

APPENDIX B – CHAPTER 5 TOXICOLOGICAL DATA SUMMARIES

INTRODUCTION

Chapter 5 in the 1993 EIS contains eight separate tables presenting toxicological data and other information relevant to conducting the ecological and human health risk assessments. In this supplemental assessment, Chapter 5 tables have been updated to varying degrees. Table 5-4 has been updated in its entirety. Tables 5-3, 5-7 and 5-8 have been updated only for chemicals new to this assessment. Tables 5-1 and 5-2 have been updated textually for chemicals new to this assessment. For Tables 5-5, 5-6, and an additional set of product sheets for each herbicide active ingredient, the reader is guided elsewhere in the document for information.

Table 5-1 Active ingredients and their formulated products that will be used by WSDOT for roadside vegetation management.

Herbicide products with two new active ingredients have been added since the 1993 EIS. The new active ingredients are Clopyralid and MCPA.

Clopyralid. Clopyralid is the active ingredient in the product Transline. Transline contains:

- 40.9% clopyralid (3,6-Dichloro-2-pyridinecarboxylic acid), Monoethanolamine salt.
- 59.1% inert ingredients, total, including: Isopropyl alcohol and Polyglycol 26-2.

The signal word associated with Transline is “Caution.”

MCPA. MCPA is the active ingredient in the product Vengeance. Vengeance contains:

- 24.5% Difenzoquat
- 12.8% MCPA ester

The signal word associated with Vengeance is “Danger” for Eye Irritation.

Bromoxynil. Bromoxynil is the active ingredient in the product Bucril. Bucril contains:

- 33.4% Octanoic acid ester of bromoxynil (3,5-dibromo-4-hydroxybenzotrile)
- 66.6% Inert ingredients, including xylene range/petroleum distillates.

The signal word associated with Bucril is “Warning.”

Di flufenzopyr/Dicamba. Di flufenzopyr and dicamba are the active ingredients in the product Overdrive. Overdrive contains:

- 21.4% Sodium salt of di flufenzopyr: 2-(1-[[[3,5-difluorophenylamino] carbonyl]-hydrazono]ethyl)-3-pyridinecarboxylic acid, sodium salt.
- 55.0% Sodium salt of 3,6-dichloro-o-anisic acid (dicamba)
- 23.6% Inert ingredients.

The signal word associated with Overdrive is “Caution.”

Flumioxazin. Flumioxazin is the active ingredient in the product Payload. Payload contains:

- 51% Flumioxazin: (2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2H-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-isoindole-1,3(2H)-dione).
- 49% Other ingredients.

The signal word associated with Payload is “Caution.”

Fluroxypyr. Fluroxypyr is the active ingredient in the product Vista. Vista contains:

- 26.2% Fluroxypyr 1-methylheptyl ester: ((4-amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy) acetic acid, 1-methylheptyl ester.
- 73.8% Inert ingredients.

The signal word associated with Vista is “Warning.”

Imazapyr. Imazapyr is the active ingredient in the products Habitat and Arsenal. Habitat and Arsenal contain:

- 28.7% Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid).
- 71.3% Inert ingredients.

The signal word associated with Habitat and Arsenal is “Caution.”

Isoxaben. Isoxaben is the active ingredient in the product Gallery 75DF. Gallery 75DF contains:

- 75% Isoxaben: N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide and isomers.
- 25% Inert ingredients.

The signal word associated with Gallery 75DF is “Caution.”

Norflurazon. Norflurazon is the active ingredient in the product Predict. Predict contains:

- 78.6% Norflurazon: 4-chloro-5-(methylamino)-2-($\alpha\alpha\alpha$ -trifluoro-m-tolyl)-3-(2H)-pyridazinone.
- 21.4% Other ingredients.

The signal word associated with Predict is “Caution.”

Oxadiazon. Oxadiazon is the active ingredient in the product Ronstar 50 WSP. Ronstar 50 WSP contains:

- 50% Oxadiazon: [2-tert-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)- Δ -1,3,4-oxadiazolin-5-one].

- 50% Inert ingredients.

The signal word associated with Ronstar 50 WSP is “Warning.”

Pendimethalin. Pendimethalin is the active ingredient in the products Pendulum 3.3 EC and Pendulum WDG. Pendulum 3.3 EC contains:

- 37.4% Pendimethalin, N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine.
- 62.6% Inert ingredients, including petroleum distillates.

Pendulum WDG contains:

- 60% Pendimethalin, N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine.
- 40% Inert ingredients.

The signal word associated with Pendulum 3.3 EC and Pendulum WDG is “Caution.”

Pyraflufen. Pyraflufen is the active ingredient in the product Edict. Edict contains:

- 2.5% Pyraflufen ethyl (ethyl 2-chloro-5-(4-chloro-5-difluoromethoxy-1-methyl-1H-pyrazol-3-yl)-4-fluorophenoxyacetate.
- 97.5% Other ingredients.

The signal word associated with Edict is “Danger.”

Sulfentrazone. Sulfentrazone is the active ingredient in the product Portfolio. Portfolio contains:

- 75% Sulfentrazone: N-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl]phenyl]methanesulfonamide.
- 25% Other ingredients.

The signal word associated with Portfolio is “Caution.”

Tebuthiuron. Tebuthiuron is the active ingredient in the product Spike 80DF. Spike 80DF contains:

- 80.0% Tebuthiuron: N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea.
- 20% Other ingredients.

The signal word associated with Spike 80DF is “Caution.”

Table 5-2 Amounts of active ingredient in each formulation, maximum label rates for each of the products, and inert ingredients.

Application rate data for each of the herbicides product types are shown in Tables 4-11 and 4-36.

The identified inert ingredients in Transline (containing the active ingredient Clopyralid) include isopropyl alcohol and the proprietary surfactant Polyglycol 26-2 (CAS# 069029-

39-6) (Dow, 2001). No toxicological data specific to Polyglycol 26-2 were found; however, Dow AgroSciences has established an “Industrial Guideline” for this material of 2 mg/m³ (Dow, 2001). The formulation of Transline is 3 lbs active ingredient /gallon.

No information on inert ingredients in Vengeance (containing the active ingredients Dicamba and MCPA) was located. The formulation of Vengeance is 3.75 lbs active ingredient/gallon.

Table 5-3 Formulated products, manufacturers for the active ingredients and physical data that are relevant to conducting an environmental risk assessment.

| | 1.0 Clopyralid | 2.0 MCPA |
|--------------------------------|---|--|
| FORMULATED PRODUCTS | Transline | Vengeance |
| MANUFACTURER | Dow AgroSciences LLC | American Cyanamid Co. |
| CHEMICAL DATA | | |
| CHEMICAL NAME | (3,6-Dichloro-2-pyridinecarboxylic acid), Monoethanolamine salt | 2-Methyl-4-chlorophenoxyacetic acid |
| SIGNAL WORD/ TOXICITY CLASS | Caution | Danger |
| MOLECULAR FORMULA | C ₆ H ₃ Cl ₂ NO ₂ | C ₁₃ H ₁₇ ClO ₃ |
| MOLECULAR WEIGHT | 192 | 256.5 |
| CAS NUMBER | 001702-17-6 | 1713-12-8 |
| SOLUBILITY (25 ⁰ C) | Miscible in water | Miscible in water |
| MELTING POINT | 151-152°C | Not available |
| VAPOR PRESSURE | 23.5 mm Hg at 20°C | Not available |
| DISSOCIATION CONSTANT | pK _a = 2.0 (exists in anion form) | Not available |
| HENRY'S LAW CONSTANT | Not available | Not available |
| Log K _{ow} | -2.63 (Log 10 K _{ow} (20°C); pH 7) | Not available |
| PH | 7.5-8.0 | 6.5 to 7.0 |
| STABILITY | Clopyralid is considered stable under normal conditions | Stable |
| CORROSIVENESS | Not corrosive to standard manufacturing materials | Not available |

Table 5-4 Toxicity data for the active ingredients to be used by WSDOT for roadside vegetation management.

Note: Numbered references refer to the 1993 EIS reference list.

| TOXICITY | 2,4-D | BROMACIL |
|---|--|---|
| ACUTE ORAL LD ₅₀ | 375 mg/kg (rat) (275) 370 mg/kg (rat) (274) 639-764 mg/kg (rat) (92) | 3,998 mg/kg (rat) (275) |
| ACUTE DERMAL LD ₅₀ | 3,980 mg/kg (rabbit) (275) 1,400 mg/kg (rabbit) (274) 1,500 mg/kg (rat) (274) | 2,000 mg/kg (rabbit) (275) |
| ACUTE INHALATION LC ₅₀ | 1.79 mg/l (92) | > 57.6 mg/l (rat) (275) |
| EYE IRRITATION | Severe eye irritant (275) | Mild irritant (275) |
| ACUTE NEUROTOXICITY | NOAEL (systemic): 227 mg/kg/day NOAEL (neurobehavioral): 67 mg/kg/day (U.S. EPA, 2001a) | NA |
| SKIN IRRITATION | NA | Very slightly irritating (rabbit) (275) |
| SKIN SENSITIZATION | Not a sensitizer (92) | Not a sensitizer (287) |
| SUBCHRONIC (RAT/ MOUSE) | NOEL (90 day): 1 mg/kg/day (rat) (275) NOAEL (90 day): 15 mg/kg/day (rat) (U.S. EPA, 2001a) NOAEL (13-wk): <15 mg/kg/day (rat) (ACGIH, 1991a) NOAEL (90 day): 10 mg/kg/day (rat) (Kobal & Budihna, 1999) NOAEL (90 day): 15 mg/kg/day (mouse) (U.S. EPA, 2001a) | NOEL (90 day): 25 mg/kg/day (rat) (275) |
| SUBCHRONIC (OTHER) | NOAEL (90 day): 1 mg/kg/day (dog) (Charles et al., 1996b) NOAEL (90 day): 10 mg/kg/day (dog) (ACGIH, 1991a) | NA |
| CHRONIC (RAT/ MOUSE) | NOEL (2 yr): 1 mg/kg/day (rat) (275, 100) NOAEL (2 yr): 5 mg/kg/day (rat) (Charles et al., 1996b) NOAEL (2 yr): 5 mg/kg/day (mouse) (Charles et al., 1996a) | NOEL (2 yr): 12.5 mg/kg/day (rat) (275) NOEL (2 yr): 2.5 mg/kg/day (rat) (62) NOAEL (2 yr): 9.82 mg/kg/day (rat) (U.S. EPA, 1996a) |
| CHRONIC (OTHER) | NOEL (2 yr): 500 ppm (dog) (286) NOEL (1 yr): 1 mg/kg/day (dog) (Charles et al., 1996b) | NOEL (2 yr): 6.25 mg/kg/day (dog) (275) NOAEL (2 yr): 150 ppm (dog) (U.S. EPA, 1996a) |
| ONCOGENICITY (MOUSE) | Not oncogenic (62) | EPA Group C, "possible human carcinogen" |

| | | |
|------------------------------------|--|---|
| | | A 2 yr study at 5,000 ppm (750 mg/kg/day) demonstrated increased hepatocellular adenomas and carcinomas (275). EPA Cancer Potency - 0.0038 (mg/kg/day) ⁻¹ (275) |
| ONCOGENICITY (OTHER) | Controversial evidence that 2,4-D caused tumors in rats. EPA believes there is not enough evidence to make a decision. No EPA cancer potency value established. Cancer potency of 0.019 per (mg/kg/day) used for risk assessment as reported by the OPP (275) | Not oncogenic at levels up to 2,500 ppm (rat) (287) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | No teratogenic effects (rat) (275) NOEL (maternal and dev): 25 mg/kg (rat) (62) NOEL (maternal): 5 mg/kg/day (rat) (275) NOEL (parental and rep): 20 mg/kg (rat) (62) NOAEL (parental and rep): 5 mg/kg (rat) (U.S. EPA, 2001a) NOAEL (maternal and rep): 10 mg/kg/day (rat) (Kobal & Budihna, 1999) NOAEL (rep): 50 mg/kg/day (rat) (ACGIH, 1991a) NOAEL (rep): 1 mg/kg/day (rat) (ACGIH, 1991a) | Not teratogenic (rat) (275) No reproductive effects at 12.5 mg/kg/day (rat) (275) NOEL (maternal): 20 mg/kg (rat) (62) NOEL (dev): 75 mg/kg (rat) (62) NOEL (maternal): >165 mg/m ³ (rat) (CalEPA, 1997d) NOEL (dev): >165 mg/m ³ (rat) (CalEPA, 1997d) NOEL (parental): 250 ppm (rat) (CalEPA, 1997d) NOEL (rep): 250 ppm (rat) (CalEPA, 1997d) |
| REPRO/DEVELOPMENTAL (OTHER) | NOAEL (dev): 10 mg/kg/day (rabbit) (U.S. EPA, 2001a) | Not teratogenic (rabbit) (275) NOEL (maternal): 100 mg/kg/day (rabbit) (62) NOEL (dev): 100 mg/kg/day (rabbit) (62) |
| GENE MUTATION | Non-mutagenic (275) | Very weak mutagen (275) |

| TOXICITY | CHLORSULFURON | CLOPYRALID |
|--------------------------------------|---|--|
| ACUTE ORAL LD ₅₀ | 3,053 mg/kg (rat, male) (80,70) 2,341 mg/kg (rat, female) (80,70) | 4,300 mg/kg (rat) (NIOSH, 2002) >5,000 mg/kg (mouse) (NIOSH, 2002) |
| ACUTE DERMAL LD ₅₀ | > 2,000 mg/kg (rabbit) (80,70) | NA |
| ACUTE INHALATION LC ₅₀ | > 5.9 mg/l/4 hours (rat) (275) | NA |
| EYE IRRITATION | Mild irritation at 10 mg (rabbit) (275,80) | NA |
| SKIN IRRITATION | Not a primary irritant (275,80) | Not a primary irritant (U.S. EPA, 1996b) |
| SKIN SENSITIZATION | Nonsensitizing (80) | Nonsensitizing (U.S. EPA, 1996b) |
| SUBCHRONIC (RAT/ MOUSE) | NOEL (6 month): 2500 ppm (rat) (80) NOEL (90 day): 5 mg/kg/day (rat) (275,100) NOEL (90 day): 365 mg/kg/day (mouse) (275) | NOAEL (90 day): <5 mg/kg/day (rat) (U.S. EPA, 1996b) NOAEL (90 day): 300 mg/kg/day (rat) (U.S. EPA, 1996b) NOAEL (90 day): 750 mg/kg/day (mouse) (U.S. EPA, 1996b) |
| SUBCHRONIC (OTHER) | NOEL (180 day): 62.5 mg/kg/day (dog) (275,100) NOAEL (6 mo): 18.5 mg/kg/day (dog) (U.S. EPA, 2002a; 2002d) | NOAEL (180 day): <15 mg/kg/day (dog) (U.S. EPA, 1996b) NOAEL (180 day): 50 mg/kg/day (dog) (U.S. EPA, 1996b) |
| CHRONIC (RAT) | NOEL (2 yr): 5 mg/kg/day (rat) (275,100) NOEL (2 yr): 100 ppm (rat) (80,100) NOEL (2 yr): 75 mg/kg/day (mice) (275,100) | NOEL: 50 mg/kg/day (rat) (U.S. EPA, 1996b; 1997b) NOEL: 15 mg/kg/day (rat) (U.S. EPA, 1996b) |
| CHRONIC (OTHER) | NOAEL (1 yr): 60.06 mg/kg/day (dog) (U.S. EPA, 2002a; 2002d) | NA |
| ONCOGENICITY (MOUSE) | Not oncogenic (275,80; U.S. EPA, 2002a; 2002d) | NA |
| ONCOGENICITY (OTHER) | Not oncogenic (275,80) | Not oncogenic (rat) (U.S. EPA, 1996b) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | Not teratogenic (rat) (275) NOEL (maternal): 25 mg/kg/day (rat) (62) NOEL (dev): 125 mg/kg/day (rat) (62) NOAEL (dev): 500 mg/kg/day (rat) (U.S. EPA, 2002a; 2002d) NOAEL (maternal): 75 mg/kg/day (rat) (U.S. EPA, 2002a; 2002d) NOEL (rep and maternal): 25 mg/kg/day (rat) (275) NOAEL (maternal): 165 | NOAEL (maternal): 75 mg/kg/day (rat) (Hayes et al., 1984) NOAEL (parental): 500 mg/kg/day (rat) (U.S. EPA, 1996b; 1997b) |

| | | |
|-----------------------------|--|---------------------------------|
| | <p>mg/kg/day (rat) (U.S. EPA, 2002a; 2002d)</p> <p>NOAEL (dev): 125 mg/kg/day (“rodent”) (U.S. EPA, 2002a; 2002d)</p> <p>NOAEL (parental): 125 mg/kg/day (“rodent”) (U.S. EPA, 2002a; 2002d)</p> <p>NOAEL (rep): 5 mg/kg/day (“rodent”) (U.S. EPA, 2002a; 2002d)</p> | |
| REPRO/DEVELOPMENTAL (OTHER) | <p>Not teratogenic (275)</p> <p>NOEL (maternal and dev): 25 mg/kg/day (rabbit) (62)</p> <p>NOEL: 75 mg/kg/day (rabbit) (80)</p> <p>NOAEL: 25 mg/kg/day (rabbit) (CalEPA, 1999)</p> | NA |
| GENE MUTATION | Not mutagenic (275) | Not mutagenic (U.S. EPA, 1996b) |

| TOXICITY | DICAMBA | DICHLORBENIL |
|---|---|---|
| ACUTE ORAL LD ₅₀ | 757-1,701 mg/kg (rat) (257) 1,707 mg/kg (rat) (256) 1,581-2,740 mg/kg (144,143) | >3,160 mg/kg (rat) (270) 2,710 mg/kg (rat) (274) 4,250 mg/kg (rat) (89) 2,056 mg/kg (mouse) (274,270) 681 mg/kg (guinea pig) (274) |
| ACUTE DERMAL LD ₅₀ | >2,000 mg/kg (rabbit) (257,256,144) | 1,350 mg/kg (rabbit) (274,270) |
| ACUTE INHALATION LC ₅₀ | >9.6 mg/l (rat) (257,256,144) | >5 mg/l (rat) (270,54) |
| EYE IRRITATION | Severe eye irritant (115,275,256,295) | Nonirritating (rabbit) (270,170) |
| SKIN IRRITATION | Slight (275,256,145) | Nonirritating (rabbit) (270,171) |
| SKIN SENSITIZATION | Moderate (guinea pig) (275,256,56) | Nonsensitizing (66,269) |
| ACUTE NEUROTOXICITY | NOEL: >316 mg/kg (CalEPA, 1996a) | NA |
| ACUTE | NA | NOEL (olfactory): 25 mg/kg/day (mouse) (Deamer et al., 1994) |
| SUBCHRONIC (RAT/ MOUSE) | NOEL: 250 mg/kg/day (rat) (257,256,147) NOAEL (neurotoxicity): 401 mg/kg/day (rat) (U.S. EPA, 1999c) | NOEL (90 day): 1.25 mg/kg/day (mouse) (269) NOEL: 2.5 mg/kg/day (rat) (103) NOEL (5 day, olfactory): 25 mg/kg/day (mouse) (Deamer et al., 1994) NOEL (13 wk): 5 mg/kg/day (rat) (U.S. EPA, 1998c) NOEL (13 wk): 19 mg/kg/day (mouse) (U.S. EPA, 1998c) |
| SUBCHRONIC (OTHER) | NOEL (21 day dermal): <100 mg/kg/day (rabbit) (256) NOAEL (21 day dermal, systemic): 1,000 mg/kg/day (rabbit) (U.S. EPA, 1999c) NOAEL (21 day dermal, irritation): 40 mg/kg/day (rabbit) (U.S. EPA, 1999c) | NOEL (90 day): 1.25 mg/kg/day (dog) (269,263) NOEL (13 wk): 3 mg/kg/day (hamster) (U.S. EPA, 1998c) NOEL (4 wk): 6 mg/kg/day (dog) (CalEPA, 1996b) NOEL (21 day, dermal): >1,000 mg/kg/day (U.S. EPA, 1998c) |
| CHRONIC (RAT/ MOUSE) | NOEL (2 yr): >0.125 mg/kg/day (rat) (256,88,148) NOEL: 115 mg/kg/day (mouse) (256,99) | NOEL (2 yr): 2.5 mg/kg/day (rat) (269,142) |
| CHRONIC (OTHER) | NOEL (1 yr): > 50-60 mg/kg/day (dog) (256,90,149) NOEL (2 yr): 0.125 mg/kg/day (dog) (U.S. EPA, 2002c) | NOEL (2 yr): 1.25 mg/kg/day (dog) (269) NOEL: 50 ppm in diet (dog) (264,62) |
| ONCOGENICITY | Not oncogenic (256,99,279) | NA |

| | | |
|------------------------------------|--|---|
| (MOUSE) | | |
| ONCOGENICITY (OTHER) | Not oncogenic (rat) (256,88,148) | Not oncogenic (rat) (270,142) Not oncogenic (hamster) (136) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | Not teratogenic (rat) (275,257,266) NOEL (maternal): 160 mg/kg/day (rat) (100,85) NOEL (dev): 400 mg/kg/day (rat) (100,85) NOEL: 25 mg/kg/day (rat) (256) NOAEL (systemic): 135 mg/kg/day (rat) (U.S. EPA, 1998c) NOAEL (rep): 45 mg/kg/day (rat) (U.S. EPA, 1998a) | NOEL: 20 mg/kg/day (rat) (269) Not teratogenic (rat) (169) NOEL: 60 mg/kg (mouse) (270) NOEL: 50 mg/kg/day (rat) (269) NOEL: 60 ppm in diet (rat) (175) NOEL (parental): 17.5 mg/kg/day (rat) (U.S. EPA, 1998c) NOEL (rep): 3 mg/kg/day (rat) (U.S. EPA, 1998c) |
| REPRO/DEVELOPMENTAL (OTHER) | Not teratogenic (rabbit) NOEL: 3.0 mg/kg/day (rabbit) (257,100,256,146) NOAEL (maternal): 30 mg/kg/day (rabbit) (U.S. EPA, 1998a) | Not teratogenic (rabbit) (12,13) NOEL (maternal): 45 mg/kg/day (rabbit) (U.S. EPA, 1998c) NOEL (dev): 45 mg/kg/day (rabbit) (U.S. EPA, 1998c) |
| GENE MUTATION | Not mutagenic (275,257) | Not mutagenic (269) |

| TOXICITY | DIURON | FOSAMINE |
|---|---|---|
| ACUTE ORAL LD ₅₀ | 3,750 mg/kg (rat) (275) 2,900 mg/kg (rat) (79) 3,400 mg/kg (rat) (84) | 24,400 mg/kg (rat) (276) 7,380 mg/kg (guinea pig) (276) |
| ACUTE DERMAL LD ₅₀ | >10,000 mg/kg (rat) (275) >2,000 mg/kg (rabbit) (79) >20,000 mg/kg (rabbit) (84) | 1,683 mg/kg (rabbit) (276) |
| ACUTE INHALATION LC ₅₀ | <2.5 mg/L (rat) (U.S. EPA, 1997a) | 3 mg/l (rat) (109) |
| EYE IRRITATION | Very slightly toxic (rabbit) (275) Mild irritant (84) | Non-irritating (rabbit) (277) |
| SKIN IRRITATION | Slight irritant (rabbit) (275) Mild conjunctival irritant (84) | Transient, mild to moderate irritation (277) |
| SKIN SENSITIZATION | Nonsensitizing (79) | Non-sensitizing (276) |
| ACUTE NEUROTOXICITY | NA | NOEL: >2,000 mg/kg (hen) (U.S. EPA, 1995a) |
| SUBCHRONIC (RAT/ MOUSE) | NOEL (90 day): 2.5 mg/kg/day (rat) (155) NOEL (6 mo): 0.5 mg/kg/day (rat) (62) | NOEL (90 day): 250/500 mg/kg/day (rat) (276) NOEL (90 day): 1,000 ppm diet (rat) (DuPont, 2002a) NOEL (90 day): 10 mg/kg/day (rat) (U.S. EPA, 1995a) |
| SUBCHRONIC (OTHER) | NA | NOEL (6 month): 25 mg/kg/day (dog) (276) NOEL (21 day, dermal): 1,500 mg/kg/day (rabbit) (U.S. EPA, 1995a) |
| CHRONIC (RAT/MOUSE) | NOEL (2 yr): 1.25 mg/kg/day (rat) (275) NOEL (2 yr): 25 ppm (rat) (84) | Data not required (109) |
| CHRONIC (OTHER) | NOEL (2 yr): 0.625 mg/kg/day (dog) (275,100) NOEL (2 yr): 25 ppm (dog) (84) | Data not required (109) |
| ONCOGENICITY (MOUSE) | Not oncogenic (275) Oncogenic in mouse (urinary bladder, renal pelvis, uterine) (CalEPA, 2002a) Oncogenic in mouse (mammary) (U.S. EPA, 1997a) Cancer potency of 0.019 per (mg/kg/day) used for risk assessment as reported by the U.S EPA (1999d) | Data not required (109) |
| ONCOGENICITY (OTHER) | Not oncogenic (rat,dog) (275) | Data not required (109) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | Not teratogenic (rat) (275) NOEL (maternal): 16 mg/kg/day (rat) (62) | NOEL ≥ 10,000 ppm (rat) (109) Not Teratogenic (rat) (109) No reproductive effects (rat) |

| | | |
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| | NOEL (dev): 80 mg/kg/day (rat) (62) NOEL: 500 mg/kg/day (rat) (U.S. EPA, 2002d; CalEPA, 2002a) NOAEL: 9 mg/kg/day (rat) (CalEPA, 2002a) NOEL: 6.25 mg/kg/day (rat) (275) NOEL (dev): <125 mg/kg/day (rat) (U.S. EPA, 2002d; CalEPA, 2002a) NOEL (parental, dev): 16.9 mg/kg/day (rat) (U.S. EPA, 1997a) | (Study rejected by CDFA) (276) (Study rejected by CalEPA, 1986) NOEL (maternal): 1,000 mg/kg/day (rat) (U.S. EPA, 1995a) NOEL (dev): 3,000 mg/kg/day (rat) (U.S. EPA, 1995a) |
| REPRO/DEVELOPMENTAL (OTHER) | Not teratogenic (dog) (275) NOEL (maternal): 10 mg/kg/day (rabbit) (62) NOEL (dev): 50 mg/kg/day (rabbit) (62) | Teratogenic when sprayed into eggs of quail and chicken (277) Teratogenic (study rejected by CDFA) (276) |
| GENE MUTATION | Not mutagenic (275,79) | Not mutagenic (276) |

| TOXICITY | GLYPHOSATE | MCPA |
|---|--|--|
| ACUTE ORAL LD ₅₀ | 4,300 mg/kg (rat) (95) | 700 mg/kg (rat) (NIOSH, 2000) 439 mg/kg (mouse) (NIOSH, 2000) |
| ACUTE DERMAL LD ₅₀ | > 5,010 mg/kg (mouse, rabbit) (95) >794 mg/kg (rabbit) (95) | >1,000 (rat) (NIOSH, 2000) >2,000 (rabbit) (NIOSH, 2000) |
| ACUTE INHALATION LC ₅₀ | Roundup: > 3.18 mg/l (rat) (196) Rodeo: > 1.3 mg/l (rat) (196) | 1,370 mg/m ³ (rat) (NIOSH, 2000) |
| EYE IRRITATION | Slightly irritating (95) | Mild irritant (NIOSH, 2000) |
| SKIN IRRITATION | Non-irritating (rabbit) (95) | Mild irritant (NIOSH, 2000) |
| SKIN SENSITIZATION | Non-irritating (8) | Not a sensitizer (NIOSH, 2000) |
| SUBCHRONIC (RAT/MOUSE) | NOEL (90 day): 20,000 ppm (rat) (194) NOAEL (28 day, inhalation): 360 mg/m ³ (rat) (U.S. EPA, 2002b) NOAEL (90 day): <50 mg/kg/day (rat) (U.S. EPA, 2002b) NOAEL (90 day): >1,267 mg/kg/day (rat) (WHO, 1994; CalEPA, 1997b) NOAEL (13 wk): 205 mg/kg/day (rat) (WHO, 1994) NOEL (90 day): 10,000 ppm (mouse) (194) NOAEL (90 day): 1,500 mg/kg/day (mouse) (U.S. EPA, 2002b) NOAEL (90 day): >9,710 mg/kg/day (mouse) (WHO, 1996) NOAEL (90 day): 9,710 mg/kg/day (mouse) (WHO, 1994; CalEPA, 1997b) NOAEL (13 wk): 507 mg/kg/day (mouse) (WHO, 1994) NOEL (90 day): <1,000 ppm in diet (rat) (U.S. EPA, 1993a) NOEL (90 day): 500 mg/kg/day (mouse) (U.S. EPA, 1993a) | NOEL (90 day): 2.5 mg/kg/day (rat) (U.S. EPA, 2003b) NOAEL (90 day): 50 ppm diet (rat) (Verschuuren et al., 1975) NOAEL (90 day): 15 mg/kg/day (rat, males) (Kobal & Budihna, 1999) |
| SUBCHRONIC (OTHER) | NOAEL (21 day, dermal): 1,000 mg/kg/day (rabbit) (U.S. EPA, 2002b) | NOAEL (2 wk): 200 mg/kg/day (hamster) (U.S. EPA, 2003b) NOAEL (3 wk): <500 mg/kg/day (rabbit) (Verschuuren et al., 1975) NOEL (90 day): 1 mg/kg/day (dog) (U.S. EPA, 2003b) NOAEL (90 day): 150 mg/kg/day (rabbit, males) (Kobal & Budihna, |

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| | | 1999) |
| CHRONIC (RAT/MOUSE) | NOEL (2 yr): 8000 ppm (rat) (194) NOEL: 31 mg/kg/day (rat) (95) NOAEL: 362 mg/kg/day (rat) (U.S. EPA, 2002b) | NOAEL (2 yr): 1.33 mg/kg/day (rat) (Bellett et al., 1999) NOAEL (2 yr): 100 ppm diet (mouse) (Bellett et al., 1999) |
| CHRONIC (OTHER) | NOEL (2 yr): 500 mg/kg/day (dog) (194) NOEL (1 yr): 20 mg/kg/day (dog) (100, 95) NOAEL (1 yr): 500 mg/kg/day (dog) (U.S. EPA, 2002b) | NOEL (1 yr): 0.15 mg/kg/day (dog) (U.S. EPA, 2003b) |
| ONCOGENICITY (MOUSE) | NOEL (systemic): 710 mg/kg/day (100) NOEL (systemic): 750 mg/kg/day (U.S. EPA, 1993a) | Increased occurrence of leukemia (Takagi, 1990) No evidence of carcinogenicity (Bellett et al., 1999) |
| ONCOGENICITY (OTHER) | Class D oncogen (100) No evidence of carcinogenicity (rat) (U.S. EPA, 2002b) | No evidence of carcinogenicity (rat) (Bellett et al., 1999) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL (dev): ≥ 3500 mg/kg/day (rat) (95) NOEL (fetotoxicity): 1000 mg/kg/day (rat) (95) NOEL (mat & dev): 1,000 mg/kg/day (rat) (100,95) NOEL: 30 mg/kg/day (3 generation, rat) (194) Not a reproductive toxicant (100,95) NOAEL (parental/systemic): 500 mg/kg/day (rat) (U.S. EPA, 2002b) NOAEL (rep): >1,500 mg/kg/day (rat) (U.S. EPA, 2002b) NOAEL (offspring): 500 mg/kg/day (rat) (U.S. EPA, 2002b) | NOEL (systemic, dev): 7.5 mg/kg/day (rat) (Bellet et al., 2001) NOEL (rep): 22.5 mg/kg/day (rat) (Bellet et al., 2001) NOAEL (dev): 150 mg/kg/day (rat) (Kobal & Budihna, 1999) |
| REPRO/DEVELOPMENTAL (OTHER) | NOEL (maternal): 175 mg/kg/day (rabbit) (100,95) NOEL (dev): >350 mg/kg/day (rabbit) (100,95) | NOAEL (dev): 150 mg/kg/day (rabbit) (Kobal & Budihna, 1999) NOAEL (parental, male): <15 mg/kg/day (rabbit) (Kobal & Budihna, 1999) NOEL (maternal, dev): >75 mg/kg/day (CalEPA, 2000a) NOEL (maternal): 15 mg/kg/day (CalEPA, 2000a) NOEL (dev): 60 mg/kg/day (CalEPA, 2000a) |
| GENE MUTATION | Not mutagenic (194,95) | Not mutagenic (Bond and Rossbacher, 1993) Weakly positive for DNA damage in CHO cells at toxic doses (Linnainmaa, 1983) |

| TOXICITY | METSULFURON METHYL | ORYZALIN |
|---|--|--|
| ACUTE ORAL LD ₅₀ | > 5,000 mg/kg (rat) (275) | >10,000 mg/kg (rat) (274,74) >1,000 mg/kg (dog, chicken) (74) >10,000 mg/kg (mouse) (NIOSH, 2003) 1,000 mg/kg (rat) (NIOSH, 2003) |
| ACUTE DERMAL LD ₅₀ | > 2,000 mg/kg (rabbit) (275) | > 5,000 mg/kg (57) > 2,000 mg/kg (rabbit) (117,91) |
| ACUTE INHALATION LC ₅₀ | > 5.0 mg/l (rat, 4 hrs) (275) | >3.56 mg/l (91) |
| EYE IRRITATION | Slight corneal clouding, moderate iritis and severe to moderate conjunctivitis in unwashed eyes (rabbit) (275) | Slightly irritating (57,91) Non-irritating (rabbit) (117) |
| SKIN IRRITATION | Moderately irritating (rabbit) (275) | Slight (rabbit) (74,57) |
| SKIN SENSITIZATION | Not a sensitizer (117) | Positive (57) |
| SUBCHRONIC (RAT/MOUSE) | NOEL (90 day): 50 mg/kg/day (rat) (275) NOEL (90 day): 666.6 mg/kg/day (mouse) (MDFA, 2002) NOAEL (90 day): 64 mg/kg/day ("rodent") (U.S. EPA, 2002c) | NOEL: > 0.275 - < 56.25 mg/kg/day (rat) (57) NOEL (1 yr): 15 mg/kg/day (rat) (100) NOEL (3 month): 80 mg/kg/day (rat) (U.S. EPA, 1994b) NOEL (3 month): 547.5 mg/kg/day (mouse) (U.S. EPA, 1994a) |
| SUBCHRONIC (OTHER) | NOEL (90 day): >125 mg/kg/day (dog) (275) NOAEL (21 day, dermal): 125 mg/kg/day (species not identified) (U.S. EPA, 2002c) | NOEL: > 18.75 - < 56.25 mg/kg/day (dog) (57) NOEL (3 month): 18.8 mg/kg/day (dog) (100) |
| CHRONIC (RAT/MOUSE) | NOEL (2 yr): 25 mg/kg/day (rat) (275,100) NOEL (2 yr): >750 mg/kg/day (mouse) (275) | NOEL (2 yr): 300 mg/kg/day diet (rat) (117) NOEL (1 yr): 15 mg/kg/day (rat) (100) |
| CHRONIC (OTHER) | NOEL (1 yr): 1.25 mg/kg/day (dog) (275,86) NOEL (1 yr): > 125 mg/kg/day (dog) (100) | NOEL (1yr): 5 mg/kg (dog) (100) |
| ONCOGENICITY (MOUSE) | Not oncogenic (mouse) (275,86) | Class C oncogen (57) Negative for oncogenicity (mouse) (91) |
| ONCOGENICITY (OTHER) | Not oncogenic (275,86) | Class C oncogen (57) Increases in thyroid gland, skin and mammary gland tumors (91) Cancer Potency Factor: 0.13 |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | Fetotoxic and teratogenic NOEL (maternal): < 40 mg/kg/day (rat) (100,86) | Not teratogenic (rat) (57) NOEL: 12.5 mg/kg/day (fetotoxic) (rat) (100) |

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| | <p>NOEL: >1,000 mg/kg/day (rat) (275,100,86)</p> <p>NOEL (maternal): 25 mg/kg/day (rat) (275,100)</p> <p>NOEL (rep and fetotoxic): >250 mg/kg/day (rat) (275,100)</p> | <p>NOEL (maternal and dev): 225 mg/kg/day (rat) (100)</p> <p>NOEL (parental): >179 mg/kg/day (rat) (CalEPA, 1993)</p> |
| REPRO/DEVELOPMENTAL (OTHER) | <p>Fetotoxic and teratogenic</p> <p>NOEL: 700 mg/kg/day (rabbit) (275,100)</p> <p>NOAEL (offspring): >342 mg/kg/day (species not identified (U.S. EPA, 2002c)</p> <p>NOAEL (parental/ systemic): 34 mg/kg/day (species not identified (U.S. EPA, 2002c)</p> <p>NOAEL (rep): >342 mg/kg/day (species not identified (U.S. EPA, 2002c)</p> | <p>NOEL (fetotoxic and mat): 25 mg/kg/day (rabbit) (100)</p> <p>NOEL: 125 mg/kg/day (teratogenic) (rabbit) (100)</p> |
| GENE MUTATION | <p>Not mutagenic (275)</p> <p>Caused chromosome aberrations (86)</p> | <p>Not mutagenic (57)</p> |

| TOXICITY | PICLORAM | SULFOMETURON METHYL |
|---|--|--|
| ACUTE ORAL LD ₅₀ | 8,200 mg/kg (rat) (277) 6,000 mg/kg (chicken) (277) 2,000-4,000 mg/kg (mouse) (73) 4,012-5,000 mg/kg (rat) (97) | > 5,000 mg/kg (male rat) (78) |
| ACUTE DERMAL LD ₅₀ | >3,980 mg/kg (rabbit) (73) | > 8,000 mg/kg (male rabbit) (78) > 2,000 mg/kg (female rabbit) (78) |
| ACUTE INHALATION LC ₅₀ | Minimal/slight: No effect in saturated atmosphere for 2 weeks. (159) K salt >1.5 mg/l (97) Acid >0.035 mg/l (97) | 5 mg/l (rat) (78) |
| EYE IRRITATION | Mild (rabbit) (277) Moderate (97) | Slightly irritating (rabbit) (277,78) |
| SKIN IRRITATION | Mild (rabbit) (277) Non-irritating (73,97) | Not a primary skin irritant. (78) |
| SKIN SENSITIZATION | Not a sensitizer (73) K salt is a sensitizer (97) | Non-sensitizing (guinea pig) (78) |
| SUBCHRONIC (RAT/MOUSE) | NOEL: 50 mg/kg/day (rat) (73,100) NOAEL (32 day): 900 mg/kg/day (mouse) (CalEPA, 1997c) NOAEL (13 wk): 50 mg/kg/day (rat) (CalEPA, 1997c) NOAEL (13 wk): <1,000 mg/kg/day (mouse) (CalEPA, 1997c) NOEL (13 wk): 90 mg/kg/day (U.S. EPA, 1995b) | NOEL (90 day): 50 mg/kg/day (rat) (155) |
| SUBCHRONIC (OTHER) | NOEL: 7 mg/kg/day (male dog) (73) NOEL: 35 mg/kg/day (female dog) (73) NOEL (6 mo): 7 mg/kg/day (dog) (100) NOEL (7 day): 400 mg/kg/day (dog) (CalEPA, 1997c) NOEL (7 day): 200 mg/kg/day (dog) (CalEPA, 1997c) NOEL (21 day dermal, systemic): >753 mg/kg/day (rabbit) (U.S. EPA, 1998b) NOEL (21 day dermal, dermal effects): <75.3 mg/kg/day (rabbit) (U.S. EPA, 1998b) NOEL (21 day dermal, systemic): >1,320 mg/kg/day (rabbit) (U.S. EPA, 1999e) NOEL (21 day dermal, systemic): 350 mg/kg/day (U.S. EPA, 1995b) | NOEL (21 day, dermal): >2,000 mg/kg (rabbit) (155) NOEL (90 day): 100 mg/kg/day (dog) (U.S. EPA, 1997c) |

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| CHRONIC (RAT/MOUSE) | NOEL (2 yr): 150 mg/kg/day (rat) (159) NOEL (2 yr): 20 mg/kg/day (rat) (100) NOAEL (2 yr): 500 mg/kg/day (mouse) (U.S. EPA, 1998b) | NOEL: 24.4 mg/kg/day (rat) (U.S. EPA, 1997c) NOAEL (18 mo): 100 ppm diet (mouse) (ACGIH, 1996) NOAEL (18 mo): 700 ppm diet (mouse) (U.S. EPA, 1997c) |
| CHRONIC (OTHER) | NOEL (1 yr): 35 mg/kg/day (dog) (U.S. EPA, 1995b) | NOEL (1 yr): 5 mg/kg/day (dog) (155) NOEL (1 yr): 100 mg/kg/day (dog) (U.S. EPA, 1997c) |
| ONCOGENICITY (MOUSE) | Not oncogenic (159,202) Class E oncogen | Not oncogenic (78, U.S. EPA, 1997c) |
| ONCOGENICITY (OTHER) | Not oncogenic (rat) (202) Not oncogenic (dog) (159) | Not oncogenic (78) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | Not teratogenic at 1,000 mg/kg (rat) (277,100) NOAEL (maternal): 147 mg/kg/day (rat) (U.S. EPA, 1998b) NOAEL (dev): >347 mg/kg/day (rat) (U.S. EPA, 1998b) NOAEL (maternal): 500 mg/kg/day (rat) (U.S. EPA, 1999e) NOAEL (dev): <500 mg/kg/day (rat) (U.S. EPA, 1999e) NOAEL (maternal): 100 mg/kg/day (rat) (U.S. EPA, 1999e) NOAEL (dev): 1,000 mg/kg/day (rat) (U.S. EPA, 1999e) NOAEL (maternal): 500 mg/kg/day (rat) (U.S. EPA, 1999e) NOAEL (dev): 1,000 mg/kg/day (rat) (U.S. EPA, 1999e) NOEL: 50 mg/kg/day (rat) (100) NOAEL (parental): 200 mg/kg/day (rat) (U.S. EPA, 1998b) NOAEL (rep): 1,000 mg/kg/day (rat) (U.S. EPA, 1998b) | Not teratogenic (rat) (277) NOEL (maternal and dev): 50 mg/kg/day (rat) (155) NOEL: 500 ppm (rat) (78) NOEL: 250 mg/kg/day (rat) (155) NOAEL: >5000 ppm (rat) (ACGIH, 1996) |
| REPRO/DEVELOPMENTAL (OTHER) | NOEL: 400 mg/kg (rabbit) (277) NOAEL (maternal): 20 mg/kg/day (rabbit) (U.S. EPA, 1999e) NOAEL (dev): 500 mg/kg/day (rabbit) (U.S. EPA, 1999e) NOAEL (maternal): 54 mg/kg/day (rabbit) (U.S. EPA, 1999e) NOAEL (dev): 1,000 mg/kg/day (rabbit) (U.S. EPA, 1999e) NOAEL (maternal): 40 mg/kg/day (rabbit) (U.S. EPA, 1998b) | Not teratogenic (rabbit) (277) NOEL: 300 mg/kg/day (rabbit) (155) |

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| | NOAEL (dev): 400 mg/kg/day (rabbit) (U.S. EPA, 1998b) | |
| GENE MUTATION | Not mutagenic (73) | Not mutagenic (78; U.S. EPA, 1997c) |

| TOXICITY | TRICLOPYR |
|---|--|
| ACUTE ORAL LD ₅₀ | 630-2560 mg/kg (male, female rat) (71) |
| ACUTE DERMAL LD ₅₀ | > 2,000 mg/kg (rabbit) (71) |
| ACUTE INHALATION LC ₅₀ | >2.6 - >4.8 mg/L (rat) (U.S. EPA, 1998f) |
| EYE IRRITATION | Slightly irritating (71) |
| SKIN IRRITATION | Non-irritating (71) |
| SKIN SENSITIZATION | Sensitizer (U.S. EPA, 1998d) |
| SUBCHRONIC (RAT/MOUSE) | NOEL: 100 mg/kg/day (rat, female) (72) NOEL: 30 mg/kg/day (rat, male) (72) NOEL (13 wk): 5 mg/kg/day (rat) (U.S. EPA, 1998d) NOEL (13 wk): 28 mg/kg/day (rat) (U.S. EPA, 1998d) |
| SUBCHRONIC (OTHER) | LOEL (7.5 month): 2.5 mg/kg/day (dog) (72) NOEL: >30 mg/kg/day (monkey) (72,62) NOEL (228 day): 10 mg/kg/day (dog) (U.S. EPA, 1998d) |
| CHRONIC (RAT) | NOEL (2 yr): 3 mg/kg/day (71,62) |
| CHRONIC (OTHER) | NOEL (2 yr): 240 ppm (5mg/kg/day) (mouse) (71) NOEL (1 yr): 5mg/kg/day (dog) (71) |
| ONCOGENICITY (MOUSE) | Not oncogenic (71) |
| ONCOGENICITY (OTHER) | NOEL (1 yr): 2.5 mg/kg/day (dog) (62) Not oncogenic (71) Increase in mammary adenomas and adenocarcinomas (rat) (MDF, 1990) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL: 100 mg/kg/day (rat) (71) NOEL (maternal): 50 mg/kg/day (rat) (62) NOEL (developmental): 100 mg/kg/day (rat) (62) NOEL: ≥ 30 mg/kg/day (3 generations) (rat) (72) |
| REPRO/DEVELOPMENTAL | NOEL: 75 mg/kg/day (rabbit) (71) NOEL (maternal): 10 mg/kg/day |

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| (OTHER) | (rabbit) (U.S. EPA, 1998a) NOEL (dev): >75 mg/kg/day (rabbit) (62) NOEL (maternal, dev): 30 mg/kg/day (rabbit) (U.S. EPA, 1998d) |
| GENE MUTATION | Not mutagenic (71) |

| TOXICITY | BROMOXYNIL OCTANOATE | DIFLUFENZOPYR/DICAMBA |
|---|--|---|
| ACUTE ORAL LD ₅₀ | 400 mg/kg (male rat), 238 mg/kg (female rat) (U.S. EPA, 1998e) | > 1800 mg/kg (rat) (BASF, 2003) |
| ACUTE DERMAL LD ₅₀ | > 2000 mg/kg (male rabbit), 1310 mg/kg (female rabbit) (U.S. EPA, 1998e) | > 5000 mg/kg (rat) (BASF, 2003) |
| ACUTE INHALATION LC ₅₀ | 0.81 mg/L (male rat), 0.72 mg/L (female rat) (U.S. EPA, 1998e) | > 5.34 mg/L (rat) (BASF, 2003) |
| EYE IRRITATION | Corneal opacity, conjunctival irritation (rabbit) (U.S. EPA, 1998e) | Moderately irritating (rabbit) (BASF, 2003) |
| SKIN IRRITATION | Slight erythema (rabbit) (U.S. EPA, 1998e) | Mildly irritating (rabbit) (BASF, 2003) |
| SKIN SENSITIZATION | Positive (modified draize test) (guinea pig) (U.S. EPA, 1998e) | Positive (guinea pig) (BASF, 2003) |
| SUBCHRONIC (RAT/MOUSE) | NOEL = 45 mg/kg/day (male rat), 13 mg/kg/day (female rat) (U.S. EPA, 1998e) | NOAEL = 352 mg/kg/day (male rat), 431 mg/kg/day (female rat) (U.S. EPA, 1999f) NOEL = 1225 mg/kg/day (male mice), 1605 mg/kg/day (female mice) (highest dose tested) (U.S. EPA, 1999f) |
| SUBCHRONIC (OTHER) | NOEL = 0.43 mg/kg/day (dog) NOEL <5 mg/kg/day (dog) (U.S. EPA, 1998e) | NOAEL = 58 mg/kg/day (male dogs), 59 mg/kg/day (female dogs) (U.S. EPA, 1999f) NOEL (systemic) = 1000 mg/kg/day (rabbit) (highest dose tested), LOAEL (dermal) = 100 mg/kg/day (lowest dose tested) (U.S. EPA, 1999f) |
| CHRONIC (RAT/MOUSE) | NOEL = 5 mg/kg/day (rat) NOEL = 2.6 mg/kg/day (male rat), 3.3 mg/kg/day (female rat) (U.S. EPA, 1998e) | NOEL = 1037 mg/kg/day (male mice), 1004 mg/kg/day (female mice) (U.S. EPA, 1999f) NOAEL = 236 mg/kg/day (male rat), 323 mg/kg/day (female rat) (U.S. EPA, 1999f) |
| CHRONIC (OTHER) | Threshold NOEL/LOEL = 1.5 mg/kg/day (dog) (U.S. EPA, 1998e) | NOAEL = 26 mg/kg/day (male dog), 28 mg/kg/day (female dog) (U.S. EPA, 1999f) |
| ONCOGENICITY (MOUSE) | Hepatocellular adenomas/carcinomas (U.S. EPA, 1998e) | Not oncogenic (U.S. EPA, 1999f) |
| ONCOGENICITY (OTHER) | Not oncogenic (rat) (U.S. EPA, 1998e) | Not oncogenic (rats) (U.S. EPA, 1999f) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL(maternal, dev) = 7.3 mg/kg/day (rat oral) NOEL (maternal) = 15 mg/kg/day, NOEL(dev) = 10 mg/kg/day (rat dermal) (U.S. EPA, 1998e) | NOAEL (dev) = 2000 ppm (rat) (U.S. EPA, 1999f) NOAEL (dev) = 30 mg/kg/day (rat) (U.S. EPA, 1999f) |

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| REPRO/DEVELOPMENTAL (OTHER) | NOEL(maternal, dev) = 80 (highest dose tested) (rabbit dermal) (U.S. EPA, 1998e) | NOAEL (dev) = 100 mg/kg/day (rabbit) (U.S. EPA, 1999f) |
| GENE MUTATION | Not mutagenic (U.S. EPA, 1998e) | Not mutagenic (U.S. EPA, 1999f) |

| TOXICITY | FLUMIOXAZIN | FLUROXYPYR |
|---|---|--|
| ACUTE ORAL LD ₅₀ | > 5000 mg/kg (rat) (U.S. EPA, 2001b) | 3192 mg/kg (male rat), 3738 mg/kg (female rat) (Dow, 2004) |
| ACUTE DERMAL LD ₅₀ | > 2000 mg/kg (rat) (U.S. EPA, 2001b) | > 2000 mg/kg (rat) (Dow, 2004) |
| ACUTE INHALATION LC ₅₀ | 3.93 mg/L (rat) (U.S. EPA, 2001b) | > 6.2 mg/L (rat) (Dow, 2004) |
| EYE IRRITATION | No corneal irritation; mild irritation of iris cleared by 24 hrs; mild irritation of conjunctivai cleared by 48 hrs (rabbit) (U.S. EPA, 2001b) | Severe, resolved at 3 wks (rabbit) (U.S. EPA, 1998f) |
| SKIN IRRITATION | Not irritating (rabbit) (U.S. EPA, 2001b) | Slight, resolved at 48 hrs (rabbit) (U.S. EPA, 1998f) |
| SKIN SENSITIZATION | Not sensitizing (guinea pig) (U.S. EPA, 2001b) | Not sensitizing (guinea pig) (U.S. EPA, 1998f) |
| SUBCHRONIC (RAT/MOUSE) | NOAEL = 69.7 mg/kg/day (male rat), 71.5 mg/kg/day (female rat) (U.S. EPA, 2001b) NOAEL = 65 mg/kg/day (male rat), 72.9 mg/kg/day (female rat) (U.S. EPA, 2001b) NOAEL = 429 mg/kg/day (mice) (U.S. EPA, 2001b) NOAEL = 151.5 mg/kg/day (male mice), 164.5 mg/kg/day (female mice) (U.S. EPA, 2001b) NOAEL (dermal) = 1000 mg/kg/day (rat) (highest dose tested) (U.S. EPA, 2001b) | NOEL = 80 mg/kg/day (male rat), 750 mg/kg/day (female rat) (U.S. EPA, 1998f) NOAEL = 1342 (male mice), 1748 (female mice) (U.S. EPA, 1998f) |
| SUBCHRONIC (OTHER) | NOAEL = 10 mg/kg/day (dog, capsule) (U.S. EPA, 2001b) | NOAEL = 1000 mg/kg/day (rabbits) (U.S. EPA, 1998f) NOAEL = 50 mg/kg/day (dogs) (U.S. EPA, 1998f) |
| CHRONIC (RAT/MOUSE) | NOAEL = 754 mg/kg/day (male mice), 859 mg/kg/day (female mice) (U.S. EPA, 2001b) NOAEL = 1.8 mg/kg/day (male rat), 2.2 mg/kg/day (female rat) (U.S. EPA, 2001b) | NOEL = 100 mg/kg/day (rats) (U.S. EPA, 1998f) NOEL = 150 mg/kg/day (mice) (U.S. EPA, 1998f) |
| CHRONIC (OTHER) | NOAEL = 100 mg/kg/day (dog, capsule) (U.S. EPA, 2001b) | NOEL > 150 mg/kg/day (dog) (U.S. EPA, 1998f) |
| ONCOGENICITY (MOUSE) | No evidence of oncogenicity (U.S. EPA, 2001b) | No evidence of oncogenicity (U.S. EPA, 1998f) |
| ONCOGENICITY (OTHER) | No evidence of oncogenicity (rat) (U.S. EPA, 2001b) | No evidence of oncogenicity (rat) (U.S. EPA, 1998f) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOAEL (maternal) = 30 mg/kg/day (rat)(highest dose tested), NOAEL (dev) = 3 | NOEL(maternal) = 125 mg/kg/day (rat), NOEL(dev) = 250 mg/kg/day (U.S. EPA, 1998f) |

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| | mg/kg/day (U.S. EPA, 2001b) NOAEL (maternal) = 12.7 mg/kg/day (rat), NOAEL (rep) = 18.9 mg/kg/day (highest dose tested), NOAEL (dev) = 6.3 mg/kg/day (male), 7.6 mg/kg/day (female) (U.S. EPA, 2001b) | |
| REPRO/DEVELOPMENTAL (OTHER) | NOAEL (maternal) = 1000 mg/kg/day (rabbit), NOAEL (dev) = 3000 mg/kg/day (U.S. EPA, 2001b) | NOEL(maternal) = 500 mg/kg/day (rabbit) (U.S. EPA, 1998f) NOEL(maternal) = 250 mg/kg/day (rabbit), NOEL(dev) = 100 mg/kg/day (U.S. EPA, 1998f) |
| GENE MUTATION | Bacterial assays equivocal (U.S. EPA, 2001b) Mammalian assays negative (U.S. EPA, 2001b) No unscheduled DNA synthesis (U.S. EPA, 2001b) | Bacterial assays negative (U.S. EPA, 1998f) Mouse lymphoma – mutagenic (U.S. EPA, 1998f) Other mammalian cells negative (U.S. EPA, 1998f) |

| TOXICITY | IMAZAPYR | ISOXABEN |
|---|--|--|
| ACUTE ORAL LD ₅₀ | > 5000 mg/kg (rat) (BASF, 2003) | > 10,000 mg/kg (rat, mouse) (NIOSH, 2003h) |
| ACUTE DERMAL LD ₅₀ | > 2148 mg/kg (mouse) > 5000 mg/kg (rabbit) (BASF, 2003) | > 200 mg/kg (rabbits) (NIOSH, 2003h) |
| ACUTE INHALATION LC ₅₀ | > 4.62 mg/L (rat) (Durkin and Follansbee, 2004) | > 1990 mg/L (rat) (NIOSH, 2003h) |
| EYE IRRITATION | Not irritating (rabbit)(BASF, 2003) | Not available |
| SKIN IRRITATION | Mildly irritating (rabbit)(BASF, 2003) | Not available |
| SKIN SENSITIZATION | Not a sensitizer (guinea pig) (Durkin and Follansbee, 2004) | Not available |
| SUBCHRONIC (RAT/MOUSE) | NOEL = 1695 mg/kg/day (male rat), 1740 mg/kg/day (female rat) (Durkin and Follansbee, 2004) | NOEL = 6.25 mg/kg/day (rat) (U.S. EPA, 2002e) |
| SUBCHRONIC (OTHER) | Not quantifiable: stomach ulcers and intestinal lesions after 12 days (female rabbits) (Cox, 1996) | NOEL = 10 mg/kg/day (dogs) (U.S. EPA, 2002e) |
| CHRONIC (RAT/MOUSE) | Not quantified : fluid in lungs, kidney cysts (mouse), Blood in spleen, thyroid cysts (rat) (Cox 1996) | NOEL = 5 mg/kg/day (male rat), 6.2 mg/kg/day (female rat) (U.S. EPA, 2002e) |
| CHRONIC (OTHER) | Not available | 10 mg/kg/day (dog) (U.S. EPA, 2002e) |
| ONCOGENICITY (MOUSE) | Not oncogenic (Durkin and Follansbee, 2004) | Significant trend with dose (0, 100, 1000, 12500 ppm in diet) for hepatocellular adenomas, carcinomas and combined in male mice only (U.S. EPA, 2002e) |
| ONCOGENICITY (OTHER) | Not oncogenic (rats) (Durkin and Follansbee, 2004) | Significant trend with dose (0, 125, 1250, 12500 ppm in diet) for adrenal pheochromocytomas in male rats only (U.S. EPA, 2002e) |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL(maternal, dev, rep) = 1471.8 mg/kg/day (male rats), 1537.1 mg/kg/day (female rats) (Durkin and Follansbee, 2004) NOEL(maternal, dev, rep) = 2000 mg/kg/day (rats) (Durkin and Follansbee, 2004) | NOEL(maternal) = 125 mg/kg/day (rat), NOEL(rep) = 625 mg/kg/day (U.S. EPA, 2002e) NOEL (maternal, rep) = 320 mg/kg/day (U.S. EPA, 2002e) |
| REPRO/DEVELOPMENTAL (OTHER) | NOEL(maternal) = 250 mg/kg/day (rabbits), NOEL(dev) = 2000 mg/kg/day (highest dose tested) (Durkin and Follansbee, 2004) NOEL(maternal, dev, rep) = 2000 mg/kg/day (rabbits) (Durkin and Follansbee, 2004) | NOEL = 1000 mg/kg/day (rabbit, highest dose tested) (U.S. EPA, 2002e) |

| | | |
|---------------|---|---|
| GENE MUTATION | S. typhimurium/E. coli, Chinese Hamster ovary, mouse micronucleus assays negative (Durkin and Follansbee, 2004) | Mouse micronucleation assay positive (U.S. EPA, 2002e) All other assays negative (U.S. EPA, 2002e) |
|---------------|---|---|

| TOXICITY | NORFLURAZON | OXADIAZON |
|--------------------------------------|--|--|
| ACUTE ORAL LD ₅₀ | > 1140 mg/kg (rat) (Syngenta, 2003) | > 5000 mg/kg (rat) (U.S. EPA, 2003e) |
| ACUTE DERMAL LD ₅₀ | > 20,000 mg/kg (rabbit) (Syngenta, 2003) | > 2000 mg/kg (rabbit) (U.S. EPA, 2003e) |
| ACUTE INHALATION LC ₅₀ | > 2.6 mg/L (rat) (Syngenta, 2003) | > 1.94 mg/L (rat) (U.S. EPA, 2003e) |
| EYE IRRITATION | Mildly irritating (rabbit) (Syngenta, 2003) | Mild irritant (rabbit) (U.S. EPA, 2003e) |
| SKIN IRRITATION | Slightly irritating (rabbit) (Syngenta, 2003) | Negligibly irritating (rabbit) (U.S. EPA, 2003e) |
| SKIN SENSITIZATION | Not a sensitizer (guinea pig) (Syngenta, 2003) | Not a sensitizer (guinea pig) (U.S. EPA, 2003e) |
| SUBCHRONIC (RAT/MOUSE) | NOEL = 12.5 mg/kg/day (male rats), 25 mg/kg/day (female rats) (U.S. EPA, 1996c) | NOAEL = 12 mg/kg/day (rat) (U.S. EPA, 2003e) |
| SUBCHRONIC (OTHER) | NOEL = 375 mg/kg/day (rabbit, dermal) (U.S. EPA, 1996c) | Not available |
| CHRONIC (RAT/MOUSE) | NOEL = 12.5 mg/kg/day (rat) (U.S. EPA, 1996c) NOEL = 12.8 mg/kg/day (male mice), 58.7 mg/kg/day (female mice) (U.S. EPA, 1996c) | NOAEL = 0.36 mg/kg/day (rat) (U.S. EPA, 2003e) |
| CHRONIC (OTHER) | NOEL = 1.55 mg/kg/day (dog) (U.S. EPA, 1996c) | NOEL = 2.5 mg/kg/day (dog) (U.S. EPA, 2003f) |
| ONCOGENICITY (MOUSE) | LOAEL = 218.8 mg/kg/day (U.S. EPA, 1996c) | Q1* = 7.11 x 10 ² (mg/kg/day) ⁻¹ (U.S. EPA, 2003e) |
| ONCOGENICITY (OTHER) | Not oncogenic (rat) (U.S. EPA, 1996c) | Not available |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | LOAEL(maternal) < 100 mg/kg/day (rat), NOAEL(dev) > 400 mg/kg/day (U.S. EPA, 1996c) | NOAEL(maternal) = 12 mg/kg/day (rat) (U.S. EPA, 2003e) |
| REPRO/DEVELOPMENTAL (OTHER) | NOEL(maternal, dev) = 30 mg/kg/day (rabbit) (U.S. EPA, 1996c) | NOEL = 500 mg/kg/day (rabbits, highest dose tested) (U.S. EPA, 2003f) |
| GENE MUTATION | No evidence, but inadequate doses used in Salmonella assay (U.S. EPA, 1996c) | Bacterial assays negative (U.S. EPA, 2003e) Mammalian assays negative (U.S. EPA, 2003e) No unscheduled DNA synthesis (U.S. EPA, 2003e) |

| TOXICITY | PENDIMETHALIN | PYRAFLUFEN |
|--------------------------------------|--|--|
| ACUTE ORAL LD ₅₀ | 1250 mg/kg (rat) (U.S. EPA, 1997d) | > 5000 mg/kg (rat) (EU, 2002) |
| ACUTE DERMAL LD ₅₀ | > 5000 mg/kg (rat) (U.S. EPA, 1997d) | > 2000 mg/kg (rat) (EU, 2002) |
| ACUTE INHALATION LC ₅₀ | > 320 mg/kg (rat) (U.S. EPA, 1997d) | > 5.03 mg/L (rat) (EU, 2002) |
| EYE IRRITATION | Slight irritation (U.S. EPA, 1997d) | Irreversible eye damage (Nichino, 2004) |
| SKIN IRRITATION | Not irritating (U.S. EPA, 1997d) | Moderate irritation (Nichino, 2004) |
| SKIN SENSITIZATION | Not a sensitizer (U.S. EPA, 1997d) | Not a sensitizer (Nichino, 2004) |
| SUBCHRONIC (RAT/MOUSE) | NOEL = 50 mg/kg/day (rat) (U.S. EPA, 1997d) NOEL = 4.98 mg/kg/day (rat) (U.S. EPA, 1997d) | NOAEL = 456 mg/kg/day (male rats), 499 mg/kg/day (female rats) (U.S. EPA, 2003g) |
| SUBCHRONIC (OTHER) | NOEL = 62.5 mg/kg/day (dog) (U.S. EPA, 1997d) | NOEL > 1000 mg/kg/day (dogs, 90 days) (U.S. EPA, 2003g) |
| CHRONIC (RAT/MOUSE) | NOEL = 25 mg/kg/day (rat) (U.S. EPA, 1997d) NOEL = 62.3 mg/kg/day (male mice), 78.3 mg/kg/day (female mice) (U.S. EPA, 1997d) | NOEL = 468.1 mg/kg/day (male rat), 578.5 mg/kg/day (female rat) (CalEPA, 2004) NOAEL = 20.99 mg/kg/day (male mice), 19.58 mg/kg/day (female mice) (U.S. EPA, 2003g) |
| CHRONIC (OTHER) | Not available | NOEL > 1000 mg/kg/day (dogs) (U.S. EPA, 2003g) |
| ONCOGENICITY (MOUSE) | Not available | Hepatocellular adenomas at 546.8 mg/kg/day (male mice), 523.7 mg/kg/day (female mice) (U.S. EPA, 2003g) |
| ONCOGENICITY (OTHER) | LOAEL = 250 mg/kg/day (rat) (U.S. EPA, 1997d) | Not available |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL (maternal, dev) > 500 mg/kg/day (rat) (U.S. EPA, 1997d) NOEL(parental) = 25 mg/kg/day (rat) (U.S. EPA, 1997d) | NOAEL(parental) = 70.8 mg/kg/day (male rats), 82.3 mg/kg/day (female rats), NOAEL(rep) > 813 mg/kg/day (U.S. EPA, 2003g) |
| REPRO/DEVELOPMENTAL (OTHER) | NOEL(maternal) = 60 mg/kg/day (rabbit), NOEL(dev) > 500 mg/kg/day (U.S. EPA, 1997d) | NOAEL(maternal) = 20 mg/kg/day (rabbit), NOAEL(rep) = 150 mg/kg/day (CalEPA, 2004) |
| GENE MUTATION | Ames assay positive (U.S. EPA, 1997d) Mammalian assays negative (U.S. EPA, 1997d) | Not mutagenic in bacterial or mammalian cell assays (U.S. EPA, 2003g) |

| TOXICITY | SULFENTRAZONE | TEBUTHIURON |
|--------------------------------------|--|---|
| ACUTE ORAL LD ₅₀ | > 2855 mg/kg (rat) (U.S. EPA, 1997e) | 477 mg/kg (male rat), 387 mg/kg (female rat), 528 mg/kg (male mice), 620 mg/kg (female mice) (U.S. EPA, 1994b) |
| ACUTE DERMAL LD ₅₀ | > 2000 mg/kg (rat) (U.S. EPA, 1997e) | > 5000 mg/kg (rat) (U.S. EPA, 1994b) |
| ACUTE INHALATION LC ₅₀ | > 4.13 mg/L (rat) (U.S. EPA, 1997e) | > 3.696 mg/L (rat) (U.S. EPA, 1994b) |
| EYE IRRITATION | Corneal opacity, iritis, diffuse irritation – resolved by 24 hrs (rabbit) (U.S. EPA, 1997e) | Slight irritation (rabbit) (U.S. EPA, 1994b) |
| SKIN IRRITATION | Not irritating (rabbit) (U.S. EPA, 1997e) | Not irritating (U.S. EPA, 1994b) |
| SKIN SENSITIZATION | Not a sensitizer (guinea pig) (U.S. EPA, 1997e) | Not a sensitizer (guinea pig) (U.S. EPA, 1994b) |
| SUBCHRONIC (RAT/MOUSE) | NOEL = 19.9 mg/kg/day (male rat), 23.1 mg/kg/day (female rat) (U.S. EPA, 1997e) NOEL = 60 mg/kg/day (male mice), 79.8 mg/kg/day (female mice) (U.S. EPA, 1997e) | NOEL = 50 mg/kg/day (rat) (U.S. EPA, 1994b) |
| SUBCHRONIC (OTHER) | NOEL = 57 mg/kg/day (male dog), 73 mg/kg/day (female dog) (U.S. EPA, 1997e) | NOEL 12.5 mg/kg/day (dog) (U.S. EPA, 1994b) |
| CHRONIC (RAT/MOUSE) | NOEL = 93.9 mg/kg/day (male mice), 116.9 mg/kg/day (female mice) (EPA, 1997e) | NOEL = 40 mg/kg/day (rat), 228 mg/kg/day (mouse) (EPA, 1994b) |
| CHRONIC (OTHER) | NOEL = 24.9 mg/kg/day (dog) (EPA, 1997e) | NOEL = 25 mg/kg/day (dog) (EPA, 1994b) |
| ONCOGENICITY (MOUSE) | Not oncogenic (EPA, 1997e) | Not available |
| ONCOGENICITY (OTHER) | Not oncogenic (rats, dogs) (EPA, 1997e) | Not available |
| REPRO/DEVELOPMENTAL (RAT/MOUSE) | NOEL(maternal) = 25 mg/kg/day (rat), NOEL(dev) = 10 mg/kg/day (EPA, 1997e) NOEL(rep) = 14 mg/kg/day (male rat), 16 mg/kg/day (female rat) (EPA, 1997e) | NOEL(maternal) = 30 mg/kg/day (rat), NOEL(dev) = 45 mg/kg/day (EPA, 1994b) NOEL(maternal) = 7 mg/kg/day (rat), NOEL(dev) = 28 mg/kg/day, NOEL(rep) < 28 mg/kg/day (EPA, 1994b) |
| REPRO/DEVELOPMENTAL (OTHER) | Not available | NOEL(maternal, dev) = 25 mg/kg/day (rabbit) (EPA, 1994b) |
| GENE MUTATION | Negative in bacterial and mammalian cell assays (EPA, 1997e) | Positive chromosomal aberration in Chinese hamster ovary cells. Negative in all other bacterial and mammalian cell assays. (EPA, 1994b) |

Table 5-5 Environmental fate of active ingredients to be used by WSDOT for roadside vegetation management.

Information regarding the environmental fate of the active ingredients can be found in Chapter 1, Section 2 of both the 1993 EIS and this supplement.

Table 5-6 Wildlife toxicity and efficacy of active ingredients to be used by WSDOT for roadside vegetation management.

Please refer to Chapters 2 and 3 for information on wildlife toxicity.

Table 5-7 Physical data, toxicity information, environmental fate and wildlife toxicity of the inert ingredients found in the herbicides to be used by WSDOT for roadside vegetation management. Additional Compounds.

| | | |
|--------------------------------|---|---|
| | 2-(2-Aminoethoxy) ethanol | Ethanol |
| Manufacturer | Texaco (NLM, 2003j) | Numerous |
| Physical Data | | |
| Ingredients | 2-(2-Aminoethoxy) ethanol | Ethanol |
| Signal Word/ Toxicity Class | Toxic (NLM, 2003j) | Danger (Aldrich, 1995) |
| Mode of Action | NA | Solvent |
| Solubility | Miscible (NJDHSS, 1998) | Miscible (NLM, 2003b) |
| Stability | Non-combustible; substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes (NLM, 2003j) | Stable (Aldrich, 1995) Highly flammable; not reactive (NLM, 2003b) |
| pH | NA | NA |
| Boiling Point | 221° (NLM, 2003j) | 78.5° (NLM, 2003b) |
| Melting Point | -12.5° (NLM, 2003j) | -114.1° (NLM, 2003b) |
| Vapor Pressure | NA | 59.3 mm Hg @ 25° C (NLM, 2003b) |
| % Volatile | NA | 100% |
| Toxicity Data | | |
| LD50 | NA | 1,400 mg/kg (human) (NIOSH, 2003g) 13.7 ml/kg (rat) (NLM, 2003b) 12.5 ml/kg (rabbit) (NLM, 2003b) |
| Acute Dermal | NA | 20,000 mg/kg (rabbit) (NIOSH, 2003g) |
| Acute Inhalation | NA | NA |
| Eye Irritation | Irritant (NJDHSS, 1998) | Irritant (Aldrich, 1995) |
| Skin Irritation | Irritant (NJDHSS, 1998) | Irritant (Aldrich, 1995) |
| Environmental Fate | NA | Evaporates and leaches into ground when spilled on soil. Volatilizes from water (half-life 6 days). Biodegraded in aerobic systems (NLM, 2003b) |
| Wildlife and Aquatic Toxicity | NA | |

| | | |
|--------------------------------|--|--|
| | Ethylenediaminetetraacetic acid (EDTA) | Glycerin |
| Manufacturer | Numerous | Numerous |
| Physical Data | | |
| Ingredients | Ethylenediaminetetraacetic acid | Glycerol |
| Signal Word/ Toxicity Class | NA | Caution! May cause irritation to skin, eyes, and respiratory tract. |
| Mode of Action | NA | NA |
| Solubility | $1 \times 10^{+3}$ mg/l @ 25°C (NLM, 2003c) | Soluble (NLM, 2003k) |
| Stability | Stable (NLM, 2003c) | Stable |
| pH | NA | Neutral (NLM, 2003k) |
| Boiling Point | NA | 290°C (NLM, 2003k) |
| Melting Point | Decomp at 240°C (NLM, 2003c) | 20°C (NLM, 2003k) |
| Vapor Pressure | NA | 1.58×10^{-4} mm Hg @ 25°C (NLM, 2003k) |
| % Volatile | NA | NA |
| Toxicity Data | | |
| LD50 | 30 mg/kg (mouse) (NIOSH, 2003b) | 4,090 mg/kg (mouse) (NIOSH, 2003c) 12,600 mg/kg (rat) (NIOSH, 2003c) |
| Acute Dermal | NA | >10,000 mg/kg (rabbit) (NIOSH, 2003c) |
| Acute Inhalation | NA | >570 mg/m ³ /1 hour (rat) (NIOSH, 2003c) |
| Eye Irritation | Irritant (NLM, 2003c) | Mild irritant (NIOSH, 2003c) |
| Skin Irritation | Irritant (NLM, 2003c) | Mild irritant (NIOSH, 2003c) |
| Environmental Fate | If released to soil or water, expected to complex with trace metals and alkaline earth metals, thereby causing an increase in the total solubility of the metals. Volatilization not likely to be significant. Reported to readily leach from soil (NLM, 2003c). | If released to soil or water, expected to rapidly degrade under aerobic conditions. The rate of volatilization from water will be slower than water itself (NLM, 2003k). |
| Wildlife and Aquatic Toxicity | NA | |

| | Isopropyl alcohol | Polyethylated tallow amines (POEA) |
|--------------------------------|--|------------------------------------|
| Manufacturer | Numerous | Monsanto |
| Physical Data | | |
| Ingredients | Isopropanol | NA |
| Signal Word/ Toxicity Class | Danger | NA |
| Mode of Action | Solvent | Surfactant |
| Solubility | 1.00x10 ⁺⁶ @ 25 °C (NLM, 2003e) | NA |
| Stability | Stable | NA |
| pH | NA | NA |
| Boiling Point | 82.5 °C @ 760 mm Hg (NLM, 2003e) | NA |
| Melting Point | -88.5 °C (NLM, 2003e) | NA |
| Vapor Pressure | 45.4 mm Hg @ 25 °C (NLM, 2003e) | NA |
| % Volatile | 100% | NA |
| Toxicity Data | | |
| LD50 | 5,272 mg/kg (man) (NIOSH, 2003d) 3,600 mg/kg (mouse) (NLM, 2003e) 5,045 mg/kg (rat) (NLM, 2003e) 8,000 mg/kg (rabbit) (NLM, 2003e) 4,797 mg/kg (dog) (NLM, 2003e) | NA |
| Acute Dermal | 12,800 mg/kg (rabbit) (NLM, 2003e) | NA |
| Acute Inhalation | 12,800 ppm/3 hour (mouse) (NIOSH, 2003d) 16,000 ppm/8 hour (rat) (NIOSH, 2003d) | NA |
| Eye Irritation | Moderate to severe irritant (NIOSH, 2003d) | Irritant (U.S. EPA, 2002b) |
| Skin Irritation | Mild irritant (NIOSH, 2003d) | Irritant (U.S. EPA, 2002b) |
| Environmental Fate | Expected to have very high mobility in soil. Readily degraded in aerobic systems with a half-life of <1 to 48 days. Readily degrades under anaerobic conditions. Volatilization from water surfaces is expected (NLM, 2003e) | NA |
| Wildlife and Aquatic Toxicity | | NA |

| | Propylene glycol | Triethylamine (N,N-diethylethanamine) |
|--------------------------------|--|---|
| Manufacturer | Numerous | Numerous |
| Physical Data | | |
| Ingredients | 1,2 - Propanediol | Triethylamine |
| Signal Word/ Toxicity Class | Caution! (Arco, 1997) | NA |
| Mode of Action | NA | NA |
| Solubility | Soluble (NLM, 2003g) | 7.37 x 10 ⁺⁴ mg/l @ 25 °C (NLM, 2003h) |
| Stability | Stable (Arco, 1997) | NA |
| pH | NA | NA |
| Boiling Point | 188.2 °C (NLM, 2003g) | 89.3 °C (NLM, 2003h) |
| Melting Point | -59 °C (NLM, 2003g) | -114.7 °C (NLM, 2003h) |
| Vapor Pressure | 0.129 mm Hg @ 25 °C (NLM, 2003g) | 57.1 mm Hg @ 25 °C (NLM, 2003h) |
| % Volatile | NA | NA |
| Toxicity Data | | |
| LD50 | 23,900-31,800 mg/kg (mouse) (NLM, 2003g) 30,000 mg/kg (rat) (NLM, 2003g) 18,000 mg/kg (rabbit) (NLM, 2003g) 19,000 mg/kg (dog) (NLM, 2003g) | 546 mg/kg (mouse) (NLM, 2003h) 460 mg/kg (rat) (NIOSH, 2003f) |
| Acute Dermal | 20,800 mg/kg (rabbit) (NIOSH, 2003e) | 570 mg/kg (rabbit) (NLM, 2003h) |
| Acute Inhalation | NA | 6,000 mg/m ³ (mouse) (NIOSH, 2003f) 1,000 ppm/4 hour (rat) (NIOSH, 2003f) 1,000 ppm/4 hour (guinea pig) (NIOSH, 2003f) |
| Eye Irritation | Mild irritant (NLM, 2003g) | Severe irritant (NLM, 2003h) |
| Skin Irritation | Not an irritant (NLM, 2003g) | Severe irritant (NLM, 2003h) |
| Environmental Fate | Rapidly degrades to CO ₂ in soil. Evaporation from dry soils is expected to occur, but to not be significant in moist soils. Essentially not volatile from water (NLM, 2003g) | Volatilization from surface water and moist soil not expected. Not expected to sorb to suspended solids and sediment (NLM, 2003h) |
| Wildlife and Aquatic Toxicity | | |

Table 5-8 Physical data, toxicity information, environmental fate and wildlife toxicity information for the adjuvants used for roadside vegetation management by WSDOT—Additional compounds.

| | Polyglycol 26-2 | Redi-Vert III |
|--------------------------------|-------------------|---|
| Manufacturer | Dow Agro-Sciences | Wilbur-Ellis Company |
| Physical Data | | |
| Ingredients | NA | Petroleum distillates, free fatty acids, and alkyldimethylamines (Wilbur-Ellis, ND) |
| Signal Word/ Toxicity Class | NA | Moderate Hazard (Wilbur-Ellis, 2002) |
| Mode of Action | NA | Encapsulates herbicide to provide better plant coverage and reduced drift |
| Solubility | NA | Insoluble (Wilbur-Ellis, 2002) |
| Stability | NA | Stable (Wilbur-Ellis, 2002) |
| pH | NA | NA |
| Boiling Point | NA | NA |
| Melting Point | NA | NA |
| Vapor Pressure | NA | < 10 mm @ 25 ° C (Wilbur-Ellis, 2002) |
| % Volatile | NA | 36.6% |
| Toxicity Data | | |
| LD50 | NA | NA |
| Acute Dermal | NA | Irritant (Wilbur-Ellis, 2002) |
| Acute Inhalation | NA | NA |
| Eye Irritation | NA | Irritant (Wilbur-Ellis, 2002) |
| Skin Irritation | NA | Irritant (Wilbur-Ellis, 2002) |
| Environmental Fate | NA | NA |
| Wildlife and Aquatic Toxicity | NA | NA |

2.1 Tables 5-9 to 5-32 Herbicide use rates and information

Information regarding WSDOT application rates and total usage for each herbicide product type is available in tables 4-11 and 4-36.

REFERENCES

- ACGIH. 1991a. 2,4-D. *Documentation of TLVs and BEIs*. American Conference of Governmental Industrial Hygienists. Cincinnati, OH.
- ACGIH. 1996. Sulfometuron methyl. *Documentation of TLVs and BEIs*. American Conference of Governmental Industrial Hygienists. Cincinnati, OH.
- Aldrich Chemical Co. 1995. Material Safety Data Sheet for Ethyl Alcohol, Denatured. Milwaukee, WI.
- Arco Chemical Co. 1997. Material Safety Data Sheet: Propylene Glycol Industrial.. Newtown Square, PA.
- BASF. 2003. Material Safety Data Sheet: Arsenal herbicide applicators concentrate. BASF Corporation. Research Triangle Park, NC.
- BASF. 2003. Material Safety Data Sheet: Overdrive Herbicide. BASF Corporation, Research Triangle Park, NC.
- Bellet E.M., van Ravenzwaay B., Pigott G. and Leeming N. 1999. Chronic dietary toxicity and oncogenicity evaluation of MCPA (4-chloro-2-methylphenoxyacetic acid) in rodents. *Regul. Toxicol. Pharmacol.* 30: 223-32.
- Bellett E.M., van Ravenzwaay B., Hellwig J., and Pigott G. 2001. Reproductive toxicity of MCPA (4-chloro-2-methylphenoxyacetic acid) in the rat. *Int. J. Toxicol.* 20: 29-38.
- Bond G.G. and Rossbacher R. 1993. A review of potential human carcinogenicity of the chlorophenoxy herbicides MCPA, MCPP, and 2,4-DP. *Br. J. Ind. Med.* 50: 340-348.
- CalEPA. 1993. *Summary of Toxicology Data: Oryzalin*. Department of Pesticide Regulation, Medical Toxicology Branch, California Environmental Protection Agency. Revised May 28.
- CalEPA. 1996a. *Summary of Toxicology Data: Dicamba*. California Environmental Protection Agency. Department of Pesticide Regulation, Medical Toxicology Branch. March 18.
- CalEPA. 1996b. *Summary of Toxicology Data: Dichlobenil*. California Environmental Protection Agency. Department of Pesticide Regulation, Medical Toxicology Branch. May 15.
- CalEPA. 1997b. *Public Health Goal for Glyphosate in Drinking Water*. Pesticide and Environmental Toxicology Section. Office of Environmental Health Hazard Assessment. California Environmental Protection Agency. December.

CalEPA. 1997c. *Public Health Goal for Picloram in Drinking Water*. Pesticide and Environmental Toxicology Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. December.

CalEPA. 1997d. *Summary of Toxicology Data: Bromacil*. California Environmental Protection Agency. Department of Pesticide Regulation, Medical Toxicology Branch. Revised November 14.

CalEPA. 1999. Chemicals meeting the criteria for listing as developmental and reproductive toxicants (DARTs) via the authoritative bodies mechanism: 5 chemicals identified by U.S. EPA. Package 11a.2. Reproductive and Cancer Health Assessment Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. February 26.

CalEPA. 2002a. Evidence on the Developmental and Reproductive Toxicity of Diuron. Draft. Reproductive and Cancer Hazard Assessment Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. September.

CalEPA. 2004. Summary of Toxicology Data: Pyraflufen-Ethyl. California Environmental Protection Agency. Pesticide Regulation, Medical Toxicology Branch.

Charles J.M., Dalgard D.W., Cunny H.C., Wilson R.D. and Bus J.S. 1996a. Comparative Subchronic and chronic dietary toxicity studies on 2,4-dichlorophenoxyacetic acid, amine, and ester in the dog. *Fund. Appl. Toxicol.* 29: 78-85.

Charles J.M., Bond D.M., Jeffries T.K., Yano B.L., Stott W.T., Johnson K.A., Cunny H.C., Wilson R.D. and Bus J.S. 1996b. Chronic dietary toxicity/oncogenicity studies on 2,4-dichlorophenoxyacetic acid in rodents. *Fund. Appl. Toxicol.* 33: 166-172.

Cox, C. 1996. Herbicide Fact Sheet: Imazapyr. *Journal of Pesticide Reform.* 16(3):16-20.

Deamer N.J., O'Callaghan J.P. and Genter M.B. 1994. Olfactory toxicity resulting from dermal application of 2,6-dichlorobenzonitrile (dichlobenil) in the C57B1 mouse. *NeuroToxicology.* 15: 287-294.

Dow. 2001. Material Safety Data Sheet: Transline Herbicide. Dow AgroSciences LLC. Indianapolis, IN. July 10.

Dow. 2004. Material Safety Data Sheet: Vista Herbicide. Dow AgroSciences LLC. Indianapolis, IN.

Durkin P, Follansbee M. 2004. Imazapyr – Human Health and Ecological Risk Assessment – Final Report. December 18.

European Commission (EU). 2002. Pyraflufen-ethyl – Final. July 2.

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June 30, 2005

Hayes W.C., Smith F.A., John J.A., and Rao K.S. 1984. Teratologic evaluation of 3,6-dichloropicolinic acid in rats and rabbits. *Fund. Appl. Toxicol.* 4: 91-97.

Kobal S. and Budihna M.V. 1999. Toxicity of herbicides 2,4-D and MCPA for rats and rabbits. *Acta Vet.* 68: 281-290.

Linnainmaa K. 1983. Sister chromatid exchanges among workers occupationally exposed to phenoxy acid herbicides 2,4-D and MCPA. *Teratog. Carcinog. Mutagen.* 3: 269-79.

M DFA (Massachusetts Department of Food and Agriculture). 1990. Triclopyr. Obtained online at http://www.state.ma.us/dfa/pesticides/rightofway/Rights_of_Way_December_2002.htm

M DFA (Massachusetts Department of Food and Agriculture). 2002. Metsulfuron Methyl. Obtained online at http://www.state.ma.us/dfa/pesticides/rightofway/Rights_of_Way_December_2002.htm

NIOSH. 1997. Picolinic acid, 3,6-dichloro-. RTECS#: TJ75500700. Registry of Toxic Effects of Chemical Substances. October.

NIOSH. 2000. Acetic acid, ((4-chloro-o-tolyl) oxy)-. RTECS#: AG1575000. Registry of Toxic Effects of Chemical Substances. September.

NIOSH. 2003a. Sulfanilamide, 3,5-dinitro-N4, N4-dipropyl-. Registry of Toxic Effects of Chemical Substances. January 29.

NIOSH. 2003b. Acetic acid, (ethylenedinitrilo) tetra -. RTECS#: AH4025000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003c. Glycerol. RTECS#: MA8050000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003d. Isopropyl alcohol. RTECS#: NT8050000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003e. 1,2 - Propanediol. RTECS#: TY2000000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003f. Triethylamine. RTECS#: YE0175000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003g. Ethyl alcohol. RTECS#: KQ6300000. Registry of Toxic Effects of Chemical Substances.

NIOSH. 2003h. Isoxaben. RTECS #: CV4370300. Registry of Toxic Effects of Chemical Substances. August.NJDHSS (New Jersey Department of Health & Senior Services). 1998. Hazardous Substance Fact Sheet: 2-(2-Aminoethoxy) ethanol. August.

NLM (National Library of Medicine). 2003b. Ethanol. CASRN: 64-17-5. Hazardous Substances Database.

NLM (National Library of Medicine). 2003c. Ethylenediamine Tetraacetic Acid. CASRN: 60-00-4. Hazardous Substances Database.

NLM (National Library of Medicine). 2003d. Gasoline. CASRN: 8008-61-9. Hazardous Substances Database.

NLM (National Library of Medicine). 2003e. Isopropanol. CASRN: 67-63-0. Hazardous Substances Database.

NLM (National Library of Medicine). 2003f. Kerosene. CASRN: 8008-20-6. Hazardous Substances Database.

NLM (National Library of Medicine). 2003g. Propylene Glycol. CASRN: 57-55-6. Hazardous Substances Database.

NLM (National Library of Medicine). 2003h. Triethylamine. CASRN: 121-44-8. Hazardous Substances Database.

NLM (National Library of Medicine). 2003j. 2-(2-Aminoethoxy)Ethanol. CASRN: 122-20-3. Hazardous Substances Database.

NLM (National Library of Medicine). 2003k. Glycerin. CASRN: 56-81-5. Hazardous Substances Database.

Nichino. 2004. Material Safety Data Sheet: Edict Herbicide/Defoliant. Nichino America, Inc. Wilmington, DE.

Syngenta. 2003. Material Safety Data Sheet: Predict Herbicide. Syngenta Crop Protection, Inc.. Greenboro, NC.

Takagi S. 1990. Chronic toxicity of 2-methyl-4-chlorophenoxyacetic acid (MCPA) in mice. *Tohoku J. Exp. Med.* 160: 97-107.

U.S. EPA. 1993a. *Reregistration Eligibility Decision (RED): Glyphosate*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-93-014. September.

U.S. EPA. 1994a. *Reregistration Eligibility Decision (RED): Oryzalin*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-94-016. September.

U.S. EPA. 1994b. Reregistration Eligibility Decision (RED): Tebuthiuron. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. June.

U.S. EPA. 1995a. *Reregistration Eligibility Decision (RED): Fosamine ammonium*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R95-004. January.

U.S. EPA. 1995b. *Reregistration Eligibility Decision (RED): Picloram*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R95-019. August.

U.S. EPA. 1996a. *Reregistration Eligibility Decision (RED): Bromacil*. United States Environmental Protection Agency. Office of Prevention, Pesticides, and Toxic Substances. EPA 738-R-96-013. August.

U.S. EPA. 1996b. Clopyralid (Confront, Stinger) Pesticide Tolerance Petition; Notice of Filing. United States Environmental Protection Agency. *Federal Register*. 61(239). December 11.

U.S. EPA. 1996c. Reregistration Eligibility Decision (RED): Norflurazon. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-98-013. July.

U.S. EPA. 1997a. Drexel Chemical Company; Pesticide Tolerance Petition Filing. United States Environmental Protection Agency. *Federal Register*. 62(16): 3685-3688. January 24.

U.S. EPA. 1997b. Clopyralid; Pesticide Tolerance for Emergency Exemptions. United States Environmental Protection Agency. *Federal Register*. 62(95): 26949-26954. May 16.

U.S. EPA. 1997c. Sulfometuron-methyl (Oust) Pesticide Petition Filing 12/97. United States Environmental Protection Agency. *Federal Register*. 62(242): 66083-66091. December 17.

U.S. EPA. 1997d. Reregistration Eligibility Decision (RED): Pendimethalin. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-97-007. June.

U.S. EPA. 1997e. Pesticide Fact Sheet: Sulfentrazone. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances.

U.S. EPA. 1998a. BASF Corporation; Pesticide Tolerance Petition Filing. United States Environmental Protection Agency. *Federal Register*. 63(224): 64481-64484. November 20.

U.S. EPA. 1998b. Dow AgroSciences LLC; Pesticide Tolerance Filing. United States Environmental Protection Agency. *Federal Register*. 63(224): 64489-64494. November 20.

U.S. EPA. 1998c. *Reregistration Eligibility Decision (RED): Dichlobenil*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-98-003. October.

U.S. EPA. 1998d. *Reregistration Eligibility Decision (RED): Triclopyr*. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-98-011. October.

U.S. EPA. 1998e. Reregistration Eligibility Decision (RED): Bromoxynil. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-98-013. December.

U.S. EPA. 1998f. Pesticide Fact Sheet: Fluroxypyr. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances.

U.S. EPA. 1999a. *Exposure Factors Handbook* (EPA/600/C-99/001). Washington, D.C.: National Center for Environmental Assessment.

U.S. EPA. 1999b. *Glossary of IRIS Terms*. Obtained online at <http://www.epa.gov/iris/gloss8.htm>.

U.S. EPA. 1999c. Dicamba (3,6-dichloro-o-anisic acid); Pesticide Tolerance. *Federal Register* 64(3): 759-769. January 6.

U.S. EPA. 1999d. Diuron; Pesticide Tolerances for Emergency Exemptions. United States Environmental Protection Agency. *Federal Register*. 64(146): 41297-41305.

U.S. EPA. 1999e. Picloram; Time-Limited Pesticide Tolerances. United States Environmental Protection Agency. *Federal Register*. 64(2): 418-425. January 5.

U.S. EPA. 1999f. Pesticide Fact Sheet: Diflufenzopyr. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances.

U.S. EPA. 2001a. Notice of Filing a Pesticide Petition to Establish a Tolerance for a Certain Pesticide Chemical in or on Food. United States Environmental Protection Agency. *Federal Register*. 66(206): 53791-53794. October 24.

- U.S. EPA. 2001b. Pesticide Fact Sheet: Flumioxazin. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances.
- U.S. EPA. 2002a. Chorsulfuron; Pesticide tolerance. United States Environmental Protection Agency. *Federal Register*. 67(157): 52866-52873. August 14.
- U.S. EPA. 2002b. Glyphosate; Pesticide Tolerances. Final Rule. United States Environmental Protection Agency. 40 CFR Part 180. *Federal Register*. 67(188): 60934-60950. September 27.
- U.S. EPA. 2002c. Notice of Filing a Pesticide Petition to Establish a Tolerance for a Certain Pesticide Chemical in or on Food. United States Environmental Protection Agency. *Federal Register*. 67(46): 10722-10727. March 8.
- U.S. EPA. 2002d. Notice of Filing Pesticide Petitions to Establish a Tolerance for Certain Pesticide Chemicals in or on Food. United States Environmental Protection Agency. *Federal Register* 67(74): 18894-18899. April 17.
- U.S. EPA. 2002e. Isoxaben (CASRN 82558-50-7). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. December 3.
- U.S. EPA. 2003a. 2,4-Dichlorophenoxyacetic acid (2,4-D) (CASRN 94-75-7). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. January 7.
- U.S. EPA. 2003b. 2-Methyl-4-chlorophenoxyacetic acid (MCPA) (CASRN 94-74-6). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. January 7.
- U.S. EPA. 2002c. Dicamba (CASRN 1918-00-9). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. January 7.
- U.S. EPA. 2002d. Diuron (CASRN 330-54-1). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. January 7.
- U.S. EPA. 2003e. Reregistration Eligibility Decision (RED): Oxadiazon. United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA 738-R-04-003. September.
- U.S. EPA. 2003f. Oxadiazon (CASRN 19666-30-9). Integrated Risk Information System (IRIS). United States Environmental Protection Agency. October 28.
- U.S. EPA. 2003g. Pyraflufen-ethyl; Pesticide Tolerance. United States Environmental Protection Agency. *Federal Register*. 68(83): 23046-23056.

Verschuuren H.G., Kroes R., and Den Tonkelaar E.M. 1975. Short-term oral and dermal toxicity of MCPA and MCPP. *Toxicology* 3: 349-59.

Wilbur-Ellis. ND. Redi-Vert III Invert Emulsion Application Adjuvant. Product Label. Wilbur-Ellis Company, Fresno, CA.

Wilbur-Ellis. 2002. Material Safety Data Sheet: Redi-Vert III. Wilbur-Ellis Company, Fresno, CA.

WHO (World Health Organization). 1994. *Environmental Health Criteria No. 159: Glyphosate*. World Health Organization. Geneva.

WHO (World Health Organization). 1996. *WHO/FAO Data Sheets on Pesticides: Glyphosate* (No. 91). Geneva.