MINNESOTA POLLUTION CONTROL AGENCY
AQUATIC LIFE CRITERIA

1997 Chapter 7050/7052 Rulemaking
SNR Exhibit 105

**Page 1 SUMMARY**

| A. Chemical: 2,4-Dimethylphenol | CAS# 105679 | Date Oct. 30, 1996 |
|---|---|---|

B. Minnesota Criterion: ug/l (unless noted otherwise)

| Water Class | Use | CC | MC | FAV | Basis[1] |
|---|---|---|---|---|---|
| 1,2A | DW, Salmonid | 21.00 | 137.08 | 274.16 | GLI2 |
| 1,2Bd | DW, NonSalmonid | 21.00 | 137.08 | 274.16 | GLI2 |
| 2B, 2C, 2D | NonSalmonid | 21.00 | 137.08 | 274.16 | GLI2 |
| Lake Superior | Other | 21.00 | 137.08 | 274.16 | GLI2 |

Toxicity related to water quality?: Suspect there may be a pH relationship. No conclusive evidence available
If yes, above criteria values determined for:
Slope: Acute:
Chronic:

| Formulas: | MPCA | EPA |
|---|---|---|
| CC: | | |
| MC: | | |
| FAV: | | |

Notes:

| C. EPA Criterion: ug/l | CCC: 450/8700 | Basis: Drinking water/nondrinking water HNV** |
|---|---|---|
| Date: GLI 1995 | MC: none | Basis: |
| | FAV: none | Basis: |

| D. Other Criteria ug/l | Source |
|---|---|
| 400 taste and odor in water | EPA. 1980. 2,4-Dimethylphenol criteria doc. |
| 2120* | EPA. 1980. 2,4-Dimethylphenol criteria doc. |

E. Notes: *EPA's acute value is based on lowest acute value found, not an FAV no#. ** HNV= Human Noncancer Value

GLI2 = Great Lakes Initiative
Tier II Methodology

[1] Criteria basis codes for part B:
EPA = From EPA criterion
PCA = Criterion developed by Minnesota Pollution Control Agency staff
T1 = Direct aquatic life toxicity, EPA national criteria procedures used
T2 = Direct aquatic life toxicity, EPA advisory procedures used
Hs = Human health systemic effects
Hc = Human health carcinogenic effects
R = Tissue residue (bioaccumulation)
W = Wildlife effects
O = Organoleptic (taste and odor)
Other = Criterion based on other end point

MINNESOTA POLLUTION CONTROL AGENCY
AQUATIC LIFE CRITERIA

**Page 2 DIRECT AQUATIC LIFE TOXICITY - EPA Criterion Available**

| A. | Chemical: 2,4-Dimethylphenol | CAS# 105679 | Date Oct. 30, 1996 |
|---|---|---|---|

| B. | EPA Criterion: ug/l | CCC: 450/8700 | Basis: Drinking water/ Nondrinking water HNVs |
|---|---|---|---|
| | Date: 1995 GLI | MC: none | Basis: |
| | | FAV: none | Basis: |

| 1. | Related to water quality?: | | | |
|---|---|---|---|---|
| 2. | Toxicity: | FAV: none | N: | ACR: none |
| | ug/l | Chronic value: none | N: | |
| 3. | Residue | | | |
| | FDA action level: | | | |
| | BCF Final: | N total: | N used: | |
| | geo mean at 1% lipid: | | | |
| | % lipid: | | | |
| | geo man unadjusted for lipid: | | | |

C. MPCA Evaluation of EPA Criterion

1. Four lowest GMAVs: None

2. Commercially or recreationally important species: None

3. Plant data:

4. Extrapolation of water quality effects:

5. Chronic data No. of values:
No. below criterion:

Notes: No EPA GLI aquatic life based criterion developed

| 6. ACRS | ACR used by EPA: none | N: |
|---|---|---|
| | Geo. mean, all ACRs: | N: |
| | ACR used by MPCA: | N: |

Notes:

D. Separate Cool/Warm Water Criterion, ug/l
No. of Salmonids deleted from lowest 4 GMAVs:
N(nonsal): FAV: MC: CC:
Adjustments to FAV:

Notes: EPA did not calculate a aquatic life-based criterion

E. Summary of changes made to EPA criterion

MINNESOTA POLLUTION CONTROL AGENCY
AQUATIC LIFE CRITERIA

**Page 3 DIRECT AQUATIC LIFE TOXICITY**
**No EPA criterion available**

| A. Chemical: 2,4-Dimethylphenol | CAS# 105679 | Date Oct. 30, 1996 |
|---|---|---|

| B. EPA National Method See GLI Tier 2 Methodology | | |
|---|---|---|
| 1. Data requirements: | Salmonid (2A water only): | |
| | Osteichthyes (fish): | Lepomis macrochirus |
| | Chordata (fish, amphibian): | Pimephales promelas |
| | Planktonic crustacean: | Daphnia magna |
| | Benthic crustacean: | |
| | Aquatic insect: | |
| | Phylum other than Arthropoda or Chordata: | |
| | Second insect or phylum not already rep.: | Tetrahymena pyriformis |

| 2. GMAVs | Lowest 4(2A): See GLI Tier 2 method | Lowest 4(2B,2C, 2D): See GLI Tier 2 method |
|---|---|---|
| ug/l | | |
| | N: | N: |
| | | |
| 3. FAV: | 2A: | 2B, 2C, 2D: |

4. Adjustments to FAVs:

| 5. Chronic data: See Table 2a | No. | Species: |
|---|---|---|
| mean values MATC | 2475.2 | Pimephales promelas |
| ug/l Early Life Stage | 2191 | Pimephales promelas |
| | | |
| | | |

| 6. ACR Measured: | Acute value | Chronic value | ACR |
|---|---|---|---|
| | 17,000 | 2475.2 | 6.868 |
| Generic: 18 | | | 18 |
| | | | 18 |
| Final: 13.055 | | | |
| | | | |

7. Final Plant Value: no acceptable data
8. Chronic Criterion (FAV/ACR) 21.000

| C. EPA Advisory Method : See GLI Tier 2 Method | | |
|---|---|---|
| 1. Data requirements: | Fish: | Pimephales promelas |
| | Crustacean: | Daphnia magna |
| No. SMAVs: | Third animal: | Tetrahymena pyriformis |
| No. GMAVs: | Plant for herbicide: | |
| Factor: Secondary acute factor: 8 | Insect for pesticide: | |

2. Lowest GMAV: 2193.3 ug/L Species: Daphnia magna
3. FAV: 274.16 MC: 137.08
4. Chronic data: See B.5.
5. ACR: 13.055 See B.6.
6. CC: 21.00
7. Citation for lowest GMAV: Aquire References No#s 5184 and 2193 as well as EPA 1978 contract No. 68-01-4646 (See 1980 EPA Criteria document).

D. Notes:

MINNESOTA POLLUTION CONTROL AGENCY
AQUATIC LIFE CRITERIA

**Page 4 HUMAN HEALTH**

| A. Chemical: 2,4-Dimethylphenol | CAS# 105679 | Date Oct. 30, 1996 |
|---|---|---|

| B. EPA Human Health Criterion: ug/l | DW and fish: 450 | fish only: 8700 | DW only: none |
|---|---|---|---|
| ADI/Ref.dose: 0.0167 mg/kg/day | Cancer Potency Slope: | | |
| Final BCF: see BAFs | %lipid: | | |
| RSC: 0.8 | | | |

| C. Minnesota Human Health Criterion | | | |
|---|---|---|---|
| 1. Ref.dose: 0.02 mg/kg/day | Source: HRLs | | |
| RSC: 0.2 | Source: HRLs | | |
| 2. Cancer Potency Slope: | Source: | | |
| 3. Measured BAFs: Species/Tissue | BAF | %lipid | Norm BAF |
| 1. Tier 3 Level | 5 | 1.82 | see GLI method |
| 2. Tier 4 Level | 7 | 3.10 | see GLI method |
| 3. | | | |
| 4. | | | |
| Geo mean: | | | |
| 4. Measured BCFs: Species/Tissue | BCF | %lipid | Norm. BCF |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| Geo mean: | | | |
| 5. Edible portion BAF or BCF | BAF | | BCF |
| Cold water: 6.0 % lipid Tier 3 / Tier 4 | 13.12/ 13.00 | | |
| Warm water: 1.5 % lipid Tier 3 / Tier 4 | 4.03/4.0 | | |
| 6. Geo mean unadjusted for lipid: | | | |
| Lake Superior: 4.5% l.p.d, Tier 3 or 4 | 18.17/18.0 | | |
| 7. log Kow: 2.3 adjust. for % lipid: | meas. | QSAR: | Est. BCF: |
| 8. Parachor: | | | |
| 9. BCF to BAF conversion factor: | | | |

| 10. Final BAF: 2A: 13.12/13 for Tier 3/Tier 4, respectfully | | | 2B,2C, 2D: 4.03/4.00 for Tier 3/Tier 4, respectfully | |
|---|---|---|---|---|
| 11. Criteria: ug/l | 2A: 391.15 | 2Bd: 441.08 | 2B/2C, 2D: 7181.9 | RAL/HBV: 100 |

| D. Organoleptic: 400 ug/l | Source: EPA. 1980. 2,4-Dimethylphenol criteria doc. |
|---|---|

Notes: Criteria for Lake Superior is 368.01 ug/L based off of a tier 3 BAf of 18.17 and a Tier 4 BAF of 18.00.

Table 1. Acute and Chronic Values: 2,4-Dimethylphenol

Oct 30, 1996, D. White

| Species Latin Name<br>Species Common Name | Effect | Conc. (ug/L) | Life Stage | Dur. (days) | Ex Ty | res Salt | Temp. (C) | Hardness (mg/L) | pH | D C | Comments | Ref No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | | | | | |
| Brachionus calyciflorus<br>Rotifer | EC50 REP | 8600 | NEWLY HATCHED, NEONATES | 2 | SU | FW | 25 | | | 2 | Can't use organisms, were fed | 3963 |
| Brachionus calyciflorus<br>Rotifer | LC50 MOR | 208000 | NEWLY HATCHED, NEONATES | 2 | SU | FW | 25 | | | 2 | Can't use, organisms were fed | 3963 |
| Brachionus calyciflorus<br>Rotifer | LOEC REP | 4000 | NEWLY HATCHED, NEONATES | 2 | SU | FW | 25 | | | 2 | | 3963 |
| Brachionus calyciflorus<br>Rotifer | NOEC REP | 2000 | NEWLY HATCHED, NEONATES | 2 | SU | FW | 25 | | | 2 | | 3963 |
| Brachionus calyciflorus<br>Rotifer | MATC REP | 2828 | NEWLY HATCHED, NEONATES | 2 | SU | FW | 25 | NR | 7.5 | 2 | Questionable if it can be used,Based on reproduction | 3963 |
| Chlorella pyrenoidosa<br>green algae | CLR | 500000 | NR | 2 | NR | FW | NR | NR | | | 100% chlorophyll destruction Fr. EPA 1980 criteria doc. | Huang & Gloyna. 1967. Environ. Health Engin Res. Lab. PB 216-749 |
| Daphnia magna<br>Water flea | MOR | 1000 | < 24 H | 2 | SU | FW | 22 | 72 | | 2 | | 5184 |
| Daphnia magna<br>Water flea | EC50 IMM | 2370 | 1ST INSTAR, <24 Hr | 2 | SU | FW | 22 | 154.5<br>89.5-180 | 7.7<br>7.2-8.0 | 2 | Temp high | 2193 |
| Daphnia magna<br>Water flea | EC50* IMM | 0.096 mmol/L | <72 H | 1 | SU | FW | 20 | | | 2 | | 3379 |
| Daphnia magna<br>Water flea | LC50 MOR | 8300 | < 24 H | 1 | SU | FW | 22 | 72 | | 2 | | 5184 |
| Daphnia magna<br>Water flea | LC50 MOR | 2100 | < 24 H | 2 | SU | FW | 22 | 72 | 6.7-8.1 | 2 | temp high, otherwise a good study | 5184 |
| Daphnia magna<br>Water flea | LC50 MOR | 2120 | NR | 2* | SU | FW | NR | NR | NR | | From 2,4-DMP criteria 1980, * assumed exposure | EPA.1978. CONTRACT NO.68-01-4646 |
| Gadus morhua<br>Atlantic cod | EC50 MUL | 3700 | EGG | 4 | SM | SW | 5 | | | 2 | | 11059 |
| Lemna minor<br>Duckweed | LC50* MOR | 290000* | NR | 3 | SU | FW | 25 | | | 3 | | 2231 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 18000 | JUVENILE, 0.32-1.2 G | 1 | SU | FW | 21-23 | 32-34 | | 2 | | 5590 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 7800 | JUVENILE, 0.32-1.2 G | 4 | SU | FW | 22<br>21 - 23 | 32 -34 | 6.5-7.9 | 2 | | 5590 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 7750 | NR | 4* | SU | FW | NR | NR | NR | | From 2,4 DMP 1980 criteria, * assumed | EPA.1978.Contract 68-01-4646 |

Table 1. Acute and Chronic Values: 2,4-Dimethylphenol

Oct 30, 1996, D. White

| Species Latin Name / Species Common Name | Effect | Conc. (ug/L) | Life Stage | Dur. (days) | Ex Ty | res Salt | Temp. (C) | Hardness (mg/L) | pH | D C | Comments | Ref No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | | | | | |
| Oncorhynchus mykiss<br>Rainbow trout | PHY | 9040 | 0.6-1.0 KG | < 0.25 | FM | FW | 11.0 -11.5 | 43.32 | | 2 | exposure value | 789 |
| Oncorhynchus mykiss<br>Rainbow trout | LETH MOR | 9040 | 0.6-1.0 KG | 0.25 | FM | FW | 11.0 -11.5 | 43.32 | | 2 | | 789 |
| Petromyzon marinus<br>Sea lamprey | STR | 5000 | LARVAE, 8-13 CM | 1 | SU | FW | 13 | | | 3 | | 638 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 17000 | 30-35 D | 4 | FM | FW | 25 | 43.3-48.5 | 7.58-9.1 | 2 | authors suspect pH relationship | 2189 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 17000 | 30-35 D | 4 | FM | FW | 25 | 43.3-48.5 | | 2 | duplicate test | 2189 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 16600 | 32 D | 4 | FM | FW | 25.6 | 45.7 | 8.6 | 1 | | 12447 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 14000 | 30-35 D | 8 | FM | FW | 25 | 43.3-48.5 | | 2 | | 2189 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 13000 | 30-35 D | 8 | FM | FW | 25 | 43.3 -48.5 | | 2 | | 2189 |
| Pimephales promelas<br>Fathead minnow | MATC GRO | 2475.2 | LARVAE | 32* | FM | FW | 25 | 46<br>44.6 -47.0 | 7.2-7.9 | 1 | *28 days post hatch,see 1980 criteria | 704 |
| Pimephales promelas<br>Fathead minnow | NR GRO | 3110 | EGG-LARVAE | 32 | FM | FW | 25 | 46<br>44.6-47.0 | | 1 | | 704 |
| Pimephales promelas<br>Fathead minnow | NR GRO | 1970 | EGG-LARVAE | 32 | FM | FW | 25 | 46<br>44.6-47.0 | | 1 | | 704 |
| Pimephales promelas<br>Fathead minnow | NR MOR | 5130 | EGG-LARVAE | 32 | FM | FW | 25 | 46<br>44.6-47.0 | | 1 | | 704 |
| Pimephales promelas<br>Fathead minnow | NR MOR | 3110 | LARVAE | 32 | FM | FW | 25 | 46<br>44.6-47.0 | | 1 | | 704 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 16,750 | NR | 4* | FM | FW | NR | NR | NR | | From 24,DMP criteria 1980, simular to Ref.2189 *assumed exposure | Phipps et al. manuscript |
| Pimephales promelas<br>Fathead minnow | E L Chronic | 2191 | NR | NR | NR | FW | NR | NR | | | *Basically an MATC end pts., Fr. 2,4 DMP criteria | EPA.1978 Contract 68-01-4646 |
| Pimephales promelas<br>Fathead minnow | MATC GRO | 2190.8 | embryos | 32* | FM | FW | NR | NR | NR | | *32 day post hatch, Based on wgt and lgth , methods incomplete | Le Blanc. 1984. In: QSAR in Environmental Toxicol. pp.235-260 |
| Stronglyocentrotus droebachie<br>Green sea urchin | EC50 MUL | 5100 | FERTILIZED EGG | 4 | SM | SW | 5 | | | 2 | | 11059 |
| Tetrahymena pyriformis | IC50 PGR | 130510 | NR | 2.5 | SU | FW | | | | 2 | | 10903 |

Table 1. Acute and Chronic Values: 2,4-Dimethylphenol

Oct 30, 1996, D. White

| Species Latin Name<br>Species Common Name | Effect | Conc.<br>(ug/L) | Life Stage | Dur.<br>(days) | Ex<br>Ty | res<br>Salt | Temp.<br>(C) | Hardness<br>(mg/L) | pH | D<br>C | Comments | Ref<br>No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | | | | | |
| Ciliate | | | | | | | | | | | | |
| Tetrahymena pyriformis<br>Ciliate | IC50 PGR | 130510 | NR | 2 | SNR | FW | NR | NR | NR | | No test methodolgy available for this organism Incipent Conc preventing growth | Schultz.1987. Ecotox. & Environ. Safe. 14: 178-183 |

Table 2a. Chronic Values: 2,4-Dimethylphenol

Oct. 30, 1996 D. White

| Species Latin Name<br>Species Common Name | Effect | Conc.<br>(ug/L) | Life Stage | Dur.<br>(days) | Ex<br>Ty | Fresh<br>Salt | Temp.<br>(C) | Hardness<br>(mg/L) | pH | D<br>C | Comments | Ref<br>No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | | | | | |
| Pimephales promelas<br>Fathead minnow | MATC GRO | 2475.2 | LARVAE | 32* | FM | FW | 25 | 46<br>44.6 - 47.0 | 7.2-7.9 | 1 | *28 days post hatch,see 1980 criteria | 704 |
| Pimephales promelas<br>Fathead minnow | E L Chronic | 2191 | NR | NR | NR | FW | NR | NR | | | *Basically an MATC end pts., Fr. 2,4 DMP criteria | EPA.1978 Contract 68-01-4646 |

Table 2b. Acute-Chronic Ratio: 2,4-Dimethylphenol

| Species Latin Name<br>Species Common Name | Acute Value<br>(ug/L) | Chronic Value<br>(ug/L) | Ratio | Ref.<br>No. |
|---|---|---|---|---|
| Pimephales promelas<br>fathead minnow | 17000 | 2475.2 | 6.868 | 2189, 704 |

Generic ACR=18
Final ACR=13.055

Table 3a. Genus Mean Acute Values: 2,4-Dimethylphenol

| Species Latin Name<br>Species Common Name | Effect | Conc. (ug/L) | Dur. (days) | Ex Ty | Fresh Salt | SMAV (ug/L) | GMAV (ug/L) | Ref No. |
|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | |
| Daphnia magna<br>water flea | LC50 MOR | 2100 | 2 | SU | FW | 2193.3 | 2193.3 | 5184 |
| Daphnia magna<br>Water flea | EC50 IMM | 2370 | 2 | SU | FW | | | 2193 |
| Daphnia magna<br>Water flea | LC50 MOR | 2120 | 2* | SU | FW | | | EPA.1978. CONTRACT NO.68-01-4646 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 7800 | 4 | SU | FW | 7774.95 | 7774.9 | 5590 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 7750 | 4* | SU | FW | | | EPA.1978.Contract 68-01-4646 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 17000 | 4 | FM | FW | 16,836.6 | 16,836.6 | 2189 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 17000 | 4 | FM | FW | | | 2189 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 16600 | 4 | FM | FW | | | 12447 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 16,750 | 4* | FM | FW | | | Phipps et al. manuscript (see note) |
| Tetrahymena pyriformis<br>Ciliate | IC50 PGR | 130510 | 2 | SNR | FW | 130,510 | 130,510 | Schultz.1987. Ecotox. & Environ. Safe. 14:178-183 |

Note: Phipps et al. manuscript may be a duplicate of AQUIRE Ref. 2189

Table 3b. Ranked Genus Mean Acute Values: 2,4-Dimethylphenol Oct. 30, 1996 D. White

| Species Latin Name<br>Species Common Name | Effect | Dur. (days) | Ex Ty | Fresh Salt | GMAV (ug/L) |
|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | |
| Tetrahymena pyriformis<br>Ciliate | IC50 PGR | 2 | SNR | FW | 130,510 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 4 | FM | FW | 16,836.6 |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 4 | FM | FW | |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 4 | FM | FW | |
| Pimephales promelas<br>Fathead minnow | LC50 MOR | 4* | FM | FW | |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 4 | SU | FW | 7774.9 |
| Lepomis macrochirus<br>Bluegill | LC50 MOR | 4* | SU | FW | |
| Daphnia magna<br>water flea | LC50 MOR | 2 | SU | FW | 2193.3 |
| Daphnia magna<br>Water flea | EC50 IMM | 2 | SU | FW | |
| Daphnia magna<br>Water flea | LC50 MOR | 2* | SU | FW | |

Minimmum families represented: 3
Secondary Acute Factor: 8.0
FAV: 274.16

Table 4. Plant Values: 2,4-Dimethylphenol

Oct. 30, 1996 D. White

| Species Latin Name<br>Species Common Name | Effect | Conc.<br>(ug/L) | Life Stage | Dur.<br>(days) | Ex<br>Ty | Fresh<br>Salt | Temp.<br>(C) | Hardness<br>(mg/L) | pH | D<br>C | Comments | Ref<br>No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105679 2,4-Dimethylphenol | | | | | | | | | | | | |
| Chlorella pyrenoidosa<br>green algae | CLR | 500000 | NR | 2 | NR | FW | NR | NR | | | 100% chlorophyll destruction<br>Fr. EPA 1980 criteria doc.<br>Data not useful | Huang & Gloyna. 1967.<br>Environ. Health Engin<br>Res. Lab. PB 216-749 |
| Lemna minor<br>Duckweed | LC50* MOR | 290000* | NR | 3 | SU | FW | 25 | | | 3 | Data not useful | 2231 |