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OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

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MEMORANDUM October 22, 2007

SUBJECT: **Propyzamide New Uses (Chicory, Belgian Endive, Dandelion Leaves, and Berry Group 13):** Revised Tier II Drinking Water Exposure Assessment.

TO: Sidney Jackson, Minor Use Team
Tobi Colvin-Snyder, Herbicide Branch
Registration Division (7505P)

Mary Clock-Rust, Registration Branch I
Sarah Levy, Registration Branch I
PV Shaw, Chief, Registration Branch I
Health Effects Division (7509P)

FROM: Greg Orrick, Environmental Scientist Greg Orrick 10-22-07
Environmental Fate and Effects Division (7507P)

THROUGH: Marietta Echeverria, Environmental Scientist
Betsy Behl, Chief, Environmental Risk Branch IV BBehl 10-22-07
Environmental Fate and Effects Division (7507P)

This Environmental Fate and Effects Division (EFED) memorandum includes a revised drinking water assessment for the new uses of propyzamide on chicory, Belgian endive, dandelion leaves, and berries in Berry Group 13 in support of human health risk assessment. This assessment was revised to reflect corrected degradation kinetics for the residues of concern and, therefore, more accurately estimate exposure in drinking water. The revisions were initiated upon receipt of registrant-submitted comments that indicated an inability to reproduce the former kinetics values for the residues of concern. Revised maximum EDWCs in surface water and in ground water were 5%-9% lower and 81% lower, respectively, than those of the original assessment. Surface water values changed less than ground water values due to the use of more current surface water models (PE v5.0) and updated crop scenarios in this assessment

This drinking water assessment reflects recent Health Effects Division (HED) decisions regarding which propyzamide degradates are of risk concern (USEPA, 2007). If a refined assessment is needed contact Greg Orrick (703-305-6140) of Environmental Risk Branch IV (7507P) to request a refined drinking water exposure assessment.

Propyzamide was first registered under the name pronamide in 1972 for use on broadleaf weeds and grasses. A Reregistration Eligibility Decision (RED) for pronamide completed in 1994 assessed use on food crops (artichoke, blackberry, blueberry, boysenberry, cherry, endive, escarole, lettuce, nectarine, peach, pear, plum, prune, raspberry, rhubarb), food and feed crops (fallow land, apple, grapes, peas, sugar beet), feed crops (alfalfa clover, sainfoin, trefoil, vetch) and non-food crops (Christmas tree farms, golf course and recreational turf, ornamentals), concluding that all products were eligible for reregistration, except for broadcast application on residential turf and late season uses on artichokes (USEPA, 1994). Assessment of drinking water exposure was not discussed in the RED.

A Tolerance Reassessment Eligibility Decision (TRED) for pronamide completed in 2002 determined that there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure to pronamide, provided that risk mitigation measures are implemented, including cancellation of all residential uses, watering-in immediately after application on athletic fields, and extension of re-entry intervals (USEPA, 2002). The TRED stated that pronamide and its metabolites containing the 3,5-dichlorobenzoyl moiety are the residues of concern, a decision that was upheld in a recent HED memorandum (USEPA, 2007). However, only the parent was modeled for drinking water exposure assessment in support of the TRED (USEPA, 2002a). The TRED identified a slight cancer risk in drinking water and found it not to be of concern.

For this assessment, available monitoring data on propyzamide were reviewed and current models were used to estimate drinking water exposure. This assessment uses a total residues of concern (TRC) approach to estimate exposure to the residues of concern, *i.e.*, propyzamide and all of its degradates containing the 3,5-dichlorobenzoyl moiety (USEPA, 2002; 2007). New data submitted after completion of the 2002 TRED were used as well to refine the current assessment's exposure estimates (aerobic soil metabolism (MRID 46413407), aerobic aquatic metabolism (MRID 46427901), and anaerobic aquatic metabolism (MRID 46413408)).

Based on the available monitoring data and the environmental fate and transport characteristics of propyzamide, the following label advisories for ground water and surface water are recommended.

> *Propyzamide is known to leach through soil into ground water under certain conditions as a result of label use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination.*
>
> *This product may contaminate surface water due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water.*

This product is classified as having high potential for runoff for several months or more after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential for contamination of water from runoff of rain water. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

The proposed label for chicory, Belgian endive, and dandelion leaves does not completely reflect the use pattern proposed in Section B of the IR-4 package and is ambiguous. In the Restrictions section of the proposed label, the maximum annual application rate is given as 3.0 lbs a.i./A per crop. However, the proposed label and Section B also state that the maximum application rate for these crops is one application per year at 2.0 lbs a.i./A. The 3.0 lbs a.i./A per crop rate appears to be incorrect, both in value and temporally. If more than one crop are planted per acre, one application could conceivably be made to multiples of the application rate per acre. For this assessment, the maximum annual application rate was assumed to be 2.0 lbs a.i./A per year. If this assumption is not accurate (and the maximum annual rate is in fact higher) or if the label is not modified to clarify the maximum rate, this assessment may underestimate potential exposure.

Furthermore, Section B of the package for chicory, Belgian endive, and dandelion leaves specifies ground application as the method of application. However, the proposed label does not specify ground application. In the absence of a labeled restriction to ground application, this use pattern was assumed to include aerial as well as ground spray applications for this assessment.

In the Restrictions section of the proposed label for Berry Group 13, the maximum annual application rate is given as 3.0 lbs a.i./A per crop. Section B of the IR-4 package states not to make more than one application at 3.0 lbs a.i./A per season to each crop. Once again, these instructions are confusing because more than one crop could be planted per acre and, therefore, one application could conceivably be made to multiples of the application rate per acre. For this assessment, the maximum annual application rate was assumed to be 3.0 lbs a.i./A per year. Furthermore, a separate maximum annual application rate should be stated for use on blueberries. If assumptions made in this assessment are not accurate (and the maximum annual rate is in fact higher) or if the label is not modified to clarify the maximum rates, this assessment may underestimate potential exposure.

The current labels (EPA Reg. No. 62719-397, 70506-78) allow two applications to artichokes. This may not reflect the cancellation of late season uses on artichokes specified in the 1994 RED. If the label is modified to reflect only one application to artichokes per year, early in the season, then the EDWCs reported in this assessment for use on artichokes will be reduced.

The current label for EPA Reg. No. 70506-78 reports maximum annual application rates on conservation reserve program established grass stands of both 2.0 lbs a.i./A and 0.4 lbs product/A per year (p. 11). We assume that the value of 2.0 lbs a.i./A per year should be corrected to read 0.2 lbs a.i./A per year.

Both current labels fail to state maximum application rates per year for certain crops. Application rates may be stated per season, such as for turf, stated per crop, such as for lettuce, endive,

escarole, and radicchio greens, or not stated per any time frame, such as for alfalfa seed. **Table i** lists the temporal limits stated per use pattern and the resultant assumptions used to derive maximum annual application rates for this assessment. Applications are assumed to be allowed once per year for all uses except lettuce for this assessment. Lettuce may be cropped twice per year and, therefore, may receive two applications per year. Exposure was estimated for both one and two applications per year on lettuce for comparison. Lettuce is the maximum use pattern of propyzamide affecting surface water exposure, as specified on the current labels. If the labels are modified to restrict application to lettuce to once per year, alfalfa for seed and artichoke will be the maximum use patterns of propyzamide affecting surface water exposure. If assumptions made in this assessment for all use patterns are not accurate (and the maximum numbers of applications and/or the maximum annual rates are in fact higher) this assessment may underestimate potential exposure.

Table i. Current Labeled Use Pattern Temporal Limits on Application Rates and Resultant Assessment Assumptions Used to Derive Maximum Annual Application Rates.			
EPA Reg. No.	**Use**	**App. Rate Temporal Limit**	**Assessment Assumptions (relevant use details)**
62719-397	Artichokes (CA)	Per season	One season per year
70506-78			
62719-397	Grasses	Per season	One season per year (for application to warm season grass)
70506-78			
62719-397	Cane berries (WA,OR)	Per year	NR[1]
70506-78		Per season	One season per year (for application in Fall or Winter months)
62719-397	Blueberries	Per year	NR[1]
70506-78			
62719-397	Reserve grass (ID,OR,WA)	Per year	NR[1]
70506-78			
62719-397	Reserve, fallow (ID,OR,WA)	Per year	NR[1]
70506-78			
62719-397	Alfalfa, clover, birdsfoot trefoil, crown vetch, sainfoin	Per season	One season per year (for application in Fall or Winter months)
70506-78		Per year	NR[1]
62719-397	Alfalfa seed (CA,ID,NV,OR,UT,WA)	Not stated	One season per year (for application in the Spring)
70506-78			
62719-397	Lettuce, endive, escarole, radicchio	Per crop	Two crops per year
70506-78		Per year	NR[1]
70506-78	Leaf lettuce (CA,AZ)	Per crop	Two crops per year
62719-397	Rhubarb (OR,WA)	Per year	NR[1]
70506-78			
62719-397	Pome fruit, stone fruit, grapes	Per season	One season per year
70506-78		Per year	NR[1]
62719-397	Winter peas (ID,OR,WA)	Per year	NR[1]
70506-78			
62719-397	Ornamentals, x-mas trees	Per year	NR[1]
70506-78			

1. NR means not required.

EXECUTIVE SUMMARY

This assessment provides revised estimated drinking water concentrations (EDWC) in surface water and in ground water from the maximum use patterns of propyzamide (pronamide; 3,5-dichloro-N-(1,1-dimethylprop-2-ynyl)benzamide) in support of human health risk assessment (**Table 1**). EDWCs of propyzamide were generated for the proposed uses on chicory, Belgian endive, dandelion leaves, and berries in Berry Group 13 (amending EPA Reg. No. 62719-397) and for currently registered high end uses (EPA Reg. No. 62719-397, 70506-78). Exposure estimates reflect total residues of concern (TRC) that include propyzamide and its degradates of risk concern (USEPA, 2002; 2007).

Table 1. Tier II 1-in-10-year Total Residue of Concern EDWCs in Surface Water and Ground Water from Proposed Propyzamide Uses on Chicory, Belgian Endive, Dandelion Leaves, and Berries and Current High End Uses (Maximum EDWCs in Bold).

Use (modeled rate)	PCA (region)	Surface Water			Ground Water Exposure (ppb)
		Peak Exposure (ppb)	Annual Mean Exposure (ppb)	30-year Mean Exposure (ppb)	
Lettuce (4 lbs a.i./A/year; 2 apps)	87% (U.S.)	**243**	**148**	**105**	0.699
Alfalfa (4 lbs a.i./A/year; 2 apps)	87% (U.S.)	40.1	26.1	16.7	0.685
Artichokes (8 lbs a.i./A/year; 2 apps)	56% (CA)	117	89.8	69.8	**1.40**
Chicory, Belgian endive, dandelion (2 lbs a.i./A/year)	87% (U.S.)	145	82.8	54.7	0.343
Stone fruit, pome fruit, grapes (4 lbs a.i./A/year)	87% (U.S.)	105	67.7	46.2	0.699
Berries other than blueberries (3 lbs a.i./A/year)	87% (U.S.)	84.9	42.1	33.4	0.524
Blueberries (2 lbs a.i./A/year)	87% (U.S.)	56.6	28.1	22.3	0.350

The surface water EDWCs in **Table 1** were adjusted by default Percent Cropped Area (PCA) factors to account for the potential fraction of agriculture in the basin where the crop is planted. The regional PCA of 0.56 was used for use on artichokes because the crop is not grown outside of California. The standard agricultural PCA of 0.87 was used for all other uses because they are not confined to specific regions of the U.S. The surface water and ground water EDWCs were calculated with the screening models PRZM/EXAMS and SCI-GROW, respectively.

Monitoring data on propyzamide are consistent with the peak (3.7-10.3 µg/L) and annual mean (0.53-4.45 µg/L) exposure estimates of propyzamide *per se* in support of the 2002 TRED (USEPA, 2002a). Monitoring data are not available on the degradates of propyzamide. Therefore, exposure estimates of total residues of concern cannot be evaluated with available monitoring data.

Propyzamide is an herbicide typically applied as a broadcast or band application and wetted in in the fall or winter months. The major routes of degradation appear to be aerobic microbial degradation in soil and photolysis in water. Four major degradates of propyzamide have been identified. The Health Effects Division (HED) found all degradates of propyzamide containing

the 3,5-dichlorobenzoyl moiety to be of risk concern, assuming that their toxicity is similar to that of propyzamide parent (USEPA, 2002; 2007). A total residues of concern (TRC) approach was used to generate EDWCs that reflect exposure to propyzamide residues of concern in drinking water, which include the parent compound and all degradates of risk concern.

Propyzamide has relatively low vapor pressure (8.5×10^{-5} torr; 25°C) and is soluble in water up to 15 mg/L (25°C). It is stable to hydrolysis, relatively persistent under soil photolysis ($t_{1/2}$ = 249 d), and moderately susceptible to aquatic photolysis ($t_{1/2}$ = 42 d). The compound may be moderately biodegraded in aerobic environments ($t_{1/2}$ = 20-392 d); however, it persists in anaerobic environments ($t_{1/2}$ = 127-450 d). Propyzamide sorption shows affinity to organic carbon and correlates well with soil cation exchange capacity. The compound may be mobile in soil [K_F range = 3.15 (1/n=1.22) – 10.1 (1/n=1.00)] and potentially presents a ground water concern in some soils, especially those that are sandy and of low organic carbon content. Propyzamide has been detected in surface water and ground water monitoring studies.

The drinking water concentrations based on total residues of concern estimated for propyzamide uses on chicory, Belgian endive, dandelion leaves, and berries in Berry Group 13 likely exceed actual values that occur in drinking water reservoirs and ground water due to the screening design of the exposure models, use of default PCAs, and the limited number of available and acceptable environmental fate studies. Environmental degradation half-lives used in the models reflect high-end confidence bounds and, therefore, increase when the data are more variable.

PROBLEM FORMULATION

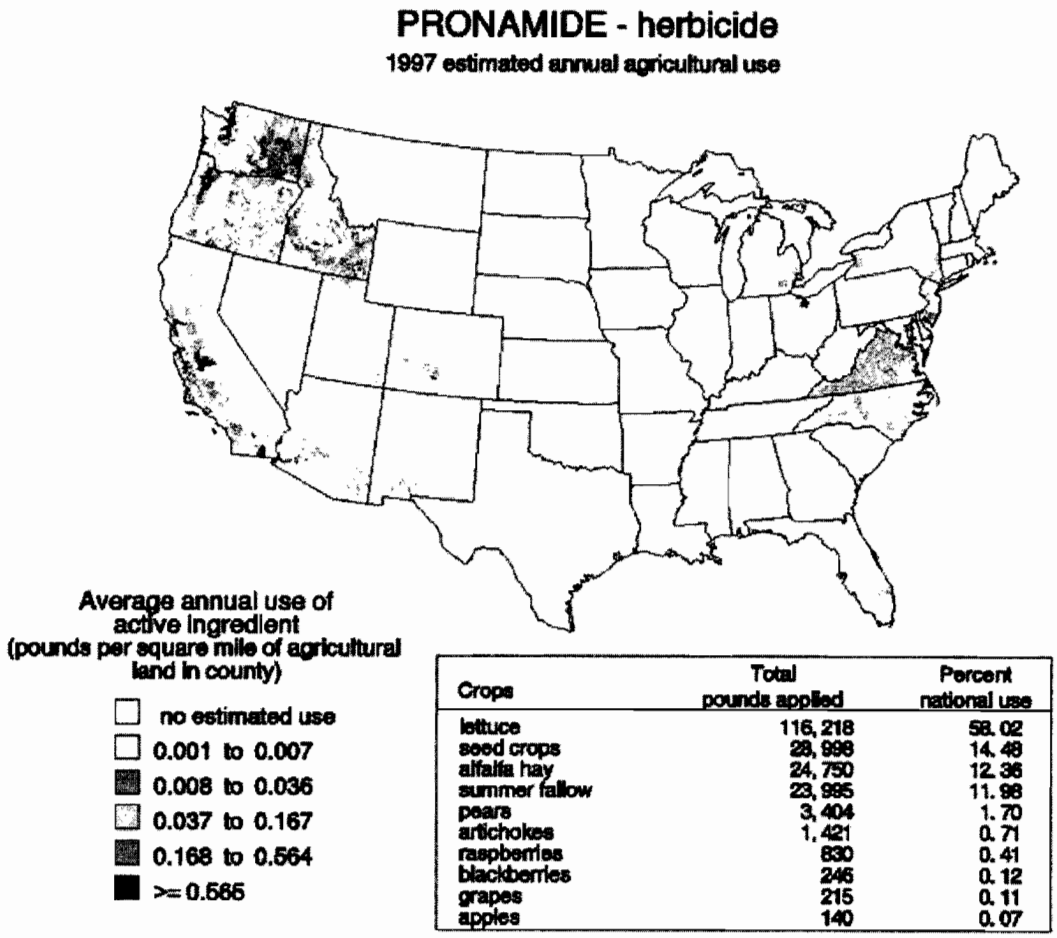
This drinking water assessment uses modeling and available monitoring data to provide estimates of surface water and ground water concentrations of residues in drinking water source water (pre-treatment) resulting from propyzamide use on vulnerable sites. EDWCs reflect drinking water exposure to residues of concern for propyzamide, which the 2002 TRED and a 2007 memorandum from HED identified as the parent compound and all degradates with the 3,5-dichlorobenzoyl moiety (USEPA, 2002; 2007). Primary routes of transport to source water include runoff, erosion, leaching, and spray drift. Due to their crop-specificity, the coupled models PRZM and EXAMS were used to assess exposure in surface water due to runoff, erosion, and spray drift from the proposed propyzamide uses. Exposure in ground water due to leaching was accessed with the screening model SCI-GROW.

ANALYSIS

Use Characterization

Propyzamide is a selective, systemic, restricted–use, organochlorine herbicide. Two Section 3 registrations (EPA Reg. No. 62719-397, 70506-78) are active, allowing use on artichokes (CA), cane berries (WA, OR), blueberries, alfalfa and related feed crops, lettuce, endive/escarole, radicchio greens, leaf lettuce (CA, AZ), rhubarb (OR, WA), pome fruit, stone fruit, grapes, winter peas (ID, OR, WA), grass, fallow and reserve lands, Christmas trees and ornamentals. As of 2002,

lettuce accounted for 48% of total usage. **Figure 1** presents the national usage pattern of propyzamide in 1997; note that lettuce received the majority of usage at that time (USGS, 2007).



Crops	Total pounds applied	Percent national use
lettuce	116,218	58.02
seed crops	28,998	14.48
alfalfa hay	24,750	12.36
summer fallow	23,995	11.98
pears	3,404	1.70
artichokes	1,421	0.71
raspberries	830	0.41
blackberries	246	0.12
grapes	215	0.11
apples	140	0.07

Figure 1. National Usage of Propyzamide in 1997 (USGS, 2007).

Propyzamide is formulated as a wettable powder in water soluble pouches and can be applied pre-plant, pre-emergence, and post-emergence by ground or aerial spray equipment, depending on the use. Wetting in of applications is recommended with rainfall or irrigation. Most application timing occurs in the fall or early winter prior to freezing. The maximum annual application rate for propyzamide uses is 8.16 pounds of active ingredient per acre (lbs a.i./A). This assessment analyzes the proposed uses on chicory, Belgian endive, dandelion greens, and berries in Berry Group 13 as well as current uses that may not have been previously assessed.

The proposed use on chicory, Belgian endive, and dandelion greens allows application once per year at up to 2.0 lbs a.i./A per crop. This use is intended for but not limited to ground spray application, which includes broadcast, banded, and bed-topped methods. This proposed use pattern is consistent with currently labeled uses on lettuce. The proposed use on berries in Berry Group 13 (which includes blackberry, blueberry, caneberry, currant, elderberry, gooseberry, huckleberry, loganberry, and black and red raspberry) allows for ground spray application once per year at up to 2.0 lbs a.i./A per crop on blueberry and up to 3.0 lbs a.i./A per crop on all other

berries. This proposed use pattern is consistent with currently labeled uses on blueberry nationwide and on blackberry, boysenberry, and raspberry in Oregon and Washington states.

Table 2 displays the maximum use patterns of chicory, Belgian endive, dandelion greens, and Berry Group 13 on the proposed labels (supplementing EPA Reg. No. 62719-397) and the maximum use patterns on the two current labels based on a review of all registered propyzamide uses (EPA Reg. No. 62719-397, 70506-78). The maximum annual use rate proposed on berries, except blueberries, is 3.0 lbs a.i./A; and on blueberries, chicory, Belgian endive, and dandelion greens is 2.0 lbs a.i./A. These rates characterize the maximum use patterns for the proposed new uses of propyzamide.

Table 2. Maximum Use Patterns for Current and Proposed Propyzamide Uses.

Use Pattern	Current/ Proposed	Single App. Rate (lbs a.i./A)	Number of App.	Annual App. Rate (lbs a.i./A)	App. Interval (days)	Application Method
Artichoke	Current	4.08	2	8.16	Not specified	Aerial/ground
Stone fruit, pome fruit, grapes	Current	4.08	1	4.08	Not applicable	Ground
Alfalfa for seed	Current	2.00 (per season)	2 (assuming two seasons/year)	4.00	Not specified	Ground
Berries other than blueberries	Current, proposed	3.06 (per season)	1 (assuming one season/year)	3.06	Not applicable	Ground
Blueberries	Current, proposed	2.04	1	2.04	Not applicable	Ground
Chicory, Belgian endive, dandelion	Proposed	2.00	1	2.00	Not applicable	Ground (aerial assumed)
Lettuce	Current	2.00 (per crop)	2 (assuming two crops/year)	4.00	180 d	Ground
Lettuce	Current	2.04 (per crop)	1 (assuming one crop/year)	2.04	Not applicable	Aerial/ground

The maximum annual application rate of propyzamide use on artichokes in California is 8 lbs a.i./A and on lettuce, grapes, stone fruit, pome fruit, and some alfalfa seed crops is 4 lbs a.i./A (**Table 2**). EDWCs generated from these maximum use patterns are used to characterize national drinking water exposure from propyzamide use. The uses on lettuce and artichokes are the maximum use patterns affecting surface water and ground water exposure, respectively.

Fate and Transport Characterization

Sufficient data are available to describe the environmental fate and transport properties of propyzamide (**Table 3**). The compound is moderately mobile and moderately degrades by aerobic biodegradation and aquatic photolysis. Half-lives for total residues of concern are estimated to range from months to years because all identified degradates except carbon dioxide are of risk

concern. Model parameters listed in **Tables 4 and 5** are generated from the fate and transport properties given below.

Table 3. General Chemical Properties and Environmental Fate Parameters of Propyzamide.

Chemical/Fate Parameter	Value	Source
Chemical name	3,5-dichloro-N-(1,1-dimethylprop-2-ynyl)benzamide	USEPA, 1994
Molecular mass	256.13 g/mol	USEPA, 1994
Vapor pressure (25°C)	8.5×10^{-5} torr	USEPA, 1994
Solubility (25°C)	15 mg/L	USEPA, 1994
Octanol-water partition coefficient (K_{OW})	1000-2000	MRID 46413408
Freundlich soil-water distribution coefficient (K_F); Freundlich organic carbon partitioning coefficient (K_{FOC})	3.15 (1/n=1.22); 1340L/kg_{OC} 3.47 (1/n=1.14); 1180 L/kg_{OC} 4.85 (1/n=1.10); 688 L/kg_{OC} 5.16 (1/n=1.07); 548 L/kg_{OC} 8.05 (1/n=1.01); 578 L/kg_{OC} 10.1 (1/n=1.00); 714 L/kg_{OC}	MRID 40211103
Hydrolysis half-life (pH 4.7, 20°C)	No significant degradation	MRID 00107980
Hydrolysis half-life (pH 7.4, 20°C)	No significant degradation	MRID 00107980
Hydrolysis half-life (pH 8.8, 20°C)	No significant degradation	MRID 00107980
Aqueous photolysis half-life; Total residues of concern half-life	41.7 d; 217 d	MRID 40420301, MRID 40320601
Soil photolysis half-life; Total residues of concern half-life	249 d; No significant degradation	MRID 41913504
Aerobic soil metabolism half-life; Total residues of concern half-life (soil texture)	20.1 d; 64.9 d (sandy loam) 21.5 d; 96.6 d (silty clay loam) 44.6 d; 166 d (loamy sand) 392 d; 2340 d (sandy loam)	MRID 41568901 MRID 46413407
Anaerobic soil metabolism half-life; Total residues of concern half-life (soil texture)	450 d; No significant degradation (sandy loam)	MRID 41913505
Aerobic aqueous metabolism half-life; Total residues of concern half-life (sediment texture)	69.0 d; 899 d (silt loam) 119 d; 782 d (sand)	MRID 46427901
Anaerobic aqueous metabolism half-life; Total residues of concern half-life (soil texture)	127 d; 402 d (loamy sand)	MRID 46413408
Terrestrial field dissipation half-life (soil texture)	18-24 d (sandy loam) 34-53 d (loam)	MRID 44078601

Transport and Mobility

Propyzamide is a soluble chemical (15 mg/L in water at 25°C; USEPA, 1994) that is not expected to volatilize significantly due to the compound's relatively low vapor pressure of 8.5×10^{-5} torr (25°C; USEPA, 1994). Propyzamide may be mobile, with Freundlich soil-water partitioning

coefficients (K_F) that ranged from 3.15 (1/n=1.22) to 10.1 (1/n=1.00) (MRID 40211103). Corresponding organic carbon partitioning coefficients (K_{FOC}) ranged from 548 to 1340 L/kg_{OC}. These values range in classification from moderately mobile to slightly mobile according to current guidance (USEPA, 2006). Mobility is partially explained by affinity to organic matter, as the coefficient of variation (CV) across six soils for K_{FOC} (40%) is less than that for K_F (47%). Propyzamide may also have greater mobility in sandy clay-poor soils, as K_F values for propyzamide correlate with cation exchange capacity ($R^2 = 0.9214$).

In general, compounds with K_F values less than five are mobile enough to potentially present a ground water concern, especially in soils that are sandy and of low organic carbon content.

Degradation

Propyzamide was stable to hydrolysis at pH 5, 7, and 9 (MRID 00107980). The compound was relatively persistent with respect to photolysis on soil ($t_{½}$ = 249 d; MRID 41913504) and moderately degraded by aquatic photolysis ($t_{½}$ = 41.7 d; MRID 40420301). Two major photodegradates were identified: RH-26059 (β-(3,5-dichlorobenzamino-β-methyl-butyric acid) was observed in the aqueous photolysis study at up to 15.0% of applied radioactivity (30 days post-treatment; MRID 40320601) and RH-24580 (M4; N-(1,1-dimethylacetonyl)-3,5-dichlorobenzamide) was observed in the soil photolysis study at up to 12.6% of the applied (28 days post-treatment; MRID 41913504). The persistence of RH-26059 could not be determined. The concentration of RH-24580 increased throughout the study.

Propyzamide was biodegraded at moderate to low rates in aerobic soils ($t_{½}$ = 20.1-392 d) and in aerobic aquatic systems ($t_{½}$ = 69.0-119 d; MRID 41568901, 46413407, 46427901). The compound biodegraded at low rates in anaerobic aquatic systems ($t_{½}$ = 127 d; MRID 46413408) and was persistent in anaerobic soils ($t_{½}$ = 450 d; MRID 41913505). The three major degradates observed in the metabolism studies were RH-24580 at up to 14.0%, 24.0%, and 32.2% of the applied (360, 45, and 30 days post-treatment, respectively), RH-24644 (M1; 2-(3,5-dichlorophenyl)-4,4-dimethyl-5-methylene-2-oxazoline) at up to 12.8%, 17.7%, 26.6%, and 31.9% of the applied (60, 360, 123, and 21 days post-treatment, respectively), and carbon dioxide at up to 50.4% of the applied (104 days post-treatment). Both major organic biodegradates of propyzamide appear to degrade at similar to slower rates relative to the parent.

Field Studies

A terrestrial field dissipation study of propyzamide was conducted with the end use product Kerb® (MRID 44078601). Kerb® was broadcast at 4 lbs a.i./A onto a bare ground plot of sandy loam soil in California and a bare ground plot of loam soil in Wisconsin. Soil samples (0-30 inch depth) were collected through 540-561 days post-treatment. At the California test site, propyzamide dissipated in the soil (0-12 inch depth) with a half-life of 18-24 days at the 95% confidence interval. At the Wisconsin site, propyzamide dissipated in the soil (0-12 inch depth) with a half-life of 34-53 days at the 95% confidence interval. These dissipation rates are consistent with degradation rates in the submitted fate and transport studies. Propyzamide was detected at the California site at a maximum concentration of 2.64 ppm (0-3 inch depth, 2 days post-treatment) and at a maximum depth of 24 inches. The compound was detected at the

Wisconsin site at a maximum concentration of 4.23 ppm (0-3 inch depth, 1 day post-treatment) and at a maximum depth of 24 inches.

Both test sites were analyzed for RH-24580 and RH-24644. At the California site, RH-24644 was detected at a maximum concentration of 0.168 ppm (0-3 inch depth; 60 days post-treatment) and at a maximum depth of 6 inches; RH-24580 was detected at a maximum concentration of 0.178 ppm (0-3 inch depth; 29 days post-treatment) and at the maximum depth sampled (30 inches). At the Wisconsin site, RH-24644 was detected at a maximum concentration of 0.161 ppm (0-3 inch depth; 16 days post-treatment) and at a maximum depth of 24 inches; RH-24580 was detected at a maximum concentration of 0.105 ppm (0-3 inch depth; 58 days post-treatment) and at a maximum depth of 12 inches.

Degradates

Major degradates of propyzamide include RH-24644, RH-24580, RH-26059, and carbon dioxide (chemical names and structures are tabulated in **Appendix II**). Six minor degradates have been identified, RH-24655 (3,5-dichloro-N-(1,1-dimethyl-2-propenyl)benzamide), RH-20839 (3,5-dichlorobenzoic acid), RH-26521 (N-(1,1-dimethyl-2,3-dihydroxypropyl)-3,5-dichlorobenzamide), RH-25891 (2-(3,5-dichlorophenyl)-4,4-dimethyl-S-hydroxymethyloxazoline), RH-26702 (N-(1,1-dimethyl-3-hydroxacetonyl)-3,5-dichlorobenzamide), and 3,5-dichlorobenzamide. A batch equilibrium study on RH-24644 and RH-24580 indicates that RH-24644 has similar to lower mobility compared to propyzamide (K_F range = 2.34 (1/n=0.98) to 55.1 (1/n=0.86); K_{FOC} range = 993-3910 L/kg$_{OC}$), whereas RH-24580 is more mobile than propyzamide (K_F range = 0.283 (1/n=0.83) to 2.36 (1/n=0.87); K_{FOC} range = 96.3-210 L/kg$_{OC}$; MRID 40211104).

The 2002 TRED states that for dietary risk assessment, propyzamide and its metabolites containing the 3,5-dichlorobenzoyl moiety are the residues of concern (USEPA, 2002). Because all identified organic degradates of propyzamide contain the 3,5-dichlorobenzoyl moiety and toxicity data for these degradates are unavailable, HED assumed that they have the same toxicity as propyzamide parent and are all residues of risk concern (USEPA, 2007). Therefore, a total residues of concern approach was used for this assessment to evaluate the potential exposure to the residues of risk concern, *i.e.*, propyzamide and all identified degradates other than carbon dioxide.

EDWCs were modeled for this assessment using recalculated degradation half-lives for the collective residues of risk concern in the submitted environmental fate studies. The collective residues include the extractable radioactivity in each study and do not include volatile residues or carbon dioxide. Because a reasonable extraction attempt was not performed for the recently submitted aerobic soil metabolism study (MRID 46413407) or the soil photolysis study (MRID 41913404), collective residues for these two studies also include the unextracted residues in soil. The logarithm-transformed data were linearly regressed to produce collective residue degradation half-lives for each environmental fate study except those regarding aerobic soil metabolism. The aerobic soil metabolism data were non-linearly regressed. As shown in **Table 3**, aerobic soil metabolism and aqueous photolysis half-lives increased from moderate values for propyzamide alone to less moderate values on the order of months counting total residues of concern. The remaining biodegradation half-live values increased to greater than 365 days for total residues of concern.

Drinking Water Exposure Modeling

Models

Exposure estimates were revised with the recently released PE v5.0 suite of models and crop scenarios. Pesticide Root Zone Model (PRZM v3.12.2, May 12, 2005) and Exposure Analysis Modeling System (EXAMS v2.98.04.06, Apr. 25, 2005) are simulation models coupled with the input shell PE v5.0 (Nov.15, 2006) to generate EDWCs of propyzamide residues that may occur in surface water used as drinking water. The PRZM model simulates pesticide movement and transformation from crop application through soil residue processes. The EXAMS model simulates pesticide loading via runoff, erosion, and spray drift assuming a standard watershed of 172.8 ha that drains into an adjacent standard drinking water index reservoir of 5.26 ha, an average depth of 2.74 m. A more detailed description of the index reservoir watershed can be found in Jones *et al.*, 1998. The coupled PRZM/EXAMS model and users manuals may be downloaded from the U.S. Environmental Protection Agency (EPA) Water Models web-page (USEPA, 2006a). EDWCs produced by PRZM/EXAMS must be manually modified by agricultural Percent Cropped Areas (PCA) to account for the maximum area within a watershed that may be planted with the modeled crop.

Screening Concentration in Ground Water (SCI-GROW v2.3, Jul. 29, 2003) is a regression model used as a screening tool to estimate pesticide concentrations found in ground water used as drinking water. SCI-GROW was developed by fitting a linear model to ground water concentrations with the Relative Index of Leaching Potential (RILP) as the independent variable. Ground water concentrations were taken from 90-day average high concentrations from Prospective Ground Water studies. The RILP is a function of aerobic soil metabolism and the soil-water partition coefficient. The output of SCI-GROW represents the concentrations of propyzamide residue that might be expected in shallow unconfined aquifers under sandy soils, which is representative of the ground water most vulnerable to pesticide contamination and likely to serve as a drinking water source. The SCI-GROW model and user's manual may also be downloaded from the EPA Water Models web-page (USEPA, 2006a). Both PRZM/EXAMS and SCI-GROW were run to estimate screening-level exposure of drinking water sources to total residues of concern of propyzamide.

Input Parameters

Input parameters for the PRZM/EXAMS model appear in **Table 4**; data sources and justification accompany values for each parameter. Explanations of various model input parameters are discussed below.

Table 4. PRZM/EXAMS Input Parameters for Propyzamide. Source Data are in Table 3.			
Input Parameter	**Value**	**Justification**	**Source**
Scenario	Artichoke: CArowcropRLF Alfalfa: CAalfalfaOP Fruit: MIcherries Berries: ORberriesOP Lettuce, chicory, Belgian endive, dandelion: CAlettuce	Most nationally protective scenarios of proposed new uses based on site vulnerability. Fruit scenarios represent different geographic areas and agronomy with similar vulnerability.	N/A[1]
Application Rate in lbs a.i./A (kg a.i./ha)	Artichoke: 4.08 (4.57) Alfalfa: 2.00 (2.24) Fruit: 4.08 (4.57) Berries: 3.06 (3.43) Blueberries: 2.04 (2.29) Lettuce: 2.04 (2.29) Chicory, Belgian endive, dandelion: 2.00 (2.24)	Label directions	Proposed and current labels
Applications per Year	Artichoke: 1,2 Alfalfa: 1,2 Fruit: 1 Berries: 1 Lettuce: 1,2 Chicory, Belgian endive, dandelion: 1	Label directions	Proposed and current labels
Application Interval (days)	Artichoke: N/A, 120 Alfalfa: N/A, 98 Fruit: N/A Berries: N/A Lettuce: N/A, 180 Chicory, Belgian endive, dandelion: N/A	Intervals were selected to reflect labeled application patterns.	Proposed and current labels
Date of Initial Application	Artichoke: Jan. 15 Alfalfa: Jan. 7 Fruit: Sep. 15 Berries: Nov. 21 Lettuce, chicory, Belgian endive, dandelion: Feb. 1	Initial application generally occurs in fall or winter.	USDA crop profiles (USDA, 2006), and label directions
Application Method	Artichoke, chicory, Belgian endive, dandelion, lettuce at 1 application/year: Aerial Other uses: Ground	Label directions	Proposed and current labels
CAM Input	Artichoke, chicory, Belgian endive, dandelion, lettuce at 1 application/year: Foliar applied (CAM=2) Other uses: Ground surface applied, unincorporated (CAM=1)	Most protective CAM from label directions based on estimates.	N/A
IPSCND Input	Artichoke, alfalfa, lettuce, chicory, Belgian endive, dandelion: 1 Fruit, berries: 3	Foliar residue after harvest is applied to the field for row and field crops and undisturbed for fruit and berry uses.	USDA crop profiles (USDA, 2006)
Spray Drift Fraction	Aerial: 0.16 Ground: 0.064	Default drinking water assessment values for aerial spray and ground spray	Input parameter guidance (USEPA, 2002b) and Spray Drift Task Force studies[2]

Table 4. PRZM/EXAMS Input Parameters for Propyzamide. Source Data are in Table 3.			
Input Parameter	**Value**	**Justification**	**Source**
Application Efficiency	Aerial: 0.95 Ground: 0.99	Default values for aerial spray and ground spray	Input parameter guidance (USEPA, 2002b)
Molecular Mass (g/mol)	256.13	Product chemistry data	USEPA, 1994
Vapor Pressure at 25°C (torr)	8.5×10^{-5}	Study value	USEPA, 1994
Solubility in Water at 25°C (mg/L)	150	Represents 10x the measured water solubility value.	USEPA, 1994
Organic Carbon Partition Coefficient (K_{OC}) (L/kg_{OC})	841	Represents the mean K_{FOC} for propyzamide parent as an estimate of the partition coefficient for the total residues.	MRID 40211103
Aerobic Soil Metabolism Half-life (days)	1580	Represents the 90th percentile confidence bound on the mean total residue half-life.	MRID 41568901 MRID 46413407
Aerobic Aquatic Metabolism Half-life (days)	1020	Represents the 90th percentile confidence bound on the mean total residue half-life.	MRID 46427901
Anaerobic Aquatic Metabolism Half-life (days)	1210	Represents 3 times a single total residue half-life.	MRID 46413408
Hydrolysis Half-lives (days)	Stable (pH 5) Stable (pH 7) Stable (pH 9)	Study values	MRID 00107980
Aqueous Photolysis Half-life (days)	217	Represents the single environmental phototransformation total residue half-life.	MRID 40420301

1. N/A means not applicable.
2. Spray Drift Task Force studies were reviewed by the FIFRA Scientific Advisory Panel (SAP meeting, Dec 10-11, 1997); online at: http://www.epa.gov/scipoly/sap/1997/index.htm.

Scenario Inputs. Currently approved PRZM scenarios were used in modeling. The California Row Crop regional scenario was used to model use on artichokes, as it was parameterized for row crop uses and propyzamide may only be applied to artichokes in California. Therefore, this scenario is both regionally and nationally protective for use on artichokes. Similarly, the Oregon berries and California alfalfa regional scenarios were used to model uses on berries in Berry Group 13 and alfalfa, respectively. Although the proposed uses on berries and alfalfa are not regionally limited, the scenarios used are representative of a large proportion of the respective agriculture and nationally protective scenarios were not available.

The Michigan cherries scenario was used to represent exposure to uses on both stone fruit and pome fruit, as it yielded more protective exposure estimates than those from the California fruit scenario. The California lettuce scenario was used to model use on lettuce, chicory, Belgian endive, and dandelion, as it was designed to be nationally protective for use on lettuce and no scenarios were available to model chicory, Belgian endive, and dandelion, which are leafy green crops similar to lettuce. The California alfalfa scenario is nationally protective for use on alfalfa.

Application methods and rates were obtained from the proposed label for chicory, Belgian endive, dandelion, and berry uses (proposed EPA Reg. No. 62719-397) and current labels for artichoke, alfalfa, lettuce, fruit, and berry uses (EPA Reg. No. 62719-397 and 70506-78). Application dates were selected in the fall and winter months. Follow up application dates for artichoke and alfalfa

uses occurred in the spring, as labeled. The second application to lettuce represents application to a second crop planted 180 days after the first. Applications to artichokes, chicory, Belgian endive, and dandelion, and single applications per year to lettuce were modeled with aerial application input values; applications to all other uses were modeled with ground application input values.

Environmental Fate. Chemical property input values were chosen in accordance with current input parameter guidance (USEPA, 2002b). Based on analysis of total residues of concern, the upper 90% confidence bound on the mean was selected for the aerobic soil metabolism half-life (1580 d) and the aerobic aquatic metabolism half-life (1020 d). The single available anaerobic aquatic metabolism half-life was multiplied by 3 to account for uncertainty (1210 d).

Percent Cropped Area. Standard percent cropped areas (PCA) were used for all uses as conservative default estimates of the extent of watershed on which crops of unknown specific PCA is grown (Effland *et al.*, 1999). The regional PCA of 0.56 was used for use on artichokes because the crop is not grown outside of California. The standard agricultural PCA of 0.87 was used for all other uses because they are not confined to specific regions of the U.S. Actual fractions of cropped area are likely to be less in some areas of the country. The PRZM/EXAMS model does not include PCA inputs. Therefore, modeled exposure estimates were manually multiplied by the appropriate PCA to yield reported EDWC values.

Input parameters for the SCI-GROW model appear in **Table 5**. Data sources and justification accompany values for each parameter.

Table 5. SCI-GROW Input Parameters for Propyzamide. Source Data are in Table 3.

Input Parameter	Value	Justification	Source
Application Rate (lbs a.i./A)	Artichoke: 4.08 Alfalfa: 2.00 Fruit: 4.08 Berries: 3.06 Blueberries: 2.04 Lettuce: 2.04 Chicory, Belgian endive, dandelion: 2.00	Label directions	Proposed and current labels
Applications per Year	Artichoke: 2 Alfalfa: 2 Fruit: 1 Berries: 1 Blueberries: 1 Lettuce: 1, 2 Chicory, Belgian endive, dandelion: 1	Label directions	Proposed and current labels
Organic Carbon Partition Coefficient (K_{OC}) (L/kg_{OC})	701	Represents the median of six K_{FOC} values.	MRID 40211103
Aerobic Soil Metabolism Half-life (days)	131	Represents the median of four values for total residues of concern.	MRID 41568901 MRID 46413407

1. N/A means not applicable.

Modeling Results

All current and proposed use patterns were modeled for surface water and ground water exposure estimates, as described above. **Table 6** lists EDWCs for the highest use patterns of propyzamide, which are also reported in **Table 1**. For characterization, **Table 6** also lists EDWCs for hypothetical variations of these use patterns that reflect potential label changes, such as reduction of the number of applications per year to 1x and/or the limitation of the use to California. The maximum use patterns that yielded the maximum surface water and ground water EDWCs for use in drinking water exposure estimation were lettuce and artichokes, respectively. Model input/output data for these estimates are attached in **Appendix I**.

Table 6. Tier II 1-in-10-year Total Residue of Concern EDWCs in Surface Water from Proposed Propyzamide Uses on Chicory, Belgian Endive, Dandelion Leaves, and Berries and Current High End Uses (maximum EDWCs in bold).

Use (modeled rate)	PCA (region)	Surface Water			Ground Water Exposure (ppb)
		Peak Exposure (ppb)	Annual Mean Exposure (ppb)	30-year Mean Exposure (ppb)	
Lettuce (4 lbs a.i./A/year; 2 apps)	87% (U.S.)	**243**	**148**	**105**	0.699
Lettuce (2 lbs a.i./A/year; 1 app)[1]	87% (U.S.)	149	84.4	55.8	0.350
Lettuce (2 lbs a.i./A/year; 1 app)[1]	56% (CA)	95.8	54.4	35.9	0.350
Alfalfa (4 lbs a.i./A/year; 2 apps)	87% (U.S.)	40.1	26.1	16.7	0.685
Alfalfa (2 lbs a.i./A/year; 1 app)[1]	87% (U.S.)	35.0	18.8	10.8	
Artichokes (8 lbs a.i./A/year; 2 apps)	56% (CA)	117	89.8	69.8	**1.40**
Artichokes (4 lbs a.i./A/year; 1 app)[1]	56% (CA)	75.5	49.7	39.4	0.699
Chicory, Belgian endive, dandelion (2 lbs a.i./A/year)	87% (U.S.)	145	82.8	54.7	0.343
Chicory, Belgian endive, dandelion (2 lbs a.i./A/year)	56% (CA)	93.6	53.3	35.2	0.343
Stone fruit, pome fruit, grapes (4 lbs a.i./A/year)	87% (U.S.)	105	67.7	46.2	0.699
Berries other than blueberries (3 lbs a.i./A/year)	87% (U.S.)	84.9	42.1	33.4	0.524
Blueberries (2 lbs a.i./A/year)	87% (U.S.)	56.6	28.1	22.3	0.350

[1] Smaller use rates and/or PCAs were modeled in these cases to indicate how potential label changes could alter exposure estimates.

The maximum EDWCs decreased by only 5%-9% for surface water and by 81% for ground water after revision of the total residue degradation half-lives. Maximum surface water values decreased little due to the use of current models and the California lettuce scenario that are expected to better represent the high-end of vulnerability where lettuce is grown in California. Surface water values

for maximum use patterns other than lettuce underwent a range of reductions from 5% to 80%, depending on the modeled scenario. The large reduction in surface water values for selected maximum use patterns and ground water values for all maximum use patterns more directly reflect the reduction in the total residue degradation half-lives.

30-year mean surface water EDWCs were slightly reduced from a range of 21-116 ppb in the previous assessment to a range of 17-105 ppb for the maximum use patterns of this revised assessment listed in **Table 6**. If uses on lettuce, alfalfa, and artichokes were limited to one application per year and uses on lettuce, chicory, Belgian endive, and dandelion were restricted to within California, 30-year mean surface water EDWCs would be reduced to a range of 11-46 ppb.

Surface water exposure values based on total residues of concern (*e.g.* peak value of 243 ppb) are one to two orders of magnitude larger than that for propyzamide *per se* in the 2002 TRED (*e.g.* peak value of 10.3 ppb) due to longer photolysis and metabolism half-lives based on total residues of concern, higher modeled use patterns, and different modeled scenarios.

The PRZM/EXAMS model generates screening-level annual peak and annual mean estimates of untreated surface water concentrations across 30 years that are equaled or exceeded once every ten years in the standard index reservoir for use as acute and chronic endpoints, respectively. PRZM/EXAMS generates overall mean estimates of untreated surface water concentrations across 30 years for assessment of risk from cancer as well. The SCI-GROW model generates a single screening-level ground water concentration estimate that might be expected in shallow unconfined aquifers under highly permeable soils, for use as both an acute and chronic endpoint.

The exposure values listed above are conservative for a number of reasons. First, the actual PCA of these crops in drinking water basins is likely to be less than 87% or 56%, the default values used in this assessment. Unfortunately, estimates of cropped area do not exist for these crops with sufficient precision and accuracy to refine this assessment. Second, the percent crop treated has been assumed to be 100%. This value may be, in fact, 100% for a given location at a given time, or it may be lower. Percent crop treated information with adequate spatial and temporal resolution is also unavailable. Furthermore, there are a number of other factors inherent in the modeling that can affect the accuracy of this analysis including the availability and quality of the model input data and the use of maximum label practices that may be greater than actual agricultural practices.

The environmental fate data for propyzamide are of generally fair quality. The metabolism values used to model surface water concentrations were increased to account for variability in accordance with EFED guidance and are uncertain to the extent that the data do not capture the environmental variability (USEPA, 2002b).

The PRZM and EXAMS models are some of the best environmental fate estimation tools available. However, they have limitations in their ability to represent some processes and factors, like spray drift, some runoff factors, within-site variability, crop growth, soil water transport, and weather. The screening model SCI-GROW is a regression model that generates EDWCs based on results of Prospective Ground Water studies using the two most significant fate parameters. Use of these models as screens is not designed to simulate specific real events or typical exposure, but to simply indicate which chemicals surpass levels of concern and warrant refinement of dietary risk.

Monitoring Data

A cursory review of both ground water and surface water monitoring data on propyzamide was conducted for the 2002 TRED (USEPA, 2002a). This assessment contains additional cursory review of currently available monitoring data. The USGS NAWQA national database currently contains monitoring data of pesticides through 2005 (USGS, 2006). In surface water, propyzamide was detected above the level of quantitation in 2.2% of samples (459 of 20,720 samples). The maximum measured surface water concentration was 1.12 µg/L in Shelby County, Tennessee in January, 2003. In ground water, propyzamide was detected above the level of quantitation in 0.05% of samples (5 of 9624 samples). The maximum measured ground water concentration was 0.820 µg/L in Benton County, Arkansas in April, 1994.

The USGS NASQAN national database contains monitoring data of pesticides by regional basin from 1996 to 2000 (USGS, 2006a). The maximum concentration of propyzamide detected in this program was 0.125 µg/L in the Colorado Basin in June, 1997. Concentrations of propyzamide were detected above the reporting limit in the Columbia, Colorado, Rio Grande, and Mississippi Basins; however, detections only occurred in the Northwest and Southwest, as shown in **Figure 2**.

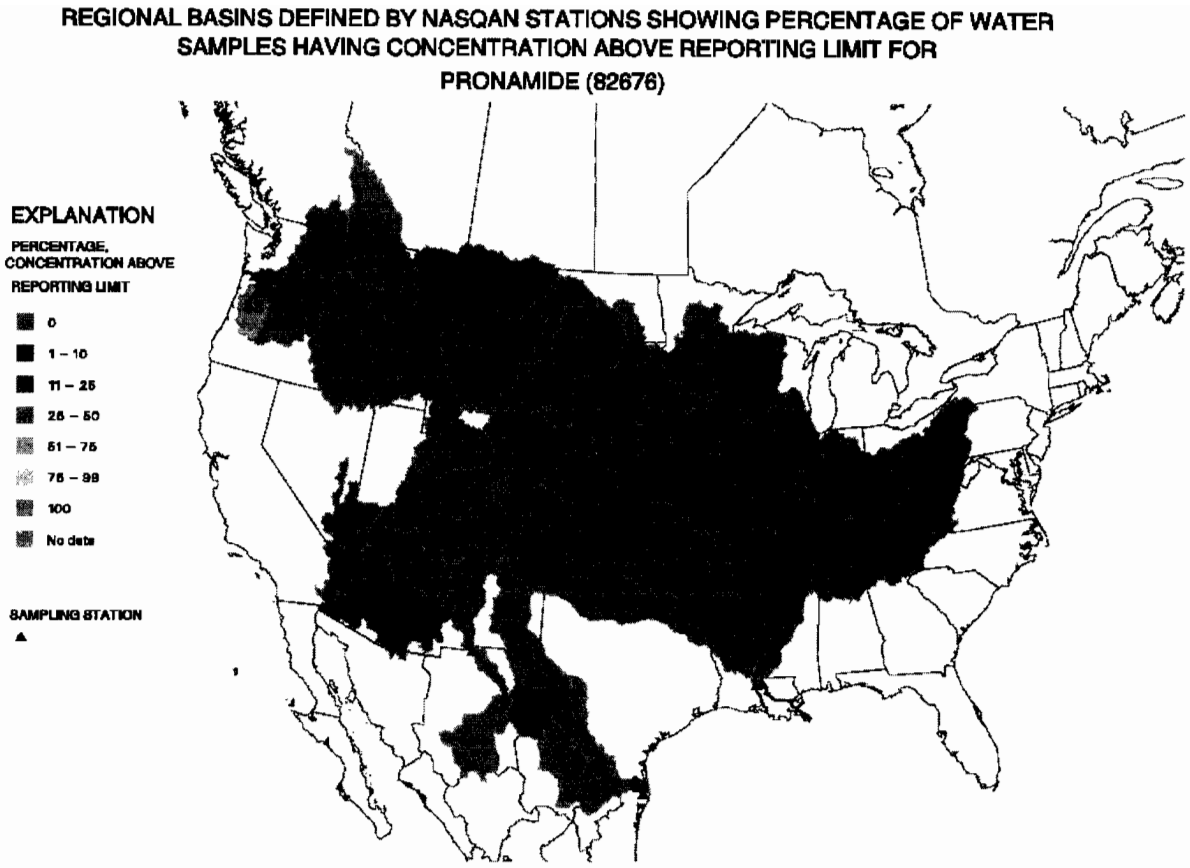


Figure 2. Percent Detection Map for Propyzamide Based on the USGS NASQAN Database (USGS, 2006a).

The California Department of Pesticide Regulation (DPR) Surface Water Database contains monitoring data of pesticides in California from 1990 to 2005 (CDPR, 2006). Propyzamide was detected in 8% of 1678 samples in the state, with the majority of detections occurring in water bodies of the Sacramento Valley. The maximum concentration of propyzamide reported in this database was 0.25 µg/L, detected in Yolo County in February, 1994.

Propyzamide was detected in one Oklahoma reservoir out of twelve, which were monitored in the Pilot Reservoir Monitoring Program due to their particular vulnerability to pesticide contamination (USEPA, 2002a). The compound was detected at up to 0.044 ppb in 83% of 41 raw water samples and up to 0.012 ppb in 42% of 19 finished water samples.

Propyzamide was not detected in 432 wells from 1984 to 1990, according to the EPA Pesticides in Ground Water Database (USEPA, 1992). Propyzamide is not a regulated chemical under the Safe Water Drinking Act (SWDA) or related statutes. Therefore, it is not listed in the EPA Safe Drinking Water Information System (SDWIS/FED) database (USEPA, 2007a) nor is it found in the EPA Unregulated Contaminants Monitoring Rules (UCMR) chemical monitoring database (USEPA, 2006b).

The available monitoring data are consistent with the peak (3.7-10.3 µg/L) and annual mean (0.53-4.45 µg/L) exposure estimates of propyzamide *per se* in support the 2002 TRED (USEPA, 2002a). Monitoring data are not available on the degradates of propyzamide. Therefore, exposure estimates of total residues of concern cannot be evaluated with monitoring data.

Drinking Water Treatment

Data on the effects of drinking water treatment on propyzamide concentrations are available from the Pilot Reservoir Monitoring Program (USEPA, 2002a). The compound was detected twice as often in raw water samples as in finished water samples. However, monitored treatment data carry some inherent uncertainty due to treatment facility design. Sampling an identical segment of water before and after treatment is difficult due to difficulties in tracking water through variable treatment processes.

Flocculation and sedimentation removal may be effective at reducing propyzamide residue concentrations. Carbon filtering may also reduce propyzamide residue concentrations due to the parent compound's moderate affinity to organic carbon. Changes in pH will not affect propyzamide, as it is stable to hydrolysis. Data regarding the effects of drinking water treatment on propyzamide residues of risk concern have not been provided to the Agency and could not be located in the public literature.

CONCLUSIONS

Tier II drinking water exposure estimates based on total residues of concern for propyzamide uses on chicory, Belgian endive, dandelion, and berries in Berry Group 13 are represented by the maximum use patterns for propyzamide, lettuce (for surface water) and artichokes (for ground water; **Tables 1 and 6**). The environmental fate data used to generate these estimates are generally fair. The total residues of concern of propyzamide include propyzamide parent and all degradates with the 3,5-dichlorobenzoyl moiety, which are assumed to have similar toxicity to propyzamide parent.

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MRID 41913505. Olson, G. and L. Lawrence. 1989. Anaerobic Metabolism of [^{14}C]Pronamide in Sandy Loam Soil. Lab. Project No. 271. Unpublished study performed by Pharmacology and Toxicology Research Laboratory, Lexington, KY; sponsored by Rohm and Haas Company, Spring House, PA. Jan. 19, 1989. 54 pp.

MRID 44078601. Choo, D. 1996. Terrestrial Field Dissipation of Kerb® Herbicide at California and Wisconsin. Lab. Project ID: Technical Report No. 34-96-100. Unpublished study performed by ABC Laboratories California, Madera, CA, Centre Analytical Laboratories, Inc., State College, PA, and QC, Inc., Southampton, PA; sponsored by Rohm and Haas Company, Spring House, PA. Jul. 15, 1996. 753 pp.

MRID 46413407. Volkl, S. 2001. Degradation Rate of ^{14}C-Propyzamide (Kerb) in Three Soils Incubated Under Aerobic Conditions. RCC Study No. 773897. Unpublished study performed by RCC Ltd., Itingen, Switzerland; sponsored by Rohm & Haas Company, Spring House, PA. Jan. 9, 2001. 134 pp.

MRID 46413408. Volkel, W. 2000. ^{14}C-Propyzamide: Anaerobic Soil Degradation. RCC Project No. 743850. Unpublished study performed by RCC Ltd., Itingen, Switzerland; sponsored by Rohm & Haas Company, Spring House, PA. Dec. 19, 2000. 119 pp.

MRID 46427901. Muller-Kallert, H. 1994. [^{14}C]-Propyzamide (Kerb): Degradation and Metabolism in Aquatic Systems. RCC Project No. 342202. Unpublished study performed by RCC Umweltchemie Ag., Itingen, Switzerland; sponsored by Rohm & Haas Company, Spring House, PA. Jun. 28, 1994. 137 pp.

Appendix I. SCI-GROW and PRZM/EXAMS Input/Output Data for Drinking Water Exposure Assessment.

SCI-GROW Input/Output Files.

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:55:30

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
2.000	2.0	4.000	7.01E+02	131.0

groundwater screening cond (ppb) = 6.85E-01
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:56:18

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
2.000	1.0	2.000	7.01E+02	131.0

groundwater screening cond (ppb) = 3.43E-01
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:56:35

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
4.080	2.0	8.160	7.01E+02	131.0

groundwater screening cond (ppb) = 1.40E+00
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:56:47

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
4.080	1.0	4.080	7.01E+02	131.0

groundwater screening cond (ppb) = 6.99E-01
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:57: 7

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
2.040	2.0	4.080	7.01E+02	131.0

groundwater screening cond (ppb) = 6.99E-01
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:57:22

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
2.040	1.0	2.040	7.01E+02	131.0

groundwater screening cond (ppb) = 3.50E-01
****

SciGrow version 2.3
chemical:Propyzamide
time is 10/ 5/2007 15:58:16

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
3.060	1.0	3.060	7.01E+02	131.0

groundwater screening cond (ppb) = 5.24E-01
****

PRZM/EXAMS Input Files.

Alfalfa

Output File: Pro_alfalfa2				
Metfile:	w93193.dvf			
PRZM scenario:	CAalfalfa_WirrigOP.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	1	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	2.242	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	07-01	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	98	days	Set to 0 or delete line for single app.
app. rate 1	apprate		kg/ha	
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF total	none, monthly or total(average of entire run)		

Artichoke

Output File: Pro_artichoke2				
Metfile:	w23234.dvf			
PRZM scenario:	CARowCropRLF.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life

Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	4.574	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.16	fraction of application rate applied to pond	
Application Date	Date	15-01	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	120	days	Set to 0 or delete line for single app.
app. rate 1	apprate		kg/ha	
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF	total	none, monthly or total(average of entire run)	

Chicory, Belgian Endive, Dandelion

Output File: Pro_chicory				
Metfile:	w23273.dvf			
PRZM scenario:	CAlettuceSTD.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	2.242	kg/ha	
Application Efficiency:	APPEFF	0.95	fraction	
Spray Drift	DRFT	0.16	fraction of application rate applied to pond	
Application Date	Date	01-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		

Flag for Index Res. Run	IR	Reservoir	
Flag for runoff calc.	RUNOFF	total	none, monthly or total(average of entire run)

Lettuce

Output File: Pro_lettuce2				
Metfile:	w23273.dvf			
PRZM scenario:	CAlettuceSTD.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	1	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	2.287	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	01-02	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	180	days	Set to 0 or delete line for single app.
app. rate 1	apprate		kg/ha	
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF	total	none, monthly or total(average of entire run)	

Fruit

Output File: Pro_MIcherries				
Metfile:	w14850.dvf			
PRZM scenario:	MICherriesSTD.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life

Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	1	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	4.574	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	15-09	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF	total	none, monthly or total(average of entire run)	

Berries

Output File: Pro_berries				
Metfile:	w24232.dvf			
PRZM scenario:	ORberriesOP.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	1	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	3.43	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	21-11	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF	total	none, monthly or total(average of entire run)	

Blueberries

Output File: Pro_blueberries				
Metfile:	w24232.dvf			
PRZM scenario:	ORberriesOP.txt			
EXAMS environment file:	ir298.exv			
Chemical Name:	Propyzamide			
Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	256.13	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	8.5e-5	torr	
Solubility	sol	150	mg/L	
Kd	Kd		mg/L	
Koc	Koc	841	mg/L	
Photolysis half-life	kdp	217	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1020	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	1210	days	Halfife
Aerobic Soil Metabolism	asm	1580	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	1	integer	See PRZM manual
Incorporation Depth:	DEPI	0	cm	
Application Rate:	TAPP	2.287	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	21-11	dd/mm or dd/mmm or dd-mm or dd-mmm	
Record 17:	FILTRA			
	IPSCND	3		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Reservoir		
Flag for runoff calc.	RUNOFF total	none, monthly or total(average of entire run)		

Appendix II. Chemical Names, Structures, and Maximum Reported Amounts of Propyzamide and its Degradates.

Table II.A. Maximum Reported Amounts of Propyzamide Degradation Products.

Degradate	Maximum % of Applied	Study Type	MRID
RH-24644 (M1)	3.75 (14 d, pH 7) 3.22 (1 d) 2.02 (28 d) **31.9** (21 d) **26.6** (12 mo) **12.8** (60 d) 4.54 (63 d) **17.7** (123 d) **0.168 ppm** (60 d)	Hydrolysis Aqueous photolysis Soil photolysis Aerobic soil metabolism Aerobic soil metabolism Anaerobic soil metabolism Anaerobic aquatic metabolism Anaerobic aquatic metabolism Terrestrial field dissipation[1]	MRID 00107980 MRID 40420301 MRID 41913504 MRID 46413407 MRID 41568901 MRID 41913505 Acc. No. 263649 MRID 46413408 MRID 44078601
RH-24655 (M2)	2.3 (123 d)	Anaerobic aquatic metabolism	MRID 46413408
RH-20839 (M3)	1.7 (30 d) 3.9 (76 d) 6.3 (123 d)	Aqueous photolysis Aerobic soil metabolism Anaerobic aquatic metabolism	MRID 40420301 MRID 46413407 MRID 46413408
RH-24580 (M4)	3.10 (28 d, pH 5) 1.40 (14 d) **12.6** (28 d) **24.0** (45 d) **14.0** (12 mo) **32.2** (30 d) 2.9 (123 d) **0.178 ppm** (29 d)	Hydrolysis Aqueous photolysis Soil photolysis Aerobic soil metabolism Aerobic soil metabolism Anaerobic aquatic metabolism Anaerobic aquatic metabolism Terrestrial field dissipation[1]	MRID 00107980 MRID 40420301 MRID 41913504 MRID 46413407 MRID 41568901 Acc. No. 263649 MRID 46413408 MRID 44078601
M5	0.1 (14-56 d)	Anaerobic aquatic metabolism	MRID 46413408
M6	0.2 (123 d)	Anaerobic aquatic metabolism	MRID 46413408
M8	2.9 (123 d)	Anaerobic aquatic metabolism	MRID 46413408
RH-26521 (M9)	0.1 (56 d) 4.2 (9 mo)	Anaerobic aquatic metabolism Aerobic soil metabolism	MRID 46413408 MRID 41568901
M10	0.3 (123 d)	Anaerobic aquatic metabolism	MRID 46413408
M11	3.5 (123 d)	Anaerobic aquatic metabolism	MRID 46413408
RH-26059	**15.0** (30 d)	Aqueous photolysis	MRID 40420301
RH-25891	1.34 (28 d, pH 5) 1.88 (30 d) 9.44 (63 d)	Hydrolysis Aqueous photolysis Anaerobic aquatic metabolism	MRID 00107980 MRID 40420301 Acc. No. 263649
RH-26702	5.16 (14 d) 8.18 (28 d)	Aqueous photolysis Soil photolysis	MRID 40420301 MRID 41913504
3,5-dichlorobenzamide	3.6 (30 d)	Aqueous photolysis	MRID 40420301
Carbon dioxide	**50.4** (104 d) 0.1 (56-123 d)	Aerobic soil metabolism Anaerobic aquatic metabolism	MRID 46413407 MRID 46413408

[1] The terrestrial field dissipation study initial application was 4 lbs a.i./A. Only two degradates were analyzed for.

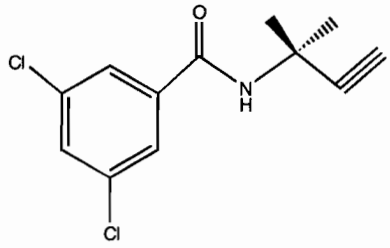
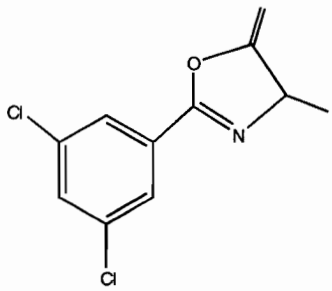
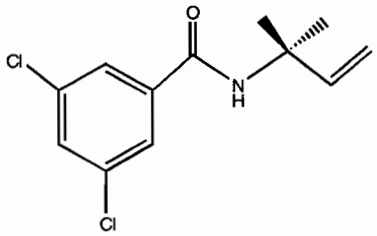
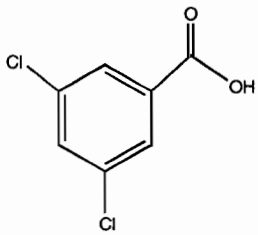
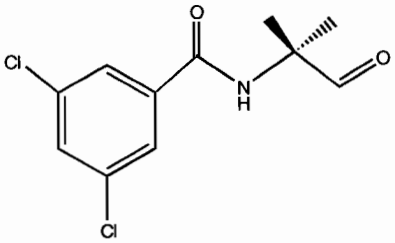
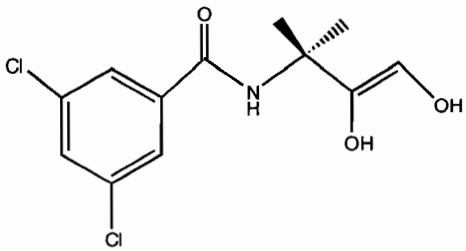
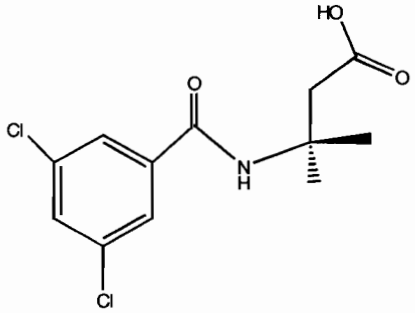
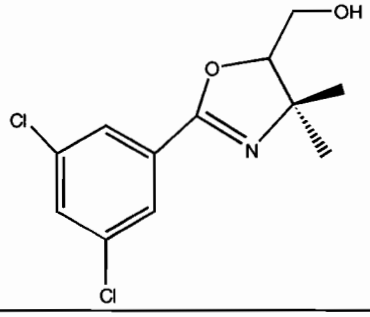
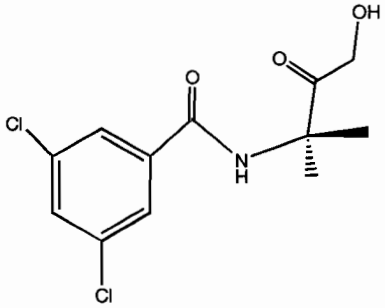
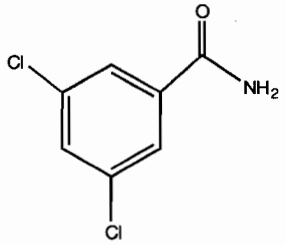
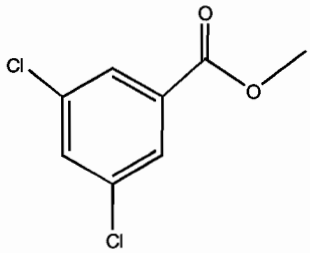
Table II.B. Chemical Names and Structures of Propyzamide and its Degradates.	
Chemical Name	**Structure**
Propyzamide (Pronamide, RH-23315) IUPAC name: 3,5-dichloro-N-(1,1-dimethylprop-2-ynyl)benzamide CAS name: 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide	
RH-24644 (M1) 2-(3,5-dichlorophenyl)-4,4-dimethyl-5-methylene-2-oxazoline	
RH-24655 (M2) 3,5-dichloro-N-(1,1-dimethyl-2-propenyl)benzamide	
RH-20839 (M3) 3,5-dichlorobenzoic acid	
RH-24580 (M4) N-(1,1-dimethylacetonyl)-3,5-dichlorobenzamide	
RH-26521 (M9) N-(1,1-dimethyl-2,3-dihydroxypropyl)-3,5-dichlorobenzamide	

Table II.B. Chemical Names and Structures of Propyzamide and its Degradates.	
Chemical Name	**Structure**
RH-26059 β-(3,5-dichlorobenzamino-β-methyl-butyric acid	
RH-25891 2-(3,5-dichlorophenyl)-4,4-dimethyl-S-hydroxymethyloxazoline	
RH-26702 N-(1,1-dimethyl-3-hydroxacetonyl)-3,5-dichlorobenzamide	
3,5-Dichlorobenzamide	
MDCB methyl 3,5-dichlorobenzoate	
Carbon dioxide