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Potential for Cyfluthrin Movement to California Ground Water as a Result of Agricultural Use

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Introduction

The Exposure Assessment Group of DPR's Human Health Assessment Branch has requested assistance from the Ground Water Protection Program (GWPP) in modeling the potential for cyfluthrin movement to ground water under California conditions. They have also requested results from ground water monitoring studies conducted for cyfluthrin.

The GWPP utilizes modeling data and ground water monitoring studies for evaluating the potential for pesticide active ingredients to contaminate California ground water under agricultural use conditions. Applications of the GWPP's model have included evaluating the potential impact on ground water of new pesticide active ingredients submitted to DPR for California registration, reevaluating pesticides with existing California registrations, identifying management practices to mitigate residue movement to ground water, prioritizing pesticides for ground water monitoring, and for water input management in field studies. The ground water model has been calibrated to predict pesticide movement in leaching vulnerable soils and residue concentrations in well water. It has been verified against well monitoring data obtained from pesticide monitoring studies conducted in areas of California where the ground water has been impacted by pesticides.

Ground water monitoring by DPR for certain pesticide active ingredients is mandated by the Pesticide Contamination Prevention Act of 1985. Agricultural use pesticides, including cyfluthrin, are evaluated based on their physical/chemical properties and use patterns and accordingly identified or not for placement on the Ground Water Protection List (Title 3 of the California Code of Regulations (CCR), section 6800[b]) for ground water monitoring.

Modeling Methodology and Parameterization

The LEACHP computer model (Hutson and Wagenet, 1992) is used by the GWPP to simulate pesticide fate and transport in the soil's upper vadose zone. The model is mechanistic in nature and simulations account for the influence of developing plant structures, evapotranspirative processes, depth-dependent soil texture and organic matter content; chemical adsorption, degradation and transformation processes; soil water movement, solute convection and dispersion, and heat flow and profile temperatures in the soil. Soil texture, organic carbon content and bulk density data used in the modeling scenario represent coarse, loamy-sand soils located in eastern Fresno County, California, in an area that is considered vulnerable to leaching of pesticide residues to ground water. Troiano et al. (1993) measured the high leaching potential of this soil in a field study that determined the effect of method and amount of irrigation water application on the movement of atrazine and bromide in soil. Data from that study were later used by Spurlock (2000) to calibrate the LEACHP model to the study area by establishing estimates for several soil hydraulic properties required for modeling of pesticides in soil. The calibrated LEACHP model was then coupled to an empirical-based model for use in a Monte Carlo probabilistic procedure to investigate the effect of irrigation management on leaching of known ground water contaminants in California. The modeling scenario was verified by good agreement between simulated output and pesticide residue concentrations measured in domestic drinking water wells located in the study area (Spurlock, 2000).

For this current analysis deterministic- and probabilistic-type modeling approaches were initially considered in order to estimate potential concentrations of cyfluthrin in domestic drinking water wells. However, the physical/chemical properties of cyfluthrin indicated that it was not conducive to mobility or persistence in the soil environment, especially when compared to the properties of those pesticides that have been found in California ground water as a result of agricultural use such as those listed in Title 3 CCR 6800(a). Consequently, the computing-intensive probabilistic modeling approach was deferred in favor of conducting a single deterministic-type simulation to evaluate the extent of cyfluthrin's fate and movement in soil and potential to even threaten ground water. With this approach the LEACHP model was configured to simulate an idealistic, worst-case modeling scenario by selecting physical/chemical parameter-values for cyfluthrin most conducive to its persistence and movement in soil, chemical application directly to the soil surface at maximum label rates across consecutive years, soil conditions vulnerable to leaching residues, shallow ground water, and excessive irrigation inputs producing large amounts of percolating water. The GWPP's ground water modeling scenario utilizes a second, empirical-based model coupled to the primary LEACHP model that simulates residue movement below the deepest simulated LEACHP soil depth of 3 meters. Simulated residues passing through this depth are transitioned to the empirical-based model for simulation in the deep vadose and saturated zones and finally to a well where residue concentrations are estimated. More detailed methodology of the GWPP's modeling scenario utilizing LEACHP and the empirical-based model, including model parameterization has been previously documented (Troiano and Clayton, 2009).

Water inputs to the modeling scenario were consistent with those to support grape production, which is a typical crop grown in the study area in the coarse-textured soils of eastern Fresno County. A 6-month irrigation period was simulated from mid-April to mid-October. Irrigation events were simulated at fixed-depth increments of 100 mm with the frequency of application determined by crop water demand and irrigation efficiency. Water applications were made at 160% of crop demand, which represented typical California agricultural irrigation efficiencies of approximately 60% for non-pressurized, surface delivery methods such as basin, border and furrow-type systems (California Agricultural Technology Institute, 1988; Snyder et al., 1986). Rainfall events were simulated during the non-irrigation season from November through April and were applied when the long-term mean daily precipitation accumulated to 12 mm since the previous water input. Mean long-term daily temperature, precipitation, and reference evapotranspiration (ETo) values were obtained from the California Irrigation Management Information System weather station #80 at California State University, Fresno (http://www.ipm.ucdavis.edu/WEATHER/wxretrieve.html) and calculated over a consecutive 20-year period. Water demand for the simulated grape crop was calculated from the long-term mean daily ETo and crop coefficients, the latter of which for grapes ranged from 0 to 0.85 depending on the stage of canopy development. Simulated irrigation applications were subsequently based on the product of this crop water demand and the excess demand factor of 1.6 to account for irrigation application inefficiencies.

The deterministic modeling approach for cyfluthrin consisted of chemical-specific parameter selection based on a worst-case scenario reflecting the longest terrestrial field dissipation (TFD) half-life and lowest carbon-normalized soil adsorption coefficient (Koc) values. Since data from these studies involve chemical interactions with soil the results can be variable due to the heterogeneous nature of soil, especially when compared to other study types that are conducted in a more uniform matrix such as air and water for volatility and solubility studies, respectively. Accordingly, for each active ingredient DPR typically receives several TFD and soil adsorption studies from which dissipation half-life and Koc values are calculated, respectively, thereby providing some indication in the variability of these parameters. However, for cyfluthrin only one TFD study was on file with DPR which provided a relatively short and possibly unrepresentative dissipation half-life value of 13.5 days. Examination of the Pesticide Properties DataBase (PPDB) maintained by the Agriculture and Environment Research Unit at the

University of Hertfordshire, UK (Lewis et. al., 2016) revealed the existence of other cyfluthrin TFD half-life values that ranged from 26 – 40 days. The data quality codes for these values were of a verified nature and classified for use for European regulatory purposes. Therefore, the value of 40 days was selected for this current evaluation of cyfluthrin to comply with the worst-case modeling scenario. For cyfluthrin solubility a single value of zero was present in DPR’s Pesticide Chemistry Database, which may have resulted from a reporting error, transcription error or rounding function. To alleviate this concern and further establish a worst-case modeling scenario, the solubility value of 0.006 mg/L was selected from the PPDB. The data quality code for this value was of a verified nature and classified for use for European regulatory purposes. These parameter values and others utilized for deterministic modeling in this current evaluation are given in Table 1, with the LEACHP model input file given in appendix 1.

Table 1. Cyfluthrin-specific LEACHP model input data. Where multiple values were available those values identified by ‘*’ were selected.

Modeling parameter	Value	Source
Active ingredient maximum annual application rate (mg/m^2)	56	Baythroid 2 Emulsifiable Pyrethroid Insecticide label[z]
Koc (cm^3/g)	62385 7667 3500 2333 1000 588*	DPR pesticide chemistry database
TFD dissipation half-life (day)	13.5	DPR pesticide chemistry database
	26-40*	PPDB, University of Hertfordshire, UK
Aqueous solubility (mg/L)	0	DPR pesticide chemistry database
	0.006*	PPDB, University of Hertfordshire, UK
Vapor density (mg/L)	7.6E-07	DPR pesticide chemistry database
Molecular diffusion coefficient in water (mm^2/day)	120[y]	Spurlock (2000)
Molecular diffusion coefficient in air (mm^2/day)	4.300E+05[y]	Spurlock (2000)
Air diff. coeff. enhancement to account for atmos. pressure fluctuations (mm^2/day)	1.400E+05[y]	Spurlock (2000)

[z] Registered for use from 12/05/03 to 12/31/09. Cyfluthrin products with agricultural uses that have active registrations have marginally lower active ingredient maximum annual application rates.

[y] Universal values utilized for most non-volatile pesticides.

The LEACHP simulation period for standard evaluations is 5 years whereby applications of the active ingredient are made annually at maximum label rates to the soil surface. Simulations for this length of time typically result in near steady-state conditions where the annual rate of chemical application and the sum of the dissipation losses approach equilibrium. At this stage of the simulation annual loading and distribution of residues in the soil profile, and residue movement below the 3.0-m deep LEACHP modeling profile are essentially stable. The empirical-based modeling phase utilizes this stabilized annual mass of residue movement below the LEACHP profile to estimate residue concentrations in well water. For this current evaluation the simulation period was extended to 20 years because of uncertainty in the effect of solubility for cyfluthrin being uncommonly low. This modification was to ensure that the dissipation processes and soil loading of cyfluthrin actually achieved steady-state conditions at termination of the simulation.

Modeling Results

Cyfluthrin residues failed to move below the LEACHP-simulated 3-meter deep soil profile. This rendered the empirical modeling procedure that would normally be coupled to the LEACHP model to simulate residue movement in the deep vadose zone redundant. The lowest depth of residue movement with respect to the resolution capabilities of the LEACHP model was 73 cm. At termination of the 20-year simulation period 50% and 95% of cyfluthrin mass contained within the soil profile failed to move deeper than 5 and 27 cm, respectively, depicting a distribution of cyfluthrin residues that rapidly declined in residue mass with soil depth (Figure 1). Modeling results indicated also that within 2 or 3 years of annual chemical applications at maximum rates the loading and movement of residues in the soil profile essentially stabilized (Figure 2). This rapid stabilization was partially due to cyfluthrin’s very low aqueous solubility where water inputs were not sufficient to fully dissolve the chemical applied to the soil surface despite simulations of winter rainfall and high irrigation applications at 160% of plant demand. Consequently, the majority of applied cyfluthrin steadily accumulated on the soil surface in an undissolved state (Figure 2). Under simulated steady-state conditions a mass balance of cyfluthrin residues also revealed losses of chemical from volatilization and transformation processes (Table 2). In terms of the soil loading of cyfluthrin, a total of only 1.7 mg/m^2 or approximately 3% of the annually applied chemical remained in a stabilized state in the upper soil profile.

Table 2. Annual mass balance of cyfluthrin additions and losses from the LEACHP model simulation following attainment of steady-state conditions.

	mg/m^2		
Addition by application to soil surface	56.0		
Loss by leaching		0.0	
Loss by volatilization		23.3	
Loss by transformation		8.9	
Loss to soil surface in undissolved state		23.7	
Total loss		55.9	
Mass balance error			0.1

Ground Water Monitoring of Cyfluthrin

The potential to detect cyfluthrin residues in California ground water is only possible if use of the chemical has occurred in the state. DPR’s pesticide use reports indicated that agricultural use of cyfluthrin in California steadily increased from negligible use in 1990 to over 25,000 lbs in 1998. Annual agricultural use then immediately dropped to between approximately 12,000 and 18,000 lbs over subsequent years (Figure 3). Other sites of cyfluthrin use include, but are not limited to outdoor use around non-agricultural buildings and structures, animal husbandry premises, recreational areas, sport fields and courts. However, cyfluthrin application to these sites is relatively low compared to agricultural sites, and was estimated at approximately 15% of all cyfluthrin use in the state.

Cyfluthrin is not currently listed on the Ground Water Protection List (Title 3 CCR 6800[b]) because its physical/chemical properties do not exceed threshold levels identified as being associated with pesticides having the potential move to ground water (Johnson, 1991). Consequently, DPR has not conducted any ground water monitoring for cyfluthrin. However, extensive sampling for cyfluthrin in California ground water has been conducted or sponsored by the State Water Resources Control Board between 2004 and 2011. During this period 1,916 unique wells were sampled for cyfluthrin. Minimum residue reporting limits varied between 0.008 and 0.053 ug/L, however, no detections of cyfluthrin were reported in well water. According to DPR’s well inventory database no other state agencies or entities have sampled for cyfluthrin in California.

Conclusions

Computer modeling of cyfluthrin under a worst-case scenario, which simulated the unlikely convergence of several chemical-, environmental-, and management-related factors conducive to offsite movement of residues, predicted that cyfluthrin movement was confined to within 73 cm of the soil surface, with 95% of the residues confined to within 27 cm of the surface. The modeling scenario simulated applications at maximum label rates on an annual basis over a 20-year period. However, after a simulation period of approximately 2 years cyfluthrin loading and dissipation in the soil had achieved steady-state conditions where further movement of residues ceased. Interestingly, cyfluthrin's unusually low solubility meant that a large proportion of its residues remained undissolved on the soil surface, and continued to accumulate there during the entire 20-year simulation period. Cyfluthrin is typically a foliar applied pesticide and the conservative modeling scenario simulated full application of the chemical directly to the soil surface. Under actual use conditions only a small fraction of the applied cyfluthrin would be expected to contact the soil surface, thereby resulting in the unlikely accumulation of undissolved residues on the soil surface. Similarly, the conservative nature of the modeling scenario used for this evaluation almost certainly overestimated the depth of movement of cyfluthrin in the soil profile.

Based on computer modeling conducted in this evaluation it is highly unlikely that cyfluthrin residues will impact ground water in California as a result of agricultural use at levels even remotely approaching current analytical method detection levels. This conclusion is supported by extensive ground water monitoring conducted or sponsored by the State Water Resources Control Board where cyfluthrin was not detected in 1,916 wells sampled throughout the state.

References

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Troiano, J., C. Garretson, C. Krauter, J. Brownell and J. Hutson. 1993. Influence of amount and method of irrigation water application on leaching of atrazine. J. Enviorn. Quality 22:290-298.

Figure 1. LEACHP-simulated distribution of cyfluthrin mass in soil.

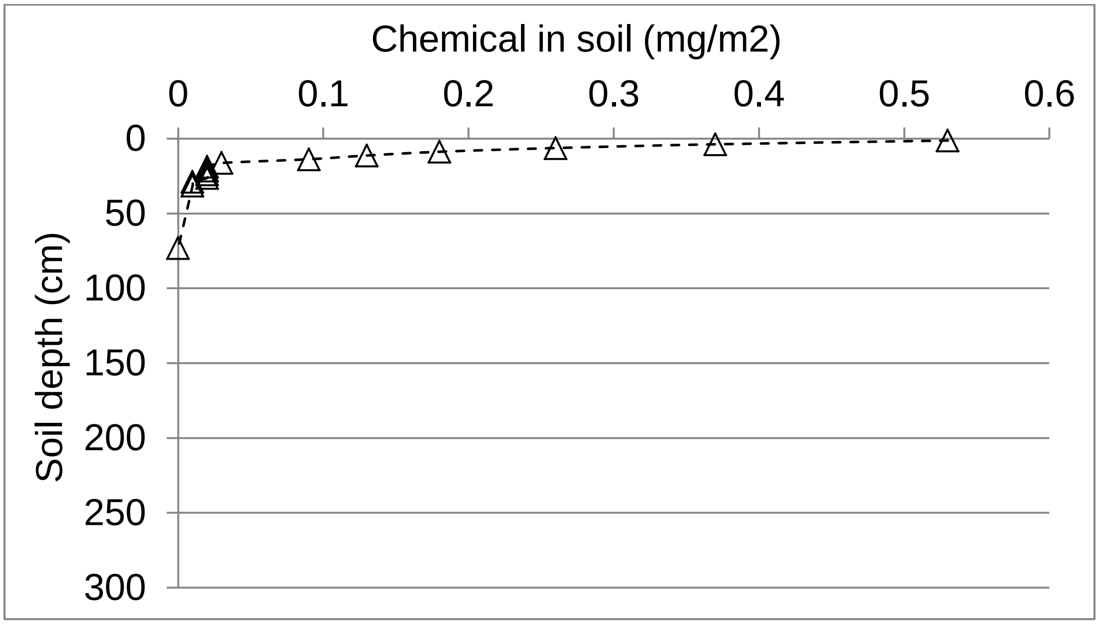


Figure 2. LEACHP-simulated movement of cyfluthrin residues over a 20-year simulation period following annual applications of cyfluthrin to the soil surface at maximum label rates.

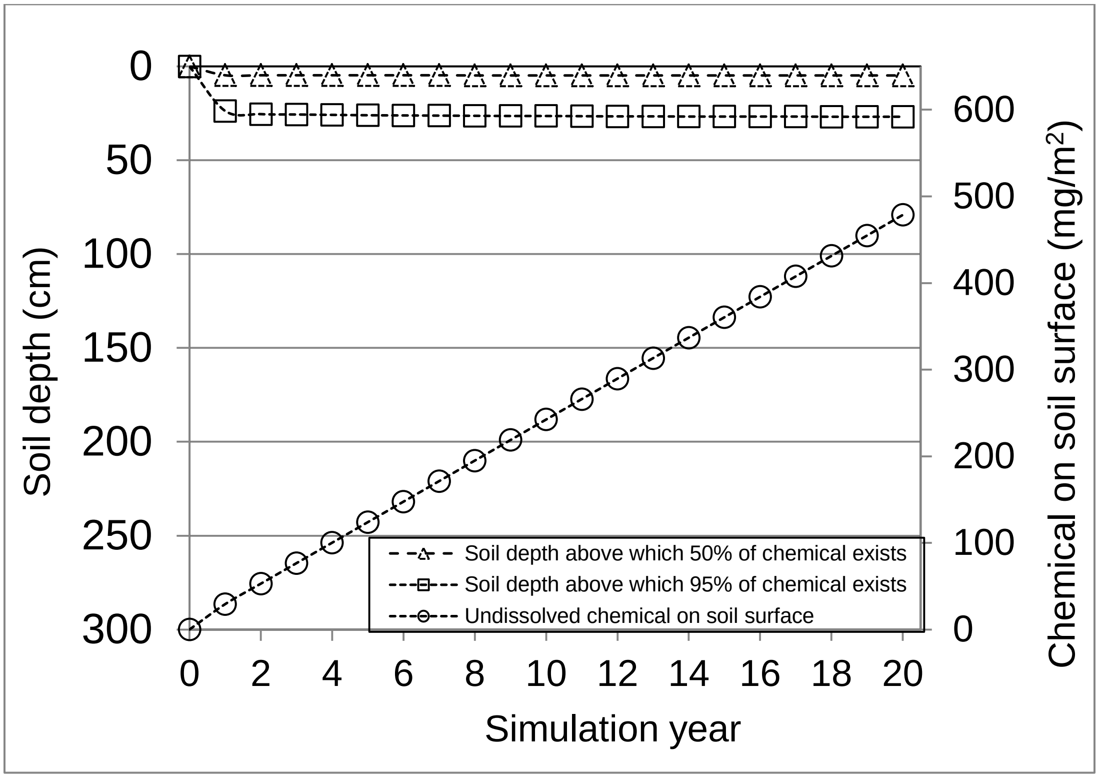
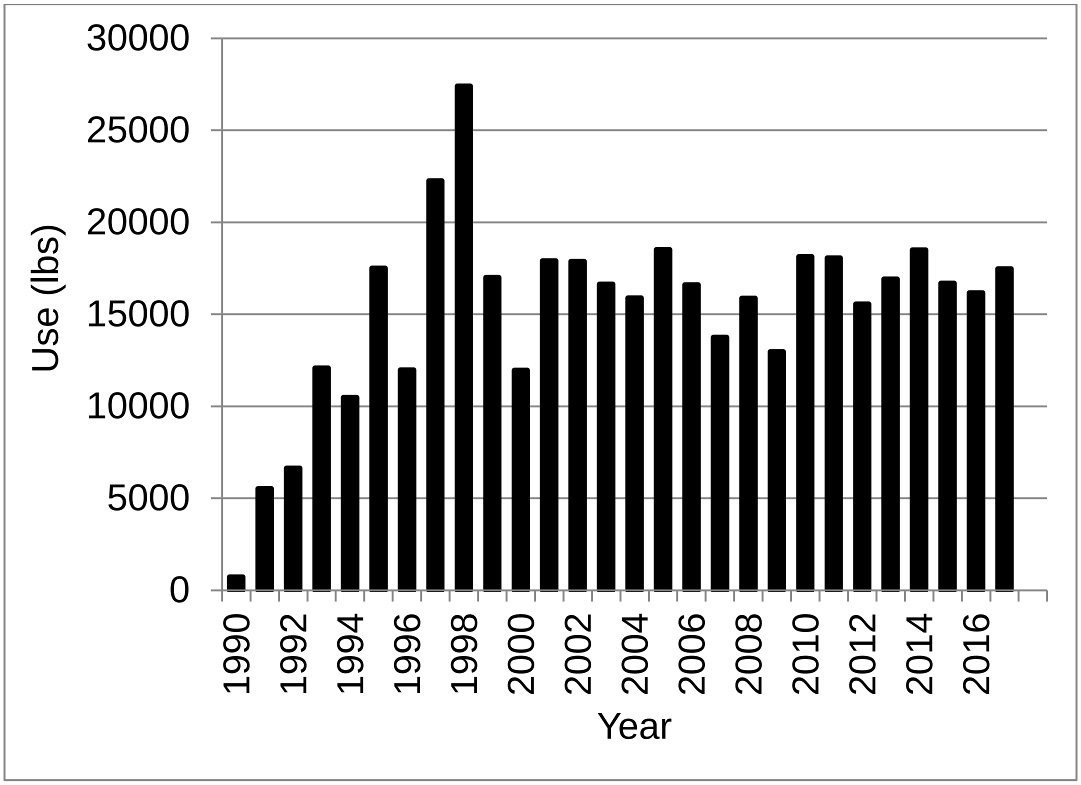


Figure 3. Annual agricultural use of cyfluthrin in California.



Appendix 1. LEACHP model input file for cyfluthrin simulation.

```
cyf160< cyfluthrin Irrigation @ 160% of plant demand. Used in batch runs (started as LEACHP<filename).
---------------------------------------------------------------------------
                      LEACHP PESTICIDE DATA FILE.
Numeric data and comments may extend to position 120. Unless defined as
'not read' a value must be present for each item, although it may not be used.
Free format with blank delimiters. Preserve division and heading records.  Number of depth segments may be changed.
***************************************************************************************************************
 1      <Date format (1: month/day/year;  2: day/month/year).  Dates must be 6 digits, 2 each for day, mo, yr.
 010195 <Starting date.  No date in the input data should precede this date.
 000365 <Ending date or day number.  The starting date is day 1. (A value <010101 is treated as a day number).
 0.05    <Largest time interval within a day (0.1 day or less).
 20      <Number of repetitions of rainfall, crop and chemical application data.
 3000   <Profile depth (mm), preferably a multiple of the segment thickness.
 25     <Segment thickness (mm).  (The number of segments should be between about 8 and 30.
 2      <Lower boundary condition: 1:fixed depth water table; 2:free drainage, 3:zero flux 4:lysimeter.
 0000   <Water table depth (mm), if the lower boundary is 1 (water table).
----------------------------------------------------------------------------
The steady-state flow option uses constant water fluxes during the application
periods specified in the rainfall data table, and a uniform water content
specified here.  Steady-state flow implies a lab column, and crop and evaporation data are ignored.
----------------------------------------------------------------------------
  1     < Water flow: 1: Richards; 2: Addiscott tipping bucket; 3: steady-state.
  0.4   < Steady-state flow water content (theta); 999: saturated column.
***************************************************************************************************************
***************************************************************************************************************
 1      <Number of output files: 1: OUT only; 2: OUT + SUM; 3: OUT + SUM + BTC
--------------------------------------
--- For the *.OUT file :
 2      <Units for depth data: 1: ug/kg, 2: mg/m2 per segment depth, 3: mg/kg, 4: g/m2, 5: kg/ha.
 1      <Node print frequency (print data for every node (1), alternate nodes (2).
 1      <Print options: 1 or 2.  Use to specify one of the following options.
 365      <Option 1: Print at fixed time intervals (days between prints).
 1      <Option 2: No. of prints (the times for which are specified below)
 2      <Tables printed: 1: mass balance; 2: + depth data; 3: + crop data
 1      <Reset *.OUT file cumulative values every 12 months after start date? 0: No, 1: Yes
---------------------------------------(if yes: .sum printouts must be monthly (code 999) and .out prints should be at the end of each
year)
--- For the * .SUM file :
 50     <Summary print interval (d)  (999 for calendar month printouts)
 000    <Surface to [depth 1?] mm     ( Three depth segments for the
 000    <Depth 1 to [depth 2?] mm      summary file. Zero defaults to nodes
```

```
 000    <Depth 2 to [depth 3?] mm      closest to thirds of the profile)
  3     <4th segment: Root zone (1); profile (2); Depth 3 to lower boundary (3); Surface to shallowest of lower boundary or water
table (4)
---------------------------------------
--- For the *.BTC (breakthrough) file :
 1.0    <Incremental depth of drainage water per output (mm)
--------------------------------------------------------------------------
-- List here the times at which the *.OUT file is desired for print option 2.
-- The number of records must match the 'No. of prints' under option 2 above.
        Date or    Time of day          (At least one must be specified
        Day no.  (to nearest tenth)      even if print option is not 2)
        --------  ----------------
        123195         .5        (These dates can be past the last day)
*************************************************************************
*************************************************************************
                  SOIL PHYSICAL PROPERTIES
-------------------------------------------------------------------------
-- Retentivity model 0 uses listed Campbell's retention parameters, otherwise
-- the desired particle size-based regression model is used.
-------------------------------------------------------------------------
 Soil |                     |Retention|   Starting   |   Roots   | Starting
layer | Clay  Silt  Organic |  model  |theta or pot'l|  (for no  | temp (C)
 no.  |             carbon  |         |(one is used) |  growth)  | (not read in
      |   %     %     %     |         |          kPa | (relative)|  LEACHC)
 ---    ----  ----   ----     ------   -----   -----    ------    -----------
       1       3       8     0.71      5   0.045     -10     0.2      20
       2       3       8     0.71      5   0.045     -10     0.2      20
       3       3       8     0.71      5   0.045     -10     0.2      20
       4       3       8     0.71      5   0.045     -10     0.2      20
       5       3       8     0.71      5   0.045     -10     0.2      20
       6       3       8     0.71      5   0.045     -10     0.2      20
       7       4       6     0.25      5    0.06     -10     0.2      20
       8       4       6     0.25      5    0.06     -10     0.2      20
       9       4       6     0.25      5    0.06     -10     0.2      20
      10       4       6     0.25      5    0.06     -10     0.2      20
      11       4       6     0.25      5    0.06     -10     0.2      20
      12       4       6     0.25      5    0.06     -10     0.2      20
      13       5       6      0.1      5    0.09     -10    0.15      20
      14       5       6      0.1      5    0.09     -10    0.15      20
      15       5       6      0.1      5    0.09     -10    0.15      20
      16       5       6      0.1      5    0.09     -10    0.15      20
      17       5       6      0.1      5    0.09     -10    0.15      20
      18       5       6      0.1      5    0.09     -10    0.15      20
      19       5       4      0.1      5   0.135     -10    0.13      20
      20       5       4      0.1      5   0.135     -10    0.13      20
```

21	5	4	0.1	5	0.135	-10	0.13	20
22	5	4	0.1	5	0.135	-10	0.13	20
23	5	4	0.1	5	0.135	-10	0.13	20
24	5	4	0.1	5	0.135	-10	0.13	20
25	6	4	0.067	5	0.15	-10	0.1	20
26	6	4	0.067	5	0.15	-10	0.1	20
27	6	4	0.067	5	0.15	-10	0.1	20
28	6	4	0.067	5	0.15	-10	0.1	20
29	6	4	0.067	5	0.15	-10	0.1	20
30	6	4	0.067	5	0.15	-10	0.1	20
31	5	4	0.009	5	0.144	-10	0.08	20
32	5	4	0.009	5	0.144	-10	0.08	20
33	5	4	0.009	5	0.144	-10	0.08	20
34	5	4	0.009	5	0.144	-10	0.08	20
35	5	4	0.009	5	0.144	-10	0.08	20
36	5	4	0.009	5	0.144	-10	0.08	20
37	6	4	0.058	5	0.135	-10	0.05	20
38	6	4	0.058	5	0.135	-10	0.05	20
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41	6	4	0.058	5	0.135	-10	0.05	20
42	6	4	0.058	5	0.135	-10	0.05	20
43	6	5	0.05	5	0.12	-10	0.04	20
44	6	5	0.05	5	0.12	-10	0.04	20
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49	5	4	0.025	5	0.128	-10	0.02	20
50	5	4	0.025	5	0.128	-10	0.02	20
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53	5	4	0.025	5	0.128	-10	0.02	20
54	5	4	0.025	5	0.128	-10	0.02	20
55	6	5	0.017	5	0.114	-32	0.02	20
56	6	5	0.017	5	0.114	-32	0.02	20
57	6	5	0.017	5	0.114	-32	0.02	20
58	6	5	0.017	5	0.114	-32	0.02	20
59	6	5	0.017	5	0.114	-32	0.02	20
60	6	5	0.017	5	0.114	-32	0.02	20
61	6	5	0.025	5	0.144	-100	0.02	20
62	6	5	0.025	5	0.144	-100	0.02	20
63	6	5	0.025	5	0.144	-100	0.02	20
64	6	5	0.025	5	0.144	-100	0.02	20
65	6	5	0.025	5	0.144	-100	0.02	20

66	6	5	0.025	5	0.144	-100	0.02	20
67	6	5	0.025	5	0.15	-316	0.02	20
68	6	5	0.025	5	0.15	-316	0.02	20
69	6	5	0.025	5	0.15	-316	0.02	20
70	6	5	0.025	5	0.15	-316	0.02	20
71	6	5	0.025	5	0.15	-316	0.02	20
72	6	5	0.025	5	0.15	-316	0.02	20
73	7	5	0.017	5	0.12	-1000	0.02	20
74	7	5	0.017	5	0.12	-1000	0.02	20
75	7	5	0.017	5	0.12	-1000	0.02	20
76	7	5	0.017	5	0.12	-1000	0.02	20
77	7	5	0.017	5	0.12	-1000	0.02	20
78	7	5	0.017	5	0.12	-1000	0.02	20
79	6	5	0.008	5	0.105	-3000	0.02	20
80	6	5	0.008	5	0.105	-3000	0.02	20
81	6	5	0.008	5	0.105	-3000	0.02	20
82	6	5	0.008	5	0.105	-3000	0.02	20
83	6	5	0.008	5	0.105	-3000	0.02	20
84	6	5	0.008	5	0.105	-3000	0.02	20
85	7	6	0	5	0.09	-3000	0.02	20
86	7	6	0	5	0.09	-3000	0.02	20
87	7	6	0	5	0.09	-3000	0.02	20
88	7	6	0	5	0.09	-3000	0.02	20
89	7	6	0	5	0.09	-3000	0.02	20
90	7	6	0	5	0.09	-3000	0.02	20
91	7	5	0	5	0.105	-3000	0.02	20
92	7	5	0	5	0.105	-3000	0.02	20
93	7	5	0	5	0.105	-3000	0.02	20
94	7	5	0	5	0.105	-3000	0.02	20
95	7	5	0	5	0.105	-3000	0.02	20
96	7	5	0	5	0.105	-3000	0.02	20
97	6	6	0	5	0.09	-3000	0.02	20
98	6	6	0	5	0.09	-3000	0.02	20
99	6	6	0	5	0.09	-3000	0.02	20
100	6	6	0	5	0.09	-3000	0.02	20
101	6	6	0	5	0.09	-3000	0.02	20
102	6	6	0	5	0.09	-3000	0.02	20
103	7	6	0	5	0.105	-3000	0.02	20
104	7	6	0	5	0.105	-3000	0.02	20
105	7	6	0	5	0.105	-3000	0.02	20
106	7	6	0	5	0.105	-3000	0.02	20
107	7	6	0	5	0.105	-3000	0.02	20
108	7	6	0	5	0.105	-3000	0.02	20
109	7	7	0.008	5	0.12	-3000	0.01	20
110	7	7	0.008	5	0.12	-3000	0.01	20

```
     111       7       7   0.008       5    0.12   -3000    0.01      20
     112       7       7   0.008       5    0.12   -3000    0.01      20
     113       7       7   0.008       5    0.12   -3000    0.01      20
     114       7       7   0.008       5    0.12   -3000    0.01      20
     115       9       7       0       5   0.135   -3000    0.01      20
     116       9       7       0       5   0.135   -3000    0.01      20
     117       9       7       0       5   0.135   -3000    0.01      20
     118       9       7       0       5   0.135   -3000    0.01      20
     119       9       7       0       5   0.135   -3000    0.01      20
     120       9       7       0       5   0.135   -3000    0.01      20
---------------------------------------------------------------------------
   1    < Use listed water contents (1) or potentials (2) as starting values.
Particle density:  Clay    Silt and sand    Organic matter  (kg/dm3) (to calculate porosity)
                   2.65         2.65              1.10
***************************************************************************
For a uniform profile: Any non-zero value here will override those in
the table below (only if retentivity model is 0).
----------------------------------------------------------------------
  0     0   <Soil bulk density and particle density (kg/dm3) .
 -0.0         <'Air-entry value' (AEV) (kPa) (a in eq 2.1 to 2.4).
  0         <Exponent (BCAM) in Campbell's water retention equation (b in eq. 2.1 to 2.4).
  2019.0000  -0.5 <Conductivity (mm/day) and corresponding matric potential (kPa) (for potential-based version of eq. 2.5).
  1         <Pore interaction parameter (P) in Campbell's conductivity equation (eq.2.5 in manual).
  48.8075123 <Dispersivity (mm) (eq. 3.12).
  -5        <For Addiscott flow: Matric potential (kPa) at field capacity
  -200      <                  : Division between mobile and immobile water (kPa)
*********************************************************************************************************
 Soil  |  Soil retentivity |   Bulk  |  Match K(h) curve at: | Dispersivity |  For Addiscott flow option:
 segment      parameters   | density |   K    Matric  using  |              |  Field     Mobile/immobile
 no.   |    AEV     BCAM   |         |         potl      P   |              | capacity      threshold
       |    kPa            |  kg/dm3 |  mm/d    kPa          |     mm       |   kPa            kPa
 -----    ------   -----     ------    ----  -----   -----       -----        ------         ---------
1     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
2     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
3     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
4     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
5     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
6     -.01644000000 5.1910000E+00   1.53     1   -15     3    30   0.3   -200
7     -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
8     -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
9     -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
10    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
11    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
12    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
13    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
```

```
14    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
15    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
16    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
17    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
18    -.01644000000 5.1910000E+00    1.5     1   -15     3    30   0.3   -200
19    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
20    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
21    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
22    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
23    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
24    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
25    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
26    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
27    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
28    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
29    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
30    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
31    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
32    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
33    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
34    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
35    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
36    -.01644000000 5.1910000E+00   1.52     1   -15     3    30   0.3   -200
37    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
38    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
39    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
40    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
41    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
42    -.01644000000 5.1910000E+00   1.55     1   -15     3    30   0.3   -200
43    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
44    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
45    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
46    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
47    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
48    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
49    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
50    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
51    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
52    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
53    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
54    -.01644000000 5.1910000E+00   1.61     1   -15     3    30   0.3   -200
55    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
56    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
57    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
58    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
```

```
59    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
60    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
61    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
62    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
63    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
64    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
65    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
66    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
67    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
68    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
69    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
70    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
71    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
72    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
73    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
74    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
75    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
76    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
77    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
78    -.01644000000 5.1910000E+00   1.56     1   -15     3    30   0.3   -200
79    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
80    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
81    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
82    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
83    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
84    -.01644000000 5.1910000E+00   1.57     1   -15     3    30   0.3   -200
85    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
86    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
87    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
88    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
89    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
90    -.01644000000 5.1910000E+00   1.59     1   -15     3    30   0.3   -200
91    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
92    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
93    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
94    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
95    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
96    -.01644000000 5.1910000E+00   1.62     1   -15     3    30   0.3   -200
97    -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
98    -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
99    -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
100   -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
101   -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
102   -.01644000000 5.1910000E+00   1.63     1   -15     3    30   0.3   -200
103   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
```

```
104   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
105   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
106   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
107   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
108   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
109   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
110   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
111   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
112   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
113   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
114   -.01644000000 5.1910000E+00   1.67     1   -15     3    30   0.3   -200
115   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
116   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
117   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
118   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
119   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
120   -.01644000000 5.1910000E+00   1.64     1   -15     3    30   0.3   -200
********************************************************************************************************
********************************************************************************************************
Runoff according to the SCS curve number approach.  Curve number listed here will be
adjusted by slope. During periods of crop growth, CN2 replaced by value for crop.
(Procedure according to J.R. Williams (1991). Runoff and Water Erosion.
Chap 18, Modeling Plant and Soil Systems, Agronomy 31.)
----------------
 75   <Curve number (CN2).  In LEACHM, water content use to adjust CN2 based on top 20 cm.
 0    <Slope, %. Used to adjust CN2 according to equation of Williams (1991).
** (Set slope to 0 to bypass the runoff routine.  Runoff owing to profile saturation will still be accumulated)
*************************************************************************
*************************************************************************
                          CROP DATA
-------------------------------------------------------------------------
  Data for at least one crop must be specified, even if no crop desired.
  For fallow soil, set flag below to 0, or germination past the simulation end date.
-------------------------------------------------------------------------
1      <Plants present: 1 yes, 0 no.  This flag overrides all other crop data.
1     <No. of crops (>0), even if bypassed.  Dates can be past last day of simulation. my comment: years (for 9, 9 yrs) of simulation.
-1500  <Wilting point (soil) kPa.
-3000  <Min.root water pot'l(kpa).
1.1    <Maximum ratio of actual to potential transpiration (dry surface).
1.05   <Root resistance (weights water uptake by depth). (>1, No weighting: 1.0).
-------------------------------------------------------------------------
Growth  Perennial  N_uptake              Date or day of          Rel.  Max crop   Crop    Mulch     ETp  |  Crop    Min   Harvested
1: No   1: Yes   1:to maturity                  Maturity         root   cover   cover at  effect   scaling| uptake    N    fraction
2: Yes  2: No    2:to harvest  Germ. Emerg.   Root  Cover  Harv. depth fraction  harvest    %      factor|  N   P   fixed
------  -------  ------------  --------------------------------- -----  ------  ----    -----kg/ha---- ----------
```

```
   2      1           1     031595  031695 061595 061595 101595  2.00   0.8      .8        0       1.0    102  20   0     .88
***********************************************************************
***********************************************************************
              INITIAL PROFILE CHEMICAL DATA
-----------------------------------------------------------------------
   2     < Number of chemical species.  At least one must be specified.
-----------------------------------------------------------------------
 Soil     Chem1     Chem2     Chem3     Chem4
layer         ----mg/kg dry soil----
-----------------------------------------------------------------------
          1           0           0           0           0
          2           0           0           0           0
          3           0           0           0           0
          4           0           0           0           0
          5           0           0           0           0
          6           0           0           0           0
          7           0           0           0           0
          8           0           0           0           0
          9           0           0           0           0
         10           0           0           0           0
         11           0           0           0           0
         12           0           0           0           0
         13           0           0           0           0
         14           0           0           0           0
         15           0           0           0           0
         16           0           0           0           0
         17           0           0           0           0
         18           0           0           0           0
         19           0           0           0           0
         20           0           0           0           0
         21           0           0           0           0
         22           0           0           0           0
         23           0           0           0           0
         24           0           0           0           0
         25           0           0           0           0
         26           0           0           0           0
         27           0           0           0           0
         28           0           0           0           0
         29           0           0           0           0
         30           0           0           0           0
         31           0           0           0           0
         32           0           0           0           0
         33           0           0           0           0
         34           0           0           0           0
         35           0           0           0           0
```

```
36           0           0           0           0
37           0           0           0           0
38           0           0           0           0
39           0           0           0           0
40           0           0           0           0
41           0           0           0           0
42           0           0           0           0
43           0           0           0           0
44           0           0           0           0
45           0           0           0           0
46           0           0           0           0
47           0           0           0           0
48           0           0           0           0
49           0           0           0           0
50           0           0           0           0
51           0           0           0           0
52           0           0           0           0
53           0           0           0           0
54           0           0           0           0
55           0           0           0           0
56           0           0           0           0
57           0           0           0           0
58           0           0           0           0
59           0           0           0           0
60           0           0           0           0
61           0           0           0           0
62           0           0           0           0
63           0           0           0           0
64           0           0           0           0
65           0           0           0           0
66           0           0           0           0
67           0           0           0           0
68           0           0           0           0
69           0           0           0           0
70           0           0           0           0
71           0           0           0           0
72           0           0           0           0
73           0           0           0           0
74           0           0           0           0
75           0           0           0           0
76           0           0           0           0
77           0           0           0           0
78           0           0           0           0
79           0           0           0           0
80           0           0           0           0
```

```
          81           0           0           0           0
          82           0           0           0           0
          83           0           0           0           0
          84           0           0           0           0
          85           0           0           0           0
          86           0           0           0           0
          87           0           0           0           0
          88           0           0           0           0
          89           0           0           0           0
          90           0           0           0           0
          91           0           0           0           0
          92           0           0           0           0
          93           0           0           0           0
          94           0           0           0           0
          95           0           0           0           0
          96           0           0           0           0
          97           0           0           0           0
          98           0           0           0           0
          99           0           0           0           0
         100           0           0           0           0
         101           0           0           0           0
         102           0           0           0           0
         103           0           0           0           0
         104           0           0           0           0
         105           0           0           0           0
         106           0           0           0           0
         107           0           0           0           0
         108           0           0           0           0
         109           0           0           0           0
         110           0           0           0           0
         111           0           0           0           0
         112           0           0           0           0
         113           0           0           0           0
         114           0           0           0           0
         115           0           0           0           0
         116           0           0           0           0
         117           0           0           0           0
         118           0           0           0           0
         119           0           0           0           0
         120           0           0           0           0
----------------------------------------------------------------------
Concentration (mg/l) below profile, used with lower boundaries 1 or 5
                     0.0       0.0       0.0       0.0      0.0
0        < Depth (mm) of water in mixing cell (boundaries 1 and 5 only). Enter 0 for no mixing cell.
**********************************************************************
```

```
***********************************************************************
                      CHEMICAL PROPERTIES
                      -------------------
Chem                  Solubility  Vapour Density    Link        Plant
 No.        Name        mg/l          mg/l                      Uptake
-------     ----        ------        --------     -------    1(yes),0(no)
  1  '  cyfluthrin'      0.006         7.567E-07       0             0
  2  '    Known GW'     .3300E+02      .8000E-05       0             0
-----------------------------------------------------------------------
       Linear(1)     |      Linear isotherm     | Freundlich isotherm
Chem     or          |   Koc    2-site model    |   Kfoc  Exponent
 No.  Freundlich(2)  |  l/kg    f      alpha    | (unit dependent!)
----   -----          -----   ---    ------      ------     ---
  1        1         587.5000   1.0      .693        100      1.0
  2        1         115.1910   1.0      .693        100      1.0
--------------------------------------------------------------------------
Diffusion coefficients:
--------------------
 120       <Molecular diffusion coefficient in water (mm2/day)
 .4300E+06 <Molecular diffusion coefficient in air (mm2/day)
 .1400E+06 <Air diff. coeff. enhancement to account for atmospheric pressure fluctuations.
***********************************************************************
*  The values of L1,L2--->Ln ('Link' in the Chemical Properties above)
*   determine which species form a transformation chain.
*   Setting Ln = 0 breaks the pathway, Ln = 1 restores it.
*
*                    Transformation pathways------------------->
*     |    RATE 1         RATE 2         RATE 3        RATE 4
*    SE1----/L1/--->SE2----/L2/--->SE3----/L3/--->SE4---/L4/--->...
*     |               |              |             |
*     | RATE 5        | RATE 6       | RATE 7      | RATE 8     Degradation
*     |               |              |             |              pathways
*     v               v              v             v                 |
*  PRODUCT         PRODUCT        PRODUCT       PRODUCT              |
*                                                                    v
****************************************************************************
             TRANSFORMATION AND DEGRADATION RATE CONSTANTS
----------------------------------------------------------------------------
     1   <Rate constants apply to bulk soil (1), or solution phase only (0)
 Temperature and water content effects (transformation rate constants only):
     1   <Include temperature subroutine and adjustments? yes(1), no(0)
     3   <Q10: factor by which rate constant changes per 10 C increase
    20   <Base temperature: at which rate constants below apply
    35   <Optimum temperature: Q10 relationship applies from 0 C to here
    50   <Maximum temperature: Rate constants decrease from optimum to here
```

```
   .08   <High end of optimum water content range: air-filled porosity
  -300   <Lower end of optimum water content: matric potential kPa
 -1500   <Minimum matric potential for transformations kPa
   0.6   <Relative transformation rate at saturation
**************************************************************************
     TRANSFORMATION RATE CONSTANTS (may be adjusted as specified above)
--------------------------------------------------------------------------
Layer          Chemical 1     Chemical 2     Chemical 3    Chemical 4
 no            ----------     ----------     ----------    ----------
---------      <--------------------- day^(-1) --------------------->
1       .01732868      .0268500       0      0
2       .01732868      .0268500       0      0
3       .01732868      .0268500       0      0
4       .01732868      .0268500       0      0
5       .01732868      .0268500       0      0
6       .01732868      .0268500       0      0
7       .01732868      .0268500       0      0
8       .01732868      .0268500       0      0
9       .01732868      .0268500       0      0
10      .01732868      .0268500       0      0
11      .01732868      .0268500       0      0
12      .01732868      .0268500       0      0
13      .01732868      .0268500       0      0
14      .01732868      .0268500       0      0
15      .01732868      .0268500       0      0
16      .01732868      .0268500       0      0
17      .01732868      .0268500       0      0
18      .01732868      .0268500       0      0
19      .01732868      .0268500       0      0
20      .01732868      .0268500       0      0
21      .01732868      .0268500       0      0
22      .01732868      .0268500       0      0
23      .01732868      .0268500       0      0
24      .01732868      .0268500       0      0
25      .01732868      .0268500       0      0
26      .01732868      .0268500       0      0
27      .01732868      .0268500       0      0
28      .01732868      .0268500       0      0
29      .01732868      .0268500       0      0
30      .01732868      .0268500       0      0
31      .01732868      .0268500       0      0
32      .01732868      .0268500       0      0
33      .01732868      .0268500       0      0
34      .01732868      .0268500       0      0
35      .01732868      .0268500       0      0
```

36	.01732868	.0268500	0	0
37	.01732868	.0268500	0	0
38	.01732868	.0268500	0	0
39	.01732868	.0268500	0	0
40	.01732868	.0268500	0	0
41	.01732868	.0268500	0	0
42	.01732868	.0268500	0	0
43	.01732868	.0268500	0	0
44	.01732868	.0268500	0	0
45	.01732868	.0268500	0	0
46	.01732868	.0268500	0	0
47	.01732868	.0268500	0	0
48	.01732868	.0268500	0	0
49	.01732868	.0268500	0	0
50	.01732868	.0268500	0	0
51	.01732868	.0268500	0	0
52	.01732868	.0268500	0	0
53	.01732868	.0268500	0	0
54	.01732868	.0268500	0	0
55	.01732868	.0268500	0	0
56	.01732868	.0268500	0	0
57	.01732868	.0268500	0	0
58	.01732868	.0268500	0	0
59	.01732868	.0268500	0	0
60	.01732868	.0268500	0	0
61	.01732868	.0268500	0	0
62	.01732868	.0268500	0	0
63	.01732868	.0268500	0	0
64	.01732868	.0268500	0	0
65	.01732868	.0268500	0	0
66	.01732868	.0268500	0	0
67	.01732868	.0268500	0	0
68	.01732868	.0268500	0	0
69	.01732868	.0268500	0	0
70	.01732868	.0268500	0	0
71	.01732868	.0268500	0	0
72	.01732868	.0268500	0	0
73	.01732868	.0268500	0	0
74	.01732868	.0268500	0	0
75	.01732868	.0268500	0	0
76	.01732868	.0268500	0	0
77	.01732868	.0268500	0	0
78	.01732868	.0268500	0	0
79	.01732868	.0268500	0	0
80	.01732868	.0268500	0	0

```
81      .01732868      .0268500       0      0
82      .01732868      .0268500       0      0
83      .01732868      .0268500       0      0
84      .01732868      .0268500       0      0
85      .01732868      .0268500       0      0
86      .01732868      .0268500       0      0
87      .01732868      .0268500       0      0
88      .01732868      .0268500       0      0
89      .01732868      .0268500       0      0
90      .01732868      .0268500       0      0
91      .01732868      .0268500       0      0
92      .01732868      .0268500       0      0
93      .01732868      .0268500       0      0
94      .01732868      .0268500       0      0
95      .01732868      .0268500       0      0
96      .01732868      .0268500       0      0
97      .01732868      .0268500       0      0
98      .01732868      .0268500       0      0
99      .01732868      .0268500       0      0
100     .01732868      .0268500       0      0
101     .01732868      .0268500       0      0
102     .01732868      .0268500       0      0
103     .01732868      .0268500       0      0
104     .01732868      .0268500       0      0
105     .01732868      .0268500       0      0
106     .01732868      .0268500       0      0
107     .01732868      .0268500       0      0
108     .01732868      .0268500       0      0
109     .01732868      .0268500       0      0
110     .01732868      .0268500       0      0
111     .01732868      .0268500       0      0
112     .01732868      .0268500       0      0
113     .01732868      .0268500       0      0
114     .01732868      .0268500       0      0
115     .01732868      .0268500       0      0
116     .01732868      .0268500       0      0
117     .01732868      .0268500       0      0
118     .01732868      .0268500       0      0
119     .01732868      .0268500       0      0
120     .01732868      .0268500       0      0
**************************************************************************
    DEGRADATION RATE CONSTANTS (not influenced by water or temperature)
--------------------------------------------------------------------------
Layer          Chemical 1     Chemical 2     Chemical 3    Chemical 4
 no            ----------     ----------     ----------    ----------
```

```
---------      <--------------------- day^(-1) --------------------->
    1          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    2          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    3          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    4          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    5          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    6          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    7          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    8          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
    9          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   10          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   11          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   12          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   13          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   14          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   15          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   16          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   17          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   18          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   19          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   20          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   21          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   22          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   23          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   24          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   25          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   26          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   27          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   28          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   29          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   30          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   31          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   32          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   33          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   34          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   35          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   36          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   37          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   38          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   39          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   40          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   41          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   42          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   43          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   44          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
```

```
45          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
46          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
47          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
48          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
49          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
50          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
51          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
52          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
53          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
54          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
55          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
56          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
57          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
58          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
59          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
60          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
61          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
62          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
63          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
64          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
65          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
66          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
67          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
68          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
69          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
70          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
71          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
72          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
73          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
74          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
75          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
76          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
77          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
78          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
79          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
80          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
81          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
82          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
83          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
84          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
85          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
86          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
87          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
88          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
89          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
```

```
   90          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   91          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   92          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   93          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   94          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   95          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   96          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   97          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   98          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
   99          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  100          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  101          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  102          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  103          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  104          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  105          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  106          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  107          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  108          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  109          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  110          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  111          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  112          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  113          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  114          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  115          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  116          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  117          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  118          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  119          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
  120          0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
**************************************************************************
**************************************************************************
                      CHEMICAL   APPLICATIONS
                      -----------------------
 1   <  Number of broadcast applications. (At least 1.  Can be past last date.
----------------------------------------------------------------------
    Date       Incorporation   Chem1      Chem2      Chem3     Chem4
(or day no.)   (segments, 0           mg/sq.m (1mg/sq.m = .01kg/ha)
    -----       is surface)   --------     -----      -----      -----
    031695          0         56        380          0              0
**************************************************************************
**************************************************************************
                    CULTIVATIONS
                    ------------
```

```
 2  < Number of cultivations.  At least one must be specified.  Can be past last day.
 ------------------------------------------------------
 Date or   Depth of cultivation
 day no.        mm
 -------      -----
 9999          200
 9999          200
***************************************************************************
***************************************************************************
                  RAIN/IRRIGATION AND WATER COMPOSITION
                  -------------------------------------
 37   < Number of water applications.  Some or all can be past last day.
  0   < For sensor-triggered irrigation, set to 1 and edit and rename PESTTEST.SCH.
---------------------------------------------------------------------------
      Start      Amount  Surface flux      Dissolved in water (can be 0)
Date/day  Time            density      Chem1     Chem2    Chem3    Chem4.....
-------  --day-  --mm--  ---mm/d----  ---------------  mg/l  -------------
000005  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000012  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000018  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000024  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000028  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000037  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000042  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000045  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000051  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000060  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000064  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000070  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000076  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000083  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000088  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000107  0.3    12.00   260.00 0.00    0.00    0.00    0.00
000142  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000159  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000171  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000182  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000192  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000202  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000213  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000224  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000236  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000248  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000265  0.3    100.00  260.00 0.00    0.00    0.00    0.00
000295  0.3    100.00  260.00 0.00    0.00    0.00    0.00
```

```
000304 0.3     16.33  260.00  0.00   0.00    0.00   0.00
000313 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000321 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000329 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000337 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000347 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000355 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000364 0.3     12.00  260.00  0.00   0.00    0.00   0.00
000365 0.3     3.32   260.00  0.00   0.00    0.00   0.00
**************************************************************************
**************************************************************************
          POTENTIAL ET (WEEKLY TOTALS, mm), DEPTH TO WATER TABLE (mm)
          MEAN WEEKLY TEMPERATURES AND MEAN WEEKLY AMPLITUDE (degrees C)
--------------------------------------------------------------------------
      Week no.    ET   Water table  Mean temp  Amplitude
      ----------------------------------------------
1      7.00    0.00   7.40    4.51
2      7.00    0.00   7.26    4.33
3      7.00    0.00   8.05    4.96
4      7.00    0.00   8.34    5.37
5      7.00    0.00   9.28    6.20
6      7.00    0.00   10.08   5.74
7      7.00    0.00   10.96   6.00
8      7.00    0.00   11.20   6.49
9      7.00    0.00   12.19   6.12
10     7.00    0.00   12.67   6.35
11     7.00    0.00   12.67   6.42
12     7.00    0.00   13.79   6.95
13     7.00    0.00   13.75   6.86
14     7.00    0.00   14.57   7.41
15     7.00    0.00   15.44   7.79
16     7.04    0.00   15.99   7.27
17     8.55    0.00   16.94   7.64
18     11.81   0.00   18.11   7.85
19     15.23   0.00   19.04   7.88
20     18.23   0.00   19.52   8.05
21     22.94   0.00   21.12   8.35
22     26.35   0.00   21.53   8.23
23     29.93   0.00   21.84   8.02
24     35.10   0.00   23.25   8.62
25     39.54   0.00   24.33   9.07
26     41.99   0.00   24.70   8.65
27     43.48   0.00   25.57   9.01
28     43.00   0.00   26.76   8.95
29     41.55   0.00   26.03   8.79
```

30	40.80	0.00	26.30	9.04
31	40.94	0.00	26.43	9.26
32	39.38	0.00	26.67	9.13
33	37.31	0.00	25.83	9.00
34	35.51	0.00	24.90	9.14
35	34.75	0.00	25.06	9.09
36	31.59	0.00	24.87	9.04
37	27.37	0.00	22.93	8.95
38	22.69	0.00	22.66	8.77
39	18.50	0.00	21.65	8.31
40	15.83	0.00	20.77	8.81
41	12.65	0.00	19.28	8.93
42	9.73	0.00	17.77	8.91
43	7.40	0.00	16.58	8.10
44	7.00	0.00	14.38	7.51
45	7.00	0.00	13.43	7.52
46	7.00	0.00	11.52	6.60
47	7.00	0.00	10.60	6.27
48	7.00	0.00	9.34	6.18
49	7.00	0.00	9.20	6.03
50	7.00	0.00	7.87	5.22
51	7.00	0.00	6.40	4.68
52	7.00	0.00	6.27	5.06
53	7.00	0.00	7.40	4.51