24	2.4	0.55	0.23
Tomatoes, FM	New Jersey	1992	25	5.3	2.47	0.46

Tomatoes, FM	**New Jersey**	**1994**	**21**	**3.5**	**1.89**	**0.55**
Tomatoes, PR	**Michigan**	**1992**	**23**	**1.1**	**0.39**	**0.34**

Crystal Ball Report
Simulation started on 6/16/05 at 12:00:15
Simulation stopped on 6/16/05 at 12:04:27

Forecast: Short range grass distribution

Statistics:	Value
Trials	10000
Mean	84.40
EFED estimated mean for risk assessment	85.00
Median	69.20
Mode	---
Standard Deviation	59.57
Variance	3,548.77
Skewness	2.38
Kurtosis	13.29
Coeff. of Variability	0.71
Range Minimum	3.04
Range Maximum	699.53
Range Width	696.49
Mean Std. Error	0.60



Forecast: Short range grass distribution (cont'd)

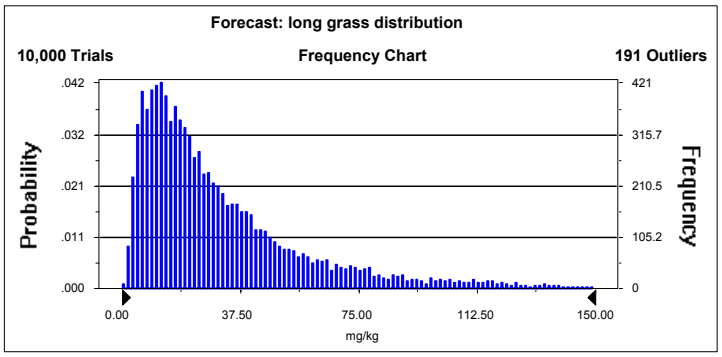
Percentiles:

Percentile	mg/kg
0%	3.04
5%	24.22
10%	30.59
15%	35.37
20%	39.79
25%	44.48
30%	49.16
35%	53.72
40%	58.92
45%	63.76
50%	69.20
55%	75.34
60%	81.70
EFED estimated mean for risk assessment	85.00
65%	88.41
70%	96.06
75%	105.62
80%	116.99
85%	132.65
90%	154.96
95%	198.72
EFED estimated upper bound for risk assessment	240.00
100%	699.53

End of Forecast

Forecast: long grass distribution

Statistics:	Value
Trials	10000
Mean	35.48
EFED estimated mean for risk assessment	36.00
Median	23.76
Mode	---
Standard Deviation	40.41
Variance	1,633.21
Skewness	5.16
Kurtosis	60.07
Coeff. of Variability	1.14
Range Minimum	0.73
Range Maximum	918.61
Range Width	917.89
Mean Std. Error	0.40



Forecast: long grass distribution (cont.)

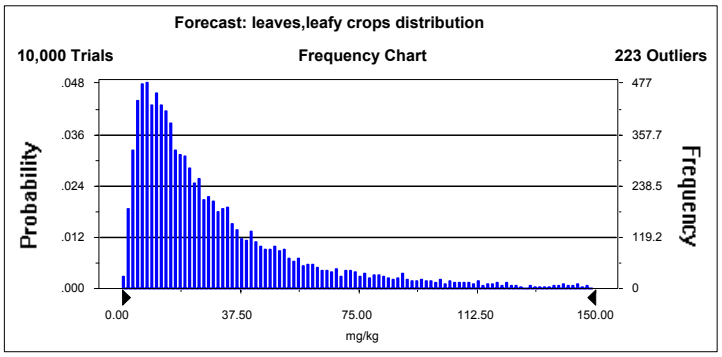
Percentiles:

Percentile	mg/kg
0%	0.73
5%	5.29
10%	7.34
15%	9.24
20%	11.02
25%	12.82
30%	14.72
35%	16.78
40%	18.89
45%	21.16
50%	23.76
55%	26.55
60%	29.90
65%	33.59
EFED estimated mean for risk assessment	36.00
70%	38.07
75%	43.19
80%	50.12
85%	59.91
90%	74.78
95%	104.94
EFED estimated upper bound for risk assessment	110.00
100%	918.61

End of Forecast

Forecast: leaves,leafy crops distribution

Statistics:	Value
Trials	10000
Mean	34.23
EFED estimated mean for risk assessment	45.00
Median	21.15
Mode	---
Standard Deviation	43.12
Variance	1,859.51
Skewness	5.07
Kurtosis	51.49
Coeff. of Variability	1.26
Range Minimum	0.54
Range Maximum	845.60
Range Width	845.06
Mean Std. Error	0.43



Forecast: leaves,leafy crops distribution (cont.)

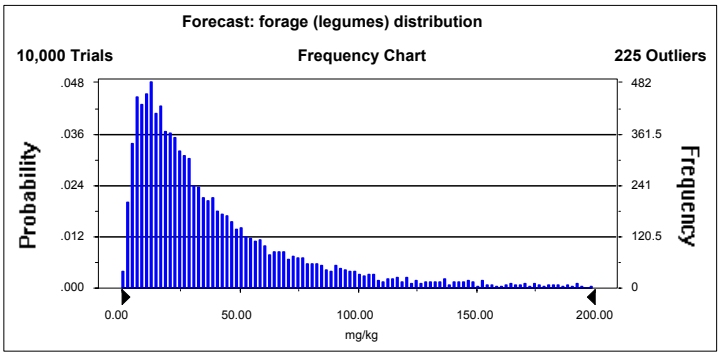
Percentiles:

Percentile	mg/kg
0%	0.54
5%	4.32
10%	6.05
15%	7.64
20%	9.29
25%	10.96
30%	12.69
35%	14.43
40%	16.41
45%	18.71
50%	21.15
55%	24.06
60%	27.32
65%	30.98
70%	35.26
75%	41.13
EFED estimated mean for risk assessment	45.00
80%	48.45
85%	58.17
90%	74.77
95%	106.10
EFED estimated upper bound for risk assessment	135.00
100%	845.60

End of Forecast

Forecast: forage (legumes) distribution

Statistics:	Value
Trials	10000
Mean	45.54
EFED estimated mean for risk assessment	45.00
Median	28.28
Mode	---
Standard Deviation	57.97
Variance	3,360.48
Skewness	5.43
Kurtosis	59.64
Coeff. of Variability	1.27
Range Minimum	1.02
Range Maximum	1,247.08
Range Width	1,246.06
Mean Std. Error	0.58



Forecast: forage (legumes) distribution (cont.)

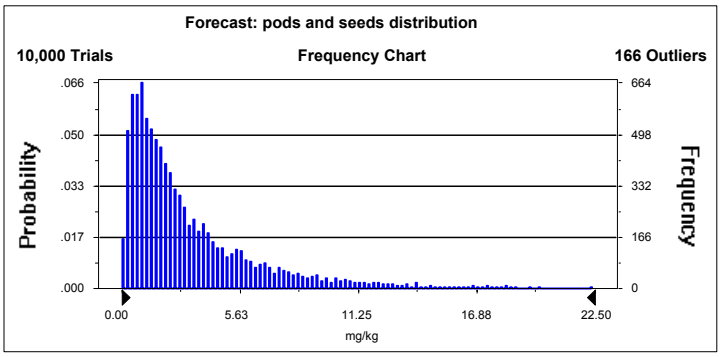
Percentiles:

Percentile	mg/kg
0%	1.02
5%	5.53
10%	7.90
15%	10.20
20%	12.34
25%	14.46
30%	16.95
35%	19.45
40%	22.20
45%	25.07
50%	28.28
55%	31.97
60%	36.46
65%	41.44
EFED estimated mean for risk assessment	45.00
70%	47.32
75%	54.91
80%	64.46
85%	77.61
90%	97.18
EFED estimated upper bound for risk assessment	135.00
95%	142.26
100%	1,247.08

End of Forecast

Forecast: pods and seeds distribution

Statistics:	Value
Trials	10000
Mean	3.98
EFED estimated mean for risk assessment	7.00
Median	2.25
Mode	---
Standard Deviation	6.53
Variance	42.60
Skewness	15.38
Kurtosis	602.64
Coeff. of Variability	1.64
Range Minimum	0.05
Range Maximum	322.55
Range Width	322.50
Mean Std. Error	0.07



Forecast: pods and seeds distribution (cont.)

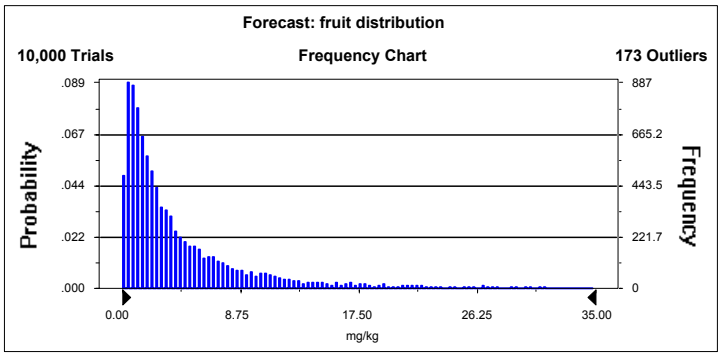
Percentiles:

Percentile	mg/kg
0%	0.05
5%	0.39
10%	0.57
15%	0.75
20%	0.92
25%	1.09
30%	1.28
35%	1.51
40%	1.72
45%	1.97
50%	2.25
55%	2.56
60%	2.92
65%	3.40
70%	3.95
75%	4.60
80%	5.53
85%	6.72
EFED estimated mean for risk assessment	7.00
90%	8.57
95%	12.39
EFED estimated upper bound for risk assessment	15.00
100%	322.55

End of Forecast

Forecast: fruit distribution

Statistics:	Value
Trials	10000
Mean	5.60
EFED estimated mean for risk assessment	7.00
Median	2.63
Mode	---
Standard Deviation	10.38
Variance	107.83
Skewness	8.93
Kurtosis	154.26
Coeff. of Variability	1.85
Range Minimum	0.04
Range Maximum	309.87
Range Width	309.83
Mean Std. Error	0.10



Forecast: fruit distribution (cont.)

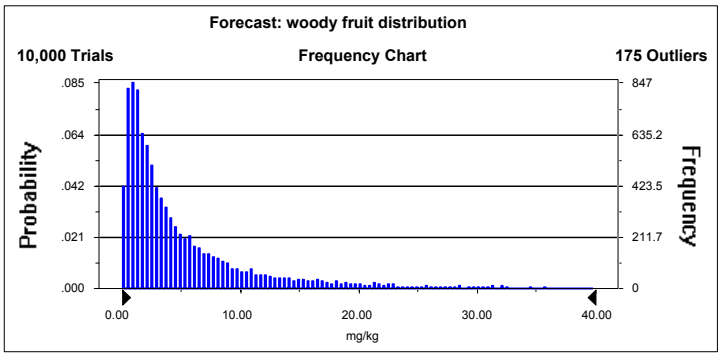
Percentiles:

Percentile	mg/kg
0%	0.04
5%	0.35
10%	0.55
15%	0.75
20%	0.95
25%	1.15
30%	1.38
35%	1.64
40%	1.92
45%	2.24
50%	2.63
55%	3.06
60%	3.59
65%	4.23
70%	5.09
75%	6.11
EFED estimated mean for risk assessment	7.00
80%	7.44
85%	9.45
90%	12.43
EFED estimated upper bound for risk assessment	15.00
95%	20.02
100%	309.87

End of Forecast

Forecast: woody fruit distribution

Statistics:	Value
Trials	10000
Mean	6.58
EFED estimated mean for risk assessment	7.00
Median	3.14
Mode	---
Standard Deviation	11.87
Variance	140.91
Skewness	10.29
Kurtosis	222.42
Coeff. of Variability	1.81
Range Minimum	0.03
Range Maximum	381.81
Range Width	381.79
Mean Std. Error	0.12



Forecast: woody fruit distribution (cont.)

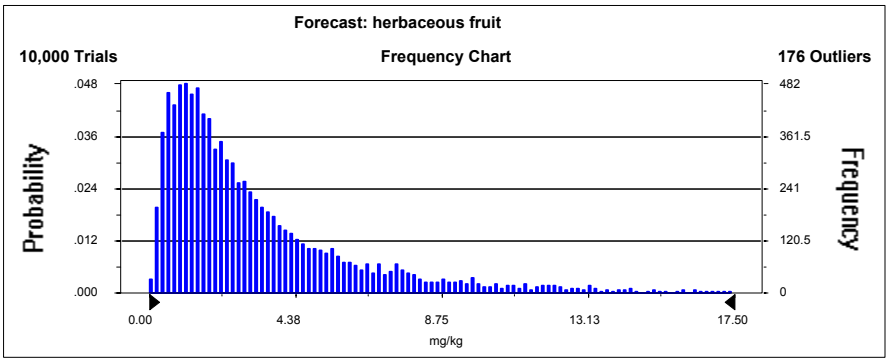
Percentiles:

Percentile	mg/kg
0%	0.03
5%	0.44
10%	0.68
15%	0.92
20%	1.16
25%	1.39
30%	1.64
35%	1.97
40%	2.30
45%	2.67
50%	3.14
55%	3.66
60%	4.27
65%	5.08
70%	6.02
EFED estimated mean for risk assessment	7.00
75%	7.25
80%	8.79
85%	11.20
EFED estimated upper bound for risk assessment	15.00
90%	15.28
95%	23.10
100%	381.81

End of Forecast

Forecast: herbaceous fruit

Statistics:	Value
Trials	10000
Mean	3.65
EFED estimated mean for risk assessment	7.00
Median	2.33
Mode	---
Standard Deviation	4.36
Variance	19.05
Skewness	5.11
Kurtosis	60.56
Coeff. of Variability	1.20
Range Minimum	0.06
Range Maximum	98.83
Range Width	98.77
Mean Std. Error	0.04



Forecast: herbaceous fruit (cont.)

Percentiles:

Percentile	mg/kg
0%	0.06
5%	0.49
10%	0.68
15%	0.87
20%	1.06
25%	1.24
30%	1.42
35%	1.62
40%	1.83
45%	2.08
50%	2.33
55%	2.62
60%	2.96
65%	3.36
70%	3.82
75%	4.42
80%	5.21
85%	6.25
EFED estimated mean for risk assessment	7.00
90%	7.81
95%	11.21
EFED estimated upper bound for risk assessment	15.00
100%	98.83

End of Forecast