G 46 REV 5 99 ENGINEERING DUPONT COMPUTATION SHEET

DRAFT

Washington Works - DOSE CALC

4-30-02

4 potential Pathways:
(1) Inhalation
(2) drinking water ingestion
(3) fish ingestion
(4) soil ingestion

Assumption: receptors are down across ohio R. from plant, in Little Hocking. Look @ adult & child.

Key Inputs → MAX dep RATE = .1999 g/m²/yr
Little Hocking ≈ .025 g/m²/yr

(1) Max level ground level concentration = 1.105 ug/m³
= [redacted] D. Mulberry

(2) Drinking water well conc = [redacted] L.H. average R. Pinchot
MAX PRIVATE WELL: 0.6 ug/L // 6.4 ug/L next highest ② R. Pinchot

(3) Mass in outfall = [redacted] ①

(4) BCF is [redacted] R. Pinchot

(5) Mean flow of Ohio River = [redacted] MILLION LITERS/day

(EFAS = upper Bert. - lower)

EXPOSURE PARAM.	Adult-RME	Adult-Lifetime	Child
Inhalation rate (IR)	15.2 m³/d	15.2 m³/d	10 m³/d
soil ingestion rate	100 mg/day	100 mg/day	200 mg/d
✓ drinking water intake	1.4 L/day	1.4 L/day	1 L/d
fish ingestion	.054 kg/d	.02 kg/d	
✓ averaging time (AT)	25,550 d	25,550 d	25,550 d
✓ body weight (BW)	70 kg	70 kg	16 kg
✓ exposure duration (ED)	30 yrs	70 yrs	6 yrs
✓ exposure frequency (EF)	365 d/yr	365 d/yr	365 d/yr
	50%	95%	

SOURCE: RAGS
*Updated input parameters, according to 1997 Env Factors Handbook

USE STANDARDS FOR MINIMUM ESSENTIAL INSTALLATIONS

CAB000119

EID546968

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SURFACE WATER CONCENTRATION - ESTIMATE

MEAN FLOW RANGE: 4.75×10^{10} to 1.2×10^{11} Liters/day

4yr 2000 DATA

* $48{,}685 \frac{\text{lbs CB}}{\text{yr}} \times \frac{1\text{ yr}}{365\text{d}} = 133 \text{ lbs/day} = 60.5 \text{ kgs/day}$ CB

Concentration @ lower flow

$$60.5 \frac{\text{kg}}{\text{d}} \times \frac{\text{d}}{4.75 \times 10^{10} \text{L}} = 1.3 \times 10^{-9} \frac{\text{kg}}{\text{L}} = 1.3 \frac{\mu\text{g}}{\text{L}} \text{ (low flow)}$$

Concentration @ higher flow:

$$60.5 \frac{\text{kg}}{\text{d}} \times \frac{\text{d}}{1.2 \times 10^{11} \text{L}} = 5.0 \times 10^{-10} \frac{\text{kg}}{\text{L}} = 0.5 \frac{\mu\text{g}}{\text{L}} \text{ (higher flow)}$$

Concentration range 0.0005 to 0.0013 mg/L

FISH CONCENTRATIONS - ESTIMATE

$CF = (\text{Dissolved water conc.}\ \text{mg/L}) \times BCF$

$CF_1 = (.0005) \times 10 = .005$ mg/kg FISH TISSUE

Conservative * $CF_2 = (.0013) \times 10 = .013$ mg/kg FISH TISSUE

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UNREALISTIC @ 1 cm

SOIL CONCENTRATION - ESTIMATE USING MAX RATE & Dt

Using a deposition rate of 0.1909 g/m²/yr
Assume chemical mixes in top 1 cm of soil

(1) First determine total mass of soil per m²:

1 m² = 10,000 cm² @ 1 cm depth, volume = 10,000 cm³

✓ assume bulk density = 1.5 g / cm³ soil

volume × ρ = mass ⇒ 10,000 cm³ × 1.5 g/cm³ = 15,000 g = 15 kg per m²

(2) Total mass of CB per m² = 0.1909 g ⇒ 190.9 mg/m²

(3) Soil conc = 190.9 mg/m² / 15 kg/m² = 12.7 mg/kg (1 cm mixing depth)

modified

USING 6 in (15 cm) mixing zone:

(1) TOTAL SOIL MASS = 150,000 cm³ × 1.5 g/cm³ = 225,000 g = 225 kg

(2) COPC MASS = 190.9 mg/m²

(3) SOIL CONC = 190.9 mg / 225 kg = 0.85 mg/kg

modified

	Receptor 1	Receptor 2
1998 @ 0-1 foot highest 1.8 mg/kg (highest)	3.6 mg/m²	4.7 mg/m²
burning cluster ⇒ .05 mg/kg	225 kg/m²	225 kg/m²
GE Boundary line: .025 mg/kg "BACKGROUND"	.016 mg/kg	.021 mg/kg

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ENGINEERING DUPONT COMPUTATIONAL SHEET

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ESTIMATE TOTAL DOSE

ESTIMATE
LIFE TIME ADULT (MAX)

	LOW FLOW	HIGH FLOW (no diff)	1 cm mix.	3 cm mix
DRINKING WATER	[illegible]	5.1×10^{-5}	5.1×10^{-5}	5.1×10^{-5}
FISH	[illegible]	1.4×10^{-6}		
SOIL			[illegible]	2.6×10^{-1}
INHAL	[illegible]	2.4×10^{-4}	2.4×10^{-4}	2.4×10^{-4}

MAXIMUM: Lower flow est + small mixing depth = .76 mg/kg day
= 760 ug/kg day

NO DIF. ANCE

LOW FLOW
WITHOUT SOIL INGEST: 2.95×10^{-4} mg/kg-day = 0.295 ug/kg-d

HIGH FLOW W/O SOIL ING: 2.92×10^{-4} mg/kg-day = 0.292 ug/kg-d

INHALATION & SOIL INGESTION DRIVE

INHALATION: MAX IN STUDY AREA = 6.08×10^{-1} ug/kg-d
MAX IN L.H. AREA = 2.5×10^{-1} ug/k-d

Back Calculation - Soil Ingestion

$$.001\ \frac{mg}{kg\text{-}d} = \frac{(\eta f) \times (100\ mg/day_{soil}) \times (10^{-6}\ \frac{kg}{mg}) \times 365\ \frac{d}{yr} \times 70\ y}{(70\ kg)(25{,}550\ days)}$$

$$\eta f = \frac{(.001)(70)(25550)}{(100)(10^{-6})(365)(70)} = 700$$

Roll up

max drinking water = 5.14×10^{-2} mg/kg-d

inhalation = 6.66×10^{-1} mg/kg-d

→ fish = 3.71×10^{-3} mg/kg-d

Soil = $\frac{1.2 \times 10^{-3}\ mg/kg\text{-}d}{0.74\ mg/kg\text{-}d}$

.92 mg/kg-d wt

max dw #

Reduce app rate by 70%

time to get to gw ?

lag time ?

PRZM

(4/16) D. Mulrooney 2003 case

~~current~~ appl. rate : (2.57 sq km) dep = 6000 gm/yr

~~target~~ Application rate : 20,000 gm/yr (yr 2000)