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M E M O R A N D U M

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SUBJECT: SUBCHRONIC 1,3-DICHLOROPROPENE AIR CONCENTRATION ESTIMATES

The Worker Health and Safety Branch (WHS) requested two-week concentration estimates for 1,3-dichloropropene (1,3-d). These subchronic estimates were calculated based on procedures described in Barry (2008). In brief, a set of studies was utilized which measured 1,3-d flux for deep shank, shallow shank and drip application methods. The measured two-week flux was utilized in a screening scenario to obtain a two-week air concentration.

Seven studies were examined (Table 1), the same set used for the acute exposure concentrations (Johnson 2008). The shallow shank applications were provided in a single study (Gillis and

Table 1. 1,3-d studies for use in estimating sub-chronic air concentrations.

Study	Location	Application Method	Study Application Rate (lbs a.i./acre)	Study Application Rate (g/m2)	Study Length (d)	Msrd Flux (fraction of applied)	Estimated 14d flux (fraction of applied)	Average daily flux (ug/m2s)	Maximum Rate Application Rate (lbs a.i./acre)
Gillis & Dowling (1999)	Salinas Valley	Shank row 12" depth	68.3	7.66	13.9	0.65	0.65	4.14	332
Gillis & Dowling (1999)	Salinas Valley	Shank broadcast 14"	122	13.67	13.8	0.65	0.65	7.45	332
Knuteson et al. (1992a)	Salinas Valley	Shank 18"	122	13.67	13.9	0.25	0.25	2.85	332
Knuteson et al. (1995)	Firebaugh (Fresno)	Shank 18"	120	13.45	20.7	0.26	0.26[a]	2.89	332
Knuteson et al. (1992b)	Imperial County	Shank 18"	121	13.56	7.7	0.11	NA[b]	NA	332
Knuteson & Dolder (2000)	Salinas	Drip	128	14.35	19.0	0.29	0.28	3.32	252
Wesenbeeck & Phillips (2000)	Douglas, GA	Drip	67.4	7.55	13.8	0.29	0.29	1.84	252

[a] 14d flux fraction was the same as 20.7d rounded to 2 decimal places. One flux period interpolated.

[b] Procedure for estimating two week flux not appropriate.

Dowling 1999). There were three deep shank studies (shank, 18 inches). And two drip application studies were also analyzed. The Imperial County study (Knuteson et al. 1992b) was only about 8 days long and techniques for estimating 14 d flux were determined to be inappropriate. For the remainder, two-week flux was measured. In several cases, the actual measurement periods were just under two weeks, but no adjustment to two weeks was used. Table 1 shows the two week flux as a fraction of the applied amount of active ingredient. Also, the corresponding average flux in terms of ug/m2s is shown.

Barry (2008) calculated a time-adjustment scaling factor based on U.S. Environmental Protection Agency methods which is used to extrapolate a two week concentration from a one-day concentration. For scaling from a daily concentration to a two-week concentration, she determined the appropriate multiplicative factor was 0.48. Two additional factors are used to convert the generic 24 h concentrations to the two-week subchronic concentrations. The first is a factor which scales the average measured flux to the nominal flux of 100 ug/m2s used to generate the generic concentrations and the second is a factor used to scale the study application rate to the maximum allowed application rate. These factors are summarized in Table 2 and explained more fully in Barry (2008).

The net adjustment factor in Table 2 is the product of the three individual adjustment factors.

Table 2. Calculation of factors for adjusting daily generic concentrations.

Study	Study Application Rate (lbs a.i./acre)	Study Application Rate (g/m2)	Average flux (ug/m2s)	Maximum Application Rate (lbs a.i./acre)	Time scale factor (24 h to 2 weeks)	Average flux scaled to 100 ug/m2s	Maximum application rate divided by study application rate	Net adjustment factor
Gillis & Dowling (1999)	68.3	7.66	4.14	332	0.48	0.04143	4.86091	0.09667
Gillis & Dowling (1999)	122	13.67	7.45	332	0.48	0.07455	2.72131	0.09738
Knuteson et al. (1992a)	122	13.67	2.85	332	0.48	0.02847	2.72131	0.03719
Knuteson et al. (1995)	120	13.45	2.89	332	0.48	0.02891	2.76667	0.03839
Knuteson et al. (1992b)	121	13.56	NA	332	0.48	NA	2.74380	NA
Knuteson & Dolder (2000)	128	14.35	3.32	252	0.48	0.03321	1.96875	0.03138
Wesenbeeck & Phillips (2000)	67.4	7.55	1.84	252	0.48	0.01837	3.73887	0.03298

The net adjustment factor is applied to the generic concentrations. There is no regulatory limit on size for a single application of 1,3-d. As with the acute concentration estimates (Johnson 2009), practical considerations limit single shank applications to 80 acres and single drip applications to 40 acres.

Table 3 outlines the concentration calculations using the net adjustment factors at various downwind distances. The concentrations at various downwind distances were computed by multiplying the net adjustment factor by the corresponding downwind generic concentration. For example, for 152 m downwind, the shank, broadcast 14 inches net adjustment factor

Table 3. Sub-chronic screening concentrations for shallow shank, deep shank and drip applications of 1,3-d.

Downwind Distance (m)					3.0	15.2	30.4	91.2	152.0	760.0
80 Acre Generic Concentrations (ug/m3)					2878	2645	2308	1634	1319	516
Study	Location	Application Method	Net adjustment factor	Max acreage	Adjusted sub-chronic screening concentrations (ug/m3)					
Gillis & Dowling (1999)	Salinas Valley	Shank row 12" depth	0.09667	80	278	256	223	158	128	50
Gillis & Dowling (1999)	Salinas Valley	Shank broadcast 14"	0.09738	80	280	258	225	159	128	50
Knuteson et al. (1992a)	Salinas Valley	Shank 18"	0.03719	80	107	98	86	61	49	19
Knuteson et al. (1995)	Firebaugh (Fresno)	Shank 18"	0.03839	80	111	102	89	63	51	20
Knuteson et al. (1992b)	Imperial County	Shank 18"	NA	80	NA	NA	NA	NA	NA	NA
40 Acre Generic Concentrations (ug/m3)					2589	2351	2019	1374	1083	379
Knuteson & Dolder (2000)	Salinas	Drip	0.03138	40	81	74	63	43	34	12
Wesenbeeck & Phillips (2000)	Douglas, GA	Drip	0.03298	40	85	78	67	45	36	13

is 0.09738 and the generic concentration is 1319 ug/m3. The resulting estimate is 128 ug/m3 (=0.09738*1319).

References

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