# Ecological Soil Screening Levels for Pentachlorophenol

## Interim Final

**OSWER Directive 9285.7-58**

**U.S. Environmental Protection Agency**
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## 1.0 INTRODUCTION

Ecological Soil Screening Levels (Eco-SSLs) are concentrations of contaminants in soil that are protective of ecological receptors that commonly come into contact with and/or consume biota that live in or on soil. Eco-SSLs are derived separately for four groups of ecological receptors: plants, soil invertebrates, birds, and mammals. As such, these values are presumed to provide adequate protection of terrestrial ecosystems. Eco-SSLs are derived to be protective of the conservative end of the exposure and effects species distribution, and are intended to be applied at the screening stage of an ecological risk assessment. These screening levels should be used to identify the contaminants of potential concern (COPCs) that require further evaluation in the site-specific baseline ecological risk assessment that is completed according to specific guidance (U.S. EPA, 1997, 1998, and 1999). The Eco-SSLs are not designed to be used as cleanup levels and the United States (U.S.) Environmental Protection Agency (EPA) emphasizes that it would be inappropriate to adopt or modify the intended use of these Eco-SSLs as national cleanup standards.

The detailed procedures used to derive Eco-SSL values are described in separate documentation (U.S. EPA, 2003). The derivation procedures represent the collaborative effort of a multi-stakeholder group consisting of federal, state, consulting, industry, and academic participants led by the U.S. EPA Office of Solid Waste and Emergency Response.

This document provides the Eco-SSL values for pentachlorophenol and the documentation for their derivation. This document provides guidance and is designed to communicate national policy on identifying pentachlorophenol concentrations in soil that may present an unacceptable ecological risk to terrestrial receptors. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus, it does not impose legally-binding requirements on EPA, states, or the regulated community, and may not apply to a particular situation based upon the circumstances of the site. EPA may change this guidance in the future, as appropriate. EPA and state personnel may use and accept other technically sound approaches, either on their own initiative, or at the suggestion of potentially responsible parties, or other interested parties. Therefore, interested parties are free to raise questions and objections about the substance of this document and the appropriateness of the application of this document to a particular situation. EPA welcomes public comments on this document at any time and may consider such comments in future revisions of this document.

## 2.0 SUMMARY OF ECO-SSLs FOR PENTACHLOROPHENOL

The use of pentachlorophenol (PCP) in the United States as an industrial wood preservative for utility poles, cross arms, and fenceposts accounts for 97% of its production and has resulted in its release to the environment through various waste streams. Other uses of PCP include the manufacture of sodium pentachlorophenate (Hagenmaier and Berchtold, 1986) and minor uses as a fungicide, bactericide, algicide, or herbicide for crops, or in the production of leathers and textiles (IARC, 1991, Lewis, 1993; HSDB).

Organic acids such as PCP can exist in soil as either a nonionic species or as an organic anion, which is dependent on the acid dissociation constant (pKa) and pH. In the pH range relevant to most environmental scenarios, PCP can exist as both a neutral species and as an anionic species; however, the majority exist as the organic anion (Lee et al., 1990). For the neutral form of PCP, sorption by soil is primarily related to hydrophobicity and the amount of organic matter present in the soil (Lagrega, 1994; Lee et al., 1990; HSDB). Differences in the distribution of several nonionic organic contaminants in diverse soil-water and sediment-water systems have been minimized by normalization to organic matter or more specifically organic carbon (OC) with OC-normalized distribution coefficients, referred to as $K_{oc}$ values. The greater the affinity of a contaminant for organic matter, the larger the organic carbon-normalized partition coefficient ($K_{oc}$), and a soil with higher amounts of organic matter has a higher propensity to sorb nonionic organic contaminants (e.g., Gertsl, 1990; Lyman et al., 1990; HSDB).

For the ionic form of PCP, the anionic species has a greater tendency relative to the neutral PCP to remain in the pore-water similar to metal anions. Therefore, the soil pH modifies the solubility, sorption, transport, and bioavailability of PCP. The fraction of PCP existing as an anion increases with increasing pH. The anion has a lower affinity for the soil relative to the neutral species. Increasing soil pH also results in an increase in the number of negatively charged soil sites with a concomitant decrease in the positively charged sites. Therefore, increasing the soil pH directly impacts the sorption and removal from the pore-water of the PCP ions (Bohn et al., 1985; HSDB).

Adsorption of PCP to soil appears to be pH dependent, with stronger adsorption under acid conditions (Callahan et al., 1979; HSDB). PCP is expected to have slight to no mobility in soil where the pH is acidic (Swann et al., 1983; HSDB). The fraction of PCP which is sorbed decreases linearly with pH to a pH of 6; above pH 6, significant adsorption of the anion again occurs, contributing as much as 20% of the total adsorption effect at pH 8 (Bengtsson et al., 1993; HSDB).

The half-life of PCP in soil is approximately weeks to months (Ide et al., 1972; Murthy et al., 1979 and Rao and Davidson, 1982; HSDB). The main degradation products of PCP in soil are 2,3,7,8-tetrachlorophenol and $CO_2$ (Knowlton and Huckins, 1983; HSDB). Both aerobic and anaerobic biodegradation rates are dependant on the concentration of PCP present in the soil. PCP does not appear to oxidize or hydrolyze under environmental conditions (Callahan et al., 1979; Weiss et al., 1982; HSDB); however, photolysis of the dissociated form from moist soil surfaces may be a significant fate process (Donaldson and Miller, 1997; HSDB).

Eco-SSL values were derived for all receptor groups (Table 2.1). The Eco-SSL values for PCP range from 2.1 mg/kg dry weight (dw) for avian wildlife to 31 mg/kg dw for soil invertebrates.

**Table 2.1 Pentachlorophenol Eco-SSLs (mg/kg dry weight in soil)**

| Plants | Soil Invertebrates | Wildlife | |
|---|---|---|---|
| | | Avian | Mammalian |
| 5.0 | 31 | 2.1 | 2.8 |

## 3.0 ECO-SSL FOR TERRESTRIAL PLANTS

Of the papers identified from the literature search process, 43 papers were selected for acquisition for further review. Of those papers acquired, four met all 11 Study Acceptance Criteria (U.S. EPA, 2003; Attachment 3-1). Each of these papers were reviewed and the studies were scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 3-2). Two studies received an Evaluation Score greater than ten (U.S. EPA, 2003; Attachment 3-1). These studies are listed in Table 3.1.

All studies eligible for Eco-SSL derivation with a bioavailability score of two were used to derive the plant Eco-SSL for PCP (U.S. EPA, 2003; Attachment 3-2). The bioavailability of PCP, an ionic organic contaminant, was scored as a metal anion using Table 2.6 in the second chapter of the Eco-SSL guidance (U.S. EPA, 2003). The Eco-SSL is the geometric mean of the effective concentration for 20% of the test population ($EC_{20}$) values for three species under one test conditions (pH and % organic matter (OM)) and is equal to 5.0 mg/kg dw.

## 4.0 ECO-SSL FOR SOIL INVERTEBRATES

Of the papers identified from the literature search process, 58 papers were selected for acquisition for further review. Of those papers acquired, 22 met all 11 Study Acceptance Criteria (U.S. EPA 2003; Attachment 3-1). Each of these papers were reviewed and the studies were scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 3-2). Ten studies received an Evaluation Score greater than ten. These studies are listed in Table 4.1.

The studies in Table 4.1 are sorted by bioavailability score. The bioavailability of PCP, an ionic organic contaminant, was scored as a metal anion using Table 2.6 in the second chapter of the Eco-SSL guidance (U.S. EPA, 2003). There are four studies eligible for Eco-SSL derivation and all were used to derive the soil invertebrate Eco-SSL for PCP (U.S. EPA, 2003; Attachment 3-2). The Eco-SSL is the geometric mean of the maximum acceptable toxicant concentration (MATC) values for four test species under three different test conditions (pH and OM) and is equal to 31 mg/kg dw.

## Table 3.1 Plant Toxicity Data - Pentachlorophenol

| Reference | IP Number | Study ID | Test Organism | | Soil pH | OM % | Bio-availability Score | ERE | Tox Parameter | Tox Value-Soil Conc. (mg/kg dw) | Total Evaluation Score | Eligible for Eco-SSL | Used for Eco-SSL? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TN&Associates Inc., 2000 | 56444 | P | Alfalfa | *Medicago sativa* | 6.3 | 0.1 | 2 | GRO | $EC_{20}$ | 5.0 | 18 | Y | Y |
| TN&Associates Inc., 2000 | 56444 | Q | Turnip | *Brassica rapa* | 6.3 | 0.1 | 2 | GRO | $EC_{20}$ | 5.0 | 18 | Y | Y |
| TN&Associates Inc., 2000 | 56444 | R | Radish | *Raphanus sative* | 6.3 | 0.1 | 2 | GRO | $EC_{20}$ | 5.0 | 18 | Y | Y |
| | | | | | | | | | Geometric Mean | 5.0 | | | |
| **Data Not Used to Derive Plant Eco-SSL** | | | | | | | | | | | | | |
| Aben et al., 1992 | 1294 | a | Thale cress | *Arabidopsis thaliana* | 5.7 | 2.4 | 1 | GRO | $EC_{50}$ | 3.0 | 12 | N | N |
| Aben et al., 1992 | 1294 | b | Thale cress | *Arabidopsis thaliana* | 6.2 | 8.1 | 1 | GRO | $EC_{50}$ | 9.0 | 12 | N | N |
| TN&Associates Inc., 2000 | 56444 | M | Alfalfa | *Medicago sativa* | 5.0 | 5.0 | 0 | GRO | $EC_{20}$ | 7.0 | 16 | Y | N |
| TN&Associates Inc., 2000 | 56444 | N | Turnip | *Brassica rapa* | 5.0 | 5.0 | 0 | GRO | $EC_{20}$ | 3.2 | 16 | Y | N |
| TN&Associates Inc., 2000 | 56444 | O | Radish | *Raphanus sative* | 5.0 | 5.0 | 0 | GRO | $EC_{20}$ | 3.0 | 16 | Y | N |

dw = dry weight
$EC_{20}$ = Effect concentration for 20% of test population
ERE = Ecologically relevant endpoint
GRO = Growth
N = No
OM = Organic matter content
Y = yes
Bioavailability Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)
Total Evaluation Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)

**Table 4.1 Invertebrate Toxicity Data - Pentachlorophenol**

| Reference | IP Number | Study ID | Test Organism | | Soil pH | OM% | Bio-availability Score | ERE | Tox Parameter | Tox Value (Soil Conc mg/kg dw) | Total Evaluation Score | Eligible for Eco-SSL Derivation? | Used for Eco-SSL? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crouau et al., 1999 | 18893 | a | Springtail | *Folsomia candida* | 6.0 | 10.0 | 1 | REP | MATC | 85 | 17 | Y | Y |
| Kammenga et al., 1996 | 5515 | | Nematode | *Plectuc acuminatus* | 5.5 | 10.0 | 1 | REP | MATC | 42 | 13 | Y | Y |
| Van Gestel et al., 1992 | 12874 | a | Earthworm | *Eisenia andrei* | 6.7 | 10.0 | 1 | REP | MATC | 14 | 16 | Y | Y |
| Van Gestel et al., 1989 | 4111 | | Earthworm | *Eisenia fetida andrei* | 6.0 | 10.0 | 1 | REP | MATC | 18 | 12 | Y | Y |
| | | | | | | | | | Geometric Mean | 31 | | | |
| **Data not Used to Derive Soil Invertebrate Eco-SSL** | | | | | | | | | | | | | |
| Aben et al., 1992 | 1294 | a | Nematode | *Globodera rostochiensis* | 5.7 | 2.4 | 1 | MOR | $LC_{50}$ | 130 | 12 | N | N |
| Aben et al., 1992 | 1294 | b | Nematode | *Globodera rostochiensis* | 6.2 | 8.1 | 1 | MOR | $LC_{50}$ | 310 | 12 | N | N |
| Heimbach, 1984 | 7843 | | Earthworm | *Eisenia fetida* | 7.0 | 10.0 | 1 | MOR | $LC_{50}$ | 87 | 11 | N | N |
| Houx et al., 1993 | 2446 | b | Nematode | *Globodera rostochiensis* | 5.9 | 8.1 | 1 | MOR | $LC_{50}$ | 310 | 11 | N | N |
| Lanno et al., 1997 | 3996 | a | Earthworm | *Lumbricus terrestris* | 7.8 | 1.5 | 2 | MOR | $LC_{50}$ | <10 | 11 | N | N |
| Van Gestel and Van Dis, 1988 | 7889 | b | Earthworm | *Eisenia fetida* | 7.0 | 1.7 | 2 | MOR | $LC_{50}$ | 16 | 11 | N | N |
| Van Gestel et al., 1991 | 6826 | a | Earthworm | *Eisenia andrei* | 5.8 | 10.0 | 1 | MOR | $LC_{50}$ | 28 | 16 | N | N |
| Van Gestel et al., 1991 | 6826 | b | Earthworm | *Eisenia andrei* | 5.8 | 10.0 | 1 | GRO | NOAEC | 32 | 16 | N | N |

dw = dry weight
ERE = Ecologically relevant endpoint
GRO = Growth
$LC_{50}$ = Concentration lethal to 50% of test population
LOAEC = Lowest observed adverse effect concentration
MATC = Maximum acceptable toxicant concentration
MOR = Mortality
N = No
NOAEC = No observed adverse effect concentration
OM = Organic matter content
REP = Reproduction
Y = Yes
Bioavailability Score described in *Guidance for Developing Eco-SSLs* (U.S.EPA, 2003)
Total Evaluation Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)

## 5.0 ECO-SSL FOR AVIAN WILDLIFE

The derivation of the Eco-SSL for avian wildlife was completed as two parts. First, the toxicity reference value (TRV) was derived according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5). Second, the Eco-SSL (soil concentration) was back-calculated for each of three surrogate species representing different trophic levels based on the wildlife exposure model and the TRV (U.S. EPA, 2003).

### 5.1 Avian TRV

The literature search completed according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-1) identified 1,073 papers with possible toxicity data for either avian or mammalian species. Of these studies, 1054 were rejected for use as described in Section 7.5. Of the remaining papers, three contained data for avian test species. These papers were reviewed and the data were extracted and scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-3 and 4-4). The results of the data extraction and review are provided as Table 5.1. The complete results are included as Appendix 5-1.

Within the reviewed papers, there are seven results for pathology (PTH), growth (GRO), and survival (MOR) effects that meet the Data Evaluation Score of >65 for use to derive the TRV (U.S. EPA, 2003; Attachment 4-4). These data are plotted in Figure 5.1 and correspond directly with the data presented in Table 5.1. The no-observed adverse effect level (NOAEL) results for growth and reproduction are used to calculate a geometric mean. This result is examined in relationship to the lowest bounded lowest-observed adverse effect level (LOAEL) for reproduction, growth, and survival to derive the TRV according to procedures in the Eco-SSL guidance (U.S. EPA, 2003); Attachment 4-5).

A geometric mean of the NOAEL values for reproduction and growth could not be calculated as there were not enough data. Therefore, the TRV is equal to the lowest NOAEL for reproduction, growth or survival and is equal to 6.73 mg PCP/kg bw/day.

**Table 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)**
**Pentachlorophenol**
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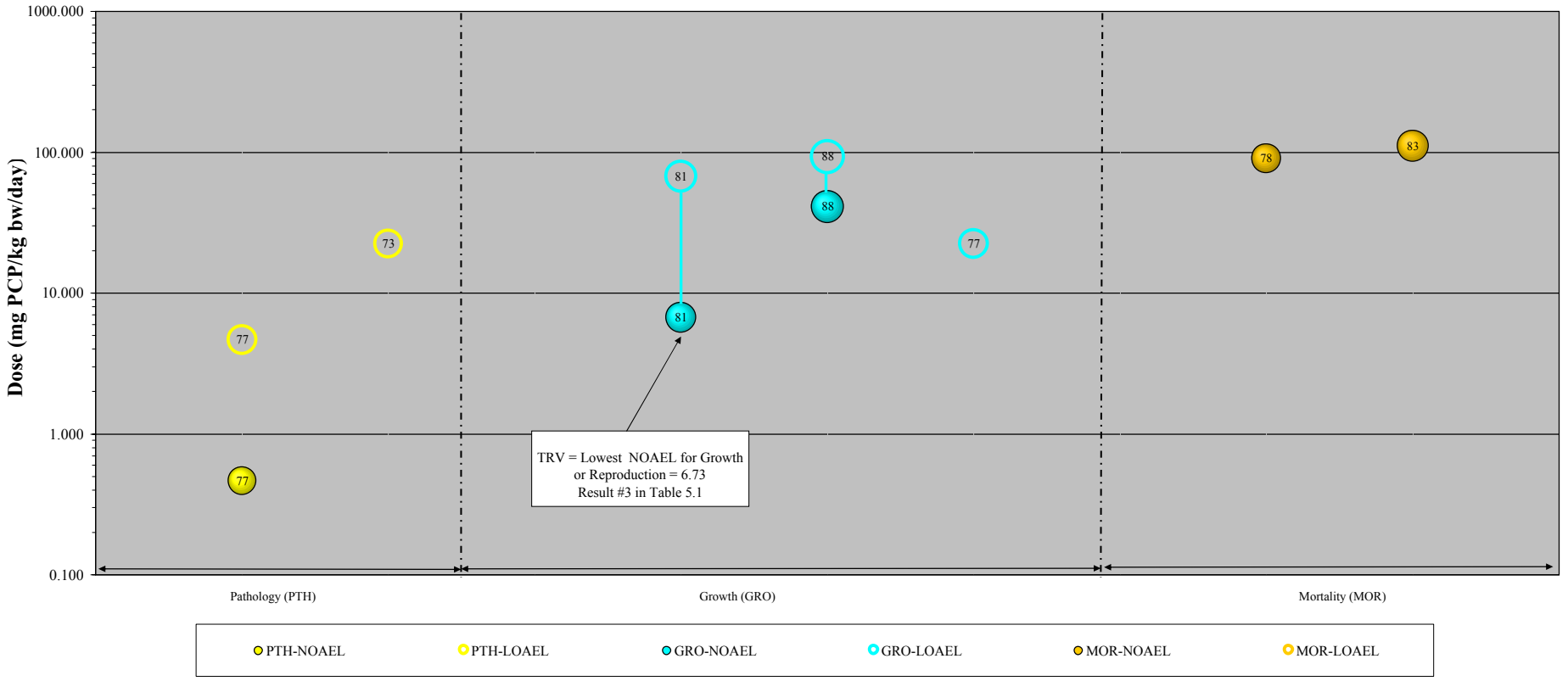
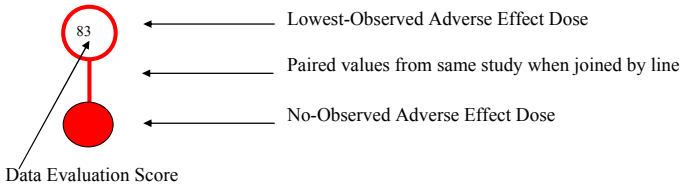
| Result # | Reference | Ref No. | Test Organism | # of Conc/ Doses | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Effect Type | Effect Measure | Response Site | NOAEL Dose* (mg/kg bw/day) | LOAEL Dose* (mg/kg bw/day) | Data Evaluation Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pathology (PTH)** | | | | | | | | | | | | | | | | | | |
| 1 | Stedman et al, 1980 | 6573 | Chicken (*Gallus domesticus* ) | 5 | U | FD | 8 | w | 1 | d | JV | NR | ORW | ORWT | KI | 0.466 | 4.66 | 77 |
| 2 | Prescott et al, 1982 | 6439 | Chicken (*Gallus domesticus* ) | 4 | U | FD | 8 | w | 1 | d | JV | NR | ORW | SMIX | KI | | 22.5 | 73 |
| **Growth (GRO)** | | | | | | | | | | | | | | | | | | |
| 3 | Stedman et al, 1980 | 6573 | Chicken (*Gallus domesticus* ) | 5 | U | FD | 1 | w | 1 | d | JV | NR | GRO | BDWT | WO | 6.73 | 67.3 | 81 |
| 4 | Nebeker et al, 1994 | 5520 | Duck (*Anas platyrhynchos* ) | 7 | M | FD | 11 | d | 4 | d | JV | NR | GRO | BDWT | WO | 40.9 | 92.9 | 88 |
| 5 | Prescott et al, 1982 | 6439 | Chicken (*Gallus domesticus* ) | 4 | U | FD | 1 | w | 1 | d | JV | NR | GRO | BDWT | WO | | 22.5 | 77 |
| **Survival (MOR)** | | | | | | | | | | | | | | | | | | |
| 6 | Prescott et al, 1982 | 6439 | Chicken (*Gallus domesticus* ) | 4 | U | FD | 8 | w | 1 | d | JV | NR | MOR | MORT | WO | 90.0 | | 78 |
| 7 | Nebeker et al, 1994 | 5520 | Duck (*Anas platyrhynchos* ) | 7 | M | FD | 11 | d | 4 | d | JV | NR | MOR | MORT | WO | 111 | | 83 |

BDWT = body weight changes; d = days; FD = food; GRO = growth; JV = juvenile; KI = kidney; LOAEL = lowest observed adverse effect level; M = measured;MOR = mortality, MORT = mortality; NOAEL = no observed adverse effect level; NR = Not reported; ORW = organ weight changes; ORWT = organ weight; SMIX = weight relative to body weight; U = unmeasured; w = weeks; WO = whole organism.

*NOAEL and LOAEL values that are equal and from the same reference represent different experimental designs.

**Figure 5.1 Avian TRV Derivation for Pentachlorophenol**




**Wildlife TRV Derivation Process**

1) There are at least three results available for two test species within the growth, reproduction, and mortality effect groups. There are enough data to derive a TRV.

2) There are only two NOAEL results available within the growth and reproduction effect groups; there are not enough values for calculation of a geometric mean.

3) The avian wildlife TRV for pentachlorophenol is equal to 6.73 mg pentachlorophenol/kg bw/day which is the lowest NOAEL value for reproduction, growth or survival.

## 5.2 Estimation of Dose and Calculation of the Eco-SSL

Three separate Eco-SSL values were calculated for avian wildlife, one for each of three surrogate receptor species representing different trophic levels. The avian Eco-SSLs were calculated according to the Eco-SSL guidance (U.S. EPA, 2003) and are summarized in Table 5.2.

**Table 5.2 Calculation of the Avian Eco-SSLs for Pentachlorophenol (PCP)**

| Surrogate Receptor Group | TRV for PCP (mg dw/kg bw/d) [1] | Food Ingestion Rate (FIR)[2] (kg dw/kg bw/d) | Soil Ingestion as Proportion of Diet ($P_s$)[2] | Concentration of PCP in Biota Type (i)[2,3] ($B_i$) (mg/kg dw) | PCP in Diet of Prey [4] ($C_{diet}$) | Eco-SSL (mg/kg dw)[5] |
|---|---|---|---|---|---|---|
| Avian herbivore (dove) | 6.73 | 0.190 | 0.139 | $B_i = Soil_j * 5.93$ where i = plants | NA | 5.9 |
| Avian ground insectivore (woodcock) | 6.73 | 0.209 | 0.030 | $B_i = 14.63 * Soil_j$ where i = earthworms | NA | 2.1 |
| Avian carnivore (hawk) | 6.73 | 0.12 | 0.05 | $B_i = 0.00452 * C_{diet} + 0.198$ where i = mammals | $C_{diet} = 14.63 * Soil_j$ | 1,500 |

[1] The process for derivation of wildlife TRVs is described in Attachment 4-5 of U.S. EPA (2003).
[2] Parameters (FIR, $P_s$, $B_i$ values, regressions) are provided in U.S. EPA (2003) Attachment 4-1 (revised February 2005).
[3] $B_i$ = Concentration in biota type (i) which represents 100% of the diet for the respective receptor.
[4] $C_{diet}$ = Concentration in the diet of small mammals consumed by predatory species (hawk).
[5] $HQ = FIR * (Soil_j * P_s + B_i) / TRV$ solved for HQ=1 where $Soil_j$ = Eco-SSL (Equation 4-2; U.S. EPA, 2003).
NA = Not Applicable

# 6.0 ECO-SSL FOR MAMMALIAN WILDLIFE

The derivation of the Eco-SSL for mammalian wildlife was completed as two parts. First, the TRV was derived according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5). Second, the Eco-SSL (soil concentration) was back-calculated for each of three surrogate receptor species based on the wildlife exposure model and the TRV (U.S. EPA, 2003).

## 6.1 Mammalian TRV

The literature search was completed according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-2) and identified 1,073 papers with possible toxicity data for PCP for either avian or mammalian species. Of these studies, 1,054 were rejected for use as described in Section 7.5. Of the remaining papers, 16 contained data for mammalian test species. These papers were reviewed and the data were extracted and scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-3 and 4-4). The results of the data extraction and review are summarized in Table 6.1. The complete results are provided as Appendix 6-1.

**Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)**
**Pentachlorophenol**


| Result # | Reference | Ref No. | Test Organism | # of Conc/ Doses | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Effect Type | Effect Measure | Response Site | NOAEL Dose* (mg/kg bw/day) | LOAEL Dose* (mg/kg bw/day) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Biochemical (BIO)** | | | | | | | | | | | | | | | | | | |
| 1 | Knudsen et al, 1974 | 20229 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 6 | w | NR | NR | JV | M | CHM | HMCT | BL | 1.71 | 3.42 | 77 |
| 2 | Schwetz et al, 1978 | 20023 | Rat (*Rattus norvegicus* ) | 5 | U | FD | 22 | mo | NR | NR | NR | B | ENZ | GPTR | SR | 9.04 | 27.1 | 80 |
| 3 | Rawlings et al, 1998 | 20124 | Sheep (*Ovis aries* ) | 2 | U | OR | 36 | d | 1-4 | yr | GE | F | HRM | THYR | SR | | 0.571 | 77 |
| 4 | Beard et al, 1999 | 20024 | Sheep (*Ovis aries* ) | 2 | U | FD | 34 | w | 1-3 | yr | GE | F | HRM | THYR | SR | | 1.0 | 74 |
| 5 | Jekat et al, 1994 | 20093 | Rat (*Rattus norvegicus* ) | 3 | U | GV | 28 | d | NR | NR | JV | F | HRM | THYR | SR | | 3.0 | 77 |
| 6 | Jekat et al, 1994 | 20093 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 28 | d | NR | NR | JV | F | HRM | THYR | SR | | 3.0 | 77 |
| 7 | Renner et al, 1987 | 19997 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 28 | d | 3.5 | mo | JV | F | CHM | PCLV | BL | | 52.7 | 80 |
| 8 | Umemura et al, 1999 | 19990 | Mouse (*Mus musculus* ) | 3 | U | FD | 8 | w | 6 | w | JV | M | ENZ | GENZ | LI | | 75.2 | 69 |
| **Behavior (BEH)** | | | | | | | | | | | | | | | | | | |
| 9 | Welsh et al, 1987 | 20813 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 201 | d | 32 | d | GE | F | FDB | FCNS | WO | 12.9 | 42.6 | 83 |
| 10 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 220 | d | NR | NR | JV | B | FDB | FCNS | WO | 23.7 | | 68 |
| 11 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 220 | d | NR | NR | JV | B | FDB | FCNS | WO | 27.7 | | 68 |
| **Pathology (PTH)** | | | | | | | | | | | | | | | | | | |
| 12 | Knudsen et al, 1974 | 20229 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 12 | w | NR | NR | JV | F | ORW | SMIX | LI | 1.17 | 2.34 | 80 |
| 13 | Jekat et al, 1994 | 20093 | Rat (*Rattus norvegicus* ) | 3 | U | GV | 28 | d | NR | NR | JV | F | ORW | ORWT | LI | 3.0 | 30.0 | 84 |
| 14 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 8 | mo | NR | NR | JV | B | ORW | ORWT | LI | 4.23 | 23.7 | 81 |
| 15 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 6 | w | JV | F | ORW | SMIX | LI | 5.38 | 26.9 | 77 |
| 16 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 8 | w | JV | F | ORW | SMIX | LI | 5.55 | 11.1 | 79 |
| 17 | Schwetz et al, 1978 | 20023 | Rat (*Rattus norvegicus* ) | 5 | U | FD | 12 | mo | NR | NR | NR | F | GRS | BDWT | WO | 9.04 | 27.1 | 83 |
| 18 | Welsh et al, 1987 | 20813 | Mouse (*Mus musculus* ) | 4 | U | FD | 181 | d | 32 | d | GE | F | PTH | HEMR | VA | 13.0 | 42.6 | 81 |
| 19 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 8 | mo | NR | NR | JV | B | ORW | ORWT | LI | 27.7 | | 77 |
| 20 | Courtney et al, 1976 | 20333 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 9 | d | NR | NR | GE | F | ORW | SMIX | LI | 74.3 | | 71 |
| 21 | Beard et al, 1999 | 20024 | Sheep (*Ovis aries* ) | 2 | U | FD | 36 | w | 1-3 | yr | GE | F | HIS | GHIS | TY | | 1.0 | 77 |
| 22 | Kerkvliet et al, 1985 | 20686 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 6-7 | w | JV | F | ORW | ORWT | LI | | 11.5 | 73 |
| 23 | Renner et al, 1987 | 19997 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 28 | d | 3.5 | mo | JV | F | ORW | SMIX | LI | | 52.7 | 83 |
| 24 | Umemura et al, 1999 | 19990 | Mouse (*Mus musculus* ) | 2 | U | FD | 25 | w | 23 | w | JV | M | ORW | ORWT | LI | | 70.7 | 73 |
| 25 | Umemura et al, 1999 | 19990 | Mouse (*Mus musculus* ) | 3 | U | FD | 8 | w | 6 | w | JV | M | HIS | GHIS | LI | | 75.2 | 72 |
| 26 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 2 | U | FD | 8 | w | NR | NR | NR | F | ORW | SMIX | LI | | 122 | 73 |
| **Reproduction (REP)** | | | | | | | | | | | | | | | | | | |
| 27 | Beard and Rawlings, 1998 | 19985 | Mink (*Mustela vison* ) | 2 | U | FD | 162 | d | NR | NR | GE | F | REP | PRWT | WO | 0.0753 | | 69 |
| 28 | Beard et al, 1999 | 20024 | Sheep (*Ovis aries* ) | 2 | U | FD | 36 | w | 1-3 | yr | GE | F | REP | PRWT | WO | 1.0 | | 79 |
| 29 | Knudsen et al, 1974 | 20229 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 12 | w | NR | NR | JV | F | REP | GREP | OV | 2.36 | 9.45 | 84 |
| 30 | Schwetz et al, 1978 | 20023 | Rat (*Rattus norvegicus* ) | 3 | U | FD | 89 | d | NR | NR | GE | F | REP | PROG | WO | 2.71 | 27.1 | 87 |
| 31 | Welsh et al, 1987 | 20813 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 181 | d | 32 | d | GE | F | REP | RSEM | WO | 3.96 | 12.9 | 87 |
| 32 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 5 | U | GV | 10 | d | NR | NR | GE | F | REP | RSEM | WO | 5.13 | 13.3 | 87 |
| 33 | Exon and Koller, 1982 | 20454 | Rat (*Rattus norvegicus* ) | 4 | M | FD | 13 | w | 21 | d | GE | F | REP | PROG | WO | 5.51 | 31.7 | 87 |
| 34 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 4 | U | GV | 10 | d | NR | NR | GE | F | REP | RSEM | WO | 14.7 | 29.4 | 92 |
| 35 | Rawlings et al, 1998 | 20124 | Sheep (*Ovis aries* ) | 2 | U | OR | 43 | d | 1-4 | yr | GE | F | REP | RHIS | OD | | 0.571 | 86 |
| 36 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | REP | PRWT | WO | | 29.4 | 86 |
| 37 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | REP | RSEM | WO | | 29.4 | 86 |
| 38 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | REP | ODVP | WO | | 30.7 | 86 |
| 39 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | REP | RSEM | WO | | 30.7 | 86 |
| 40 | Courtney et al, 1976 | 20333 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 9 | d | NR | NR | GE | F | REP | PRWT | WO | | 74.3 | 86 |
| **Growth (GRO)** | | | | | | | | | | | | | | | | | | |
| 41 | Huwe et al, 2000 | 19901 | Rat (*Rattus norvegicus* ) | 2 | UX | FD | 14 | d | NR | NR | JV | NR | GRO | BDWT | WO | 0.427 | | 73 |
| 42 | Knudsen et al, 1974 | 20229 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 12 | w | NR | NR | JV | F | GRO | BDWT | WO | 2.50 | 10.0 | 82 |
| 43 | Schwetz et al, 1978 | 20023 | Rat (*Rattus norvegicus* ) | 3 | U | FD | 110 | d | NR | NR | JV | F | GRO | BDWT | WO | 2.71 | 27.1 | 85 |
| 44 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 8 | mo | NR | NR | JV | M | GRO | BDWT | WO | 4.23 | 23.7 | 85 |
| 45 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 220 | d | NR | NR | JV | M | GRO | BDWT | WO | 4.95 | 27.7 | 85 |
| 46 | Welsh et al, 1987 | 20813 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 181 | d | 32 | d | GE | F | GRO | BDWT | WO | 12.9 | 42.6 | 85 |
| 47 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 5 | U | GV | 10 | d | NR | NR | GE | F | GRO | BDWT | WO | 13.3 | 30.7 | 85 |
| 48 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 4 | U | GV | 10 | d | NR | NR | GE | F | GRO | BDWT | WO | 14.7 | 29.4 | 90 |
| 49 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 8 | w | JV | F | GRO | BDWT | WO | 27.8 | | 77 |
| 50 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | GRO | BDWT | WO | 29.4 | | 84 |
| 51 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | GRO | BDWT | WO | 30.7 | | 84 |
| 52 | Exon and Koller, 1982 | 20454 | Rat (*Rattus norvegicus* ) | 4 | M | FD | 10 | w | 21 | d | JV | F | GRO | BDWT | WO | 31.7 | | 72 |
| 53 | Renner et al, 1987 | 19997 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 28 | d | 3.5 | mo | JV | F | GRO | BDWT | WO | 52.7 | | 78 |
| 54 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 6 | w | JV | F | GRO | BDWT | WO | 54.8 | | 77 |
| 55 | Kerkvliet et al, 1985 | 20686 | Mouse (*Mus musculus* ) | 4 | U | FD | 8 | w | 6-7 | w | JV | F | GRO | BDWT | WO | 57.6 | | 77 |
| 56 | Umemura et al, 1999 | 19990 | Mouse (*Mus musculus* ) | 2 | U | FD | 25 | w | 23 | w | JV | M | GRO | BDWT | WO | 70.7 | | 77 |

**Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)**
**Pentachlorophenol**
**Page 2 of 2**

| Result # | Reference | Ref No. | Test Organism | # of Conc/ Doses | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Effect Type | Effect Measure | Response Site | NOAEL Dose* (mg/kg bw/day) | LOAEL Dose* (mg/kg bw/day) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 57 | Kerkvliet et al, 1982 | 20129 | Mouse (*Mus musculus* ) | 2 | U | FD | 8 | w | NR | NR | NR | NR | GRO | BDWT | WO | 122 | | 77 |
| 58 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | GRO | BDWT | WO | | 29.4 | 84 |
| 59 | Schwetz et al, 1974 | 20203 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 4 | d | NR | NR | GE | F | GRO | BDWT | WO | | 30.7 | 84 |
| 60 | Courtney et al, 1976 | 20333 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 9 | d | NR | NR | GE | F | GRO | BDWT | WO | | 74.3 | 84 |
| **Survival (MOR)** | | | | | | | | | | | | | | | | | | |
| 61 | Beard and Rawlings, 1998 | 19985 | Mink (*Mustela vison* ) | 2 | U | FD | 162 | d | NR | NR | GE | F | MOR | MORT | WO | 0.0753 | | 77 |
| 62 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 8 | mo | NR | NR | JV | B | MOR | MORT | WO | 23.7 | | 82 |
| 63 | Kimbrough and Linder, 1978 | 20197 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 8 | mo | NR | NR | JV | B | MOR | MORT | WO | 27.7 | | 82 |
| 64 | Welsh et al, 1987 | 20813 | Rat (*Rattus norvegicus* ) | 4 | U | FD | 181 | d | 32 | d | GE | F | MOR | MORT | WO | 42.6 | | 82 |
| 65 | Umemura et al, 1999 | 19990 | Mouse (*Mus musculus* ) | 2 | U | FD | 25 | w | 23 | w | JV | M | MOR | SURV | WO | 70.7 | | 78 |
| 66 | Renner et al, 1987 | 19997 | Rat (*Rattus norvegicus* ) | 2 | U | GV | 28 | d | 3.5 | mo | JV | F | MOR | MORT | WO | | 52.7 | 88 |

B = both; BDWT = body weight changes; BL = blood; bw = body weight; CHM = chemical changes; d- day; ENZ = enyzme level changes; F = female; FCNS = food consumption; FD = food; FDB = feeding behavior; GE = gestation; GENZ = general enzyme changes; GHIS = general histology; GPTR = glutamic pyruvic transaminase; GREP = general reproductive effect; GRO = growth; GRS = gross body weight changes; GV = gavage; HEMR = hemorrhageHIS = histological changes; HMCT = hematocrit; HRM = hormone changes; JV = juvenile; kg = kilograms; LI = liver; LOAEL = lowest observed adverse effect level; mo = months; M = male; M = measured; MOR = effects on mortality and survival; MORT = mortality; NOAEL = No Observed Advese Effect Level; NR = Not reported; OD = oviduct; ODVP = offspring development; OR = other oral; ORW = organ weight changes; ORWT = organ weight changes; OV = ovary; PCLV = packed cell volume; PROG = progeny numbers/counts; PRWT = progeny weight; PTH = pathology; REP = reproduction; RHIS = reproductive histology; RSEM = resorbed embryos; SMIX = weight relative to body weight; SR = serum; SURV = survival; THYR = thyroxone; TY = thyroid; U = unmeasured; UX = measured but values not reported; VA = vagina; w = weeks; WO = whole organism; yr = year.

*NOAEL and LOAEL values that are equal and from the same reference represent different experimental designs.

Within the 16 papers there are 66 results for biochemical (BIO), behavior (BEH), pathology (PTH), reproduction (REP), growth (GRO), and survival (MOR) endpoints with a total Data Evaluation Score >65 that were used to derive the TRV (U.S. EPA 2003; Attachment 4-4). These data are plotted in Figure 6.1 and correspond directly with the data presented in Table 6.1. The NOAEL results for growth and reproduction are used to calculate a geometric mean NOAEL. This geometric mean is examined in relationship to the lowest bounded LOAEL for reproduction, growth, and survival to derive the TRV according to the Eco-SSL guidance (U.S. EPA 2003; Attachment 4-5).

A geometric mean of the NOAEL values for reproduction and growth was calculated at 8.42 mg PCP/kg bw/day. This value is lower than the the lowest bounded LOAEL for reproduction, growth, or mortality results. Therefore, the TRV is equal to the geometric mean of NOAEL values for reproduction and growth and is equal to 8.42 mg PCP/kg bw/day.

## 6.2 Estimation of Dose and Calculation of the Eco-SSL

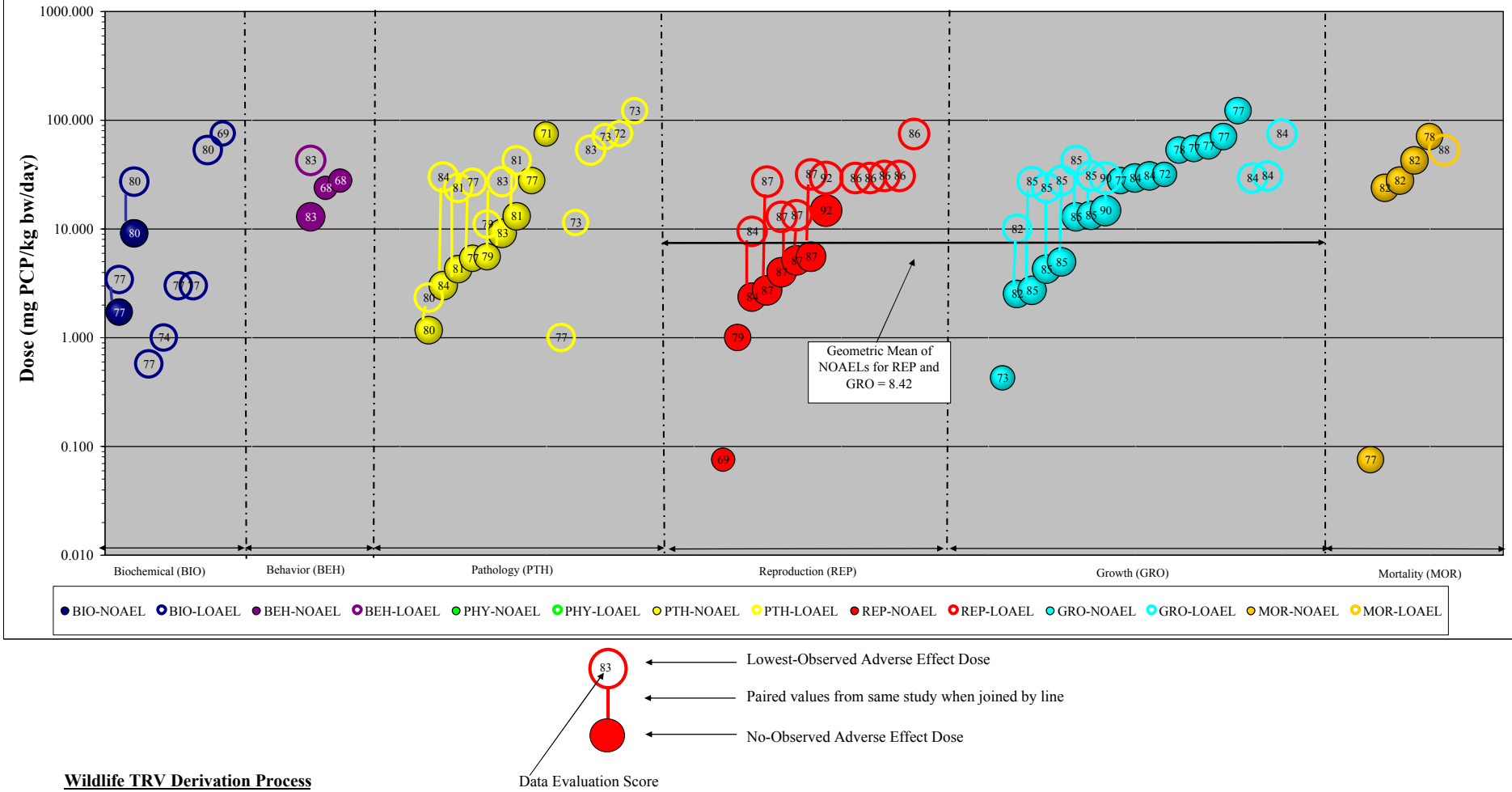
Three separate Eco-SSL values were calculated for mammalian wildlife, one for each of three surrogate receptor groups representing different trophic levels. The mammalian Eco-SSLs derived for PCP were calculated according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5) and are summarized in Table 6.2.

**Table 6.2 Calculation of the Mammalian Eco-SSLs for Pentachlorophenol**

| Surrogate Receptor Group | TRV for PCP (mg dw/kg bw/d) [1] | Food Ingestion Rate (FIR)[2] (kg dw/kg bw/d) | Soil Ingestion as Proportion of Diet ($P_s$)[2] | Concentration of PCP in Biota Type (i)[2,3] ($B_i$) (mg/kg dw) | PCP in Diet of Prey [4] ($C_{diet}$) | Eco-SSL (mg/kg dw)[5] |
|---|---|---|---|---|---|---|
| Mammalian herbivore (vole) | 8.42 | 0.0875 | 0.032 | $B_i = Soil_j * 5.93$ where i = plants | NA | 16 |
| Mammalian ground insectivore (shrew) | 8.42 | 0.209 | 0.030 | $B_i = 14.63 * Soil_j$ where i = earthworms | NA | 2.8 |
| Mammalian carnivore (weasel) | 8.42 | 0.130 | 0.057 | $B_i = 0.00452 * C_{diet} + 0.198$ where i = mammals | $C_{diet} = 14.63 * Soil_j$ | 590 |

[1] The process for derivation of wildlife TRVs is described in Attachment 4-5 of U.S. EPA (2003).
[2] Parameters (FIR, $P_s$, $B_i$ values, regressions) are provided in U.S. EPA (2003) Attachment 4-1 (revised February 2005).
[3] $B_i$ = Concentration in biota type (i) which represents 100% of the diet for the respective receptor.
[4] $C_{diet}$ = Concentration in the diet of small mammals consumed by predatory species (weasel).
[5] HQ = FIR * ($Soil_j$ * $P_s$ + $B_i$) / TRV solved for HQ=1 where $Soil_j$ = Eco-SSL (Equation 4-2; U.S. EPA, 2003).
NA = Not Applicable

**Figure 6.1 Mammalian TRV Derivation for Pentachlorphenol**







**Wildlife TRV Derivation Process**

1) There are at least three results available for two test species within the growth, reproduction, and mortality effect groups. There are enough data to derive a TRV.

2) There are three NOAEL results available within the growth and reproduction effect groups for calculation of a geometric mean.

4) The geometric mean is equal to 8.42 mg pentachlorophenol /kg bw/d but is lower than the lowest bounded LOAEL for results within the reproduction, growth, and survival (MOR) effect groups.

5) The mammalian wildlife TRV for pentachlorophenol is equal to 8.42 mg pentachlorophenol/kg bw/day which is the geometric mean of NOAEL values for reproduction and growth.

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## 7.5 References Rejected for Use in Derivation of Wildlife TRV

These references were reviewed and rejected for use in derivation of the Eco-SSL. The definition of the codes describing the basis for rejection is provided at the end of the reference sections.

**Diss** The action of phencyclidine upon hippocampal neurons. *917024 ORDER NO: NOT AVAILABLE FROM UNIVERSITY MICROFILMS INT'L.*

**Diss** Alteration in central nervous system noradrenergic function associated with aging in the rat. *884182 ORDER NO: AAD85-12017*

**No COC** Analysis of the interaction of pcp-like agents on operant behaviors in the rat. *01156309 ORDER NO: AAD91-06059*

**Diss** Antibody-based medications as short- and long-term antagonists of. *01691223 ORDER NO: AAD99-20411*

**Diss** Behavioral and biochemical analysis of phencyclidine. *1045920 ORDER NO: AAD89-05455*

**Diss** Behavioral and neurochemical consequences of prenatal exposure to phencyclidine in mice: mid versus late gestation. *0985614 ORDER NO: AAD88-03536*

**Diss** Behavioral characterization of sigma site compounds (sigma site compounds). *01107453 ORDER NO: AAD90-13894*

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| **Diss** | The behavioral effects of drug interactions: phencyclidine and central nervous system depressant. *828556 ORDER NO: AAD83-25721* |
| **Diss** | Behavioral interactions between delta-9-tetrahydrocannabinol, phencyclidine and ethanol in rats (delta-9-tetrahydrocannabinol). *01222636 ORDER NO: AAD92-16707* |
| **Diss** | A behavioral model for evaluating the interaction between phencyclidine (pcp) and the sigma receptor. *1071025 ORDER NO: AAD89-15599* |
| **Diss** | The behavioral pharmacology of novel n-methyl-d-aspartate receptor channel blockers (nmda). *01695959 ORDER NO: AAD99-23749* |
| **Diss** | Behavioral pharmacology of phencyclidine (pcp) in the rat (aggression, opioid, dopamine). *868518 ORDER NO: AAD84-28919* |
| **Diss** | Biochemical and pharmacological studies of transmethylation mechanisms in the central nervous system (clioquinol). *01706096 ORDER NO: NOT AVAILABLE FROM UNIVERSITY MICROFILMS INT'L.* |
| **Diss** | Comparison of central sites of action and cns depressant properties of phencyclidine and (+)-n-allylnormetazocine. *901393 ORDER NO: AAD85-25979* |
| **Diss** | Comparison of the behavioral pharmacology of phencyclidine to related compounds (pcp). *808941 ORDER NO: AAD83-06301* |
| **Diss** | Conditioned taste aversions in rats as a behavioral baseline to assess the discriminative stimulus properties of phencyclidine. *945938 ORDER NO: AAD87-05009* |
| **Diss** | Creativity at the task and process level: what is responsible for age differences? (divergent thinking, convergent thinking). *01636929 ORDER NO: AAD98-26255* |
| **Diss** | Cyclazocine: dissociation of its opioid and non-opioid effects using eeg, eeg power spectra and behavior in the rat. *955014 ORDER NO: AAD87-12470* |
| **No COC** | Dependence on phencyclidine: behavioral and biochemical aspects (drug dependence, operant behavior). *01164407 ORDER NO: AAD91-19378* |
| **Diss** | Development of an improved rat model of pneumocystis carinii pneumonia and investigations of novel chemotherapeutic agents (immune deficiency, aids. *01413015 ORDER NO: AADAA-I9514430* |
| **Diss** | Development of dicationic compounds as anti-microbial agents (pneumocystis carinii, opportunistic infections, diamidoximes, immune deficiency). *01681862 ORDER NO: AAD99-14926* |
| **No Oral** | Differential effect of metaphit on the biochemical and functional properties of receptors for n-methyl-d-aspartate (nmda) and phencyclidine (pcp) (methylaspartate). *01204627 ORDER NO: AAD92-05488* |
| **No Oral** | Discriminative learning with an interoceptive drug stimulus and an exteroceptive stimulus: stimulus interaction and relative salience. *01403622 ORDER NO: AADAA-I9509216* |
| **Diss** | Dissociative anesthetics selectively block long-term potentiation in the rat hippocampus. *858440 ORDER NO: AAD84-19907* |

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| **Diss** | The effect of a single administration of phencyclidine on behavior and some neurochemical parameters in the rat. *816980 ORDER NO: AAD83-17163* |
| **Diss** | The effect of pentachlorophenol on the reproductive performance in rats. *718584 ORDER NO: AAD13-16620* |
| **No COC** | Effects of opioids on the acquisition and performance of discriminations in squirrel monkeys (monkeys). *01147464 ORDER NO: AAD91-08037* |
| **Diss** | Evaluation of the effectiveness of molybdate as an inhibitor of xenobiotic sulfation in rats (sulfation inhibition, intestinal absorption, biotransformation). *01613685 ORDER NO: AAD98-11345* |
| **Diss** | Evaluation of the reinforcing efficacy of orally-delivered phencyclidine and ethanol in rhesus monkeys under fixed- and progressive-ratio schedules (drug abuse). *01613652 ORDER NO: AAD98-11275* |
| **Diss** | Examination of the cerebrospinal fluid of the dog original title: laboruntersuchung des liquor cerebrospinalis beim hund. *01230230 ORDER NO: NOT AVAILABLE FROM UNIVERSITY MICROFILMS INT'L.* |
| **Diss** | Fos induction within the ventral tegmental area following infusions of phencyclidine, mk-801, and nomifensine into the core and shell subterritories of the nucleus accumbens septi. *01707933 ORDER NO: AADMQ-39442* |
| **Diss** | Immunotherapy for phencyclidine abuse (drug abuse, pcp). *01432793 ORDER NO: AADAA-I9532080* |
| **Diss** | Inactivation of cytochrome p450 2b1 by clorgyline, deprenyl and phencyclidine. *01619796 ORDER NO: AAD98-15374* |
| **Diss** | The investigation of n-benzylpiperidines: as possible phencyclidine antagonists. *0959781 ORDER NO: AAD87-16499* |
| **Diss** | The investigation of some analogs of phencyclidine (pcp) as possible antagonists to phencyclidine. *778671 ORDER NO: AAD82-10469* |
| **Diss** | Involvement of sigma binding sites in the regulation of posture and movement. *1084730 ORDER NO: AAD90-02260* |
| **Diss** | Locomotor sensitization and neural degeneration associated with chronic phencyclidine administration in rats: a potential model of schizophrenia. *01698470 ORDER NO: AAD99-24635* |
| **Diss** | Metabolic and neurochemical aspects of phencyclidine toxicity. |
| **Diss** | The n-acetylation polymorphism: the metabolic activation of 2-aminofluorene and dna damage in mice. *0979586 ORDER NO: AAD88-01419* |
| **Diss** | Neuronal degeneration in the neurologically mutant mouse lurcher (cerebellum, apoptosis). *01448550 ORDER NO: AADAA-I9539517* |
| **Diss** | Part I. metabolic activation of cyclic tertiary amines. part ii neurotoxic activation of beta, beta prime-iminodipropionitrile (idpn). *01404431 ORDER NO: AADAA-I9510906* |
| **Diss** | Pharmacokinetic mechanisms of antibody therapy for pcp toxicity and abuse (immunoglobulin g). |

*01691226 ORDER NO: AAD99-20414*

**Diss** Pharmacological characterization and nociceptive action of excitatory amino acids in the rodent spinal cord. *0962316 ORDER NO: AAD87-18629*

**Diss** Pharmacological modulation of hypoxic membrane changes and neuronal survival in rat hippocampal slices. *01092937 ORDER NO: AAD90-03684*

**Diss** Pharmacology and characterization of n-methyl-d-aspartate neurotoxicity in developing central nervous system. *01209422 ORDER NO: AAD92-08613*

**Diss** Phencyclidine and central dopamine receptor sensitivity; behavioral and biochemical studies in differentially housed mice. *879307 ORDER NO: AAD85-07167*

**Diss** Phencyclidine disposition in dogs (pcp). *824041 ORDER NO: AAD83-22654*

**Diss** Phencyclidine exposure and the developing mouse. *791828 ORDER NO: AAD82-23760*

**Diss** Phencyclidine-induced potentiation of brain stimulation reward: acute effects are not altered by repeated administration. *01330619 ORDER NO: AADMM-80958*

**Diss** The phencyclidine model of schizophrenia: dysregulation of brain dopamine systems induced by nmda receptor antagonists. an experimental study. *01688017 ORDER NO: NOT AVAILABLE FROM UNIVERSITY MICROFILMS INT'L.*

**HHE** Phencyclidine (pcp) interaction with ethyl alcohol and morphine: pharmacology and disposition of pcp and metabolites in rats and human postmortem specimens. *1067974 ORDER NO: AAD89-13774*

**Diss** Phencyclidine: the rapid induction of tolerance, the development of physical dependence, and the effect of acute treatment and chronic infusion of 3h-spiperone binding to dopamine d-2 receptors in the rat striatum|+. *826493 ORDER NO: AAD83-25103*

**Diss** Purkinje cells and the control of neuronal survival in the developing cerebellum (l7adt, apoptosis, cell proliferation). *01674357 ORDER NO: AAD99-11176*

**Diss** Regulation of striatal nmda receptor function in normal and altered states: implications for schizophrenia (nucleus accumbens, striatum, phencyclidine, gaba). *01636908 ORDER NO: AAD98-26225*

**Diss** The role of male reproductive tract glutathione in protecting against chemically induced dominant lethal mutation. *1067277 ORDER NO: AAD89-10131*

**Diss** The role of the n-methyl-d-aspartate receptor in synaptic structural plasticity: possible implications for learning. *01224952 ORDER NO: AADNN-65960*

**Diss** Searching for evidence of transfer between drug facilitators (drug discrimination, methadone, pcp). *01631941 ORDER NO: AAD98-24006*

**No Org** Shortened analogs of somatostatin. *Can.* 41 pp.

**Diss** Smoking studies of phencyclidine: pyrolysis and biodisposition in mice (pcp, thc). *806439 ORDER NO: AAD83-06297*

**Diss** Toxicologic and pharmacologic effects of phencyclidine hydrogen chloride in the dog. *693220 ORDER NO: AAD80-18829*

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**No COC** Yanai, J., Avraham, Y., Levy, S., Maslaton, J., Pick, C. G., Rogel-Fuchs, Y., and Zahalka, E. A. 1992. alterations in septohippocampal cholinergic innervations and related behaviors after early exposure to heroin and phencyclidine. *Brain Research. Developmental Brain Research* 69(2): 207-14.

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**FL** Yershova L.K. and Khomenko N.R. 1981. effect of some organochlorine pesticides on central nervous system Function. *Fiziologich. Zh., Kiev* VOL. 27, NO. 4: pp. 557-560.

**No COC** Yonezawa Y(A), Hondo, H., Hashimoto, K., Matsumoto, T., Hirano, M., Uchimura, H., and Kuroki, T. 1993. effect of phencyclidine on endogenous excitatory amino acid release from the rat anterior cingulate cortex: an in vivo microdialysis study. *Journal of Neural Transmission General Section* 94(3): 235-240.

**No COC** Yonezawa Yuji(A), Kuroki Toshihide, Kawahara Takeshi, Tashiro Nobutada, and Uchimura Hideyuki. 1998. involvement of gamma-aminobutyric acid neurotransmission in phencyclidine-induced dopamine release in the medial prefrontal cortex. *European Journal of Pharmacology* 341(1): 45-56.

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**No COC** Young, T., Lawson, G. W., and Gacono, C. B. 1987. clinical aspects of phencyclidine (pcp). *International Journal Of The Addictions* 22(1): 1-15.

**Food** Yuan, J. 1995. effects of drinking pattern on the peak/trough blood concentrations in drinking water studies. *Food And Chemical Toxicology : An International Journal Published For The British Industrial Biological Research Association.* 33(7): 565-571.

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**No Oral** Yukhananov, R. Yu. and Larson, A. A. 1994. morphine modulates excitatory amino acid-induced activity in the mouse spinal cord: short-term effects on n-methyl-d-aspartate (nmda) and long-term effects on kainic acid. *Vol. 646, No. 2, Pp. 194-200* Brain Res.

**Acu** Zbinden, G. and Flury-Roversi, M. significance of the ld50-test for the toxicological evaluation of chemical substances. *Arch. Toxicol. 47(2): 77-99 1981 (52 References)*

**No COC** Zerbe, R. L., Bayorh, M. A., Quirion, R., and Kopin, I. J. the role of vasopressin suppression in phencyclidine induced Diuresis. *Pharmacology (Basel). 26 (2). 1983. 73-78.*

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**Unrel** Zukin, S. R., Brady, K. T., Slifer, B. L., and Balster, R. L. 1984. behavioral and biochemical stereoselectivity of sigma opiate pcp receptors. *Brain Research* 294(1): 174-177.

**No COC** Zukin, S. R., Fitz-Syage, M. L., Nichtenhauser, R., and Zukin, R. S. specific binding of tritium labeled phencyclidine in rat central nervous tissue further characterization and technical

considerations.. *Brain Research. 258 (2). 1983. 277-284.*

**No COC** Zukin, S. R., Fitz Syage, M. L., Nichtenhauser, R., and Zukin, R. S. 1983. specific binding of ( super(3)h)phencyclidine in rat central nervous tissue: further characterization and technical considerations. *Vol. 258, No. 2, Pp. 277-284* Brain Res.

**No COC** Zukin, S. R., Fitz-Syage, M. L., Nichtenhauser, R., and Zukin, R. S. 1983. specific binding of [3h]phencyclidine in rat central nervous tissue: further characterization and technical considerations. *Brain Research* 258(2): 277-84.

**No COC** Zukin, S. R. and Zukin, R. S. specific tritium labeled phencyclidine binding in rat central nervous system. *PROC NATL ACAD SCI U S A. Proceedings of the National Academy of Sciences of the United States of America. 76 (10). 1979. 5372-5381.*

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| Literature Rejection Categories | | |
|---|---|---|
| **Rejection Criteria** | **Description** | **Receptor** |
| ABSTRACT<br>(Abstract) | Abstracts of journal publications or conference presentations. | Wildlife<br>Plants and Soil Invertebrates |
| ACUTE STUDIES<br>(Acu) | Single oral dose or exposure duration of three days or less. | Wildlife |
| AIR POLLUTION<br>(Air P) | Studies describing the results for air pollution studies. | Wildlife<br>Plants and Soil Invertebrates |
| ALTERED RECEPTOR<br>(Alt) | Studies that describe the effects of the contaminant on surgically-altered or chemically-modified receptors (e.g., right nephrectomy, left renal artery ligature, hormone implant, etc.). | Wildlife |
| AQUATIC STUDIES<br>(Aquatic) | Studies that investigate toxicity in aquatic organisms. | Wildlife<br>Plants and Soil Invertebrates |
| ANATOMICAL STUDIES<br>(Anat) | Studies of anatomy. Instance where the contaminant is used in physical studies (e.g., silver nitrate staining for histology). | Wildlife |
| BACTERIA<br>(Bact) | Studies on bacteria or susceptibility to bacterial infection. | Wildlife<br>Plants and Soil Invertebrates |
| BIOACCUMULATION SURVEY<br>(Bio Acc) | Studies reporting the measurement of the concentration of the contaminant in tissues. | Wildlife<br>Plants and Soil Invertebrates |
| BIOLOGICAL PRODUCT<br>(BioP) | Studies of biological toxicants, including venoms, fungal toxins, *Bacillus thuringiensis*, other plant, animal, or microbial extracts or toxins. | Wildlife<br>Plants and Soil Invertebrates |
| BIOMARKER<br>(Biom) | Studies reporting results for a biomarker having no reported association with an adverse effect and an exposure dose (or concentration). | Wildlife |
| CARCINOGENICITY STUDIES<br>(Carcin) | Studies that report data only for carcinogenic endpoints such as tumor induction. Papers that report systemic toxicity data are retained for coding of appropriate endpoints. | Wildlife<br>Plants and Soil Invertebrates |
| CHEMICAL METHODS<br>(Chem Meth) | Studies reporting methods for determination of contaminants, purification of chemicals, etc. Studies describing the preparation and analysis of the contaminant in the tissues of the receptor. | Wildlife<br>Plants and Soil Invertebrates |
| CONFERENCE PROCEEDINGS<br>(CP) | Studies reported in conference and symposium proceedings. | Wildlife<br>Plants and Soil Invertebrates |
| DEAD<br>(Dead) | Studies reporting results for dead organisms. Studies reporting field mortalities with necropsy data where it is not possible to establish the dose to the organism. | Wildlife<br>Plants and Soil Invertebrates |
| DISSERTATIONS<br>(Diss) | Dissertations are excluded. However, dissertations are flagged for possible future use. | Wildlife |
| DRUG<br>(Drug) | Studies reporting results for testing of drug and therapeutic effects and side-effects. Therapeutic drugs include vitamins and minerals. Studies of some minerals may be included if there is potential for adverse effects. | Wildlife<br>Plants and Soil Invertebrates |
| DUPLICATE DATA<br>(Dup) | Studies reporting results that are duplicated in a separate publication. The publication with the earlier year is used. | Wildlife<br>Plants and Soil Invertebrates |

| Literature Rejection Categories | | |
|---|---|---|
| **Rejection Criteria** | **Description** | **Receptor** |
| ECOLOGICAL INTERACTIONS (Ecol) | Studies of ecological processes that do not investigate effects of contaminant exposure (e.g., studies of "silver" fox natural history; studies on ferrets identified in iron search). | Wildlife<br>Plants and Soil Invertebrates |
| EFFLUENT (Effl) | Studies reporting effects of effluent, sewage, or polluted runoff. | Wildlife<br>Plants and Soil Invertebrates |
| ECOLOGICALLY RELEVANT ENDPOINT (ERE) | Studies reporting a result for endpoints considered as ecologically relevant but is not used for deriving Eco-SSLs (e.g., behavior, mortality). | Plants and Soil Invertebrates |
| CONTAMINANT FATE/METABOLISM (Fate) | Studies reporting what happens to the contaminant, rather than what happens to the organism. Studies describing the intermediary metabolism of the contaminant (e.g., radioactive tracer studies) without description of adverse effects. | Wildlife<br>Plants and Soil Invertebrates |
| FOREIGN LANGUAGE (FL) | Studies in languages other than English. | Wildlife<br>Plants and Soil Invertebrates |
| FOOD STUDIES (Food) | Food science studies conducted to improve production of food for human consumption. | Wildlife |
| FUNGUS (Fungus) | Studies on fungus. | Wildlife<br>Plants and Soil Invertebrates |
| GENE (Gene) | Studies of genotoxicity (chromosomal aberrations and mutagenicity). | Wildlife<br>Plants and Soil Invertebrates |
| HUMAN HEALTH (HHE) | Studies with human subjects. | Wildlife<br>Plants and Soil Invertebrates |
| IMMUNOLOGY (IMM) | Studies on the effects of contaminants on immunological endpoints. | Wildlife<br>Plants and Soil Invertebrates |
| INVERTEBRATE (Invert) | Studies that investigate the effects of contaminants on terrestrial invertebrates are excluded. | Wildlife |
| IN VITRO (In Vit) | *In vitro* studies, including exposure of cell cultures, excised tissues and/or excised organs. | Wildlife<br>Plants and Soil Invertebrates |
| LEAD SHOT (Lead shot) | Studies administering lead shot as the exposure form. These studies are labeled separately for possible later retrieval and review. | Wildlife |
| MEDIA (Media) | Authors must report that the study was conducted using natural or artificial soil. Studies conducted in pore water or any other aqueous phase (e.g., hydroponic solution), filter paper, petri dishes, manure, organic or histosoils (e.g., peat muck, humus), are not considered suitable for use in defining soil screening levels. | Plants and Soil Invertebrates |
| METHODS (Meth) | Studies reporting methods or methods development without usable toxicity test results for specific endpoints. | Wildlife<br>Plants and Soil Invertebrates |
| MINERAL REQUIREMENTS (Mineral) | Studies examining the minerals required for better production of animals for human consumption, unless there is potential for adverse effects. | Wildlife |
| MIXTURE (Mix) | Studies that report data for combinations of single toxicants (e.g. cadmium and copper) are excluded. Exposure in a field setting from contaminated natural soils or waste application to soil may be coded as Field Survey. | Wildlife<br>Plants and Soil Invertebrates |

| Literature Rejection Categories | | |
|---|---|---|
| **Rejection Criteria** | **Description** | **Receptor** |
| MODELING<br>(Model) | Studies reporting the use of existing data for modeling, i.e., no new organism toxicity data are reported. Studies which extrapolate effects based on known relationships between parameters and adverse effects. | Wildlife<br>Plants and Soil Invertebrates |
| NO CONTAMINANT OF CONCERN<br>(No COC) | Studies that do not examine the toxicity of Eco-SSL contaminants of concern. | Wildlife<br>Plants and Soil Invertebrates |
| NO CONTROL<br>(No Control) | Studies which lack a control or which have a control that is classified as invalid for derivation of TRVs. | Wildlife<br>Plants and Soil Invertebrates |
| NO DATA<br>(No Data) | Studies for which results are stated in text but no data is provided. Also refers to studies with insufficient data where results are reported for only one organism per exposure concentration or dose (wildlife). | Wildlife<br>Plants and Soil Invertebrates |
| NO DOSE or CONC<br>(No Dose) | Studies with no usable dose or concentration reported, or an insufficient number of doses/concentrations are used based on Eco-SSL SOPs. These are usually identified after examination of full paper. This includes studies which examine effects after exposure to contaminant ceases. This also includes studies where offspring are exposed in utero and/or lactation by doses to parents and then after weaning to similar concentrations as their parents. Dose cannot be determined. | Wildlife<br>Plants and Soil Invertebrates |
| NO DURATION<br>(No Dur) | Studies with no exposure duration. These are usually identified after examination of full paper. | Wildlife<br>Plants and Soil Invertebrates |
| NO EFFECT<br>(No Efct) | Studies with no relevant effect evaluated in a biological test species or data not reported for effect discussed. | Wildlife<br>Plants and Soil Invertebrates |
| NO ORAL<br>(No Oral) | Studies using non-oral routes of contaminant administration including intraperitoneal injection, other injection, inhalation, and dermal exposures. | Wildlife |
| NO ORGANISM<br>(No Org) or NO SPECIES | Studies that do not examine or test a viable organism (also see in vitro rejection category). | Wildlife<br>Plants and Soil Invertebrates |
| NOT AVAILABLE<br>(Not Avail) | Papers that could not be located. Citation from electronic searches may be incorrect or the source is not readily available. | Wildlife<br>Plants and Soil Invertebrates |
| NOT PRIMARY<br>(Not Prim) | Papers that are not the original compilation and/or publication of the experimental data. | Wildlife<br>Plants and Soil Invertebrates |
| NO TOXICANT<br>(No Tox) | No toxicant used. Publications often report responses to changes in water or soil chemistry variables, e.g., pH or temperature. Such publications are not included. | Wildlife<br>Plants and Soil Invertebrates |
| NO TOX DATA<br>(No Tox Data) | Studies where toxicant used but no results reported that had a negative impact (plants and soil invertebrates). | Plants and Soil Invertebrates |
| NUTRIENT<br>(Nutrient) | Nutrition studies reporting no concentration related negative impact. | Plants and Soil Invertebrates |
| NUTRIENT DEFICIENCY<br>(Nut def) | Studies of the effects of nutrient deficiencies. Nutritional deficient diet is identified by the author. If reviewer is uncertain then the administrator should be consulted. Effects associated with added nutrients are coded. | Wildlife |
| NUTRITION<br>(Nut) | Studies examining the best or minimum level of a chemical in the diet for improvement of health or maintenance of animals in captivity. | Wildlife |
| OTHER AMBIENT CONDITIONS<br>(OAC) | Studies which examine other ambient conditions: pH, salinity, DO, UV, radiation, etc. | Wildlife<br>Plants and Soil Invertebrates |

| Literature Rejection Categories | | |
|---|---|---|
| **Rejection Criteria** | **Description** | **Receptor** |
| OIL<br>(Oil) | Studies which examine the effects of oil and petroleum products. | Wildlife<br>Plants and Soil Invertebrates |
| OM, pH<br>(OM, pH) | Organic matter content of the test soil must be reported by the authors, but may be presented in one of the following ways; total organic carbon (TOC), particulate organic carbon (POC), organic carbon (OC), coarse particulate organic matter (CPOM), particulate organic matter (POM), ash free dry weight of soil, ash free dry mass of soil, percent organic matter, percent peat, loss on ignition (LOI), organic matter content (OMC).<br><br>With the exception of studies on non-ionizing substances, the study must report the pH of the soil, and the soil pH should be within the range of $4 and #8.5. Studies that do not report pH or report pH outside this range are rejected. | Plants and Soil Invertebrates |
| ORGANIC METAL<br>(Org Met) | Studies which examine the effects of organic metals. This includes tetraethyl lead, triethyl lead, chromium picolinate, phenylarsonic acid, roxarsone, 3-nitro-4-phenylarsonic acid,, zinc phosphide, monomethylarsonic acid (MMA), dimethylarsinic acid (DMA), trimethylarsine oxide (TMAO), or arsenobetaine (AsBe) and other organo metallic fungicides. Metal acetates and methionines are not rejected and are evaluated. | Wildlife |
| LEAD BEHAVIOR OR HIGH DOSE MODELS<br>(Pb Behav) | There are a high number of studies in the literature that expose rats or mice to high concentrations of lead in drinking water (0.1, 1 to 2% solutions) and then observe behavior in offspring, and/or pathology changes in the brain of the exposed dam and/or the progeny. Only a representative subset of these studies were coded. Behavior studies examining complex behavior (learned tasks) were also not coded. | Wildlife |
| PHYSIOLOGY STUDIES<br>(Phys) | Physiology studies where adverse effects are not associated with exposure to contaminants of concern. | Wildlife |
| PLANT<br>(Plant) | Studies of terrestrial plants are excluded. | Wildlife |
| PRIMATE<br>(Prim) | Primate studies are excluded. | Wildlife |
| PUBL AS<br>(Publ as) | The author states that the information in this report has been published in another source. Data are recorded from only one source. The secondary citation is noted as Publ As. | Wildlife<br>Plants and Soil Invertebrates |
| QSAR<br>(QSAR) | Derivation of Quantitative Structure-Activity Relationships (QSAR) is a form of modeling. QSAR publications are rejected if raw toxicity data are not reported or if the toxicity data are published elsewhere as original data. | Wildlife<br>Plants and Soil Invertebrates |
| REGULATIONS<br>(Reg) | Regulations and related publications that are not a primary source of data. | Wildlife<br>Plants and Soil Invertebrates |
| REVIEW<br>(Rev) | Studies in which the data reported in the article are not primary data from research conducted by the author. The publication is a compilation of data published elsewhere. These publications are reviewed manually to identify other relevant literature. | Wildlife<br>Plants and Soil Invertebrates |

| Literature Rejection Categories | | |
|---|---|---|
| **Rejection Criteria** | **Description** | **Receptor** |
| SEDIMENT CONC<br>(Sed) | Studies in which the only exposure concentration/dose reported is for the level of a toxicant in sediment. | Wildlife<br>Plants and Soil Invertebrates |
| SCORE<br>(Score) | Papers in which all studies had data evaluation scores at or lower then the acceptable cut-off (#10 of 18) for plants and soil invertebrates). | Plants and Soil Invertebrates |
| SEDIMENT CONC<br>(Sed) | Studies in which the only exposure concentration/dose reported is for the level of a toxicant in sediment. | Wildlife<br>Plants and Soil Invertebrates |
| SLUDGE | Studies on the effects of ingestion of soils amended with sewage sludge. | Wildlife<br>Plants and Soil Invertebrates |
| SOIL CONC<br>(Soil) | Studies in which the only exposure concentration/dose reported is for the level of a toxicant in soil. | Wildlife |
| SPECIES | Studies in which the species of concern was not a terrestrial invertebrate or plant or mammal or bird. | Plants and Soil Invertebrates<br>Wildlife |
| STRESSOR<br>(QAC) | Studies examining the interaction of a stressor (e.g., radiation, heat, etc.) and the contaminant, where the effect of the contaminant alone cannot be isolated. | Wildlife<br>Plants and Soil Invertebrates |
| SURVEY<br>(Surv) | Studies reporting the toxicity of a contaminant in the field over a period of time. Often neither a duration nor an exposure concentration is reported. | Wildlife<br>Plants and Soil Invertebrates |
| REPTILE OR AMPHIBIAN<br>(Herp) | Studies on reptiles and amphibians. These papers flagged for possible later review. | Wildlife<br>Plants and Soil Invertebrates |
| UNRELATED<br>(Unrel) | Studies that are unrelated to contaminant exposure and response and/or the receptor groups of interest. | Wildlife |
| WATER QUALITY STUDY<br>(Wqual) | Studies of water quality. | Wildlife<br>Plants and Soil Invertebrates |
| YEAST<br>(Yeast) | Studies of yeast. | Wildlife<br>Plants and Soil Invertebrates |

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# Appendix 5-1

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*Avian Toxicity Data Extracted and Reviewed for Wildlife Toxicity Reference Value (TRV) - Pentachlorophenol*

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***March 2005***
***Revised April 2007***

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# Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
# Pentachlorophenol
# Page 1 of 1

| Ref | | | Exposure | | | | | | | | | | | | | | | | | | | | | | | | Effects | | | | | Exposure | | | | Result | | Data Evaluation Score | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result # | Ref N. | Reference | Chemical Form | MW% | Test Species | Phase # | # of Conc/ Doses | Conc/ Doses | Conc/Dose Units | Wet Weight Reported? | Percent Moisture | Application Frequency | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Control Type | Test Location | Effect Type | Effect Measure | Response Site | Study NOAEL | Study LOAEL | Body Weight Reported? | Body Weight in kg | Ingestion Rate Reported? | Ingestion Rate in kg/day or L/day | NOAEL Dose (mg/kg/day) | LOAEL Dose (mg/kg/day) | Data Source | Dose Route | Test Concentrations | Chemical form | Dose Quantification | Endpoint | Dose Range | Statistical Power | Exposure Duration | Test Conditions | Total |
| **Pathology** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 6573 | Stedman et al, 1980 | PCP - Purified | 100 | Chicken (*Gallus domesticus* ) | 1 | 5 | 0/1/10/100/1000 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 1 | d | JV | NR | C | Lab | ORW | ORWT | KI | 10.0 | 100 | Y | 1.889 | N | 0.0881 | 0.466 | 4.66 | 10 | 10 | 5 | 10 | 6 | 4 | 8 | 10 | 10 | 4 | 77 |
| 2 | 6439 | Prescott et al, 1982 | PCP - Purified (Dowicide E-7) | 88 | Chicken (*Gallus domesticus* ) | 1 | 4 | 0/600/1200/2400 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 1 | d | JV | NR | V | Lab | ORW | SMIX | KI | | 600 | Y | 2.44 | N | 0.1040 | | 22.5 | 10 | 10 | 5 | 10 | 6 | 4 | 4 | 10 | 10 | 4 | 73 |
| **Growth** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 6573 | Stedman et al, 1980 | PCP - Purified | 100 | Chicken (*Gallus domesticus* ) | 1 | 5 | 0/1/10/100/1000 | mg/kg diet | N | na | ADL | U | FD | 1 | w | 1 | d | JV | NR | C | Lab | GRO | BDWT | WO | 100 | 1000 | Y | 0.6584 | N | 0.04434 | 6.73 | 67.3 | 10 | 10 | 5 | 10 | 6 | 8 | 8 | 10 | 10 | 4 | 81 |
| 4 | 5520 | Nebeker et al, 1994 | PCP - Reagent grade | 100 | Duck (*Anas platyrhynchos* ) | 1 | 7 | 0/25.0/54.2/105.0/233.2/423.2/961.0 | ug/g diet | N | na | DLY | M | FD | 11 | d | 4 | d | JV | NR | C | Lab | GRO | BDWT | WO | 423.2 | 961 | Y | 0.2337 | N | 0.02259 | 40.9 | 92.9 | 10 | 10 | 10 | 10 | 6 | 8 | 10 | 10 | 10 | 4 | 88 |
| 5 | 6439 | Prescott et al, 1982 | PCP - Purified (Dowicide E-7) | 88 | Chicken (*Gallus domesticus* ) | 1 | 4 | 0/600/1200/2400 | mg/kg diet | N | na | ADL | U | FD | 1 | w | 1 | d | JV | NR | V | Lab | GRO | BDWT | WO | | 600 | Y | 2.44 | N | 0.1040 | | 22.5 | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| **Survival** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6439 | Prescott et al, 1982 | PCP - Purified (Dowicide E-7) | 88 | Chicken (*Gallus domesticus* ) | 1 | 4 | 0/600/1200/2400 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 1 | d | JV | NR | V | Lab | MOR | MORT | WO | 2400 | | Y | 2.44 | N | 0.1040 | 90.0 | | 10 | 10 | 5 | 10 | 6 | 9 | 4 | 10 | 10 | 4 | 78 |
| 7 | 5520 | Nebeker et al, 1994 | PCP - Reagent grade | 100 | Duck (*Anas platyrhynchos* ) | 1 | 7 | 0/25.0/54.2/105.0/233.2/423.2/961.0 | ug/g diet | N | na | DLY | M | FD | 11 | d | 4 | d | JV | NR | C | Lab | MOR | MORT | WO | 961 | | Y | 0.1419 | N | 0.01633 | 111 | | 10 | 10 | 10 | 10 | 6 | 9 | 4 | 10 | 10 | 4 | 83 |

All abbreviations and definitions are used in coding studies are available from Attachment 4-3 of the Eco-SSL guidance (U.S. EPA 2003).


# Appendix 6-1

*Mammalian Toxicity Data Extracted and Reviewed for Wildlife Toxicity Reference Value (TRV) - Pentachlorophenol*

***March 2005***
**Revised April 2007**

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# Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
# Pentachlorophenol
# Page 1 of 2

| Ref | | | Exposure | | | | | | | | | | | | | | | | | | | | | | | Effects | | | | | Conversion to mg/kg bw/day | | | | Result | | Data Evaluation Score | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result # | Ref N. | | Chemical Form | MW% | Test Species | Phase # | # of Conc/ Doses | Conc/ Doses | Conc/Dose Units | Wet Weight Reported? | Percent Moisture | Application Frequency | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Control Type | Test Location | Enpoint Number | Effect Type | Effect Measure | Response Site | Study NOAEL | Study LOAEL | Body Weight Reported? | Reported Body Weight | Ingestion Rate Reported? | Ingestion Rate in kg or L/day | NOAEL Dose (mg/kg/day)* | LOAEL Dose (mg/kg/day)* | Data Source | Dose Route | Test Concentrations | Chemical form | Dose Quantification | Endpoint | Dose Range | Statistical Power | Exposure Duration | Test Conditions | Total |
| **Biochemical** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 20229 | Knudsen et al, 1974 | PCP - Not Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/25/50/200 | mg/kg diet | N | na | ADL | U | FD | 6 | w | NR | NR | JV | M | C | Lab | 3 | CHM | HMCT | BL | 25.0 | 50.0 | Y | 0.2590 | Y | 0.0177 | 1.71 | 3.42 | 10 | 10 | 5 | 10 | 7 | 1 | 10 | 10 | 10 | 4 | 77 |
| 2 | 20023 | Schwetz et al, 1978 | PCP - Purified | 90.4 | Rat (*Rattus norvegicus* ) | 2 | 5 | 0/1/3/10/30 | mg/kg bw/d | N | na | ADL | U | FD | 22 | mo | NR | NR | NR | B | V | Lab | 2 | ENZ | GPTR | SR | 10.0 | 30.0 | Y | 0.3780 | N | 0.03088 | 9.04 | 27.1 | 10 | 10 | 5 | 10 | 10 | 1 | 10 | 10 | 10 | 4 | 80 |
| 3 | 20124 | Rawlings et al, 1998 | PCP - Purified | 99.9 | Sheep (*Ovis aries* ) | 1 | 2 | 0/2 | mg/kg bw/d | N | na | 2 per w | U | OR | 36 | d | 1-4 | yr | GE | F | C | Lab | 2 | HRM | THYR | SR | | 2.0 | Y | 54.7 | N | 1.843 | | 0.571 | 10 | 8 | 10 | 10 | 10 | 1 | 4 | 10 | 10 | 4 | 77 |
| 4 | 20024 | Beard et al, 1999 | PCP - Purity not specified | 100 | Sheep (*Ovis aries* ) | 1 | 2 | 0/1 | mg/kg bw/d | N | na | DLY | U | FD | 34 | w | 1-3 | yr | GE | F | V | FieldA | 2 | HRM | THYR | SR | | 1.0 | Y | 70.0 | N | 0.00772 | | 1.0 | 10 | 10 | 5 | 10 | 10 | 1 | 4 | 10 | 10 | 4 | 74 |
| 5 | 20093 | Jekat et al, 1994 | PCP - Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 3 | 0/3/30 | mg/kg bw/d | N | na | 2 per d | U | GV | 28 | d | NR | NR | JV | F | V | Lab | 1 | HRM | THYR | SR | | 3.0 | Y | 0.2000 | N | 0.01830 | | 3.0 | 10 | 8 | 10 | 10 | 10 | 1 | 4 | 10 | 10 | 4 | 77 |
| 6 | 20093 | Jekat et al, 1994 | Sodium pentachlorophenolate | 100 | Rat (*Rattus norvegicus* ) | 2 | 3 | 0/3 | mg/kg bw/d | N | na | 2 per d | U | GV | 28 | d | NR | NR | JV | F | V | Lab | 1 | HRM | THYR | SR | | 3.0 | Y | 0.2000 | N | 0.01830 | | 3.0 | 10 | 8 | 10 | 10 | 10 | 1 | 4 | 10 | 10 | 4 | 77 |
| 7 | 19997 | Renner et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/53.27 | mg/kg bw/d | N | na | DLY | U | GV | 28 | d | 3.5 | mo | JV | F | V | Lab | 3 | CHM | PCLV | BL | | 52.7 | Y | 0.2710 | N | 0.02349 | | 52.7 | 10 | 8 | 10 | 10 | 10 | 1 | 4 | 10 | 10 | 7 | 80 |
| 8 | 19990 | Umemura et al, 1999 | PCP - Purified | 98.6 | Mouse (*Mus musculus* ) | 1 | 3 | 0/600/1200 | mg/kg diet | N | na | DLY | U | FD | 8 | w | 6 | w | JV | M | C | Lab | 1 | ENZ | GENZ | LI | | 600 | N | 0.0316 | N | 0.004015 | | 75.2 | 10 | 10 | 5 | 10 | 5 | 1 | 4 | 10 | 10 | 4 | 69 |
| **Behavior** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 20813 | Welsh et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4/13/43 | mg/kg bw/d | N | na | ADL | U | FD | 201 | d | 32 | d | GE | F | C | Lab | 2 | FDB | FCNS | WO | 13.0 | 43.0 | Y | 0.3214 | Y | 0.02320 | 12.9 | 42.6 | 10 | 10 | 5 | 10 | 10 | 4 | 10 | 10 | 10 | 4 | 83 |
| 10 | 20197 | Kimbrough and Linder, 1978 | PCP - Technical | 84.6 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 220 | d | NR | NR | JV | B | C | Lab | 2 | FDB | FCNS | WO | 28.0 | | Y | 0.5340 | Y | 0.07491 | 23.7 | | 10 | 10 | 5 | 10 | 10 | 4 | 4 | 1 | 10 | 4 | 68 |
| 11 | 20197 | Kimbrough and Linder, 1978 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 2 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 220 | d | NR | NR | JV | B | C | Lab | 2 | FDB | FCNS | WO | 28.0 | | Y | 0.4950 | Y | 0.08081 | 27.7 | | 10 | 10 | 5 | 10 | 10 | 4 | 4 | 1 | 10 | 4 | 68 |
| **Pathology** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | 20229 | Knudsen et al, 1974 | PCP - Not Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/25/50/200 | mg/kg diet | N | na | ADL | U | FD | 12 | w | NR | NR | JV | F | C | Lab | 4 | ORW | SMIX | LI | 25.0 | 50.0 | Y | 0.2010 | Y | 0.0094 | 1.17 | 2.34 | 10 | 10 | 5 | 10 | 7 | 4 | 10 | 10 | 10 | 4 | 80 |
| 13 | 20093 | Jekat et al, 1994 | PCP - Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 3 | 0/3/30 | mg/kg bw/d | N | na | 2 per d | U | GV | 28 | d | NR | NR | JV | F | V | Lab | 2 | ORW | ORWT | LI | 3.0 | 30.0 | Y | 0.2000 | N | 0.01830 | 3.0 | 30.0 | 10 | 8 | 10 | 10 | 10 | 4 | 8 | 10 | 10 | 4 | 84 |
| 14 | 20197 | Kimbrough and Linder, 1978 | PCP - Technical | 84.6 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 8 | mo | NR | NR | JV | B | C | Lab | 4 | ORW | ORWT | LI | 5.0 | 28.0 | Y | 0.5340 | Y | 0.07491 | 4.23 | 23.7 | 10 | 10 | 5 | 10 | 10 | 4 | 8 | 10 | 10 | 4 | 81 |
| 15 | 20129 | Kerkvliet et al, 1982 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 1 | 4 | 0/50/250/500 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 6 | w | JV | F | V | Lab | 2 | ORW | SMIX | LI | 50.0 | 250 | Y | 0.0343 | N | 0.004295 | 5.38 | 26.9 | 10 | 10 | 5 | 10 | 6 | 4 | 8 | 10 | 10 | 4 | 77 |
| 16 | 20129 | Kerkvliet et al, 1982 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 2 | 4 | 0/50/100/250 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 8 | w | JV | F | V | Lab | 2 | ORW | SMIX | LI | 50.0 | 100 | Y | 0.0290 | N | 0.003742 | 5.55 | 11.1 | 10 | 10 | 5 | 10 | 6 | 4 | 10 | 10 | 10 | 4 | 79 |
| 17 | 20023 | Schwetz et al, 1978 | PCP - Purified | 90.4 | Rat (*Rattus norvegicus* ) | 2 | 5 | 0/1/3/10/30 | mg/kg bw/d | N | na | ADL | U | FD | 12 | mo | NR | NR | NR | F | V | Lab | 1 | GRS | BDWT | WO | 10.0 | 30.0 | Y | 0.3780 | N | 0.03088 | 9.04 | 27.1 | 10 | 10 | 5 | 10 | 10 | 4 | 10 | 10 | 10 | 4 | 83 |
| 18 | 20813 | Welsh et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | | 4 | 0/4/13/43 | mg/kg bw/d | N | na | ADL | U | FD | 181 | d | 32 | d | GE | F | C | Lab | 4 | PTH | HEMR | VA | 13.0 | 42.6 | Y | 0.3214 | Y | 0.02320 | 13.0 | 42.6 | 10 | 10 | 5 | 10 | 10 | 4 | 8 | 10 | 10 | 4 | 81 |
| 19 | 20197 | Kimbrough and Linder, 1978 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 2 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 8 | mo | NR | NR | JV | B | C | Lab | 4 | ORW | ORWT | LI | 28.0 | | Y | 0.4950 | Y | 0.08081 | 27.7 | | 10 | 10 | 5 | 10 | 10 | 4 | 4 | 10 | 10 | 4 | 77 |
| 20 | 20333 | Courtney et al, 1976 | PCP - Analytical | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/75 | mg/kg bw/d | N | na | DLY | U | GV | 9 | d | NR | NR | GE | F | V | Lab | 2 | ORW | SMIX | LI | 75.0 | | Y | 0.3846 | N | 0.03132 | 74.3 | | 10 | 8 | 10 | 10 | 10 | 4 | 4 | 1 | 10 | 4 | 71 |
| 21 | 20024 | Beard et al, 1999 | PCP - Purity not specified | 100 | Sheep (*Ovis aries* ) | 1 | 2 | 0/1 | mg/kg bw/d | N | na | DLY | U | FD | 36 | w | 1-3 | yr | GE | F | V | FieldA | 1 | HIS | GHIS | TY | | 1.0 | Y | 70.0 | N | 0.00772 | | 1.0 | 10 | 10 | 5 | 10 | 10 | 4 | 4 | 10 | 10 | 4 | 77 |
| 22 | 20686 | Kerkvliet et al, 1985 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 1 | 4 | 0/100/250/500 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 6-7 | w | JV | F | V | Lab | 2 | ORW | ORWT | LI | | 100 | Y | 0.0242 | N | 0.003224 | | 11.5 | 10 | 10 | 5 | 10 | 6 | 4 | 4 | 10 | 10 | 4 | 73 |
| 23 | 19997 | Renner et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/53.27 | mg/kg bw/d | N | na | DLY | U | GV | 28 | d | 3.5 | mo | JV | F | V | Lab | 2 | ORW | SMIX | LI | | 52.7 | Y | 0.2710 | N | 0.02349 | | 52.7 | 10 | 8 | 10 | 10 | 10 | 4 | 4 | 10 | 10 | 7 | 83 |
| 24 | 19990 | Umemura et al, 1999 | PCP - Purified | 98.6 | Mouse (*Mus musculus* ) | 2 | 2 | 0/600 | mg/kg diet | N | na | DLY | U | FD | 25 | w | 23 | w | JV | M | C | Lab | 3 | ORW | ORWT | LI | | 600 | Y | 0.0445 | N | 0.005320 | | 70.7 | 10 | 10 | 5 | 10 | 6 | 4 | 4 | 10 | 10 | 4 | 73 |
| 25 | 19990 | Umemura et al, 1999 | PCP - Purified | 98.6 | Mouse (*Mus musculus* ) | 1 | 3 | 0/600/1200 | mg/kg diet | N | na | DLY | U | FD | 8 | w | 6 | w | JV | M | C | Lab | 2 | HIS | GHIS | LI | | 600 | N | 0.0316 | N | 0.004015 | | 75.2 | 10 | 10 | 5 | 10 | 5 | 4 | 4 | 10 | 10 | 4 | 72 |
| 26 | 20129 | Kerkvliet et al, 1982 | PCP - Analytical | 99 | Mouse (*Mus musculus* ) | 3 | 2 | 0/1000 | mg/kg diet | N | na | ADL | U | FD | 8 | w | NR | NR | NR | F | C | Lab | 2 | ORW | SMIX | LI | | 1000 | Y | 0.0380 | N | 0.004672 | | 122 | 10 | 10 | 5 | 10 | 6 | 4 | 4 | 10 | 10 | 4 | 73 |
| **Reproduction** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | 19985 | Beard and Rawlings, 1998 | PCP - Purity not specified | 100 | Mink (*Mustela vison* ) | 1 | 2 | 0/1 | mg/kg/d | N | na | NR | U | FD | 162 | d | NR | NR | GE | F | C | Lab | 1 | REP | PRWT | WO | 1.0 | | N | 0.5960 | N | 0.04490 | 0.0753 | | 10 | 10 | 5 | 10 | 5 | 10 | 4 | 1 | 10 | 4 | 69 |
| 28 | 20024 | Beard et al, 1999 | PCP - Purity not specified | 100 | Sheep (*Ovis aries* ) | 1 | 2 | 0/1 | mg/kg bw/d | N | na | DLY | U | FD | 36 | w | 1-3 | yr | GE | F | V | FieldA | 3 | REP | PRWT | WO | 1.0 | | Y | 70.0 | N | 0.00772 | 1.0 | | 10 | 10 | 5 | 10 | 10 | 10 | 4 | 6 | 10 | 4 | 79 |
| 29 | 20229 | Knudsen et al, 1974 | PCP - Not Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/25/50/200 | mg/kg diet | N | na | ADL | U | FD | 12 | w | NR | NR | JV | F | C | Lab | 5 | REP | GREP | OV | 50.0 | 200 | Y | 0.2010 | Y | 0.0095 | 2.36 | 9.45 | 10 | 10 | 5 | 10 | 7 | 10 | 8 | 10 | 10 | 4 | 84 |
| 30 | 20023 | Schwetz et al, 1978 | PCP - Purified | 90.4 | Rat (*Rattus norvegicus* ) | 1 | 3 | 0/3/30 | mg/kg bw/d | N | na | ADL | U | FD | 89 | d | NR | NR | GE | F | V | Lab | 2 | REP | PROG | WO | 3.00 | 30.0 | Y | 0.3340 | N | 0.02789 | 2.71 | 27.1 | 10 | 10 | 5 | 10 | 10 | 8 | 10 | 10 | 4 | 87 |
| 31 | 20813 | Welsh et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4/13/43 | mg/kg bw/d | N | na | ADL | U | FD | 201 | d | 32 | d | GE | F | C | Lab | 3 | REP | RSEM | WO | 4.0 | 13.0 | Y | 0.4701 | Y | 0.02410 | 3.96 | 12.9 | 10 | 10 | 5 | 10 | 10 | 10 | 8 | 10 | 10 | 4 | 87 |
| 32 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 2 | 5 | 0/5.8/15/34.7/50 | mg/kg bw/d | N | na | DLY | U | GV | 10 | d | NR | NR | GE | F | V | Lab | 2 | REP | RSEM | WO | 5.8 | 15.0 | Y | 0.3940 | N | 0.03195 | 5.13 | 13.3 | 10 | 8 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 4 | 87 |
| 33 | 20454 | Exon and Koller, 1982 | PCP - Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4.8/71.4/411.5 | mg/kg diet | N | na | ADL | M | FD | 13 | w | 21 | d | GE | F | C | Lab | 2 | REP | PROG | WO | 71.4 | 411.5 | N | 0.5230 | N | 0.0403 | 5.51 | 31.7 | 10 | 10 | 10 | 10 | 5 | 10 | 8 | 10 | 10 | 4 | 87 |
| 34 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/15/30/50 | mg/kg bw/d | N | na | DLY | U | GV | 10 | d | NR | NR | GE | F | V | Lab | 2 | REP | RSEM | WO | 15.0 | 30.0 | Y | 0.4020 | N | 0.03248 | 14.7 | 29.4 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 4 | 92 |
| 35 | 20124 | Rawlings et al, 1998 | PCP - Purified | 99.9 | Sheep (*Ovis aries* ) | 1 | 2 | 0/2 | mg/kg bw/d | N | na | 2 per w | U | OR | 43 | d | 1-4 | yr | GE | F | C | Lab | 1 | REP | RHIS | OD | | 2.0 | Y | 54.7 | N | 1.843 | | 0.571 | 10 | 8 | 10 | 10 | 10 | 4 | 4 | 10 | 10 | 4 | 86 |
| 36 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 5 | 2 | 0/30 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 2 | REP | PRWT | WO | | 30.0 | Y | 0.4080 | N | 0.03288 | | 29.4 | 10 | 8 | 10 | 10 | 10 | 10 | 4 | 10 | 10 | 4 | 86 |
| 37 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 3 | 2 | 0/30 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 2 | REP | RSEM | WO | | 30.0 | Y | 0.3210 | N | 0.02700 | | 29.4 | 10 | 8 | 10 | 10 | 10 | 10 | 4 | 10 | 10 | 4 | 86 |
| 38 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 6 | 2 | 0/34.7 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 2 | REP | ODVP | WO | | 34.7 | Y | 0.4220 | N | 0.03380 | | 30.7 | 10 | 8 | 10 | 10 | 10 | 10 | 4 | 10 | 10 | 4 | 86 |
| 39 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 4 | 2 | 0/34.7 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 2 | REP | RSEM | WO | | 34.7 | Y | 0.3780 | N | 0.03088 | | 30.7 | 10 | 8 | 10 | 10 | 10 | 10 | 4 | 10 | 10 | 4 | 86 |
| 40 | 20333 | Courtney et al, 1976 | PCP - Analytical | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/75 | mg/kg bw/d | N | na | DLY | U | GV | 9 | d | NR | NR | GE | F | V | Lab | 3 | REP | PRWT | WO | | 75.0 | N | 0.3846 | N | 0.03132 | | 74.3 | 10 | 8 | 10 | 10 | 10 | 10 | 4 | 10 | 10 | 4 | 86 |
| **Growth** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | 19901 | Huwe et al, 2000 | PCP - Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/0.10 | mg/org/d | N | na | DLY | UX | FD | 14 | d | NR | NR | JV | NR | V | Lab | 1 | GRO | BDWT | WO | 0.100 | | Y | 0.2343 | N | 0.02084 | 0.427 | | 10 | 10 | 10 | 10 | 6 | 8 | 4 | 1 | 10 | 4 | 73 |
| 42 | 20229 | Knudsen et al, 1974 | PCP - Not Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/25/50/200 | mg/kg diet | N | na | ADL | U | FD | 12 | w | NR | NR | JV | F | C | Lab | 1 | GRO | BDWT | WO | 50.0 | 200 | Y | 0.1900 | Y | 0.0095 | 2.50 | 10.0 | 10 | 10 | 5 | 10 | 7 | 8 | 8 | 10 | 10 | 4 | 82 |
| 43 | 20023 | Schwetz et al, 1978 | PCP - Purified | 90.4 | Rat (*Rattus norvegicus* ) | 1 | 3 | 0/3/30 | mg/kg bw/d | N | na | ADL | U | FD | 110 | d | NR | NR | JV | F | V | Lab | 1 | GRO | BDWT | WO | 3.00 | 30.0 | Y | 0.3340 | N | 0.02789 | 2.71 | 27.1 | 10 | 10 | 5 | 10 | 10 | 8 | 8 | 10 | 10 | 4 | 85 |
| 44 | 20197 | Kimbrough and Linder, 1978 | PCP - Technical | 84.6 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 8 | mo | NR | NR | JV | M | C | Lab | 3 | GRO | BDWT | WO | 5.0 | 28.0 | Y | 0.5870 | Y | 0.06814 | 4.23 | 23.7 | 10 | 10 | 5 | 10 | 10 | 8 | 8 | 10 | 10 | 4 | 85 |

# Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
## Pentachlorophenol
## Page 2 of 2

| Ref | | | Exposure | | | | | | | | | | | | | | | | | | | | | | | Effects | | | | | Conversion to mg/kg bw/day | | | | Result | | Data Evaluation Score | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Result # | Ref N. | | Chemical Form | MW% | Test Species | Phase # | # of Conc/ Doses | Conc/ Doses | Conc/Dose Units | Wet Weight Reported? | Percent Moisture | Application Frequency | Method of Analyses | Route of Exposure | Exposure Duration | Duration Units | Age | Age Units | Lifestage | Sex | Control Type | Test Location | Enpoint Number | Effect Type | Effect Measure | Response Site | Study NOAEL | Study LOAEL | Body Weight Reported? | Reported Body Weight | Ingestion Rate Reported? | Ingestion Rate in kg or L/day | NOAEL Dose (mg/kg/day)* | LOAEL Dose (mg/kg/day)* | Data Source | Dose Route | Test Concentrations | Chemical form | Dose Quantification | Endpoint | Dose Range | Statistical Power | Exposure Duration | Test Conditions | Total |
| 45 | 20197 | Kimbrough and Linder, 1978 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 2 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 220 | d | NR | NR | JV | M | C | Lab | 3 | GRO | BDWT | WO | 5.0 | 28.0 | Y | 0.5580 | Y | 0.07168 | 4.95 | 27.7 | 10 | 10 | 5 | 10 | 10 | 8 | 8 | 10 | 10 | 4 | 85 |
| 46 | 20813 | Welsh et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4/13/43 | mg/kg bw/d | N | na | ADL | U | FD | 181 | d | 32 | d | GE | F | C | Lab | 1 | GRO | BDWT | WO | 13.0 | 43.0 | Y | 0.3252 | Y | 0.02250 | 12.9 | 42.6 | 10 | 10 | 5 | 10 | 10 | 8 | 8 | 10 | 10 | 4 | 85 |
| 47 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 2 | 5 | 0/5.8/15/34.7/50 | mg/kg bw/d | N | na | DLY | U | GV | 10 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | 15.0 | 34.7 | Y | 0.3940 | N | 0.03195 | 13.3 | 30.7 | 10 | 8 | 5 | 10 | 10 | 8 | 10 | 10 | 10 | 4 | 85 |
| 48 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/15/30/50 | mg/kg bw/d | N | na | DLY | U | GV | 10 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | 15.0 | 30.0 | Y | 0.4020 | N | 0.03248 | 14.7 | 29.4 | 10 | 8 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 4 | 90 |
| 49 | 20129 | Kerkvliet et al, 1982 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 2 | 4 | 0/50/100/250 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 8 | w | JV | F | V | Lab | 1 | GRO | BDWT | WO | 250 | | Y | 0.0286 | N | 0.003699 | 27.8 | | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| 50 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 5 | 2 | 0/30 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | 30.0 | | Y | 0.4080 | N | 0.03288 | 29.4 | | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 10 | 10 | 4 | 84 |
| 51 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 6 | 2 | 0/34.7 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | 34.7 | | Y | 0.4220 | N | 0.03380 | 30.7 | | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 10 | 10 | 4 | 84 |
| 52 | 20454 | Exon and Koller, 1982 | PCP - Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4.8/71.4/411.5 | mg/kg diet | N | na | ADL | M | FD | 10 | w | 21 | d | JV | F | C | Lab | 1 | GRO | BDWT | WO | 411.5 | | N | 0.5230 | N | 0.0403 | 31.7 | | 10 | 10 | 10 | 10 | 5 | 8 | 4 | 1 | 10 | 4 | 72 |
| 53 | 19997 | Renner et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/53.27 | mg/kg bw/d | N | na | DLY | U | GV | 28 | d | 3.5 | mo | JV | F | V | Lab | 1 | GRO | BDWT | WO | 52.7 | | Y | 0.2710 | N | 0.02349 | 52.7 | | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 1 | 10 | 7 | 78 |
| 54 | 20129 | Kerkvliet et al, 1982 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 1 | 4 | 0/50/250/500 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 6 | w | JV | F | V | Lab | 1 | GRO | BDWT | WO | 500 | | Y | 0.0312 | N | 0.003973 | 54.8 | | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| 55 | 20686 | Kerkvliet et al, 1985 | PCP - Technical | 86 | Mouse (*Mus musculus* ) | 1 | 4 | 0/100/250/500 | mg/kg diet | N | na | ADL | U | FD | 8 | w | 6-7 | w | JV | F | V | Lab | 1 | GRO | BDWT | WO | 500 | | Y | 0.0234 | N | 0.003137 | 57.6 | | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| 56 | 19990 | Umemura et al, 1999 | PCP - Purified | 98.6 | Mouse (*Mus musculus* ) | 2 | 2 | 0/600 | mg/kg diet | N | na | DLY | U | FD | 25 | w | 23 | w | JV | M | C | Lab | 2 | GRO | BDWT | WO | 600 | | Y | 0.0445 | N | 0.005320 | 70.7 | | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| 57 | 20129 | Kerkvliet et al, 1982 | PCP - Analytical | 99 | Mouse (*Mus musculus* ) | 3 | 2 | 0/1000 | mg/kg diet | N | na | ADL | U | FD | 8 | w | NR | NR | NR | NR | C | Lab | 1 | GRO | BDWT | WO | 1000 | | Y | 0.0380 | N | 0.004672 | 122 | | 10 | 10 | 5 | 10 | 6 | 8 | 4 | 10 | 10 | 4 | 77 |
| 58 | 20203 | Schwetz et al, 1974 | PCP - Purified | 98 | Rat (*Rattus norvegicus* ) | 3 | 2 | 0/30 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | | 30.0 | Y | 0.2980 | N | 0.02540 | | 29.4 | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 10 | 10 | 4 | 84 |
| 59 | 20203 | Schwetz et al, 1974 | PCP - Commercial | 88.4 | Rat (*Rattus norvegicus* ) | 4 | 2 | 0/34.7 | mg/kg bw/d | N | na | DLY | U | GV | 4 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | | 34.7 | Y | 0.3030 | N | 0.02575 | | 30.7 | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 10 | 10 | 4 | 84 |
| 60 | 20333 | Courtney et al, 1976 | PCP - Analytical | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/75 | mg/kg bw/d | N | na | DLY | U | GV | 9 | d | NR | NR | GE | F | V | Lab | 1 | GRO | BDWT | WO | | 75.0 | N | 0.3846 | N | 0.03132 | | 74.3 | 10 | 8 | 10 | 10 | 10 | 8 | 4 | 10 | 10 | 4 | 84 |
| **Survival** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 61 | 19985 | Beard and Rawlings, 1998 | PCP - Purity not specified | 100 | Mink (*Mustela vison* ) | 1 | 2 | 0/1 | mg/kg/d | N | na | NR | U | FD | 162 | d | NR | NR | GE | F | C | Lab | 2 | MOR | MORT | WO | 1.0 | | N | 0.5960 | N | 0.04490 | 0.0753 | | 10 | 10 | 5 | 10 | 5 | 9 | 4 | 10 | 10 | 4 | 77 |
| 62 | 20197 | Kimbrough and Linder, 1978 | PCP - Technical | 84.6 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 8 | mo | NR | NR | JV | B | C | Lab | 1 | MOR | MORT | WO | 28.0 | | Y | 0.5340 | Y | 0.07491 | 23.7 | | 10 | 10 | 5 | 10 | 10 | 9 | 4 | 10 | 10 | 4 | 82 |
| 63 | 20197 | Kimbrough and Linder, 1978 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 2 | 4 | 0/0.9/5/28 | mg/kg bw/d | N | na | ADL | U | FD | 8 | mo | NR | NR | JV | B | C | Lab | 1 | MOR | MORT | WO | 28.0 | | Y | 0.4950 | Y | 0.08081 | 27.7 | | 10 | 10 | 5 | 10 | 10 | 9 | 4 | 10 | 10 | 4 | 82 |
| 64 | 20813 | Welsh et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/4/13/43 | mg/kg bw/d | N | na | ADL | U | FD | 181 | d | 32 | d | GE | F | C | Lab | 4 | MOR | MORT | WO | 43.0 | | Y | 0.3214 | Y | 0.02320 | 42.6 | | 10 | 10 | 5 | 10 | 10 | 9 | 4 | 10 | 10 | 4 | 82 |
| 65 | 19990 | Umemura et al, 1999 | PCP - Purified | 98.6 | Mouse (*Mus musculus* ) | 2 | 2 | 0/600 | mg/kg diet | N | na | DLY | U | FD | 25 | w | 23 | w | JV | M | C | Lab | 1 | MOR | SURV | WO | 600 | | Y | 0.0445 | N | 0.005320 | 70.7 | | 10 | 10 | 5 | 10 | 6 | 9 | 4 | 10 | 10 | 4 | 78 |
| 66 | 19997 | Renner et al, 1987 | PCP - Purified | 99 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/53.27 | mg/kg bw/d | N | na | DLY | U | GV | 28 | d | 3.5 | mo | JV | F | V | Lab | 4 | MOR | MORT | WO | | 52.7 | Y | 0.2710 | N | 0.02349 | | 52.7 | 10 | 8 | 10 | 10 | 10 | 9 | 4 | 10 | 10 | 7 | 88 |
| **Data Not Used to Derive Wildlife Toxicity Reference Value** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 67 | 20229 | Knudsen et al, 1974 | PCP - Not Purified | 100 | Rat (*Rattus norvegicus* ) | 1 | 4 | 0/25/50/200 | mg/kg diet | N | na | ADL | U | FD | 12 | w | NR | NR | JV | B | C | Lab | 2 | FDB | FCNS | WO | 200 | | Y | 0.3400 | Y | 0.0161 | 9.47 | | 10 | 10 | 5 | 10 | 7 | 4 | 4 | 1 | 10 | 4 | 65 |
| 68 | 20044 | Savolainen and Pekari, 1979 | Sodium pentachlorophenol | 86.1 | Rat (*Rattus norvegicus* ) | 1 | 2 | 0/20 | mg/L | N | na | DLY | U | DR | 3 | w | NR | NR | JV | M | C | Lab | 1 | ENZ | GENZ | BR | | 20.0 | Y | 0.2070 | N | 0.02399 | | 2.00 | 10 | 5 | 5 | 10 | 6 | 1 | 4 | 10 | 10 | 4 | 65 |

All abbreviations and definitions are used in coding studies are available from Attachment 4-3 of the Eco-SSL *guidance* (U.S. EPA 2003).

*Duplicate values for NOAELs and LOAELs for the same reference represent results from different experimental designs and are identified by different Phase numbers.