United States
Environmental Protection
Agency

Prevention, Pesticides
And Toxic Substances
(7508W)

EPA 738-R-94-022
September 1994

Reregistration Eligibility Decision (RED)

Hexazinone

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

CERTIFIED MAIL

Dear Registrant:

I am pleased to announce that the Environmental Protection Agency has completed its reregistration eligibility review and decisions on the pesticide chemical case hexazinone. The enclosed Reregistration Eligibility Decision (RED) contains the Agency's evaluation of the data base of this chemical, its conclusions of the potential human health and environmental risks of the current product uses, and its decisions and conditions under which these uses and products will be eligible for reregistration. The RED includes the data and labeling requirements for products for reregistration. It also includes requirements for additional data (generic) on the active ingredient to confirm the risk assessments.

To assist you with a proper response, read the enclosed document entitled "Summary of Instructions for Responding to the RED." This summary also refers to other enclosed documents which include further instructions. You must follow all instructions and submit complete and timely responses. **The first set of required responses are due 90 days from the receipt of this letter. The second set of required responses are due 8 months from the date of this letter.** Complete and timely responses will avoid the Agency taking the enforcement action of suspension against your products.

If you have questions on the product specific data requirements or wish to meet with the Agency, please contact the Special Review and Reregistration Division representative Franklin Gee at (703) 308-8008. Address any questions on required generic data to the Special Review and Reregistration Division representative Andrew Ertman at (703) 308-8063.

Sincerely yours,

Louis P. True, Jr., Acting Director
Special Review and
Reregistration Division

Enclosures:

SUMMARY OF INSTRUCTIONS FOR RESPONDING TO THE REREGISTRATION ELIGIBILITY DECISION (RED)

1. **DATA CALL-IN (DCI) OR "90-DAY RESPONSE"**--A Product Specific Data Call-In is enclosed with this RED and must be completed and submitted within 90 days of receipt of this package. The response consists of a "Data Call-In Response" form and a "Requirements Status and Registrant's Response" form. Additional generic may also be required to confirm or support the assessment of the active ingredient. If generic data are required, Generic Data Call-Ins are being sent only to certain manufacturing use registrants. Generic Data Call-Ins are **not** being sent to end use product registrants. However, please note that instructions for completing the Data Call-Ins, which are incorporated as an Appendix to the RED, may address both generic and product specific data. If you are an end use registrant, be sure to follow the instructions for product specific data.

2. **TIME EXTENSIONS AND DATA WAIVER REQUESTS** No time extension requests will be granted for the 90-day response. Time extension requests may be submitted only with respect to actual data submissions. Requests for data waivers must be submitted as part of the 90-day response. Requests for time extensions should be submitted in the 90-day response, but certainly no later than the 8-month response date. All data waiver and time extension requests must be accompanied by a full justification. All waivers and time extensions must be granted by EPA in order to go into effect.

3. **APPLICATION FOR REREGISTRATION OR "8-MONTH RESPONSE"** **You must submit the following items for each product within eight months of the RED issuance date (the cover letter date).**

a. **Application for Reregistration** (EPA Form 8570-1). Use only an original application form. Mark it "Application for Reregistration." Send your Application for Reregistration (along with the other forms listed in b-e below) to the address listed in item 5.

b. **Five copies of draft labeling** which complies with the RED and current regulations and requirements. Only make labeling changes which are required by the RED and current regulations (40 CFR 156.10) and policies. Submit any other amendments (such as formulation changes, or labeling changes not related to reregistration) separately. You may delete uses which the RED says are ineligible for reregistration. For further labeling guidance, refer the labeling section of the EPA publication "General Information on Applying for Registration in the U.S., Second Edition, August 1992" (available from the National Technical Information Service, publication #PB92-221811; 703-487-4650).

c. **Generic or Product Specific Data**. Submit all data in a format which complies with PR Notice 86-5, and/or submit citations of data already submitted and give the EPA identifier (MRID) numbers. Before citing these studies, you must **make sure that they meet the Agency's acceptance criteria** (attached to the DCI).

d. **Two copies of the Confidential Statement of Formula (CSF)** for each basic and each alternate formulation. The labeling and CSF which you submit for each product must comply with P.R. Notice 91-2 by declaring the active ingredient as the **nominal concentration**. You have two options for submitting a CSF: (1) accept the standard certified limits (see 40 CFR §158.175) or (2) provide certified limits that are

supported by the analysis of five batches. If you choose the second option, you must submit or cite the data for the five batches along with a certification statement as described in 40 CFR §158.175(e). A copy of the CSF is enclosed; follow the instructions on its back.

e. **Certification With Respect to Citation of Data**. Complete and sign this form (EPA form 8570-29) for each product. **Cite-all is not a valid option for reregistration.**

4. **COMMENTS IN RESPONSE TO FEDERAL REGISTER NOTICE**

Comments pertaining to the content of the RED may be submitted to the address shown in the Federal Register Notice which announces the availability of this RED.

5. **WHERE TO SEND ALL DCI RESPONSES (90-DAY) AND APPLICATIONS FOR REREGISTRATION (8-MONTH RESPONSES)**

By U.S. Mail:

Document Processing Desk **(RED-SRRD-0266)**
Office of Pesticide Programs (H7504C)
EPA, 401 M St. S.W.
Washington, D.C. 20460-0001

By express:

Document Processing Desk **(RED-SRRD-0266)**
Office of Pesticide Programs (H7504C)
Room 266A, Crystal Mall 2
1921 Jefferson Davis Hwy.
Arlington, VA 22202

6. **EPA'S REVIEWS**--EPA will screen all submissions for completeness; those which are not complete will be returned with a request for corrections. EPA will try to respond to data waiver and time extension requests within 60 days. EPA will also try to respond to all 8-month submissions with a final reregistration determination within 14 months after the RED has been issued.

REREGISTRATION ELIGIBILITY DECISION

HEXAZINONE

LIST A

CASE 0266

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
SPECIAL REVIEW AND REREGISTRATION DIVISION

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HEXAZINONE REREGISTRATION ELIGIBILITY DECISION TEAM

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GLOSSARY OF TERMS AND ABBREVIATIONS

AE	Acid equivalent
a.i.	Active Ingredient
ARC	Anticipated Residue Contribution
CAS	Chemical Abstracts Service
CSF	Confidential Statement of Formula
DRES	Dietary Risk Evaluation System
DWEL	Drinking Water Equivalent Level (DWEL) The DWEL represents a medium specific (i.e. drinking water) lifetime exposure at which adverse, non carcinogenic health effects are not anticipated to occur.
EEC	Estimated Environmental Concentration. The estimated pesticide concentration in an environment, such as a terrestrial ecosystem.
EP	End-Use Product
EPA	U.S. Environmental Protection Agency
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FFDCA	Federal Food, Drug, and Cosmetic Act
GLC	Gas Liquid Chromatography
GRAS	Generally Recognized As Safe as designated by FDA
HA	Health Advisory (HA) The HA values are used as informal guidance to municipalities and other organizations when emergency spills or contamination situations occur.
HDT	Highest Dose Tested

GLOSSARY OF TERMS AND ABBREVIATIONS

LC_{50}	Median Lethal Concentration. A statistically derived concentration of a substance that can be expected to cause death in 50% of test animals. It is usually expressed as the weight of substance per weight or volume of water, air or feed, e.g., mg/l, mg/kg or ppm.
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation). It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LD_{lo}	Lethal Dose-low. Lowest Dose at which lethality occurs
LEL	Lowest Effect Level
LOC	Level of Concern
LOEL	Lowest Observed Effect Level
MCLG	Maximum Contaminant Level Goal (MCLG) The MCLG is used by the Agency to regulate contaminants in drinking water under the Safe Drinking Water Act.
µg/g	Micrograms Per Gram
mg/L	Milligrams Per Liter
MP	Manufacturing-Use Product
MPI	Maximum Permissible Intake
MOE	Margin Of Exposure
MRID	Master Record Identification (number). EPA's system of recording and tracking studies submitted.
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NOEL	No Observed Effect Level
OPP	Office of Pesticide Programs

GLOSSARY OF TERMS AND ABBREVIATIONS

PADI	Provisional Acceptable Daily Intake
PAM	Pesticide Analytical Method
PPE	Personal Protective Equipment
ppb	Parts Per Billion
ppm	Parts Per Million
PRN	Pesticide Registration Notice
Q^*_1	The Carcinogenic Potential of a Compound, Quantified by the EPA's Cancer Risk Model
RED	Reregistration Eligibility Decision
REI	Restricted Entry Interval
RfD	Reference Dose
RS	Registration Standard
TD	Toxic Dose. The dose at which a substance produces a toxic effect.
TC	Toxic Concentration. The concentration at which a substance produces a toxic effect.
TEP	Typical End-Use Product
TGAI	Technical Grade Active Ingredient
TMRC	Theoretical Maximum Residue Contribution
TLC	Thin Layer Chromatography
WPS	Worker Protection Standard

EXECUTIVE SUMMARY

This Reregistration Eligibility Decision document (RED) addresses the reregistration eligibility of the pesticide hexazinone, 3-cyclohexyl-6-(dimethylamino)-1-methyl-S-triazine-2,4-(1H,3H)-dione.

Hexazinone is a triazine-dione herbicide registered for use on alfalfa, pasture and range grasses, pineapples, sugarcane, and blueberries. It is also registered for use on ornamental plants, forest trees, and non-crop areas. Hexazinone is registered for pre-emergent, post-emergence, layby, directed spray, and basal soil applications. There are presently 20 end-use hexazinone products and one technical (manufacturing-use) product registered.

Hexazinone was first registered by the Agency in November, 1975 for general weed control in non-cropland areas. A Registration Standard for Hexazinone was issued in February, 1982 (NTIS# PB87-110292) that identified data gaps according to guidelines then in place. After issuance of the 1982 Standard, new uses for hexazinone were established on blueberries, rangeland, pasture grasses, and pineapple. A second Registration Standard was issued in September, 1988 (NTIS# PB89-126080). The 1988 Standard summarized available data supporting the registration of products containing hexazinone as the active ingredient and required additional product chemistry, residue chemistry, toxicology, ecological effects, and environmental fate data.

The Agency has now completed its review of the hexazinone target data base including data submitted in response to the 1988 Registration Standard and has determined that the uses of hexazinone as currently registered will not cause unreasonable adverse effects to humans or the environment. All uses of hexazinone are eligible for reregistration. Existing tolerances for blueberries, pineapple and sugarcane were reassessed. Tolerances for several other crops and commodities could not be reassessed; however, enough data were available to conduct a risk assessment. The Agency believes that existing tolerances are protective until data are available for reassessment. All uses of hexazinone that did not have tolerances reassessed at this time are eligible for reregistration. The Agency is requiring additional studies in the residue chemistry, ecological effects, and environmental fate disciplines that will be called in on a confirmatory basis. The following data are required: residue analytical methods (ruminant only), magnitude of the residue grass hay and alfalfa seed screenings, magnitude of the residue in meat/milk, storage stability (alfalfa and metabolite C for grass), rotational crops, seed germination/seedling emergence, vegetative vigor, a batch equilibrium study, aquatic sediment dissipation, a prospective groundwater monitoring study and spray drift data.

OPP's Carcinogenicity Peer Review Committee classified the carcinogenic potential of hexazinone as "Group D" on July 27, 1994. The Peer Review Committee concluded that the evidence was inadequate and could not be interpreted as showing either the presence or absence of a carcinogenic effect. However, further testing is not likely to provide any additional clarification. Based on these findings, the Agency cannot conclude that hexazinone has been found to induce cancer within the meaning of the Delaney clause and therefore food

and feed additive regulations are not barred by the Delaney clause of the Federal Food Drug and Cosmetic Act.

On February 11, 1993, the OPP Reference Dose Committee established a Reference Dose (RfD) for hexazinone of 0.05 mg/kg/day based upon a No Observed Effect Level (NOEL) of 5 mg/kg/day from a one-year feeding study in dogs. An Uncertainty Factor (UF) of 100 was used to account for the inter-species extrapolation and intra-species variance. The Anticipated Residue Contribution (ARC) for the general U.S. population was calculated by using anticipated residues. The ARC was determined to be 7% of the RfD. The subgroup most highly exposed, non-nursing infants (< 1 yr) has an ARC from all uses of 40% of the RfD. A Health Advisory (HA) was issued by the Agency's Office of Water in August, 1988. A lifetime HA was set at 0.21 mg/L, or 200 ppb.

Hexazinone meets the Agency's exposure criteria for requiring both handler (mixer/ loader/applicator) and postapplication/reentry data. However, because there are no acute or chronic toxicological endpoints of concern with the exception of acute eye irritation (Toxicity Category I), handler and postapplication/reentry data are not required to support the reregistration of hexazinone. Because hexazinone is in Toxicity Category I for primary eye irritation, a 48 hour Restricted Entry Interval (REI) is required.

Hexazinone exceeds the Levels of Concern (LOCs) for both terrestrial and aquatic plants. The unrefined risk quotients range from 4.6 to 2142.8 depending on the application rate. Hexazinone also exceeds the LOC for small mammals at several of the higher application rates, however, using typical residues as the EEC estimates, the risk quotients range from < 0.1 to 0.6.

Based on laboratory data, hexazinone appears to be persistent and mobile in soil and aquatic environments. Field and forestry dissipation data confirm this. In addition, hexazinone was reported in runoff water (80 to 140 ppb) up to 6 months posttreatment in the forestry dissipation study. Therefore, field and laboratory data are consistent and indicate that hexazinone may be of concern for groundwater and surface water contamination. Groundwater detections have been reported in Hawaii (0.06-0.72 ppb), Florida (0.12-2.90 ppb), Maine (0.2-29 ppb), and North Carolina (0.74-34 ppb); levels well below the Health Advisory (200 ppb).

Hexazinone exceeds the following Levels of Concern (LOCs) for groundwater: groundwater quality, and non-target aquatic and terrestrial plants. Hexazinone exhibits many of the properties and characteristics associated with chemicals that have been detected in ground water. Considering the mode of activation of the chemical; i.e., rainfall within two weeks of an application, there is a strong possibility of movement to ground water, especially in vulnerable areas. For these reasons, hexazinone use is likely to have a significant impact on ground-water quality. In areas where irrigation water is contaminated with hexazinone, or where ground water discharges to surface water, hexazinone residues in ground water could pose a threat to plants.

Following discussions with the technical registrant, duPont, several risk mitigation measures were agreed upon. These measures include a ground water label advisory, Agency notification of **any** domestic hexazinone detections in ground water, submission to the Agency of a report compiled by duPont and the state of Maine regarding ground water contamination, the development and submission of educational materials regarding product stewardship (with an emphasis on groundwater issues) and a lowering of the maximum application rate from 13.5 lb ai/acre to 8 lb ai/acre.

Before reregistering the products containing hexazinone, the Agency is requiring that product specific data, revised Confidential Statements of Formula (CSF) and revised labeling be submitted within eight months of the issuance of this document. These data include product chemistry for each registration and acute toxicity testing. After reviewing these data and any revised labels and finding them acceptable in accordance with Section 3(c)(5) of FIFRA, the Agency will reregister a product. Those products which contain other active ingredients will be eligible for reregistration only when the other active ingredients are determined to be eligible for reregistration.

I. INTRODUCTION

In 1988, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was amended to accelerate the reregistration of products with active ingredients registered prior to November 1, 1984. The amended Act provides a schedule for the reregistration process to be completed in nine years. There are five phases to the reregistration process. The first four phases of the process focus on identification of data requirements to support the reregistration of an active ingredient and the generation and submission of data to fulfill the requirements. The fifth phase is a review by the U.S. Environmental Protection Agency (referred to as "the Agency") of all data submitted to support reregistration.

FIFRA Section 4(g)(2)(A) states that in Phase 5 "the Administrator shall determine whether pesticides containing such active ingredient are eligible for registration" before calling in data on products and either reregistering products or taking "other appropriate regulatory action." Thus, reregistration involves a thorough review of the scientific data base underlying a pesticide's registration. The purpose of the Agency's review is to reassess the potential hazards arising from the currently registered uses of the pesticide; to determine the need for additional data on health and environmental effects; and to determine whether the pesticide meets the "no unreasonable adverse effects" criterion of FIFRA.

This document presents the Agency's decision regarding the reregistration eligibility of the registered uses of hexazinone. The document consists of six sections. Section I is the introduction. Section II describes hexazinone, its uses, data requirements and regulatory history. Section III discusses the human health and environmental assessment based on the data available to the Agency. Section IV presents the reregistration decision for hexazinone. Section V discusses the reregistration requirements for hexazinone. Finally, Section VI is the Appendices which support this Reregistration Eligibility Decision. Additional details concerning the Agency's review of applicable data are available on request.

II. CASE OVERVIEW

A. Chemical Overview

The following active ingredient is covered by this Reregistration Eligibility Document:

- **Common Name:** Hexazinone
- **Chemical Name:** 3-cyclohexyl-6-(dimethylamino)-1-methyl-S-triazine-2,4-(1H,3H)-dione
- **Chemical Family:** Triazine-dione
- **CAS Registry Number:** 51235-04-2
- **OPP Chemical Code:** 107201
- **Empirical Formula:** $C_{12}H_{20}N_4O_2$
- **Trade and Other Names:** Velpar
- **Basic Manufacturer:** DuPont Agricultural Products

B. Use Profile

The following is information on the current registered uses with an overview of use sites and application methods. A detailed table of the uses of hexazinone can be found in Appendix A.

Type of Pesticide: herbicide

Mechanism of Action: 1,3,5-Triazine-2,4-dione contact herbicide, inhibitor of photosynthesis

Use Groups and Sites:

TERRESTRIAL FOOD CROP
Blueberry

TERRESTRIAL FOOD AND FEED CROP
Pineapple, sugarcane

TERRESTRIAL FEED CROP
Agricultural rights-of-way/fencerows/hedgerows, alfalfa, grass forage/fodder/ hay, pastures, rangeland

TERRESTRIAL NON-FOOD CROP
Agricultural fallow/idleland, Christmas tree plantations, industrial areas (outdoor), nonagricultural rights-of-way/fencerows/hedgerows, nonagricultural uncultivated areas/soils, recreational areas

AQUATIC NON-FOOD INDUSTRIAL
Drainage systems

FORESTRY
Conifer release, forest plantings (reforestation programs), forest trees (all or unspecified)

Pests: Alexandergrass, aspen, barnyardgrass, blackgum, blue mustard, bristly foxtail, brown panicum, chickweed, common groundsel, dallisgrass, deerbrush caenothus, dogbane, dogwood, elm, fiddleneck, filaree, fireweed, fleabane, fuzzy crotalaria, goosegrass, Great Plains yucca, green ash, guineagrass, hackberry, hawthorn, heath aster, henbit, hickory, honeysuckle, Jim Hill mustard, jimsonweed, junglerice, juniper, lambsquarters, lantana, London rocket, lotebrush condalia, manzanita, mexicantea, minerslettuce, morningglory, oak, osageorange, Pennsylvania smartweed, perennial bluegrass, periwinkle, persimmon, pigweed, plantain, purslane, radiate fingergrass, ricegrass paspalum, sandbur, sensitive plant, shepherdspurse, showy crotalaria, signalgrass, small broomrape, smartweed, snowbrush caenothus, sour paspalum, sowthistle, spanishneedles, speedwell, swollen fingergrass, tarweed cuphea, Texas millet panicum, Texas whitebrush, vaseygrass, wild carrot, wild mustard, wild parsnip, willow, willowweed, woodsorrel, yellow foxtail, yellow rocket. (Partial control or suppression only: curly dock, dandelion, dogwood, marestail, milkweed, nutsedge, pricklylettuce, quackgrass, redcedar, red maple, ryegrass, sumac, sweetgum, trumpet creeper).

Formulation Types:
Granular--10 to 75%
Pelleted/tableted--10 to 90%
Emulsifiable concentrate--25%
Liquid ready to use--1.25%
Soluble concentrate/solid--90%
Technical Grade Active Ingredient--98.7%

Methods and Rates of Application:

Granular In any season, at pre- or postplant, pre- or posttransplant, or when needed, broadcast by aircraft or ground equipment or granule applicator at 1.25 to 12 lb active ingredient (ai)/acre. In summer or winter, apply spot soil treatment by hand at 0.005 lb ai/1" stem diameter. At pre- or postplant, apply band treatment by ground equipment at 2 lb ai/acre.

Pelleted/tableted In any season or at preharvest, apply spot soil treatment by hand at 0.002 to 0.005 lb ai/1" stem diameter. In summer, winter, or at preharvest, apply soil treatment by hand at 3.8 to 5.8 lb ai/ acre. In any season or when needed, broadcast by hand, aircraft or ground equipment at 2 to 12 lb ai/acre. When needed, apply tree injection treatment by appropriate equipment.

Emulsifiable concentrate In any season, at dormant, delayed dormant, stubble, or seed crop stages, or when needed, spray by sprayer, boom sprayer, ground, or aircraft equipment at 1 to 8 lb ai/acre. In fall, winter, or spring, at pre- or postplant, or posttransplant, apply band treatment by sprayer, boom sprayer, or ground equipment at 2 to 3 lb ai/acre. In any season, in Feb to June, at preharvest, or when needed, apply basal spray by hand held sprayer at 0.002 lb ai/1" stem diameter or 4 to 6 lb ai/acre. In Feb to June, apply bark cut treatment by sprayer. In Feb to June, fall, winter, or spring, at pre- or postplant, or when needed, broadcast by sprayer, boom sprayer, ground or aircraft equipment, or hand held sprayer at 2 to 12 lb ai/acre. In Feb to June, summer, or winter, apply soil treatment (specialized) by hand held sprayer at 6 to 12 lb ai/acre. In Feb to June or summer, treat trees by injection with appropriate equipment at 0.0005 lb/4" interval.

Liquid ready to use In summer, fall, or winter, apply basal spray by hand held sprayer at 0.2 to 0.3 gal ai/1,000 sq ft. In summer, fall, or winter, apply directed spray by sprayer at 6.6 to 8.3 gal ai/ acre. When needed, broadcast by hand held sprayer, sprayer, or boom sprayer at 10 to 12.45 gal ai/acre.

Soluble concentrate/solid At postemergence, layby, or when needed, apply directed spray by sprayer, boom or knapsack sprayer at 0.9 to 13.5 lb ai/acre. In spring, summer, at stubble, pre- or postemergence, dormant, or seed crop stages, or when needed, spray by boom sprayer, aircraft equipment, or sprayer at 0.9 to 5.4 lb ai/acre. In any season, at pre- or postplant, pre- or postemergence, postharvest, stubble, or dormant stages, or when needed, broadcast by boom or hand held sprayer, ground or aircraft equipment at 0.9 to 13.5 lb ai/acre. In fall, winter, or spring, at pre- or postplant, apply band treatment by boom sprayer, sprayer, or ground equipment at 0.9 to 2.7 lb ai/acre. When needed, apply spot treatment by sprayer or knapsack sprayer at

1.8 to 3.6 lb ai/acre. When needed, apply basal spray by hand held or power sprayer at 7.2 lb ai/acre.

Use Limitations:

Do not apply through any type of irrigation system. Do not apply within 30 to 60 days before grazing, harvest, or feeding.

C. Estimated Usage of Pesticide

This section summarizes the best estimates available for the pesticide uses of hexazinone. These estimates are derived from a variety of published and proprietary sources available to the Agency. The data, reported on an aggregate and site (crop) basis, reflect annual fluctuations in use patterns as well as the variability in using data from various information sources.

The table below summarizes the pesticides use by site.

Site[1]	Acres Grown[2] (000)	Acres Treated (000)	Percent Crop Treated	Pounds AI Applied (000)
Alfalfa	25,048	200-450	1-2	100-300
Blueberry	22	2-5	9-23	2-20
Pineapple[3]	29	Unknown	Unknown	Unknown
Rangeland	N/A	80-650	N/A	10-60
Sugarcane	875	< 1- < 1	< 1- < 1	< 1- < 1
Woodland	483,319	20-50	< 1- < 1	10-35
Other	N/A	25-45	N/A	5-15
Total		327-1,200		127-430

1 Site identification based on REFS.
2 1990-1992 average (USDA/NASS).
3 There is no known usage data available for pineapple.

D. Data Requirements

Data requested in the 1988 Registration Standard for hexazinone include studies on product chemistry, residue chemistry, toxicology, ecological effects, and environmental fate. These data were required to support the uses listed in the Registration Standard. Appendix B includes all data requirements identified by the Agency for currently registered uses needed to support reregistration.

E. Regulatory History

Hexazinone is the accepted common name for the chemical 3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5 triazine-2,4(1H,3H)-dione. Hexazinone is a proprietary chemical of E.I. duPont de Nemours and Company, Inc. which is the sole producer and primary registrant of this broad spectrum herbicide. Hexazinone was first registered by the Agency in November 1975 for general weed control in non-cropland areas. Use in the culture of Christmas trees and forest trees was added in 1977. Use patterns for the culture of sugarcane and alfalfa were conditionally registered in 1980 and 1981, respectively.

In February 1982, the Agency issued a Pesticide Registration Standard for hexazinone. At that time the registered food uses were for the culture of sugarcane and alfalfa; and the non-food uses were identified as non-cropland, Christmas tree plantations, and reforestation areas. Formulations of hexazinone products consisted of a 90% soluble powder, a 0.5% liquid, a 25% liquid, a 10% pellet and a 60% dry flowable. Three of the registered pesticide products were marketed under the duPont trademarked name Velpar®.

The Agency's Office of Drinking Water issued a drinking water Health Advisory for hexazinone in August 1988. A Lifetime Health Advisory (HA) was determined to be 0.21 mg/L (200 ppb) for an adult consuming 2 liters of water per day. For a 10 kg child a one- and ten-day health advisory was determined to be 2 mg/L.

A second Registration Standard was issued in September, 1988 (NTIS# PB89-126080). The 1988 Standard summarized available data supporting the registration of products containing hexazinone as the active ingredient and required additional product chemistry, residue chemistry, toxicology, ecological effects, and environmental fate data.

OPP's Carcinogenicity Peer Review Committee classified the carcinogenic potential of hexazinone as "Group D" on July 27, 1994. They recommended for purposes of risk characterization that the Reference Dose (RfD) approach should be used for quantification of human risk. Their determination was made on the basis of a weight-of-evidence analysis with particular emphasis on carcinogenic potential.

There are presently 20 end-use hexazinone products and one technical (manufacturing-use) product registered.

Hexazinone may be used as a non-selective herbicide in non-cropland areas, and it may be used as a selective herbicide for pine release in reforestation practices and in the culture of alfalfa, blueberries, pineapples, rangeland and pastures, and sugarcane. It controls a broad spectrum of annual biennial and perennial weeds, including

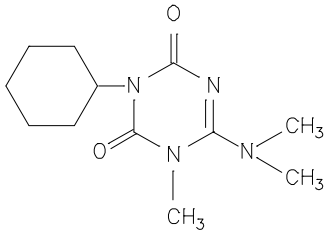
undesirable woody plants. It is used as a harvesting aid in harvesting wood pulp, used in the manufacture of paper.

III. SCIENCE ASSESSMENT

A. Physical Chemistry Assessment

DESCRIPTION OF CHEMICAL

Hexazinone [3-cyclohexyl-6-(dimethylamino)-1-methyl-S-triazine-2,4-(1H,3H)-dione] is a triazine-dione herbicide. The molecular structure of hexazinone is illustrated below:



Other identifying characteristics and codes are:

Empirical Formula:	$C_{12}H_{20}N_4O_2$
Molecular Weight:	252.3
CAS Registry No.:	51235-04-2
Shaughnessy No.:	107201

IDENTIFICATION OF ACTIVE INGREDIENT

Technical hexazinone is a white crystalline solid with a melting point of 113.5 C and a bulk density of 0.61 g/mL. Its solubility in water at 25 C is 2.98 g/100g. Hexazinone solubilities in methanol, acetone, and hexane are 265,79, and 0.3 g/100 g, respectively.

CONCLUSIONS

All pertinent product chemistry data requirements for the hexazinone 98% technical (EPA Reg. No. 352-399) have been satisfied.

B. Human Health Assessment

1. Toxicology Assessment

a. Acute Toxicity

The table below summarizes the results and categories for the acute toxicity studies.

Guideline	Results	Toxicity Category	Citation (MRID)
Acute Oral LD_{50} Rat	1200 mg/kg	III	41235004
Acute Dermal LD_{50} Rabbit	> 5278 mg/kg	IV	00104974
Acute Inhalation LC_{50} Rat	3.94 mg/L	IV	41756701
Primary Eye Irritation Rabbit	Severe	I	00106003
Dermal Irritation Rabbit	Mild	IV	00106004
Dermal Sensitization Guinea Pig	Not a sensitizer	N/A[1]	41235005

[1] N/A = Not Applicable
* Note: Data pertaining to acute eye irritation, dermal irritation, and dermal sensitization are not required to support the reregistration of the TGAI. These data are presented for informational purposes.

b. Subchronic Toxicity

90-Day Feeding in Rats: Sprague-Dawley rats were fed diets containing 0, 200, 1000 or 5000 ppm of technical grade hexazinone for three months. The only treatment-related effect was a decrease in body weight gain of males (7%) and females (15%), when compared with the controls, in the 5000 ppm group. Other parameters examined (mortality, toxic signs, food consumption, clinical pathology, organ weights and histopathology) were not affected. Based on these findings, the systemic NOEL for both sexes was 1000 ppm (50 mg/kg) and the systemic LOEL was 5000 ppm (250 mg/kg)(MRID 00104977).

90-Day Feeding in Dogs: Beagle dogs were fed diets containing 0, 200, 1000 or 5000 ppm of technical grade hexazinone for three months. At the 5000 ppm level, body weight gains and albumin/ globulin values were decreased, and alkaline phosphatase activity and absolute and relative liver weights were increased, each in both sexes. There were no compound-related histological effects. Based on these findings, the systemic NOEL for both sexes was 1000 ppm (25 mg/kg) and the systemic LOEL was 5000 ppm (125 mg/kg)(MRID 001114484).

21-Day Dermal Toxicity in Rabbits: Technical hexazinone was applied to the intact skin of New Zealand white rabbits, using 5 rabbits/sex/dose. The levels of hexazinone tested were 0, 50, 400 or 1000 mg/kg/day. The rabbits were exposed for 6 hours/day, for 21 days. The NOEL for both sexes was $\geq$ 1000 mg/kg/day (HDT)(MRID 41309005).

c. Chronic toxicity

Chronic Feeding/Carcinogenicity in Rats: Male and female Sprague-Dawley rats were fed diets containing 0, 200, 1000 or 2500 ppm of hexazinone for two years. Nothing remarkable was observed in the low-dose group. In the mid-dose group, females had a slight decrease (about 5%) in body weight gain and food efficiency, compared with the controls. The following treatment-related effects were reported for the high-dose group: decreased body weight gains of males and females; decreased food consumption of males and food efficiency of females; increased white blood cells and eosinophil in males; alkaline urine in males and females; decreased absolute and relative weights of liver, heart and kidneys in males; and increased relative weights of brain, kidneys and stomach in females. Based on these findings, the systemic NOEL for both sexes was 200 ppm (10 mg/kg/day) and the systemic LOEL was 1000 ppm (50 mg/kg/day)(MRID 00108638).

Chronic Feeding in Dogs: Beagle dogs were fed diets containing 0, 200, 1500 or 6000 ppm of hexazinone for 12 months. Nothing remarkable was observed in the low-dose group, in both sexes. In the mid-dose group, the following findings were observed in males: increased serum alkaline phosphatase and globulin, decreased albumin, increased incidence of hepatocellular vacuolation and thinness (in one dog). The only findings reported for the mid-dose females were pale kidneys (in one dog) and an increased incidence of cytoplasmic inclusions and pigmented Kupffer cells in the liver. In the high-dose group, the following effects were observed in both sexes: decreased body weight gain and food consumption; decreased serum albumin, calcium, cholesterol, glucose and inorganic phosphorus; increased blood urea nitrogen (BUN), globulin, mean corpuscular volume (MCV) and mean corpuscular hemoglobin concentration (MCHC); and increased serum aspartate amino transferase (AST or SGOT), alanine amino transferase (ALT or SGPT) and alkaline phosphatase activities. Red blood cells, hematocrit and hemoglobin were decreased only in the males, total protein was decreased only in the females, whereas creatinine was increased only in the females. Also, relative liver weight (liver weight/body weight ratio) was increased in the males (57.1%) and the females (62.5%). Non-neoplastic liver histopathology was present in

both sexes at the high-dose. Based on the above findings, the systemic NOEL for both sexes was 200 ppm (5 mg/kg/day) and the systemic LOEL was 1500 ppm (37.5 mg/kg/day) (MRID 42162301).

d. Carcinogenicity

Chronic Feeding/Carcinogenicity in Rats: Sprague-Dawley rats were fed diets containing 0, 200, 1000 or 2500 ppm of hexazinone for two years. Hexazinone was not carcinogenic in this study (MRID 00108638).

Carcinogenicity in Mice: CD-1 mice were fed diets containing 0, 200, 2500 or 10000 ppm of hexazinone for two years. The average consumption of hexazinone in mg/kg/day was 28, 366 or 1635, respectively, for males and 34, 450 or 1915, respectively, for females. Nothing remarkable was observed in the low dose-group. In the mid-dose group, body weight gains were decreased in both sexes and there was an increased incidence of liver hypertrophy and hepatocellular adenomas and carcinomas in the males, when the treated mice were compared with the concurrent controls. Relative to the control values, the following findings were reported for the high-dose group: decreased body weight gains in both sexes; increased mean absolute liver weight in males; increased mean relative weight (liver weight/body weight ratio) in males and females; increased incidence of hepatocellular hypertrophy in males and females; increased incidence of hepatic focal necrosis and hyperplastic nodules in males; increased incidence of hepatocellular adenomas and adenomas plus carcinomas in both sexes (when compared with concurrent and historical controls). Based on the above findings, the systemic NOEL was 200 ppm (28 mg/kg/day for males and 34 mg/kg/day for females) and the systemic LOEL was 2500 ppm (1635 mg/kg/day for males and 1915 mg/kg/day for females). Also, hexazinone appeared to be carcinogenic in this study (MRID 00079203, 41359301 and 42509301).

Peer Review: The carcinogenic potential of hexazinone was evaluated by OPP's Carcinogenicity Peer Review Committee (CPRC) on July 27, 1994. The Committee concluded that hexazinone should be classified as a Group D chemical. It was also recommended that, for the purpose of Risk Characterization, the Reference Dose (RfD) approach should be used for quantification of human risk.

The CPRC decision to re-categorize hexazinone as Group D was based on the registrant's submission of a reevaluation of mouse liver sections (based on the latest diagnostic criteria for mouse liver

neoplasms). Based on these new data, there was only a statistically significant increasing trend in combined adenoma/carcinoma in female CD-1 mice. It was noted though, that combined adenoma/carcinoma hepatocellular tumors in female CD-1 mice occur at a low rate (< 5% in historical controls, and the incidence in these concurrent controls was only 1-2%) whereas the incidence for combined liver tumors at the HDT was 9%.

Overall, it was felt that the animal evidence was equivocal (not entirely negative, but yet not convincing) based on the new readings. Based on these data, the only statistically significant increase was in the female mice (by trend test, but not by pairwise comparison with controls). Additional testing would not provide any clarification, therefore hexazinone was re-categorized as a Group D; not classifiable as to human carcinogenicity.

e. Developmental Toxicity

Developmental Toxicity in Rats: Mated Sprague-Dawley rats were administered single oral daily doses of hexazinone by gavage during gestation days 7 through 16. The following dose levels were tested: 0, 40, 100, 400 and 900 mg/kg/day. Treatment-related effects, observed only in dams from the 400 mg/kg/day and 900 mg/kg/day groups, included alopecia, and stained chin and nose; decreased body weight gain and food consumption during and after dosing, until the termination of the study; and increased relative liver weight (liver weight/body weight ratio). Treatment-related developmental effects, observed only in the 400 mg/kg/day and 900 mg/kg/day groups, included decreased fetal body weights; and increased incidence of fetuses with no kidney papilla and with unossified sternebrae. Maternal and developmental toxic effects observed in the 900 mg/kg/day group were, in most instances, statistically significant (p # 0.05) when compared with those observed in the control group. Maternal and developmental toxic effects observed in the 400 mg/kg/day group were minimal and only occasionally statistically significant (p #0.05) when compared with those noted in the controls. Based on the above findings, maternal NOEL and LOEL were 100 mg/kg/day and 400 mg/kg/day, respectively. The developmental NOEL and LOEL were also 100 mg/kg/day and 400 mg/kg/day, respectively (MRID 40397501).

Developmental Toxicity in Rabbits: Pregnant New Zealand white rabbits were administered single oral daily doses of hexazinone by gavage during gestation days 6 through 19. The following dose levels were used: 0, 20, 50 and 125 mg/kg/day. Treatment-related maternal

toxic effects were observed only in the high-dose group and included increased incidence of depression and discharge from the eyes; decreased body weight gain; and increased resorptions. Treatment-related developmental effects were observed also only in the high-dose group and included decreased fetal body weight gain and delayed ossification of extremities. Based on these findings, the NOEL and LOEL for maternal toxicity were 50 mg/kg/day and 125 mg/kg/day, respectively. The NOEL and LOEL for developmental toxicity were also 50 mg/kg/day and 125 mg/kg/day, respectively (MRID 00028863).

f. Reproductive Toxicity

2-Generation Reproduction Rat: In the one study available, male and female Sprague-Dawley rats were administered hexazinone continuously in the diet for two successive generations at the following dose levels: 0, 200, 2000 or 5000 ppm. Treatment-related effects were observed only in the mid-dose and high-dose groups and included decreased body weight gain in P1 and F1 females during growth and gestation; decreased food consumption in F1 females during gestation; decreased pup weight in F1, $F2_a$ and $F2_b$ litters; and decreased pup survival in $F2_b$ litters (only in the high-dose group). Based on these findings, the systemic NOEL and LOEL were 200 ppm (10 mg/kg/day) and 2000 ppm (100 mg/kg/day), respectively. The NOEL and LOEL for reproductive toxicity were also 200 ppm and 2000 ppm, respectively (MRID 42066501).

g. Mutagenicity

Hexazinone was found to be positive for mutagenicity in one chromosome aberration assay (in vitro cytogenetic assay), but was negative in the remaining studies.

Gene Mutation Assay in Ames Test: Hexazinone was tested with metabolic activation (rat liver microsomal fraction commonly known as S-9 fraction, plus cofactors) at concentrations ranging from 400 to 2000 ug/plate and without metabolic activation at concentrations ranging from 200 to 1000 ug/plate. The strains of Salmonella typhimurium used were TA1535, TA1537, TA1538, TA98 and TA100. No increases in reverse mutations were observed at any concentration. Positive results were obtained with standard reference mutagens (positive controls)(MRID 00098982).

Gene Mutation Assay in Mammalian Cells: Hexazinone was tested in the Chinese hamster ovary (CHO) cells/hypoxanthine - guanine -

phosphoribosyl transferase (HGPRT) assay, with and without metabolic activation. No mutagenic response was observed up to cytotoxic doses (13.9 mM without metabolic activation and 9.9 mM with metabolic activation (MRID 00076956).

Structural Chromosome Aberration Assay; In vitro Cytogenetic Assay: The mutagenic potential of hexazinone was evaluated in vitro, using Chinese hamster ovary (CHO) cell system with and without metabolic activation. The concentrations of hexazinone tested (which were not toxic to cells) ranged from 1.58 to 19.82 mM, without metabolic activation and from 0.32 to 15.85 mM, with metabolic activation. Hexazinone was mutagenic in this study. Relative to the control (solvent) values, there was a significant ($p < 0.01$) increase in structural chromosomal aberrations/cell at hexazinone concentrations of 15.85 mM (and above), without and with metabolic activation (MRID 00130709).

Structural Chromosome Aberration Assay; In vivo Cytogenetic Assay: Single doses of hexazinone (0, 100, 300 or 1000 mg/kg) were administered by oral gavage to mature male and female Sprague-Dawley rats, and their bone marrow cells were examined for clastogenic (chromosome-damaging) effect. Relative to the control (solvent) values, no significant increase of chromosomal aberrations was observed in any of the treated groups. However, a highly significant number of chromosomal aberrations was observed in the bone marrow cells of rats treated with cyclophosphamide, a standard reference mutagen (MRID 00131355).

Other Genotoxic Effects Assay; Unscheduled DNA Synthesis in Rat Hepatocytes: Primary hepatocytes, obtained from the livers of 8-week old male Sprague-Dawley rats, were exposed to eight hexazinone concentrations ranging from $1x10^{-5}$ mM to 30 mM. Hexazinone did not elicit unscheduled DNA synthesis at any level of concentrations tested. Positive results were obtained with 7,12-Dimethylbenz(a) anthracene - DMBA, a standard reference compound (positive control)(MRID 00130708).

h. Metabolism

General Metabolism: In the one study available, three groups of male and female Sprague Dawley rats were treated as follows: (1) Group A received a single intragastric low dose of ^{14}C-hexazinone (14 mg/kg) without preconditioning (treatment with non-radioactive hexazinone); (2) Group B received a single intragastric dose of ^{14}C-hexazinone (14 mg/kg) after three weeks of preconditioning with 100 ppm of non-

radioactive hexazinone in the diet; and (3) Group C received a single intragastric high-dose of ^{14}C-hexazinone (1000 mg/kg) without preconditioning.

Hexazinone was rapidly metabolized by hydroxylation and demethylation, and eliminated by the rats in urine and feces during the 3 to 6-day testing periods. About 77% and 20% (of the administered dose) of ^{14}C-hexazinone was excreted in urine and feces, respectively. Practically all radioactivity was recovered in the first 24 hours after treatment. Very low levels of radioactivity (about 0.2% of the administered dose) were detected in the G.I. tract, hide, organs (heart, lungs, liver, spleen, kidneys, brain, and testes or ovaries), muscle, fat and blood. Eight metabolites were identified in urine and feces. The major metabolites in both urine and feces were (1) 3-(4-hydroxy-cyclohexyl)-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione and (2) 3-(4-hydroxycyclohexyl)-6-(methylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione (MRID 00247874).

i. Other Toxic Endpoints

Dermal Penetration/Absorption: This study is not required. Based upon a comparison of the results of a Developmental Toxicology Study in rabbits (MRID 00028863, Developmental NOEL = 50 mg/kg/day) and a 21-Day Dermal Toxicity Study in Rabbits (MRID 41309005, NOEL = 1000 mg/kg/day), little or no absorption of hexazinone through the skin is anticipated.

Domestic Animal Safety: Data are not required for the use patterns of hexazinone (a selective herbicide used to control grasses, broadleaf weeds, and woody plants).

j. Reference Dose (RfD)

OPP's RfD Committee recommended that an RfD should be established based upon a NOEL of 5 mg/kg/day for changes in clinical chemistry and histopathological parameters observed at 37.57 mg/kg/day in males and females in the one-year feeding study in dogs (MRID 42162301). An Uncertainty Factor (UF) of 100 was used to account for the inter-species extrapolation and intra-species variance. On this basis, the RFD was calculated to be 0.05 mg/kg/day. Based on available information, there does not appear to be any reference to an evaluation of hexazinone by JMPR/International Programme on Chemical Safety (IPCS).

2. Exposure Assessment

a. Dietary Exposure

Confined Rotational Crops: A study was submitted, reviewed, and found supplemental; additional data were required on onions, and new studies were required on sorghum (small grain) and a leafy vegetable crop.

The supplemental onion data have been submitted, reviewed, and the root crop portion of the confined rotational crop requirement is considered satisfied. A rotational restriction of 12 months for root crops is required and no tolerances are needed for root crops rotated into fields 12 months after treatment with hexazinone. If the registrant desires plant back intervals of less than 12 months, appropriate tolerances for root crops may need to be established. Depending on the results of the confined rotational crop studies in sorghum and leafy vegetables, additional data may be needed to fulfill §165-2, Field Rotational Crop Studies. The sorghum and leafy vegetable data are due to the Agency by 5/31/95 (MRID 41008401, 42824001).

Plant Metabolism: The initial Hexazinone Registration Standard dated 2/82 concluded that the qualitative nature of the residue in plants is adequately understood. Studies conducted on sugarcane, alfalfa, and pineapple indicate that root uptake is the principal mechanism for the absorption of hexazinone by plants from soils. Hexazinone is translocated through the xylem to the foliage where it blocks the photosynthetic process. The data indicate that hexazinone is metabolized by hydroxylation to metabolite A which is then metabolized to metabolite C by demethylation and to metabolite E after oxidation. Residues of concern are hexazinone and its metabolites A [3-(4-hydroxycyclohexyl)-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4-(1H,3H)-dione)], B [3-cyclohexyl-6-(methylamino)-1-methyl-1,3,5-triazine-2,4-(1H,3H)-dione], C [3-(4-hydroxycyclohexyl)-6-(methylamino)-1-methyl-1,3,5-triazine-2,4-(1H,3H)-dione], D [3-cyclohexyl-1-methyl-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione], and E [3-(4-hydroxycyclohexyl)-1-methyl-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione] (MRID 00078047, 00104846, 00126127).

Animal Metabolism: The nature of the residue of hexazinone in livestock commodities is adequately understood. Metabolites of concern are those containing the triazine ring. Hexazinone and metabolites A, B, C, D, E, and F [3-cyclohexyl-6-amino-1-methyl-1,3,5-triazine-2,4-

(1H,3H)-dione] will be regulated. Recovery data are needed for metabolite F.

In poultry, the maximum residue expected in poultry tissues would be 0.005 ppm, an order of magnitude below the limit of detection for hexazinone metabolites. The Agency concludes that tolerances for hexazinone in poultry commodities are not required and the existing tolerances for these commodities should be revoked. Additional raw data are required to support the goat metabolism study (MRID 41524801, 42187901, 42219301, 42248901, 42690601, 43074201).

Residue Analytical Methods - Plants: An adequate method for purposes of data collection and enforcement of tolerances for hexazinone residues and metabolites A, B, C, D, and E in or on plant commodities is available. The GLC/nitrogen-detection method for determining trifluoroacetic anhydride-derivatized residues of hexazinone is described in PAM, Vol. II, as Method I. The combined limit of quantitation for hexazinone residues by the method in PAM, Vol. II, is 0.55 ppm (41572101, 41572102, 41572103, 41572104, 41572105, 41572106, 42987201, 43025401).

Residue Analytical Methods - Animals: There are no existing tolerance enforcement methods available for ruminant commodities in PAM, Vol. II. The registrant has proposed to develop methods to detect marker compounds in ruminants using six markers. Data collection and tolerance enforcement methodology for ruminant commodities must be capable of determining hexazinone residues of concern. Because the chemical structures of metabolite F and B are similar, it may also be possible to adapt the method for determining plant metabolites to determine ruminant metabolites.

Storage Stability: The available storage stability data indicate that residues of hexazinone and its metabolites A, B, C, D, and E are stable under frozen (-10 to -20 EC) storage conditions in blueberries for up to 13 months, in pineapple fruit for up to 8 months, in pineapple juice for up to 6 months, in sugarcane for up to 12 months, and in sugarcane processed commodities for up to 6 months. Additional data are required on storage stability of metabolites A, C, and E in pineapple bran. Hexazinone and metabolites A, B, D, and E are stable under frozen storage conditions in grass for up to 24 months; additional data are required on storage stability of metabolite C in grass matrices for 34 months. A 2-year interim report is due by 1/31/95 and the final study is

due by 1/31/96. The requirement for storage stability data on alfalfa remains outstanding; these data are due to the Agency by 4/30/96 (MRID 42867501, 42535601, 42492101, 42423001, 42276001, 42867501).

Magnitude of the Residue in Meat, Milk, Poultry, and Eggs: A cattle feeding study is still required. The most recent metabolism studies indicated a very significant transfer of residues to meat and milk. The existing tolerances for meat/meat byproducts and milk do not reflect the current metabolic profile and the current tolerance levels cannot be reassessed until the cattle feeding study is completed. The existing tolerances are protective until the new data are evaluated. This study is due to the Agency by 5/30/95.

Poultry feeding studies are not required because the maximum residue expected in poultry tissues would be 0.005 ppm, an order of magnitude below the limit of detection for hexazinone metabolites.

Magnitude of the Residue in Plants: Data have been submitted on magnitude of the residue in plants for all registered crops. Additional information or data are required on alfalfa seed and seed screenings, grass hay and processed commodities of pineapple. Certain label changes were required for alfalfa, blueberries, pineapple, pineapple forage, and sugarcane. These uses are only on duPont labels and all have been or are being amended. Data show that hexazinone concentrates in certain processed fractions of alfalfa, pineapple, and sugarcane. The Agency has determined that establishing food and feed additive tolerances for these commodities is appropriate and consistent with the Delaney Clause of Section 409 of the Federal Food, Drug, and Cosmetic Act (FFDCA) (MRID 43074401, 43074402, 41964101, 41964102, 41898301, 42418001, 42419101, 42867501, 42492101, 42535601, 42322701, 42417901, 42276001, 43074401, 43074402).

b. Occupational and Residential Exposure

Postapplication/reentry data and handler (mixer/loader/ applicator) data are required when both toxicity and exposure criteria are met. Hexazinone is a selective herbicide used to control undesirable herbaceous plants in forage grasses, sugarcane, and alfalfa. Hexazinone is also used to control herbaceous and woody plants in Christmas tree plantations and non-crop areas, and to control undesirable plant species in forestry site preparation and conifer release programs.

Agricultural crops are treated using groundboom equipment, aircraft, and wiper/wick applicators. Label directions also include directions for impregnating dry bulk fertilizer with hexazinone. Undesirable small trees growing in rangeland and pasture sites are treated using exact delivery handgun applicators.

Non-crop areas such as highway right-of-ways, petroleum tank farms, ditch banks, industrial plant sites, and railroads are treated using handgun or fixed boom sprayers for liquid formulations. A pelleted formulation provides for treating undesirable species by placing one or two pellets next to the tree or shrub to be controlled.

Forestry applications include the use of aircraft, groundboom equipment, handguns, and the use of back-pack equipment modified for granular applications. Undesirable trees may also be treated by injection using hypo-hatchet type equipment primarily along ditch banks or in areas with high water tables.

Hexazinone is not intended for use in residential areas.

Uses Within the Scope of the Worker Protection Standard (WPS)

The 1992 Worker Protection Standard for Agricultural Pesticides (WPS) established certain worker-protection requirements (personal protective equipment, restricted entry intervals, etc.) to be specified on the label of all products that contain uses within the scope of the WPS. Uses within the scope of the WPS include all commercial (non-homeowner) and research uses on farms, forests. nurseries, and greenhouses to produce agricultural plants (including food, feed, and fiber plants, trees, turf grass, flowers, shrubs, ornamentals, and seedlings). Uses within scope include not only uses on plants, but also uses on the soil or planting medium the plants are (or will be) grown in.

At this time some of the registered uses of hexazinone are within the scope of the WPS and some uses are outside the scope of the WPS. Those that are outside the scope of the WPS include use:

- on pastures or rangelands;
- on plants grown for other than commercial or research purposes;
- on plants that are in ornamental gardens, parks, golf courses, and public or private lawns and grounds and that are intended only for decorative or environmental benefit. (However, pesticides used on sod farms ARE covered by the WPS);

- in a manner not directly related to the production of agricultural plants, including, for example, control of vegetation along rights-of-way and in other non-crop areas.

Toxicity Information

Acute Toxicity: The toxicological data base for hexazinone is adequate and will support reregistration. Acute toxicity studies indicate that technical hexazinone is category III for acute oral toxicity, category IV for acute dermal toxicity, category IV for acute inhalation toxicity, category IV for skin irritation potential, and category I for eye irritation potential. It is not classified as a skin sensitizer.

Other Adverse Effects: For occupational/residential exposure, there are no toxicological end-points of concern for hexazinone. The Agency notes that it is classified as Group D for carcinogenic potential with a reference dose of 0.05 mg/kg/day and is poorly absorbed through the skin with little or no absorption anticipated. Since both the handler and post-application exposure concerns are predominantly related to skin contact, the toxicity criteria for either occupational or residential exposure assessments are not triggered.

3. Risk Assessment

a. Dietary

Toxicological Endpoint: The DRES chronic analysis used a Reference Dose (RfD) of 0.05 mg/kg body weight/day, based on a No Observable Effect Level (NOEL) of 5.0 mg/kg bwt/day and an uncertainty factor of 100. The NOEL was based on a one year feeding study in dogs (MRID 42162301) which demonstrated liver effects in both males and females at 38 mg/kg bwt/day (OPP RfD Peer Review Committee on February 11, 1993). Hexazinone was classified as a Group D chemical by the OPP Carcinogenicity Peer Review Committee on July 27, 1994.

Residue Information: Food uses in this analysis include all published tolerances listed in the Tolerance Index System (TIS) and 40 CFR §180.396. All published tolerances are being supported in the reregistration of hexazinone. New values for anticipated residues (ARs) have been prepared by the Chemistry Branch-Reregistration Support (CBRS). Tolerances exist for animal feed commodities which result in secondary residues in meat of cattle, goats, horse, poultry, hogs and sheep as well as milk and eggs (the database from which the ARs were calculated is incomplete and a reassessment of the ARs may be necessary

in the future). The anticipated residues for blueberries, milk, and sugarcane (DRES commodities cane sugar and sugar-molasses) are higher than the tolerance residues in this analysis. According to the Agency these anticipated residues (except milk) were determined as one-half the combined limit of quantitation of the residues regulated.

Results: The DRES chronic analysis used tolerance level residues and 100 percent crop treated information to estimate the Theoretical Maximum Residue Contribution (TMRC) for the overall U.S. population and 22 DRES subgroups. Anticipated residues were used for further refinement to calculate the Anticipated Residue Contribution (ARC) for those same population groups. The ARC for the overall U.S. population from all tolerances is 3.5×10^{-3} mg/kg bwt/day or 7% of the RfD. The subgroup most highly exposed, non-nursing infants (< 1 yr) has an ARC from all uses of 2.0×10^{-2} mg/kg bwt/day, representing 40% of the RfD. The children (1-6 yrs) subgroup has an ARC from all tolerances of 1.0×10^{-2} mg/kg bwt/day, or 20% of the RfD. There are no pending or new tolerances being proposed for the reregistration of hexazinone. Anticipated residues were used for all commodities. However, a source of overestimation exists in that 100 percent crop treated was assumed for all commodities. The dietary risk from hexazinone through the published tolerances appears to be minimal. However, residue chemistry data gaps for hexazinone remain and data submitted in the future could alter estimated dietary exposure to hexazinone residues.

b. Occupational and Residential

Agency review of the complete toxicological data submitted to support reregistration indicates that for hexazinone the toxicology criteria for a post-application exposure assessment are not met. Therefore, no occupational exposure assessment is required. Hexazinone is not used in residential areas.

No changes in the personal protective equipment required by the WPS are being imposed in this document. However, the REI is being changed from 24 to 48 hours because hexazinone is in toxicity category I for primary eye irritation.

4. Data Requirements

The following data required for the reregistration of hexazinone are considered confirmatory:

Residue Chemistry:

- 171-4d Residue Analytical Method Ruminant
- 171-4e Storage Stability (Alfalfa, Metabolite C for Grass)
- 171-4j Magnitude of the Residue in Meat/Milk
- 171-4k Magnitude of the Residue in Grass Hay and Alfalfa Seed Screenings

C. Environmental Assessment

1. Environmental Fate

a. Environmental Chemistry, Fate and Transport Data

Hydrolysis: Hexazinone will not hydrolyze under normal environmental conditions. Hexazinone was reported to be stable in pH 5, 7, and 9 buffer solutions when incubated in the dark at 25 C. Unchanged hexazinone comprised from 99 - 100% of total radioactivity recovered in all samples (MRIDs 00064620, 41587301).

Photodegradation in Water: No photodegradation half-life in water for hexazinone was reported. Hexazinone did not appear to degrade significantly in buffered pH 7 solution when exposed to an artificial light source. Hexazinone accounted for 86.6 to 96.0% of applied radioactivity over the 30 day testing period. Dark controls were reported to have similar results with hexazinone accounting for 91.3 to 97.2% of applied radioactivity over the 30-day testing period. Analytical methods were not sufficient to characterize the remaining 2.6 to 9.9% of applied radioactivity (MRID 41300801).

Photodegradation on soil: Hexazinone had a reported half-life of 82 days, which is equivalent to a half-life of approximately 228 days at latitude 30° to 50° N with 12 hours of natural sunlight, when applied to sandy loam soil and exposed to an intermittent (xenon arc lamp) light source for 30 days. However, hexazinone did not appear to degrade significantly in dark control samples. At least 6 degradates were discernible, with only one product, 3-cyclohexyl-6-(methylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione, accounting for at least 10% applied radioactivity. Of the degradation products, $^{14}CO_2$ accounted for

only 0.2% of the total applied radioactivity. The remaining minor degradation products, none of which comprised more than 2.6% of the total applied radioactivity, did not appear to correspond to any of the other reference compounds (MRID 41300802).

Aerobic soil metabolism: Hexazinone had reported half-lives of 216 days and 1440 days when applied to non-sterile and sterile sandy loam soil and exposed to aerobic conditions in the dark at 25EC, respectively. The non-sterile and sterile soil data indicated that degradation was mainly a result of microbiological activity. There were 4 metabolites formed in non-sterile soil. The major degradation products were 3-hydroxy-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,-3H)-dione, accounting for at least 18.7% (2.24 ppm) of applied radio-activity after 365 days posttreatment and 3-(ketocyclohexyl)-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione, accounting for at least 10.9% (1.31 ppm) of applied radioactivity after 365 days posttreatment. Two minor metabolites, Metabolite B and Metabolite D, reached a maximum concentration of 2.3% (0.28 ppm) and 4.8% (0.58 ppm), respectively, of the applied radioactivity (MRID 41807401, 42635001).

Anaerobic aquatic metabolism: Hexazinone had reported half-lives of 230 days and > 1500 days when applied to non-sterile and sterile sediment pond water, respectively, and exposed to anaerobic conditions in the dark at 25EC. The non-sterile and sterile soil data indicated that degradation was mainly a result of microbiological activity. There were 4 metabolites formed in non-sterile soil. The major degradation products were 3-hydroxyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-tri-azine-2,4(1H,3H)-dione, accounting for approximately 5.5% (0.66 ppm) of applied radioactivity after 365 days posttreatment and 3-(ketocyclohexyl)-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione, accounting for approximately 25.0% (3.00 ppm) of applied radioactivity after 365 days posttreatment. Another metabolite, 3-cyclohexyl-1-methyl-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione, accounted for at least 24.0% (2.88 ppm) of the applied radioactivity (MRID 41807402, 42657301).

Aerobic aquatic metabolism: Hexazinone had a reported half-life of > 2 months under both sterile and non-sterile conditions incubated at 25EC. Three major metabolites and one minor metabolite were identified. The major metabolites [3-(4-ketocyclohexyl)-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione; 3-(2-hydroxycyclohexyl)-6-(dimethyl-amino-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione; 3-(cyclohexyl-6-(methylamino)-1-methyl-1,3,5- triazine-2,4(1H,3H)-dione] were present

each at concentrations less than 7% of the applied radioactivity. One minor metabolite, 3-(cyclohexyl-1-methyl-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione, reached a maximum concentration of 1.3% of applied radioactivity. The reported data indicated there were no significant differences in the sterile and non-sterile data. This lack of significant differences could be related to the duration of the test period (56 days). The aerobic soil metabolism study which was carried out for 1 year had reported half-lives of 216 days and 1440 days when applied to non-sterile and sterile soils, respectively (MRID 41811801).

Leaching/Adsorption/Desorption: Based on batch equilibrium, radioactive hexazinone weakly adsorbs on Hanford sandy loam and Cecil sandy loam soils (Ka = 0.24 - 0.45). However, it appeared to weakly adsorb on Flanagan silt loam soil (Ka = 1.03) and strongly adsorb on Madera loam soil (Ka = 10.8). Adsorbed radioactivity was relatively easily desorbed from these soils (1/nD = 0.36 to 0.72). Furthermore, based on supplemental soil thin layer chromatography data, the soil mobility of hexazinone (Rf = 0.05 to 0.60) and its major soil degradates (Rf = 0.02 to 0.73), ranged from immobile (EPA Class 1) to mobile (EPA Class 4). In general, the relative mobility of hexazinone degradates appeared to be similar or identical to that of the parent material. The batch equilibrium study is scientifically valid and is acceptable to partially fulfill the data requirement. Aged mobility data (preferably batch equilibrium) for hexazinone metabolites are required. These data are due by 4/1/95 (MRIDs 00646262, 41528101).

Field dissipation: Hexazinone had dissipation half-lives of 123 to 154 days in bare ground silt loam soil in Newark, DE and bare ground silty clay loam soil in Greenville, MS. Metabolites A, A-1, B, C, and 1 were identified in soils at maximum concentrations of 0.04, 0.21, 0.31, 1.23, and 0.71 ppm, respectively. The reported data indicate that hexazinone did not move below the top 30 cm of soil (> 95% confined to the upper 30 cm of soil) at the Newark, DE site. However, hexazinone did move to a depth of 60-75 cm at the Greenville, MS site. In addition, hexazinone metabolites (listed above) leached to a depth of 75 cm in soil during the testing period.

Two of the bare soil field dissipation studies (MRID 42377901) are scientifically valid and provide acceptable data to fulfill the field dissipation data requirement. However, the bare soil field dissipation study done in California (MRID 42379201) is of uncertain value. Although the study was conducted on bare soil, < 30% recovery of the theoretical application rate was detected in the Day 0 posttreatment sample. This recovery is inadequate to confirm the validity of the study.

However, no further field dissipation data for hexazinone are needed at this time (MRID 42377901).

Forestry dissipation: Hexazinone dissipated with reported half-lives of 26 to 59 days and 19 to 36 days in plants for the ULW end-product site and the Velpar L end-product site, respectively. Similar half-lives of 55 to 77 days were reported for litter and soil (except litter covered soil) for the two sites. For litter covered soil, a half-life of 265 days was reported by the author. By day 365 posttreatment, hexazinone was discernible only in sediment samples. In addition, metabolites A, B, C, D, E, G, and H were discernible in various matrices (soil, water, litter and/or vegetation) samples. However, metabolite G was not confirmed by mass spectrometry. Hexazinone moved off-site through leaching and runoff. Hexazinone (0.01 to 0.04 ppm) was observed in soil at depths > 30 cm. In addition, hexazinone was detected (80 to 140 ppb) in runoff water up to 6 months post-application (MRIDs 00072664, 42336401).

b. Environmental Fate Assessment

Based on laboratory data, hexazinone appears to be persistent and mobile in soil and aquatic environments. Field and forestry dissipation data confirm this. In addition, hexazinone was reported in runoff water (80 to 140 ppb) up to 6 months posttreatment in the forestry dissipation study. Therefore, field and laboratory data are consistent and indicate that hexazinone may be of concern for groundwater and surface water contamination. Groundwater contamination has been reported in Hawaii (0.06-0.72 ppb), Florida (0.12-2.90 ppb), Maine (0.2-29 ppb), and North Carolina (0.74-34 ppb). Hexazinone can contaminate surface waters by spray drift at application and probably for several months post-application via runoff (primarily by dissolution in runoff water). It may be persistent in some receiving surface waters (particularly those with low microbiological activities and long hydrological resident times). Based upon its low soil/water partitioning, it will probably exist primarily dissolved in the water column. Based on the octanol/water coefficient (15), hexazinone is not expected to accumulate in fish. However, supplemental confined rotational crop data indicated that hexazinone does accumulate in crops grown on treated soil. Even though additional data are needed on the mobility of degradates, the data reviewed suggests that the degradates are also persistent and mobile.

2. Ecological Effects

a. Ecological Effects Data

(1) Terrestrial Data

Acute Avian Oral Toxicity: Study results indicate that hexazinone is practically non-toxic to birds on an acute oral basis. Using 98% pure test material resulted in an LD_{50} of 2251 mg/kg (MRID 00073988).

Avian Subacute Dietary Toxicity: The results summarized in the table below indicate that on a subacute dietary basis, hexazinone is practically non-toxic to birds (MRIDs 00104981, 00072663, 00107878).

Test Species	Test Material	LC_{50}	Citation (MRID)
Mallard	97.5%	> 5,000 ppm	00104981
Bobwhite	99%	> 5,000 ppm[1]	00072663
Bobwhite	97.5%	> 5,000 ppm	00107878

[1] An LC50 of 11,346 ppm was calculated based on 3 out of 10 mortalities in the highest dose tested, which was 5000 ppm.

Avian Reproduction: Two avian reproduction studies conducted show that the No Observed Effect Concentration (NOEC) for the bobwhite quail is < 100 and for the mallard duck is > 1000 ppm. The NOEC for the bobwhite quail was based on effects to the 14 day survivors weight at 100 ppm. No effects were seen at the other doses. The mallard duck study showed no statistically significant effects. A weight reduction trend was observed in the male body weight change (MRIDs 41764901, 41764902, 41938001).

(2) Aquatic Data

Acute Freshwater Fish Toxicity - TGAI: The results of studies conducted show that technical hexazinone is practically nontoxic to freshwater fish in acute exposures. The table below summarizes the results of these studies (MRIDs 00104980, 00076959).

Test Species	Test Material	LC_{50}	Citation (MRID)
Rainbow Trout	97.5%	> 320 ppm	00104980
Bluegill Sunfish	97.5%	> 370 ppm	00104980
Fathead Minnow	97.5%	274 ppm	00104980
Bluegill Sunfish	95%	505 ppm	00076959

Acute Freshwater Fish - TEP: The results of the studies summarized in the table below show that the 25% hexazinone product is practically non-toxic to freshwater fish in acute exposures.

Test Species	Test Material	LC_{50}	Citation (MRID)
Bluegill Sunfish	25%	> 1000 ppm	41235001
Rainbow Trout	25%	> 585.6 ppm	41235002

Early Life Stage Fish - TGAI: The results of a study done with the fathead minnow with 98% pure hexazinone resulted in a Maximum Allowable Toxicant Concentration (MATC) of 24.6 ppm. The MATC is the geometric mean of the No Observed Effect Level (NOEL), which was 17 mg/l and the Lowest Observed Effect Level (LOEL), which was 35.5 mg/l. Fish length was the parameter affected in the study (MRID 41406001).

Acute Aquatic Invertebrate Toxicity - TGAI: A study on *Daphnia magna* with 95% pure hexazinone resulted in an EC_{50} of 151.6 ppm. This demonstrates that hexazinone is practically nontoxic to freshwater invertebrates in acute exposures (MRID 00116269).

Acute Aquatic Invertebrate Toxicity - TEP: A study on *Daphnia magna* with 25% pure hexazinone resulted in an EC_{50} of 339.9 ppm. This study shows that hexazinone typical end-use product is practically nontoxic to freshwater invertebrates in acute exposures (MRID 41235003).

Life Cycle Aquatic Invertebrate - TGAI: The table below summarizes the results of two studies conducted.

Test Species	Test Material	MATC	Citation (MRID)
Daphnia magna	89.3%	20-50 ppm	00078041
Daphnia magna	> 98%	48.5 ppm	41406002

In the first study the affected parameter was reproduction. This study was classified as supplemental because a description of the dilution water was not sufficient, and no description of the dilution preparation was provided. The second study was also classified as supplemental because data on the dry weight of the first generation daphnids was not provided. The affected parameter was daphnid survival. The MATC is the geometric mean between the NOEL (29 mg/l) and the LOEL (81 mg/l). The combination of both studies fulfills the guideline requirements for an aquatic invertebrate reproductive test (MRIDs 00078041, 41406002).

Estuarine and Marine Toxicity - TGAI: The table below summarizes the results of three separate studies.

Test Species	Test Material	Results	Citation (MRID)
Eastern oyster	95%	48 hour EC_{50} > 320 ppm	00047164
Grass shrimp	95%	96 hour LC_{50} = 78 ppm	00047164
Fiddler crab[1]	95%	96 hour LC_{50} > 1000 ppm	00047164

[1]The test organism was not a recommended species.

These studies demonstrate that hexazinone is practically nontoxic to mollusks and slightly toxic to crustaceans. The estuarine/marine fish study was waived based on the low toxicity of hexazinone to freshwater fish (MRID 00047164).

(3) Non-Target Insects Data

Honey Bee Acute Contact: A study conducted with 98% pure hexazinone on *Apis mellifera* resulted in an LD_{50} of > 100 Fg/bee. The results show that hexazinone is relatively nontoxic to honey bees (MRID 41216502).

(4) Non-Target Plant Data

The acceptable phytotoxicity data on hexazinone are summarized below. The first three studies are for terrestrial plants and the remaining studies are for aquatic plants.

Test/Species	% ai	Results	MRID #
Seed Germination[1]	100	EC25 > 12.0 lbs ai/acre	43162501
Seedling Emergence[2]	100	See Table 1	43162501
Vegetative Vigor[3]	100	See Table 2	43162501
Navicula pelliculosa	100	EC50 = 12 ppb	43302701
Lemna gibba	100	EC50 = 37.4 ppb	43225101
Anabaena flos-aquae	100	EC50 = 0.21 ppm	43302701
Selenastrum capricornutum	100	EC50 = 7.0 ppb	41287001
Skeletonema costatum	100	EC50 = 12 ppb	43225102

1 Study is classified as core except for cucumber which is invalid. A new study is not required.

2 Study is core for all species except for cucumber (invalid) and onion and pea (supplemental). A new study is required for cucumber and additional information is required for onion and pea.

3 The study is core for all species except for cucumber. A new study for cucumber is required.

Table 1. Results of the Seedling Emergence Test

Species	Parameter	EC25 (lbs ai/a)
Onion[1]	Visual Injury	--
Corn	Weight	0.019
Wheat	Weight	0.029
Sorghum	Weight	0.019
Sugar Beet	Weight	0.010
Soybean	Weight	0.055
Pea[1]	Visual Injury	--

Table 1. Results of the Seedling Emergence Test		
Species	**Parameter**	**EC25 (lbs ai/a)**
Tomato	Weight	0.0064
Rape	Weight	0.013
Cucumber[2]	--	--

[1] The EC25 for these two species cannot be determined because the raw data were not in a format to allow for a statistical test.
[2] The results for cucumber are invalid because seeds were treated with pesticides other than hexazinone.

Table 2. Results of the Vegetative Vigor Study		
Species	**Parameter**	**EC25 (lb ai/a)**
Onion	Shoot Weight	0.046
Corn	Total Weight	0.071
Wheat	Total Weight	0.020
Sorghum	Total Weight	0.025
Sugar Beet	Total Weight	0.012
Soybean	Total Weight	0.025
Pea	Shoot Weight	0.012
Tomato	Shoot Weight	0.013
Rape	Weight	0.011
Cucumber[1]	--	--

[1] The results for the cucumber are invalid because seeds were treated with pesticides other than hexazinone.

The guideline requirements for terrestrial studies are satisfied for all species except cucumber, onion and pea. New seedling emergence and vegetative vigor studies with cucumber are required. The guideline requirements for aquatic plant growth are satisfied.

b. Ecological Effects Risk Assessment

This section consists of numerous risk assessments each covering a different combination of endpoint and exposure scenarios. Each risk

assessment includes a risk quotient which combines the toxicity and exposure information. For each risk quotient there is an established value above which the risk is considered to be at a high level of concern (LOC). In addition to these high risk values, restricted use is considered when the risk quotient exceeds 0.1 for acute aquatic risk or 0.2 for acute avian risk. The generic risk quotients and their respective LOC's for each risk assessment are provided in the following table. Note that the same risk quotients are used for non-endangered and endangered species, but the acute LOC is lower for endangered species.

Established Levels of Concern (LOCs)

Endpoint/Scenario	Risk Quotient	Non-Endangered LOC	Endangered LOC
Mammalian Acute	EEC/LC_{50}	0.5	0.1
Mammalian Chronic	EEC/LEL	1.0	1.0
Avian Acute	EEC/LC_{50}	0.5	0.1
Avian Chronic	EEC/LEL	1.0	1.0
Aquatic Acute	EEC/LC_{50}	0.5	0.05
Aquatic Chronic	EEC/LEL	1.0	1.0

Risk to Terrestrial Animals

Hexazinone is registered for numerous outdoor uses, including agricultural crops such as alfalfa and sugarcane, and nonagricultural uses including forests and ditch banks. Exposure to nontarget organisms can result from direct applications, spray drift from treated areas, and runoff from treated areas. Such exposures would be chronic as well as acute.

Avian Acute Oral and Subacute Dietary Effects

Granular Formulations: The maximum application rate for a granular formulation is 12 lbs ai/acre. A broadcast application with no incorporation, which is the application scenario resulting in the greatest exposure, results in a risk quotient of 0.3 as shown in the calculation below.

Calculation of LD50/ft2 (Using Quail LD50 = 2251 mg/kg)
[For Broadcast Application (No Incorporation)]

mg/ft^2 = application rate (lbs ai/acre) X 453,590 mg/lb ÷ 43,560 ft^2/acre

= [12 lbs ai/acre X 453,590 mg/lb] ÷ 43,560 ft^2/acre

= 124.96 mg/ft^2

$LD50/ft^2$ = mg/ft^2 ÷ [(LD50) X (bird weight in kg)]

= 124.96 mg/ft^2 ÷ [(2251 mg/kg) X (0.178 kg)]

= 0.3 $LD50/ft^2$

The LOC for endangered species, which is 0.1, is triggered at this application rate. No other LOCs are exceeded for the granular formulation.

Non-Granular Formulations: The maximum Estimated Environmental Concentrations (EECs) for different substrates expected immediately after application of the non-granular formulations are presented in the following table. EECs were estimated for each use pattern.

EEC Immediately After Application for Different Application Rates in Different Substrates (in ppm from Hoerger and Kenaga (1972))

Substrate	1.5 lbs	2 lbs	3.6 lbs	4 lbs	6 lbs	7.2 lbs	12 lbs	13.5 lbs
Short Grass	360	480	864	960	1440	1728	2280	3240
Long Grass	165	220	396	440	660	792	1320	1485
Leaves and Leafy Crops	187	250	450	500	750	900	1500	1687
Forage and Insects	87	116	209	232	348	417	696	783
Seeds	18	21	43	48	72	86	144	162
Fruits	10	14	25	28	42	50	84	94

The risk quotients = EEC/LC50, based on the above EECs are presented in the following table. The LC50 used in the calculation is 10,000 ppm. 10,000 ppm was used because all of the results of the dietary toxicity studies are expressed as greater than either 5,000 ppm or

10,000 ppm. However, the only study in which an effect was actually observed was for the bobwhite quail where there were 3 mortalities out of 10 at the highest dose tested, which was 5,000 ppm. Extrapolation to estimate an LC50 value from this information resulted in an estimate of 11,346 ppm. This together with the information available from the other studies suggests that 10,000 ppm is an appropriate estimate of the LC50.

Avian Acute Risk Quotients for Different Application Rates and Different Substrates

Substrate	1.5 lbs	2 lbs	3.6 lbs	4 lbs	6 lbs	7.2 lbs	12 lbs	13.5 lbs
Short Grass	< 0.1	< 0.1	< 0.1	0.1	0.1	0.2	0.2	0.3
Long Grass	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.1
Leaves and Leafy Crops	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.2	0.2
Forage and Insects	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Seeds	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fruits	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

The restricted use LOC, which is 0.2, is exceeded for the three highest application rates for shortgrass, and for leaves and leafy crops for the two highest application rates. The only acute dietary study in which there were effects showed only 3 birds out of 10 dying at the highest dose tested, 5,000 ppm. No mortalities occurred in any of the studies at a dose around 3,240 ppm which is the highest residue level. In light of the responses seen in the studies there appears to be little concern for acute effects to grazing birds. The LOC for endangered species, which is 0.1, is triggered for short grass at application rates of 4 lbs. or greater; for long grass at application rates of 12 lbs. or greater; for leaves and leafy crops at 7.2 lbs. or greater; and for forage and insects at 13.5 lbs. However, due to the relatively low risk quotients for the unrefined assessment, this risk is not a major concern.

Avian Chronic Effects

The avian reproduction studies show that the NOEC for the bobwhite quail is < 100 based on effects to the 14 day survivors weight at 100 ppm. However, no effects were seen at the other doses tested which were 300 and 1,000 ppm. The NOEC for the mallard duck is > 1,000 ppm based on no statistically significant effects for any of the parameters tested. However, a weight reduction trend was observed in the parental male body weight. There was no significant dose response

in any of the avian reproduction studies. Testing at higher doses would provide more confidence in the NOEC value. However, based on the results of these two studies an NOEC of 1,000 ppm was used in the risk assessment.

A calculation of the risk quotients = EEC/LC50, based on the above EECs and an NOEC of 1,000 ppm is presented in the following table:

Avian Chronic Risk Quotients for Different Application Rates and Different Substrates

Substrate	1.5 lbs	2 lbs	3.6 lbs	4 lbs	6 lbs	7.2 lbs	12 lbs	13.5 lbs
Short Grass	< 1	< 1	< 1	1.0	1.4	1.7	2.3	3.2
Long Grass	< 1	< 1	< 1	< 1	< 1	< 1	1.3	1.5
Leaves and Leafy Crops	< 1	< 1	< 1	< 1	< 1	1.0	1.5	1.7
Forage and Insects	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.1
Seeds	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Fruits	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

No chronic effects for birds are expected when the application rate is less than 4 lbs ai/A. Included in this use rate are alfalfa, sugarcane, pineapple, Christmas trees and conifer release. There may be a possibility of chronic effects at higher application rates, where the LOC is greater than 1, but this is not certain. Hexazinone is a persistent chemical but, considering a single application per year and its low bioaccumulation, the likelihood for chronic avian concerns even at rates greater than 6.0 lbs ai/A is minimal.

Mammalian Acute Oral and Subacute Dietary Effects

The LC50 for small mammals is estimated from the LD50 of the rat (1200 mg/kg) and the body weight and food consumption of three representative small mammals. The LC50 is equal to the LD50 of the rat multiplied by the ratio of the body weight to the daily food consumption. A representative of a herbivore (meadow vole), a granivore (deer mouse), and of an insectivore (least shrew) are used to estimate the risk to small mammals. The estimated LC50s are shown in the following table:

Estimated LC50 for Three Small Mammals Representing Different Food Habits				
Species	**Body Weight**	**Food Consumption**	**Estimated LC50**	**Expected Food**
Meadow Vole	46 g	28.1 g	1964.4	grass
Deer Mouse	13 g	2.1 g	7428.5	seeds
Least Shrew	5 g	5.5 g	1090.9	insects

The above estimated LC50s for each organism were used with the maximum residues [from Hoerger and Kenaga (1972)], resulting from each application rate to calculate the risk quotients (EEC/LC50) for small mammals. The results are shown in the following table:

Risk Quotients and LOCs for Three Small Mammals Assuming Maximum Residues					
Use Sites	**Application Rate**	**Species**	**Maximum EEC (expected food)**	**Risk Quotient (EEC/LC50)**	**LOC**
Christmas Tree Plantations, Forest Plantings	2 lbs ai/acre	meadow vole	480 ppm (grass)	**0.2**	***HR ≥ 0.5** ***RU ≥ 0.2** ***ES ≥ 0.1**
		deer mouse	21 ppm (seeds)	0.002	
		least shrew	116 ppm (insects)	**0.1**	
Sugarcane, pineapple	3.6 lbs ai/acre	meadow vole	864 ppm (grass)	**0.43**	HR ≥ 0.5 **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	43 ppm (seeds)	0.003	
		least shrew	209 ppm (insects)	**0.19**	
Forestry	6.0 lbs ai/acre	meadow vole	1440 ppm (grass)	**0.73**	**HR ≥ 0.5** **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	48 ppm (seeds)	0.006	
		least shrew	417 ppm (insects)	**0.38**	
Drainage Systems, Industrial Areas, Non Agricultural Rights of Way	12 lbs ai/acre	meadow vole	2280 ppm (grass)	**1.16**	**HR ≥ 0.5** **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	144 ppm (seeds)	0.02	
		least shrew	696 ppm (insects)	**0.63**	

Risk Quotients and LOCs for Three Small Mammals Assuming Maximum Residues					
Use Sites	**Application Rate**	**Species**	**Maximum EEC (expected food)**	**Risk Quotient (EEC/LC50)**	**LOC**
Industrial Areas, Non Agricultural Rights of Way, Fencerows, Hedgerows	13.5 lbs ai/acre	meadow vole	3240 ppm (grass)	**1.65**	**HR ≥ 0.5** **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	162 ppm (seeds)	0.02	
		least shrew	783 ppm (insects)	**0.72**	

* HR = High Risk
* RU = Restricted Use
* ES = Endangered Species

The risk quotients range from < 0.1 to 1.65. Because some of these risk quotients exceed the established LOCs, a refined exposure assessment was done. Typical residues were used for the EEC's in the following table to calculate the risk quotients.

Risk Quotients and LOCs for Three Small Mammals Assuming Typical Residues					
Use Sites	**Application Rate**	**Species**	**Typical EEC (expected food)**	**Risk Quotient (EEC/LC50)**	**LOC**
Christmas Tree Plantations, Forest Plantings	2 lbs ai/acre	meadow vole	184 ppm (grass)	0.09	HR ≥ 0.5 RU ≥ 0.2 ES ≥ 0.1
		deer mouse	6 ppm (seeds)	0.0008	
		least shrew	66 ppm (insects)	0.06	
Sugarcane, pineapple	3.6 lbs ai/acre	meadow vole	331.2 ppm (grass)	**0.16**	HR ≥ 0.5 RU ≥ 0.2 **ES ≥ 0.1**
		deer mouse	10.8 ppm (seeds)	0.001	
		least shrew	118.8 ppm (insects)	**0.1**	
Forestry	6.0 lbs ai/acre	meadow vole	552 ppm (grass)	**0.28**	HR ≥ 0.5 **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	18 ppm (seeds)	0.002	
		least shrew	198 ppm (insects)	**0.18**	
Drainage Systems, Industrial Areas, Non agricultural rights of way	12 lb ai/acre	meadow vole	1104 ppm (grass)	**0.56**	**HR ≥ 0.5** **RU ≥ 0.2** **ES ≥ 0.1**
		deer mouse	36 ppm (seeds)	0.004	
		least shrew	396 ppm (insects)	**0.36**	

Risk Quotients and LOCs for Three Small Mammals Assuming Typical Residues					
Use Sites	**Application Rate**	**Species**	**Typical EEC (expected food)**	**Risk Quotient (EEC/LC50)**	**LOC**
Industrial areas, Non agricultural rights of way fencerows, hedge rows	13.5 lbs ai/acre	meadow vole	1242 ppm (grass)	**0.6**	**HR $\geq$ 0.5** **RU $\geq$ 0.2** **ES $\geq$ 0.1**
		deer mouse	40.5 ppm (seeds)	0.005	
		least shrew	445.5 ppm (insects)	**0.41**	

Using typical residues, the risk quotients range from < 0.1 to 0.6. The endangered species LOC of 0.1 is exceeded, for grass and insect eating mammals, at use rates of 3.6 lbs ai/acre or greater; the restricted use LOC of 0.2 is exceeded, for grass and insect eating mammals, at use rates of 6.0 lbs ai/acre or greater; and the high risk LOC is exceeded, for grass and insect eating mammals, at 12 and 13.5 lbs ai/acre. The use patterns represented by these application rates are likely to include the habitat or feeding grounds for small mammals.

Risk to Aquatic Animals

Estimated Environmental Concentrations

Ground Application: Using an application rate of 13.5 lb ai/acre, which is the highest application rate, estimated runoff to a 6 foot deep water body results in an EEC of 412 ppb for ground application, as illustrated in the calculations below.

Runoff of a pesticide from ground applications is estimated by multiplying the application rate (lbs ai/acre) by the percent runoff from a 10-acre drainage basin into a 1 acre water body. Based on hexazinone's solubility (2.98 g/100g) the maximum pesticide runoff, which is 5%, was assumed.

Runoff = application rate (lbs ai/acre) X % Runoff X 10-acre drainage basin

= 13.5 lbs X 0.05 X 10

= 6.75 lbs

EEC = runoff (lbs ai) X EEC (ppb) of a 1 lb ai/acre direct application for a 6-ft. deep water body

= 6.75 X 61 ppb

= 411.75 ppb

Aerial Application: Using an application rate of 1.5 lb ai/acre, which is the lowest application rate, estimated residues in a 6 foot deep water body, resulting from aerial application, are 32 ppb. These calculations are illustrated below.

Residues of a pesticide from aerial applications are estimated by multiplying the application rate (lbs ai/acre) adjusted by the aerial application efficiency (60%); by the percent runoff (based on solubility) from a 10-acre drainage basin into a 1 acre water body; and adding this runoff amount to the estimated spray drift which is assumed to be 5% in the absence of spray drift data. Based on hexazinone's solubility (3.30 ppm) the maximum pesticide runoff, which is 5%, was assumed.

Runoff = application rate (lbs ai/acre) X application efficiency X %runoff X 10-acre drainage basin

= 1.5 lbs X 0.6 X 0.05 X 10

= .45 lbs

Drift = application rate X %drift

= 1.5 lbs X 0.05

= 0.075 lbs

EEC = total lbs runoff + total drift X EEC (ppb) of a l lb ai/acre direct application for a 6 foot deep water body

= .525 X 61 ppb

= 32.0 ppb

The following table shows the EECs for ground and aerial applications using the maximum use rates for each use pattern.

EECs Expected Immediately After Application to a Six Foot Deep Water Body			
Use Pattern	**Max. Application (lbs ai/A)**	**EEC Ground Application**	**EEC Aerial Application**
Terrestrial Feed Crop Use, Alfalfa	1.5	45.7 ppb	32 ppb
Terrestrial Non-Food Crop, Christmas Tree	2	61 ppb	42.7 ppb
Terrestrial Food Use, Sugarcane and Pineapple	3.6	109.8 ppb	72.8 ppb
Forestry, Conifer Release	4	122 ppb	n/a
Forestry	6	183 ppb	n/a
Terrestrial Non-Food Crop, Non Agricultural Rights of Way, Florida Only	7.2	219.6 ppb	n/a
Terrestrial Non-Food Crop and Aquatic Non-Food Drainage Systems	12	366 ppb	256.2 ppb
Terrestrial Non-Food Crop and Aquatic Non-Food Industrial, Texas Only	13.5	411.7 ppb	n\a

No LOC's for fish or aquatic invertebrates are exceeded by the highest EEC, which is 412 ppb for the 13.5 lb ai/acre application rate and using the most sensitive species in each category. The freshwater acute risk quotients (RQ) for this application rate are: 0 for aquatic invertebrates (RQ = .4/152) and 0 for fish (RQ = .4/274). The freshwater chronic risk quotients are: 0.02 (RQ = .4/20) for aquatic invertebrates and 0.02 (RQ = .4/24.6) for fish. The estuarine/marine risk quotient for the most sensitive species, the grass shrimp, is .01 (RQ = .4/78).

Risk to Terrestrial, Semi-Aquatic and Aquatic Plants

Exposure of terrestrial and aquatic plants to hexazinone is estimated based on expected runoff from a maximum application rate for ground application; and from runoff and drift for aerial application. Direct applications by ground on forests and rights of way are also a concern because endangered and other non-target plants growing in forests and rights-of-way will be directly exposed to the pesticide.

Terrestrial Plants: The use of hexazinone exceeds the levels of concern for nontarget terrestrial endangered and non-endangered plants. The levels of concern are exceeded for all application rates for both ground and aerial application. The following table contains the EECs for different scenarios and the corresponding risk quotients.

The runoff scenario used for areas adjacent to a use site is 1 treated acre draining into a 1 acre site. The scenario for wet areas is 10 treated acres draining into a 1 acre site. Aerial application is assumed to result in 5% drift.

Risk to Terrestrial and Semi-Aquatic Plants Resulting from the Use of Hexazinone

Use Site	Application Rate	EEC (lbs ai/acre) and Risk Quotients (EEC/EC25)							LOC
		Adjacent to a Site			Wet Areas		Treated Site (Direct Application)		
			EEC	RQ	EEC	RQ	EEC	RQ	
Agricultural Rights of Way	1.125 lbs ai/acre	Ground[1]	0.056	8.8	0.56	88.9	1.125	178.5	1
Alfalfa	1.5 lbs ai/acre	Ground[1]	0.075	11.9	0.75	119.0	n/a	n/a	
		Aerial[2]	0.12	19	0.53	83.3	n/a	n/a	
		Aerial[3]	0.075	6.8	0.075	48.2	n/a	n/a	
Forestry	6.0 lbs ai/acre	Ground[1]	0.3	47.6	3.0	476	6.0	952	
		Aerial[2]	0.48	76.2	2.1	333	3.6[4]	327.2[4]	
		Aerial[3]	0.3	27.2	0.3	27.2			
Non-Agricultural Areas	13.5 lbs ai/acre	Ground[1]	0.675	107.1	6.75	1071	13.5	2142.8	

[1] (runoff), EC25 = 0.0063 lbs ai/acre Seedling Emergence Study
[2] (runoff + drift), EC25 = 0.0063 Seedling Emergence Study
[3] (drift only), EC25 = 0.011 lbs ai/acre Vegetative Vigor Study
[4] (direct), EC25 = 0.011 lbs ai/acre Vegetative Vigor Study

Aquatic Plants: The use of hexazinone exceeds the levels of concern for aquatic plants (freshwater and estuarine/marine). The levels of concern are exceeded for all application rates using ground or aerial application.

The EECs for all uses except alfalfa are calculated based on runoff from a 10 acre drainage basin into a 1 acre pond which is 6 inches deep. The alfalfa scenario is a 10 acre drainage basin into a 1 acre pond which is 6 feet deep. Aerial application is assumed to result in 5% drift.

Risk to Aquatic Plants Resulting from the Use of Hexazinone; RQ = EEC/EC50; EC50 is 7 ppb for *Selenastrum capricornutum*							
Use Site	**Application Rate**	**Direct/ Indirect Application**	**EEC (ppb) and Risk Quotient**				**LOC**
			Ground Application		**Aerial Application**		
			EEC	**RQ**	**EEC**	**RQ**	
Agricultural Rights of Way	1.125 lbs ai/acre	Indirect	411	58.7	n/a	n/a	1
		Direct	852.8	117.9	n/a	n/a	
Alfalfa	1.5 lbs ai/acre	Indirect	47.8	6.5	32.3	4.6	
Forestry	6.0 lbs ai/acre	Indirect	2202	314.6	1541.4	220.2	
		Direct	4404	629.1	2642.4	377.4	
Non-Agricultural Areas	13.5 lbs ai/acre	Indirect	4954.5	707.8	n/a	n/a	
		Direct	9909	1415.6	n/a	n/a	

EEC Calculation for Terrestrial Plant Exposure

Application Rate - 1.125 lbs ai/acre

1. Unincorporated Ground Application
   1.125 lbs ai/acre X 5% runoff X 1 acres = 0.056 lbs ai

2. Direct Application
   1.125 lbs ai/acre

Application Rate - 1.5 lbs ai/acre

1. Unincorporated Ground Application
   1.5 lbs ai/acre X 5% runoff X 1 acres = 0.075 lbs ai

2. Aerial Application
   a. Runoff: (from site after application)
   1.5 lbs ai/acre X 60% efficiency X 5% runoff X 1 acres = 0.045 lbs ai

   b. Drift: (from site during application)
   1.5 lbs ai/acre X 5% (drift) = 0.075 lbs ai

   c. Total Loading = Runoff + Drift
   = 0.045 + 0.075 = 0.12 lbs ai

3. Aerial Drift Calculation
Drift: (from site during application)
1.5 lbs ai/acre X 5% (drift) = 0.075 lbs ai

Application Rate - 6 lbs ai/acre

1. Unincorporated Ground Application
6.0 lbs ai/acre X 5% runoff X 1 acres = 0.3 lbs ai

2. Aerial Application
a. Runoff: (from site after application)
6 lbs ai/acre X 60% efficiency X 5% runoff X 1 acres = 0.18 lbs ai

b. Drift: (from site during application)
6.0 lbs ai/acre X 5% (drift) = 0.3 lbs ai

c. Total Loading = Runoff + Drift
= 0.18 + 0.3 = 0.48 lbs ai

3. Aerial Drift Calculation
Drift: (from site during application)
6 lbs ai/acre X 5% (drift) = 0.3 lbs ai

4. Direct Application (ground)
6 lbs ai/acre

5. Direct Application (aerial)
6 lbs ai/acre X 60% efficiency = 3.6 lbs ai

Application Rate - 13.5 lbs ai/acre

1. Unincorporated Ground Application
13.5 lbs ai/acre X 5% runoff X 1 acres = 0.675 lbs ai

2. Direct Application
13.5 lbs ai/acre

EEC Calculation for Semi-Aquatic Plant Exposure [Semi-Aquatic plants are plants that require saturated soils for some part of their life cycle (wetlands, marshes, bogs)]

Application Rate - 1.125 lbs ai/acre

1. Unincorporated Ground Application
   1.125 lbs ai/acre X 5% runoff X 10 acres = 0.56 lbs ai

2. Direct Application
   1.125 lbs ai/acre

Application Rate - 1.5 lbs ai/acre

1. Unincorporated Ground Application
   1.5 lbs ai/acre X 5% runoff X 10 acres = 0.75 lbs ai

2. Aerial Application
   a. Runoff: (from site after application)
   1.5 lbs ai/acre X 60% efficiency X 5% runoff X 10 acres = 0.45 lbs ai

   b. Drift: (from site during application)
   1.5 lbs ai/acre X 5% (drift) = 0.075 lbs ai

   c. Total Loading = Runoff + Drift
   = 0.45 + 0.75 = 0.53 lbs ai

3. Aerial Drift Calculation
   Drift: (from site during application)
   1.5 lbs ai/acre X 5% (drift) = 0.075 lbs ai

Application Rate - 6 lbs ai/acre

1. Unincorporated Ground Application
   6.0 lbs ai/acre X 5% runoff X 10 acres = 3 lbs ai

2. Aerial Application
   a. Runoff: (from site after application)
   6 lbs ai/acre X 60% efficiency X 5% runoff X 10 acres = 1.8 lbs ai

   b. Drift: (from site during application)
   6.0 lbs ai/acre X 5% (drift) = 0.3 lbs ai

c. Total Loading = Runoff + Drift
= 1.8 + 0.3 = 2.1 lbs ai

3. Aerial Drift Calculation
Drift: (from site during application)
6.0 lbs ai/acre X 5% (drift) = 0.3 lbs ai

4. Direct Application
6.0 lbs ai/acre

Application Rate - 13.5 lbs ai/acre

1. Unincorporated Ground Application
13.5 lbs ai/acre X 5% runoff X 10 acres = 6.75 lbs ai

2. Direct Application
13.5 lbs ai/acre

EEC Calculation for Aquatic Plant Exposure

Application Rate - 1.125 lbs ai/acre (Agricultural Rights of Way)

1. Unincorporated Ground Application
a. Indirect Application

1.125 lbs ai/acre X 5% runoff X 10 acres = 0.56 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 734 ppb X 0.56 lbs = 411.04 ppb

b. Direct Application

1.125 lbs ai/acre

Therefore: EEC = 1.125 lbs ai X 734 ppb = 825.75 ppb

Application Rate - 1.5 lbs ai/acre (Alfalfa)

1. Unincorporated Ground Application
a. Indirect Application

1.5 lbs ai/acre X 5% runoff X 10 acres = 0.75 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 feet deep is 61 ppb

Therefore: EEC = 61 ppb X 0.75 lbs = 45.75 ppb

2. Aerial Application

a. Indirect Application

i. Runoff: (from site after application)

1.5 lbs ai/acre X 60% efficiency X 5% runoff X 10 acres = 0.45 lbs ai

ii. Drift: (from site during application)

1.5 lbs ai/acre X 5% (drift) = 0.075 lbs ai

iii. Total Loading = Runoff + Drift

= 0.45 + 0.075 = 0.53 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 feet deep is 61 ppb.

Therefore: EEC = 61 ppb X 0.53 lbs ai = 32.33 ppb

Application Rate - 6 lbs ai/acre (Forestry)

1. Unincorporated Ground Application

a. Indirect Application

6.0 lbs ai/acre X 5% runoff X 10 acres = 3 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 734 ppb X 3 lbs ai = 2202 ppb

b. Direct Application

6.0 lbs ai/acre

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 6.0 lbs ai X 734 ppb = 4404 ppb

2. Aerial Application

a. Indirect Application

i. Runoff: (from site after application)

6 lbs ai/acre X 60% efficiency X 5% runoff X 10 acres = 1.8 lbs ai

ii. Drift: (from site during application)

6.0 lbs ai/acre X 5% (drift) = 0.3 lbs ai

iii. Total Loading = Runoff + Drift

= 1.8 + 0.3 = 2.1 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 734 ppb X 2.1 lbs ai = 1541.2 ppb

b. Direct Application

6.0 lbs ai/acre X 60% efficiency = 3.6 lbs ai/acre

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 734 ppb X 3.6 lbs ai = 2642.4 ppb

Application Rate - 13.5 lbs ai/acre (Non-Agricultural Areas)

1. Unincorporated Ground Application

a. Indirect Application

13.5 lbs ai/acre X 5% runoff X 10 acres = 6.75 lbs ai

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb

Therefore: EEC = 734 ppb X 6.75 lbs = 4954.8 ppb

b. Direct Application

13.5 lbs ai/acre

EEC of 1 lb ai direct application to 1 acre water body 6 inches deep is 734 ppb.

Therefore: EEC = 13.5 lbs ai X 734 ppb = 9909 ppb

Risk to Endangered Species

Hexazinone exceeds the endangered species LOCs for both aquatic and terrestrial plants at all use rates. The risk quotients range from 4.6 to 2142.8.

No concern exists for endangered aquatic animals. Hexazinone exceeds the endangered species level of concern, using typical residues, for grass and insect eating mammals at use rates of 3.6 lbs ai/acre or greater. Using the maximum application rate for the granular formulation, which is 12 lbs ai/acre, and assuming no soil incorporation results in a risk quotient of 0.3 which exceeds the acute avian LOC for endangered birds.

At the present time EPA is working with the Fish and Wildlife Service and other Federal and State agencies to develop a program to avoid jeopardizing the continued existence of the identified species by the use of pesticides. When this program goes into effect endangered species precautionary labeling will be required.

3. Data Requirements

Ecological Effects:

- 123-1(a) Seed Germination/Seedling Emergence (cucumber, onion, pea)
- 123-1(b) Vegetative Vigor (cucumber)

Environmental Fate:

- 163-1 Leaching/Adsorption/Desorption
- 164-2 Aquatic Field Dissipation (not required if all aquatic uses are removed from hexazinone product labels)
- 166-1 Prospective Groundwater Monitoring Study
- 201-1 Droplet Size Spectrum
- 202-1 Drift Field Evaluation-

4. Summary of LOC Exceedance and Risk Characterization

a. Ecological Effects

Hexazinone exceeds the levels of concern for both endangered and non-endangered aquatic and terrestrial plants. The risk quotients range from 4.6 to 2142.8 depending on the application rate.

Contamination of aquatic sites within or adjacent to treated areas could be of ecological significance and may be exacerbated by the persistence and mobility of the chemical. Aquatic plants are an important component of the ecosystem. Algae are the link between solar radiation, aquatic animals and humans which are dependent on the oxygen produced by algae during photosynthesis. Algae are responsible for maintaining the quality of the aquatic habitat for fish, while at the same time providing food for fish either directly or indirectly. Thus, effects to aquatic plants expected from the use of hexazinone may alter aquatic ecosystems. The severity of these effects is dependent upon the frequency of the exposure to hexazinone and the nature of the receiving body. For example, the conifer release may be representative of a situation in which the pesticide is used only once in several years and the receiving body is a stream. In contrast, sugarcane fields may be treated once per year and drain into a shallow marsh. A much greater effect would be expected to occur from the latter use.

Hexazinone exceeds levels of concern for both endangered and non-endangered small mammals at several of the higher application rates. Using typical residues as the EEC estimates, the risk quotients range from < 0.1 to 0.6. Using the maximum application rate for the granular formulation, which is 4 lbs ai/acre, and assuming no soil incorporation results in a risk quotient of 0.1 which is the acute avian LOC for endangered birds.

Risk mitigation measures for ecological effects are discussed in Parts IV and V of this document.

b. Ground Water

Hexazinone exceeds the following Levels of Concern for ground water:

Ground Water Quality: Hexazinone exhibits many of the properties and characteristics associated with chemicals that have been detected in ground water. Considering the mode of activation of the chemical; i.e.,

rainfall within two weeks of an application, there is a strong possibility of movement to ground water, especially in vulnerable areas. For these reasons, hexazinone use is likely to have a significant impact on ground-water quality. Hexazinone has been detected in ground water in Hawaii (0.06-0.72 ppb), Florida (0.12-2.90 ppb), Maine (0.2-29 ppb), and North Carolina (0.74-34 ppb), although well below the Health Advisory Level.

Based on this information, the Agency is requiring a ground water advisory and other risk mitigation measures that are discussed in Parts IV and V of this document.

The ecological effects assessment indicates that hexazinone presents a concern to terrestrial and aquatic plants. In areas where irrigation water is contaminated with hexazinone, or where ground water discharges to surface water, hexazinone residues in ground water could pose a threat to plants.

IV. RISK MANAGEMENT AND REREGISTRATION DECISION

A. Determination of Eligibility

Section 4(g)(2)(A) of FIFRA calls for the Agency to determine, after submission of relevant data concerning an active ingredient, whether products containing the active ingredients are eligible for reregistration. The Agency has previously identified and required the submission of the generic (i.e. active ingredient specific) data required to support reregistration of products containing hexazinone active ingredients. The Agency has completed its review of these generic data, and has determined that the data are sufficient to support reregistration of all products containing hexazinone. Appendix B identifies the generic data requirements that the Agency reviewed as part of its determination of reregistration eligibility of hexazinone, and lists the submitted studies that the Agency found acceptable.

The data identified in Appendix B were sufficient to allow the Agency to assess the registered uses of hexazinone and to determine that hexazinone can be used without resulting in unreasonable adverse effects to humans and the environment. The Agency therefore finds that all products containing hexazinone as the active ingredients are eligible for reregistration. The reregistration of particular products is addressed in Section V of this document.

The Agency made its reregistration eligibility determination based upon the target data base required for reregistration, the current guidelines for conducting acceptable studies to generate such data, and the data identified in Appendix B. Although the Agency has found that all uses of hexazinone are eligible for

reregistration, it should be understood that the Agency may take appropriate regulatory action, and/or require the submission of additional data to support the registration of products containing hexazinone, if new information comes to the Agency's attention or if the data requirements for registration (or the guidelines for generating such data) change.

1. Eligibility Decision

Based on the reviews of the generic data for the active ingredient hexazinone, the Agency has sufficient information on the health effects of hexazinone and on its potential for causing adverse effects in fish and wildlife and the environment. Therefore, the Agency concludes that products containing hexazinone for all uses are eligible for reregistration.

The Agency has determined that hexazinone products, labeled and used as specified in this Reregistration Eligibility Decision, will not pose unreasonable risks or adverse effects to humans or the environment. Tolerances for alfalfa green forage, alfalfa hay, grass hay, meat/meat byproducts and milk could not be reassessed, however enough data were available to conduct a risk assessment. The Agency believes that existing tolerances are protective until data are available for reassessment.

2. Eligible and Ineligible Uses

The Agency has determined that all uses of hexazinone are eligible for reregistration.

B. Regulatory Position

The following is a summary of the regulatory positions and rationales for hexazinone. Where labeling revisions are imposed, specific language is set forth in Section V of this document.

1. Tolerance Reassessment

TOLERANCE REASSESSMENT SUMMARY

The combined limit of quantitation for hexazinone residues by the method in PAM, Vol. II, is 0.55 ppm. The highest limit of quantitation for an individual hexazinone metabolite is 0.2 ppm, for metabolite C. The tolerance level for non-detectable residues will be 0.2 ppm. Metabolite F should be included in the tolerance expression if detected by the current analytical method. If not detected, it will be accounted for during the risk assessment.

Tolerances Listed Under 40 CFR §180.396:

The tolerances listed in 40 CFR §180.396 are for the combined residues of hexazinone and its metabolites (calculated as hexazinone) in or on plant and animal commodities. Sufficient data are available to ascertain the adequacy of the established tolerance listed in 40 CFR for blueberries, pineapple, and sugarcane, provided all labels are amended to impose appropriate PHIs, and provided the sugarcane tolerance is changed to a tolerance with a regional registration in a separate subsection of 40 CFR 180.396. Data show that hexazinone concentrates in certain processed fractions of alfalfa, pineapple, and sugarcane. The Agency has determined that establishing food and feed additive tolerances for these commodities is appropriate and consistent with the Delaney Clause of Section 409 of the Federal Food, Drug, and Cosmetic Act (FFDCA). A tolerance for residues on grass hay is pending under PP 1F3967.

As there are no Codex tolerances for residues of hexazinone and its metabolites in plant and animal commodities, there is no question with respect to Codex/U.S. tolerance compatibility.

TOLERANCE REASSESSMENT SUMMARY

Commodity	Current Tolerance (ppm)	Tolerance Reassessment (ppm)	Comment/*Correct Commodity Definition*
Tolerances listed under 180.396			
Alfalfa green forage	2.0	Reserved[1]	*Alfalfa, forage*
Alfalfa hay	8.0	Reserved[1]	*Alfalfa, hay*
Blueberries	0.2	0.2[2]	
Cattle, fat	0.1	Reserved[1]	
Cattle, mbyp	0.1		
Cattle, meat	0.1		
Eggs	0.1	Revoke[3]	
Goats, fat	0.1	Reserved[1]	
Goats, mbyp	0.1		
Goats, meat	0.1		
Grasses, pasture	10	Combine into one tolerance at 10 ppm	*Grass, forage*
Grasses, range	10		
Grass, hay	30 (pending)	Reserved[1]	
Hogs, fat	0.1	Reserved[1]	
Hogs, mbyp	0.1		
Hogs, meat	0.1		
Horses, fat	0.1		
Horses, mbyp	0.1		

Commodity	Current Tolerance (ppm)	Tolerance Reassessment (ppm)	Comment/*Correct Commodity Definition*
Horses, meat	0.1		
Milk	0.1		
Pineapple (whole fruit)	0.5	0.2[2]	*Pineapples*
Pineapple, fodder	5.0	Revoke[4]	
Pineapple, forage	5.0	Revoke[4]	
Poultry, fat	0.1	Revoke[3]	
Poultry, mbyp	0.1		
Poultry, meat	0.1		
Sheep, fat	0.1		
Sheep, mbyp	0.1	Reserved[1]	
Sheep, meat	0.1		
Sugarcane	0.2	0.2[2, 5]	

1. Data on hexazinone are inadequate to reassess tolerances.
2. Tolerances for non-detectable residues in plant commodities will be set at 0.2 ppm, the limit of quantitation for metabolite C (blueberries, sugarcane, pineapple).
3. The maximum residue expected in poultry tissues would be 0.005 ppm, an order of magnitude below the limit of detection for hexazinone metabolites. Tolerances for hexazinone in poultry commodities are not required and the existing tolerances for these commodities should be revoked.
4. Not a regulated raw agricultural commodity (RAC).
5. Residue data were not provided for Florida, the major growing site in the U.S. for sugarcane. Revoke tolerance and reestablish as a tolerance with regional registration placed in a separate section of 40 CFR 180.396.

The Agency cannot conclude that hexazinone has been found to induce cancer within the meaning of the Delaney clause and therefore food and feed additive regulations are not barred by the Delaney clause of the Federal Food Drug and Cosmetic Act. Currently there are no existing food or feed additive tolerances for hexazinone. Food/feed additive tolerances must be established for sugarcane molasses, alfalfa meal, and pineapple processing residue.

Both food and feed additive tolerance petitions have been submitted for sugarcane molasses and bagasse (FAP #4H5683). The proposed food and feed additive tolerances of 0.5 ppm on sugarcane molasses are appropriate. The proposed tolerance of 0.5 ppm on sugarcane bagasse is not needed because sugarcane bagasse is no longer considered a major livestock feed; this proposal should be withdrawn.

Residue data were not submitted and are not required on alfalfa meal, but residues can be translated from alfalfa hay to meal because of similar dry matter content (90% in hay, 91% in meal). Accordingly, a food additive tolerance of 8.0 ppm for alfalfa meal is required.

Residues of metabolite B have been shown to concentrate in bran (pineapple processing residue), but the concentration factor could not be determined because residues of parent and metabolites A through F were non-detectable on the harvested fruit. Data have been generated on pineapple processing residue; once these data have been evaluated, a feed additive tolerance for pineapple processing residue will be required.

2. Restricted Use Classification

Hexazinone is not currently classified for restricted use and no change in its classification is being imposed by this document. However, hexazinone may be considered for restricted use for ground water concerns once the Restricted Use Rule is finalized.

3. Reference Dose

The RfD is 0.05 mg/kg body weight/day, based on a No Observable Effect Level (NOEL) of 5.0 mg/kg bwt/day and an uncertainty factor of 100. The NOEL was based on a one year feeding study in dogs (MRID 42162301) which demonstrated liver effects in both males and females at 38 mg/kg bwt/day (OPP RfD Peer Review Committee on February 11, 1993). The ARC for the overall U.S. population from all tolerances is 3.5×10^{-3} mg/kg bwt/day or 7% of the RfD. The subgroup most highly exposed, non-nursing infants (< 1 yr) has an ARC from all uses of 2.0×10^{-2} mg/kg bwt/day, representing 40% of the RfD. The children (1-6 yrs) subgroup has an ARC from all tolerances of 1.0×10^{-2} mg/kg bwt/day, or 20% of the RfD. Anticipated residues were used for all commodities. However, a source of overestimation exists in that 100 percent crop treated was assumed for all commodities.

4. Cancer Classification

Hexazinone was classified as to its carcinogenic potential as a "Group D" chemical by the OPP Carcinogenicity Peer Review Committee on July 27, 1994.

5. Risk Mitigation

Groundwater Concerns: Due to groundwater concerns, the following mitigation steps are required:

- Hexazinone has been detected in ground water. Therefore, **all product labels must carry a groundwater advisory.** The label language for this advisory can be found in Part V of this document.

- Registrants must report **any domestic hexazinone ground water detections at any levels** to the Agency.
- Because of particular ground water concerns in Maine, the Agency is requiring that duPont prepare a report of the ongoing research in that state in regard to ground water detections. The details of this requirement are contained in Part V of this document.
- DuPont is also required to submit educational materials that are currently being developed to the Agency. These materials should be in specific regard to product stewardship and address the potential of ground water contamination from the use of hexazinone.

In addition to these measures, the Agency is requiring that a prospective ground water monitoring study be conducted for hexazinone to determine the potential of this chemical to leach to ground water. Site selection will be done in consultation with the Agency.

Surface Water Concerns: Due to surface water concerns, the following mitigation step is required:

- DuPont, the technical manufacturer of hexazinone, is in the process of consolidating precautionary label language in regard to surface water contamination for all of their hexazinone products. After the Agency has reviewed and approved these label amendments, all registrants will be required to amend their hexazinone labels in the same way.

Risk to Non-Target Terrestrial and Aquatic Plants and Small Mammals: Due to the risk to non-target plants, the following mitigation step is required:

- Reduction of the maximum application rate from 13.5 lb ai/acre to 8 lb ai/acre.

6. Spray Drift Label Advisory

In order to inform the user of best management practices that would minimize spray drift from the target site, the Agency is currently preparing spray drift labeling statements. This future labeling may be required for all hexazinone products that may be applied aerially to agricultural crops.

7. Endangered Species Statement

Hexazinone exceeds the level of concern at all use rates for endangered aquatic and terrestrial plants that may be exposed. The risk quotients range from 4.6 to 2142.8.

Hexazinone exceeds levels of concern for endangered small mammals at use rates of 3.6 lbs ai/acre and up. Using typical residues as the EEC estimates, the risk quotients range from < 0.1 to 0.6. Using the maximum application rate for the granular formulation, which is 4 lbs ai/acre, and assuming no soil incorporation results in a risk quotient of 0.1 which is the acute avian LOC for endangered birds.

At the present time EPA is working with the Fish and Wildlife Service and other Federal and State agencies to develop a program to avoid jeopardizing the continued existence of the identified species by the use of pesticides. When this program goes into effect endangered species precautionary labeling will be required.

8. Labeling Rationale

a. Compliance with Worker Protection Standard (WPS)

Any product whose labeling reasonably permits use in the production of an agricultural plant on any farm, forest, nursery, or greenhouse must comply with the labeling requirements of PR Notice 93-7, "Labeling Revisions Required by the Worker Protection Standard (WPS)," and PR Notice 93-11, "Supplemental Guidance for PR Notice 93-7," which reflect the requirements of EPA's labeling regulations for worker protection statements (40 CFR part 156, subpart K). These labeling revisions are necessary to implement the WPS (40 CFR part 170) and must be completed in accordance with, and within the deadlines specified in, PR Notices 93-7 and 93-11. Unless otherwise specifically directed in this RED, all statements required by PR Notices 93-7 and 93-11 are to be on the product label exactly as instructed in those notices.

After April 21, 1994, except as otherwise provided in PR Notices 93-7 and 93-11, all products within the scope of those notices must bear WPS PR Notice complying labeling when they are distributed or sold by the primary registrant or any supplementally registered distributor.

After October 23, 1995, except as otherwise provided in PR Notices 93-7 and 93-11, all products within the scope of those notices must bear WPS PR Notice complying labeling when they are distributed or sold by any person.

Post-Application Restrictions

WPS Entry Restrictions: Some registered uses of hexazinone are within the scope of the WPS.

Restricted Entry Interval: Under the WPS, interim restricted entry intervals (REI) for all uses within the scope of the WPS are based on the acute toxicity of the active ingredient. The toxicity categories of the active ingredient for acute dermal toxicity, eye irritation potential, and skin irritation potential are used to determine the interim WPS REI. If one or more of the three acute toxicity effects are in toxicity category I, the interim WPS REI is established at 48 hours. If none of the acute toxicity effects are in category I, but one or more of the three is classified as category II, the interim WPS REI is established at 24 hours. If none of the three acute toxicity effects are in category I or II, the interim WPS REI is established at 12 hours. A 48-hour REI is increased to 72 hours when an organophosphate pesticide is applied outdoors in arid areas. In addition, the WPS specifically retains two types of REI's established by the Agency prior to the promulgation of the WPS: (1) product-specific REI's established on the basis of adequate data, and (2) interim REI's that are longer than those that would be established under the WPS.

For occupational end-use products containing hexazinone as an active ingredient, **the Agency is establishing a 48-hour REI** for each use of the product that is within the scope of the WPS. The basis for this requirement is that hexazinone is categorized as toxicity category I (severe) for eye irritation potential. The WPS REI in effect until now was 24 hours. The Agency notes that the WPS places very specific restrictions on entry during restricted-entry intervals when that entry involves contact with treated surfaces and it believes that these existing WPS protections are sufficient to mitigate post-application exposures of workers who contact surfaces treated with hexazinone.

Early-Entry PPE: The WPS establishes very specific restrictions on entry by workers to areas that remain under a REI if the entry involves contact with treated surfaces. Among those restrictions are a prohibition of routine entry to perform hand labor tasks and requirement that personal protective equipment be worn. Personal protective equipment requirements for persons who must enter areas that remain under a REI are based on the toxicity concerns about the active ingredient. The requirements are set in one of two ways:

1. If EPA has no special concerns about the acute or other adverse effects of an active ingredient, it establishes the early-entry PPE requirements based on the acute dermal toxicity, skin irritation potential, and eye irritation potential of the active ingredient.

2. If EPA has special concerns about an active ingredient due to very high acute toxicity or to certain other adverse effects, such as allergic effects, cancer, developmental toxicity, or reproductive effects, it may establish early-entry PPE requirements that are more stringent than would be established otherwise.

Since hexazinone is classified as category IV for skin irritation potential and for acute dermal toxicity and EPA has no special concerns about other adverse effects, the PPE required for early entry is the minimum early entry PPE permitted under the WPS: coveralls, chemical-resistant gloves, shoes, and socks. Since hexazinone is classified as category I for eye irritation potential, protective eyewear is also required.

Non-WPS Entry Restrictions: Some registered uses of hexazinone are outside the scope of the WPS. The Agency is establishing the following entry restriction for all non-WPS occupational uses of hexazinone end-use products (except pellet formulations): "Do not enter or allow others to enter the treated area until sprays have dried." The basis for this requirement is that hexazinone is categorized as toxicity category I (severe) for eye irritation potential.

Personal Protective Equipment (PPE) Requirements

Handler PPE: For each end-use product, PPE requirements for pesticide handlers will be set during reregistration in one of two ways:

1. If the Agency has no special concerns regarding other adverse effects of an active ingredient, the PPE for pesticide handlers will be established based on the acute toxicity of the end-use product. For occupational-use products, PPE will be established using the process described in PR Notice 93-7 or more recent EPA guidelines.

2. If the Agency has special concerns about an active ingredient due to very high acute toxicity or certain adverse effects, such as allergic effects or other effects (cancer, developmental toxicity, reproductive effects, etc):

- the Agency may establish in the RED minimum or "baseline" handler PPE requirements for that active ingredient that pertain to all or most occupational end-use products containing that active ingredient.
- these minimum PPE requirements must be compared with the PPE that would be designated on the basis of the acute toxicity of each end-use product, and
- the more stringent choice for each type of PPE (i.e., bodywear, hand protection, footwear, eyewear, etc.) must be placed on the label of the end-use product.

There are no special toxicological concerns about hexazinone that warrant the establishment of active-ingredient-based PPE requirements for pesticide handlers.

V. ACTIONS REQUIRED BY REGISTRANTS

This section specifies the data requirements and responses necessary for the reregistration of both manufacturing-use and end-use products.

A. Manufacturing-Use Products

1. Additional Generic Data Requirements

The generic data base supporting the reregistration of hexazinone for the above eligible uses has been reviewed and determined to be substantially complete. The following generic data will be required on a confirmatory basis:

- 123-1(a) Seed Germination/Seedling Emergence (cucumber, onion, pea)
- 123-1(b) Vegetative Vigor (cucumber)
- 163-1 Leaching, Adsorption/Desorption
- 164-2 Aquatic Field Dissipation (not required if all aquatic uses are removed from hexazinone product labels)
- 165-1 Confined Rotational Crops
- 166-1 Prospective Groundwater Monitoring Study
- 201-1 Droplet Size Spectrum
- 202-1 Drift Field Evaluation
- 171-4d Residue Analytical Method Ruminant
- 171-4e Storage Stability (Alfalfa, Metabolite C for Grass)
- 171-4j Magnitude of the Residue in Meat/Milk
- 171-4k Magnitude of the Residue in Grass Hay and Alfalfa Seed Screenings

2. Labeling Requirements for Manufacturing-Use Products

There are no labeling requirements for manufacturing-use products.

B. End-Use Products

1. Additional Product-Specific Data Requirements

Section 4(g)(2)(B) of FIFRA calls for the Agency to obtain any needed product-specific data regarding the pesticide after a determination of eligibility has been made. The product specific data requirements are listed in Appendix G, the Product Specific Data Call-In Notice.

Registrants must review previous data submissions to ensure that they meet current EPA acceptance criteria (Appendix F; Attachment E) and if not, commit to conduct new studies. If a registrant believes that previously submitted data meet current testing standards, then study MRID numbers should be cited according to the instructions in the Requirement Status and Registrants Response Form provided for each product.

2. Labeling Requirements for End-Use Products

Due to risk mitigation measures imposed, several label requirements have been imposed. Please refer to section V(C) for details.

a. Worker Protection Standard (WPS)

The RED evaluation of the REI established by the WPS concluded that **the REI should be changed to 48 hours**. The WPS REI in effect until now was 24 hours. The Agency found no reason to retain the 24-hour interim REI placed on hexazinone products by PR Notice 93-7. The new 48-hour REI must be inserted into the standardized REI statement required by PR Notice 93-7.

The PPE for early entry under the 48-hour REI for hexazinone is coveralls, chemical resistant gloves, shoes plus socks, and protective eyewear. These PPE must be inserted into the early entry PPE statement required by PR Notice 93-7.

b. Ground Water Labeling

- All product labels must carry the following advisory: "This chemical is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of

this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination."

c. Surface Water Labeling

- DuPont, the technical manufacturer of hexazinone, is in the process of consolidating label language relating to surface and ground water for all of their hexazinone products. After the Agency has reviewed and approved these label amendments, all hexazinone labels must carry this labeling.

3. Other Ground Water Requirements

- The Agency is requiring that registrants report **any domestic hexazinone ground water detections at any levels** to the Agency.
- The Agency is requiring that duPont prepare a report of the ongoing research in Maine in regard to ground water detections in blueberry use areas and submit it to the Agency. This report must be submitted within one year from receipt of this RED document. DuPont must do a one year follow-up to the original report as well.
- The Agency is also requiring that duPont submit an analytical method **or** immunoassay for detection of hexazinone in ground water. This must be submitted within one year from receipt of this RED document.
- DuPont is required to submit educational materials that are currently being developed to the Agency. These materials should be in specific regard to product stewardship and address the potential of ground water contamination from use of hexazinone. This information must be submitted within one year from receipt of this RED document.

4. Risk To Non-Target Plants and Small Mammals

Due to the risk to non-target plants and small mammals, the following mitigation step is required:

- Reduction of the maximum application rate from 13.5 lb ai/acre to 8 lb ai/acre.

C. Existing Stocks

Registrants may generally distribute and sell products bearing old labels/labeling for 26 months from the date of the issuance of this Reregistration Eligibility Decision (RED). Persons other than the registrant may generally distribute or sell such products for 50 months from the date of the issuance of this RED.

However, existing stocks time frames will be established case-by-case, depending on the number of products involved, the number of label changes, and other factors. Refer to "Existing Stocks of Pesticide Products; Statement of Policy"; Federal Register, Volume 56, No. 123, June 26, 1991.

The Agency has determined that registrants may distribute and sell hexazinone products bearing old labels/labeling for 26 months from the date of issuance of this RED. Persons other than the registrant may distribute or sell such products for 50 months from the date of the issuance of this RED. Registrants and persons other than registrants remain obligated to meet pre-existing Agency imposed label changes and existing stocks requirements applicable to products they sell or distribute.

VI. APPENDICES

APPENDIX A. Table of Use Patterns Subject to Reregistration

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
FOOD/FEED USES												
AGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS				Use Group: TERRESTRIAL FEED CROP								
Spray., When needed., Boom sprayer.	EC	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	FL	C46, G01(37), G83(37)
	EC	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	LA	C46, G01(37), G83(37)
	EC	NA	1.125 lb A	*	NS	NS	NS	NS	NS	NS	AL	C46, G01(37), G83(37)
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS		C46, G01(60), H12(60)
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	LA	C46, G01(37), G83(37)
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	MS	C46, G01(37), G83(37)
ALFALFA				Use Group: TERRESTRIAL FEED CROP								
Low volume spray (concentrate)., Dormant., Aircraft.	EC	NA	1.5 lb A	*	NS	1/1 yr	NS	NS	NS	NS	MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS	1/1 yr	NS	NS	NS	NS	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Dormant., Boom sprayer.	EC	NA	1.5 lb A	*	NS	1/1 yr	NS	NS	NS	NS	MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS	1/1 yr	NS	NS	NS	NS	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Late spring., Aircraft.	EC	NA	1.5 lb A	*	NS	NS	NS	NS	NS	NS	001, 013 MT, SD, ND, WY	C46, G01(30), G83(30)
					Geo.013: Northeastern and Midwestern states are the specific allowable geographic areas for this application method. Late spring and between cuttings is the specific application method timing.							
	SC/S	NA	.9 lb A	*	NS	NS	NS	NS	NS	NS	001, 013 MT, ND, SD, WY	C46, G01(30), G83(30)
					Geo.013: Northeastern and Midwestern states are the specific allowable geographic areas for this application method.							

USES ELIGIBLE FOR REREGISTRATION

FOOD/FEED USES (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
ALFALFA (con't)				Use Group: TERRESTRIAL FEED CROP (con't)									
Low volume spray (concentrate)., Late spring., Boom sprayer.	EC	NA	1.5 lb A	*	NS	NS	NS	NS	NS	NS	001, 013	MT, SD, ND, WY	C46, G01(30), G83(30)
					Geo.013: Northeastern and Midwestern states are the specific allowable geographic areas for this application method. Late spring and between cuttings is the specific application method timing.								
	SC/S	NA	.9 lb A	*	NS	NS	NS	NS	NS	NS	001, 013	MT, ND, SD, WY	C46, G01(30), G83(30)
					Geo.013: Northeastern and Midwestern states are the specific allowable geographic areas for this application method.								
Low volume spray (concentrate)., Seed crop., Aircraft.	EC	NA	1.5 lb A	*	NS	NS	NS	NS	NS	NS	CA	MT, SD, ND, WY	C14, C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS	NS	NS	NS	NS	NS	CA	MT, ND, SD, WY	C14, C46, G01(30), G83(30)
Low volume spray (concentrate)., Seed crop., Boom sprayer.	EC	NA	1.5 lb A	*	NS	NS	NS	NS	NS	NS	CA	MT, SD, ND, WY	C14, C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS	NS	NS	NS	NS	NS	CA	MT, ND, SD, WY	C14, C46, G01(30), G83(30)
Low volume spray (concentrate)., Spring., Aircraft.	EC	NA	1.5 lb A	*	NS	1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A	*	NS	1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Spring., Boom sprayer.	EC	NA	1.5 lb A	*	NS	1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, SD, ND, WY	C46, G01(30), G83(30)

USES ELIGIBLE FOR REREGISTRATION

FOOD/FEED USES (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
ALFALFA (con't)					Use Group: TERRESTRIAL FEED CROP (con't)							
	SC/S	NA	1.35 lb A	*	NS 1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Stubble., Aircraft.	EC	NA	1.5 lb A	*	NS 1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A	*	NS 1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Stubble., Boom sprayer.	EC	NA	1.5 lb A	*	NS 1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A	*	NS 1/1 yr	NS	NS	NS	NS	CT, DE, IL, IN, IA, KY, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, VA, WV, WI	MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Winter., Aircraft.	EC	NA	1.5 lb A	*	NS 1/1 yr	NS	NS	NS	NS		MT, SD, ND, WY	C46, G01(30), G83(30)
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS		MT, ND, SD, WY	C46, G01(30), G83(30)
Low volume spray (concentrate)., Winter., Boom sprayer.	EC	NA	1.5 lb A	*	NS 1/1 yr	NS	NS	NS	NS		MT, SD, ND, WY	C46, G01(30), G83(30)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
FOOD/FEED USES (con't)												
ALFALFA (con't)				Use Group: TERRESTRIAL FEED CROP (con't)								
	SC/S	NA	1.35 lb A 1.35 lb A 1.35 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS		MT, ND, SD, WY	C46, G01(30), G83(30)
Spray., Delayed dormant., Sprayer.	EC	NA	1 lb A 1 lb A .75 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	WY		C46
BLUEBERRY				Use Group: TERRESTRIAL FOOD CROP								
Ground spray., Dormant., Boom sprayer.	EC	NA	2 lb A	*	NS NS	NS	NS	NS	NS	NC		C46, H01(50)
GRASS FORAGE/FODDER/HAY				Use Group: TERRESTRIAL FEED CROP								
Spray., When needed., Boom sprayer.	SC/S	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS			C46, G01(60), H12(60)
PASTURES				Use Group: TERRESTRIAL FEED CROP								
Basal spray., When needed., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS NS	.66 lb	NS	NS	NS			C46
Spray., When needed., Boom sprayer.	EC	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS	AL		C46, G01(37), G83(37)
	EC	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS	FL		C46, G01(37), G83(37)
	EC	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS	LA		C46, G01(37), G83(37)
	SC/S	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS	LA		C46, G01(37), G83(37)
	SC/S	NA	1.125 lb A	*	NS 1/1 yr	NS	NS	NS	NS	MS		C46, G01(37), G83(37)
Tree injection treatment., Summer., Injection.	EC	NA	.001585 lb ft. interval	*	NS NS	.66 lb	NS	NS	NS			C46
Tree injection treatment., Summer., Tree injection equipment.	EC	NA	.001585 lb ft. interval	*	NS NS	.66 lb	NS	NS	NS			C46
PINEAPPLE				Use Group: TERRESTRIAL FOOD+FEED CROP								
Broadcast., Postharvest., Sprayer.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb	NS	NS	NS			C46

USES ELIGIBLE FOR REREGISTRATION

FOOD/FEED USES (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
PINEAPPLE (con't)				Use Group: TERRESTRIAL FOOD+FEED CROP (con't)								
Broadcast., Postplant., Sprayer.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
Broadcast., Preplant., Aircraft.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
Broadcast., Preplant., Sprayer.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
Directed spray., Postemergence., Boom sprayer.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
Directed spray., Postemergence., Knapsack sprayer.	SC/S	NA	1.8 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
Spot treatment., When needed., Sprayer.	SC/S	NA	3.6 lb A	*	NS NS	5.4 lb		NS	NS	NS		C46
RANGELAND				Use Group: TERRESTRIAL FEED CROP								
Basal spray., Late winter., Hand held sprayer.	EC	NA	.002114 lb in. DBH	*	NS NS	2 lb		NS	NS	NS	TX	C46
	EC	NA	.002114 lb in. DBH	*	NS NS	NS		NS	NS	NS	NM	C46
Basal spray., Spring., Hand held sprayer.	EC	NA	.002114 lb in. DBH	*	NS NS	2 lb		NS	NS	NS	TX	C46
	EC	NA	.002114 lb in. DBH	*	NS NS	NS		NS	NS	NS	NM	C46
Basal spray., When needed., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS NS	.66 lb		NS	NS	NS		C46
Spot soil treatment., Late winter., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	.595 lb	NS	NS			
Spot soil treatment., Spring., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	.595 lb	NS	NS			
Tree injection treatment., Summer., Injection.	EC	NA	.001585 lb ft. interval	*	NS NS	.66 lb		NS	NS	NS		C46
Tree injection treatment., Summer., Tree injection equipment.	EC	NA	.001585 lb ft. interval	*	NS NS	.66 lb		NS	NS	NS		C46
SUGARCANE				Use Group: TERRESTRIAL FOOD+FEED CROP								
Band treatment., Fall., Boom sprayer.	SC/S	NA	.9 lb A .45 lb A	F C	NS 1/1 yr	NS	1.35 lb	NS	NS	LA		C46, GA4

USES ELIGIBLE FOR REREGISTRATION

FOOD/FEED USES (con't)

SUGARCANE (con't) — Use Group: TERRESTRIAL FOOD+FEED CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Band treatment., Spring., Boom sprayer.	SC/S	NA	.9 lb A .45 lb A	F C	NS 1/1 yr	NS	1.35 lb	NS	NS	LA		C46, GA4
Broadcast., Dormant., Boom sprayer.	SC/S	NA	.9 lb A .675 lb A .45 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	TX		C46, GA4
Broadcast., Early postemergence., Boom sprayer.	SC/S	NA	.9 lb A .675 lb A .45 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	TX		C46, GA4
Broadcast., Fall., Boom sprayer.	SC/S	NA	.9 lb A .45 lb A	F C	NS 1/1 yr	NS	1.35 lb	NS	NS	LA		C46, GA4
Broadcast., Preemergence., Boom sprayer.	SC/S	NA	.9 lb A .675 lb A .45 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	TX		C46, GA4
Broadcast., Spring., Boom sprayer.	SC/S	NA	.9 lb A .45 lb A	F C	NS 1/1 yr	NS	1.35 lb	NS	NS	LA		C46, GA4
Broadcast., Stubble., Boom sprayer.	SC/S	NA	.9 lb A .675 lb A .45 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	TX		C46, GA4
Directed spray., Layby., Boom sprayer.	SC/S	NA	.9 lb A .675 lb A .45 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	TX		C46, GA4
Directed spray., Postemergence., Boom sprayer.	SC/S	NA	1.8 lb A .9 lb A	O C	NS 1/1 yr	NS	NS	NS	NS	FL		C46, GA4
Low volume spray (concentrate)., Postemergence., Boom sprayer.	SC/S	NA	3.6 lb A 1.8 lb A .9 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	HI, PR		C46, GA4
Low volume spray (concentrate)., Preemergence., Aircraft.	SC/S	NA	3.6 lb A 1.8 lb A .9 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	HI		C46, GA4
Low volume spray (concentrate)., Preemergence., Boom sprayer.	SC/S	NA	3.6 lb A 1.8 lb A .9 lb A	F M C	NS 1/1 yr	NS	NS	NS	NS	FL, HI, PR		C46, GA4
Spot treatment., When needed., Knapsack sprayer.	SC/S	NA	1.8 lb A	*	NS 1/1 yr	NS	NS	NS	NS	HI, PR		C46, GA4

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION													
NON-FOOD/NON-FEED													
AGRICULTURAL FALLOW/IDLELAND				Use Group: TERRESTRIAL NON-FOOD CROP									
Bark cut treatment., April., Sprayer.	EC	NA		UC	*	NS	NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., February., Sprayer.	EC	NA		UC	*	NS	NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., June., Sprayer.	EC	NA		UC	*	NS	NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., March., Sprayer.	EC	NA		UC	*	NS	NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., May., Sprayer.	EC	NA		UC	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., April., Hand held sprayer.	EC	NA	.002114 lb in. DBH		*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., February., Hand held sprayer.	EC	NA	.002114 lb in. DBH		*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., June., Hand held sprayer.	EC	NA	.002114 lb in. DBH		*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., March., Hand held sprayer.	EC	NA	.002114 lb in. DBH		*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., May., Hand held sprayer.	EC	NA	.002114 lb in. DBH		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., April., Aircraft.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., April., Sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., February., Aircraft.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., February., Sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., June., Aircraft.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., June., Sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., March., Aircraft.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., March., Sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., May., Aircraft.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., May., Sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46
Soil treatment (specialized)., April., Hand held sprayer.	EC	NA	6 lb A		*	NS	NS	NS	NS	NS	NS	FL	C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed		Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION													
NON-FOOD/NON-FEED (con't)													
AGRICULTURAL FALLOW/IDLELAND (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)									
Soil treatment (specialized)., February., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., June., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., March., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., May., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., April., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., April., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., February., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., February., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., June., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., June., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., March., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., March., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., May., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
Tree injection treatment., May., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL		C46
CHRISTMAS TREE PLANTATIONS				Use Group: TERRESTRIAL NON-FOOD CROP									

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

CHRISTMAS TREE PLANTATIONS (con't) — Use Group: TERRESTRIAL NON-FOOD CROP (con't)

Band treatment., Spring., Sprayer.	EC	NA	2 lb A 1.75 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	013	CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)
					Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
	SC/S	NA	1.8 lb A 1.575 lb A 1.125 lb A	F M C	NS	NS	NS	NS	NS	NS	013	CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)
					Geo.013: See above								
Broadcast., Fall., Aircraft.	SC/S	NA	1.8 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
Broadcast., Fall., Sprayer.	SC/S	NA	1.8 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Broadcast., Spring., Aircraft.	SC/S	NA	1.8 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Broadcast., Spring., Sprayer.	EC	NA	2 lb A 1.75 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS		CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)
	SC/S	NA	1.8 lb A 1.575 lb A 1.125 lb A	F M C	NS	NS	NS	NS	NS	NS	013	CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)
					Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method. This application method may be used in areas west of the Rocky Mountains with dosages of 2 pounds per acre in 20 gallons of water.								
Directed spray., Spring., Sprayer.	EC	NA	2 lb A 1.75 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS		CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
CHRISTMAS TREE PLANTATIONS (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)							
Directed spray., When needed., Sprayer.	SC/S	NA	1.8 lb A	F	NS	NS	NS	NS	NS	NS	013	CT, DE, ME, MD, NH, NJ, NY, NC, PA, RI, TX, VT, VA, WV	C46, G01(30)
			1.575 lb A	M									
			1.125 lb A	C									
					Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method. This application method may be used in areas west of the Rocky Mountains with dosages of 2 pounds per acre in 20 gallons of water.								
Spray., Fall., Aircraft.	EC	NA	2 lb A	F	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
			1.75 lb A	M	Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable								
			1.25 lb A	C	geographic area for this application method.								
Spray., Fall., Ground.	EC	NA	2 lb A	F	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
			1.75 lb A	M	Geo.013: See above								
			1.25 lb A	C									
Spray., Spring., Aircraft.	EC	NA	2 lb A	F	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
			1.75 lb A	M	Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this								
			1.25 lb A	C	application method.								
Spray., Spring., Ground.	EC	NA	2 lb A	F	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
			1.75 lb A	M	Geo.013: See above								
			1.25 lb A	C									
CONIFER RELEASE				Use Group: FORESTRY									
Band treatment., Fall., Boom sprayer.	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									
Band treatment., Fall., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Band treatment., Late winter., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

CONIFER RELEASE (con't) — Use Group: FORESTRY (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate /crop /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed		Use Limitations Codes
Band treatment., Postplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: See above								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Band treatment., Preplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: See above								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Band treatment., Spring., Boom sprayer.	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									
Band treatment., Spring., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas are the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.								
Basal spray., Early summer., Hand held sprayer.	EC	NA	4 lb A	F	NS	NS	NS	NS	NS	NS			C46, G01(30)
			4 lb A	M									
			1.5 lb A	C									
Basal spray., Late winter., Hand held sprayer.	EC	NA	4 lb A	F	NS	NS	NS	NS	NS	NS			C46, G01(30)
			4 lb A	M									
			1.5 lb A	C									
Basal spray., Preharvest., Hand held sprayer.	EC	NA	4 lb A	F	NS	NS	NS	NS	NS	NS			C46, G01(30)
			4 lb A	M									
			1.5 lb A	C									

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
CONIFER RELEASE (con't)					Use Group: FORESTRY (con't)							
Basal spray., When needed., Hand held sprayer.	EC	NA	.002114 lb in. DBH	*	NS	NS	NS	NS	NS	NS		C46, G01(30)
Broadcast., Early summer., Aircraft.	P/T	NA	3 lb A 2.5 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	013 Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall is the specific allowable geographic area for this site on label.	
Broadcast., Early summer., Ground.	P/T	NA	3 lb A 2.5 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	013 Geo.013: See above	
Broadcast., Fall., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.	C46, G01(30)
	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains and east of the Cascades are the specific allowable geographic areas for this application method.	G01(30)
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains in the Snowbelt region is the specific allowable geographic area.	C46, G01(60), H12(60)
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.	C46, G01(30)
Broadcast., Fall., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
Broadcast., Fall., Granule applicator.	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains in the Snowbelt region is the specific allowable geographic area. A backpack equipped with a granular applicator is the specific type of application method equipment.	C46, G01(60), H12(60)
Broadcast., Fall., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013 Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.	C46, G01(30)

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

CONIFER RELEASE (con't) — Use Group: FORESTRY (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains and east of the Cascades are the specific allowable geographic areas for this application method.							
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.							
Broadcast., Late winter., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: See above							
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: See above							
Broadcast., Late winter., Granule applicator.	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: West of the Rocky Mountains in the Rainbelt region is the specific allowable geographic area. A backpack equipped with a granular applicator is the specific type of application method equipment.							
Broadcast., Late winter., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: See above							
Broadcast., Postplant., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: See above							
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: See above							
Broadcast., Postplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: See above							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: See above							

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed		Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION													
NON-FOOD/NON-FEED (con't)													
CONIFER RELEASE (con't)					Use Group: FORESTRY (con't)								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Broadcast., Posttransplant., Aircraft.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013		G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this								
			.75 lb A	C	application method.								
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
Broadcast., Posttransplant., Ground.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013		G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this								
			.75 lb A	C	application method.								
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
Broadcast., Preplant., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
	G	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013		G01(30)
			3.5 lb A	M	Geo.013: East and west of the Rocky Mountains is the specific allowable geographic area								
			3 lb A	C	for this application method. Maximum dosage for areas west of the Rocky Mountains is 20 pounds per acre.								
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Broadcast., Preplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: See above								
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: See above								
Broadcast., Pretransplant., Aircraft.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013		G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this								
			.75 lb A	C	application method.								

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

CONIFER RELEASE (con't) — Use Group: FORESTRY (con't)

	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
Broadcast., Pretransplant., Ground.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013		G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method.								
			.75 lb A	C									
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.								
Broadcast., Spring., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas is the specific allowable geographic area for this application method.								
	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									
	G	NA	3 lb A	F	NS	NS	NS	NS	NS	NS			G01(30)
			2.2 lb A	M									
			1.5 lb A	C									
	G	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	013		C46, G01(60),
			2.25 lb A	M									H12(60)
			1.5 lb A	C	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall are the specific allowable geographic areas for this application method. Product may be applied at a rate of 4 pounds per acre west of the Rocky Mountains.								
	G	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	013, 014		G01(30)
			2.25 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall, and east and west of the Cascades are the specific allowable geographic areas for this application method. Maximum dosage for east and west of the Cascades is 12 pounds per acre.								
			1.5 lb A	C									
	P/T	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	013		
			2.5 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall is the specific allowable geographic area for this site on label.								
			1.5 lb A	C									
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas are the specific allowable geographic area for this application method.								
Broadcast., Spring., Boom sprayer.	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

CONIFER RELEASE (con't) — Use Group: FORESTRY (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Broadcast., Spring., Granule applicator.	G	NA	3 lb A 2.25 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall are the specific allowable geographic areas for this application method. Product may be applied at a rate of 4 pounds per acre west of the Rocky Mountains. A backpack equipped with a granular applicator is the specific type of application method equipment.							
Broadcast., Spring., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas is the specific allowable geographic area for this application method.							
	G	NA	3 lb A 2.25 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	013, 014	G01(30)
					Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall, and east and west of the Cascades are the specific allowable geographic areas for this application method. Maximum dosage for east and west of the Cascades is 12 pounds per acre.							
	G	NA	3 lb A 2.2 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	014, 013	G01(30)
					Geo.013: East of the Rocky Mountains and east and west of the Cascades are the specific allowable geographic areas for this application method.							
	P/T	NA	3 lb A 2.5 lb A 1.5 lb A	F M C	NS	NS	NS	NS	NS	NS	013	
					Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall is the specific allowable geographic area for this site on label.							
	SC/S	NA	2.7 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas are the specific allowable geographic area for this application method.							
Directed spray., Late winter., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
Directed spray., Spring., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: See above							
Ground spray., Early spring., Sprayer.	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	008	C46, G01(30)
Ground spray., Early summer., Sprayer.	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	008, 016	C46, G01(30)
Ground spray., Late spring., Sprayer.	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	016	C46, G01(30)
Soil treatment., Early summer., By hand.	P/T	NA	3.770 lb A	*	NS	NS	NS	NS	NS	NS		G01(30)
Soil treatment., Late winter., By hand.	P/T	NA	3.770 lb A	*	NS	NS	NS	NS	NS	NS		G01(30)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
CONIFER RELEASE (con't)				Use Group: FORESTRY (con't)								
Spot soil treatment., Early summer., By hand.	P/T	NA	.001984 lb A	*	NS	NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Late winter., By hand.	P/T	NA	.001984 lb A	*	NS	NS	NS	NS	NS	NS		G01(30)
Spray., Early spring., Aircraft.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	008	C46, G01(30)
	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	008	C46, G01(30)
Spray., Early spring., Ground.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	008	C46, G01(30)
Spray., Early summer., Aircraft.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	008, 016	C46, G01(30)
	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	008, 016	C46, G01(30)
Spray., Early summer., Ground.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	008, 016	C46, G01(30)
Spray., Late spring., Aircraft.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	016	C46, G01(30)
	SC/S	NA	3.6 lb A	*	NS	NS	NS	NS	NS	NS	016	C46, G01(30)
Spray., Late spring., Ground.	EC	NA	4 lb A	*	NS	NS	NS	NS	NS	NS	016	C46, G01(30)
Tree injection treatment., Summer., Injection.	EC	NA	1.321E-04 lb in. interval	*	NS	NS	NS	NS	NS	NS		C46, G01(30)
Tree injection treatment., Summer., Tree injection equipment.	EC	NA	1.321E-04 lb in. interval	*	NS	NS	NS	NS	NS	NS		C46, G01(30)
DRAINAGE SYSTEMS				Use Group: AQUATIC NON-FOOD INDUSTRIAL								
Basal spray., Early summer., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., Fall., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., Late winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

DRAINAGE SYSTEMS (con't) — Use Group: AQUATIC NON-FOOD INDUSTRIAL (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS			C46
Basal spray., Winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Early summer., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Early summer., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Early summer., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Fall., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Fall., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Late winter., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Late winter., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Late winter., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Spring., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Spring., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Aircraft.	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Boom sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL, AR, FL, GA, LA, MS, OK, NC, SC, TN, TX		C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

DRAINAGE SYSTEMS (con't) — Use Group: AQUATIC NON-FOOD INDUSTRIAL (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Ground.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., When needed., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Winter., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Winter., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Directed spray., Early summer., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Fall., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Late winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., When needed., Sprayer.	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Directed spray., Winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., Early summer., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., Late winter., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
DRAINAGE SYSTEMS (con't)				Use Group: AQUATIC NON-FOOD INDUSTRIAL (con't)								
Spot soil treatment., Early summer., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spot soil treatment., Fall., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spot soil treatment., Late winter., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spot soil treatment., Spring., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spot soil treatment., Winter., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spray., When needed., Boom sprayer.	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL	C46
FOREST PLANTINGS (REFORESTATION PROGRAMS)				Use Group: FORESTRY								
Band treatment., Fall., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
Band treatment., Postplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: See above							
Band treatment., Preplant., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
Band treatment., Preplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method. Dosage is given at the broadcast rate; for band treatment, reduce dosage proportionately.							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: See above							
Band treatment., Spring., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't) Use Group: FORESTRY (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Basal spray., Early summer., Hand held sprayer.	EC	NA	6 lb A	F	NS	NS	NS	NS	NS	NS			C46
			6 lb A	M									
			3 lb A	C									
Basal spray., Late winter., Hand held sprayer.	EC	NA	6 lb A	F	NS	NS	NS	NS	NS	NS			C46
			6 lb A	M									
			3 lb A	C									
Basal spray., Preharvest., Hand held sprayer.	EC	NA	6 lb A	F	NS	NS	NS	NS	NS	NS			C46
			6 lb A	M									
			3 lb A	C									
Basal spray., When needed., Hand held sprayer.	EC	NA	.002114 lb in. DBH	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Early summer., Aircraft.	P/T	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013		
			3 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual								
			2 lb A	C	rainfall is the specific allowable geographic area for this site on label.								
Broadcast., Early summer., Ground.	P/T	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013		
			3 lb A	M	Geo.013: See above								
			2 lb A	C									
Broadcast., Fall., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46
					Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.								
	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		G01(30)
					Geo.013: West of the Rocky Mountains and east of the Cascades are the specific allowable geographic areas for this application method.								
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013		C46, G01(60), H12(60)
					Geo.013: West of the Rocky Mountains in the Snowbelt region is the specific allowable geographic area.								
Broadcast., Fall., Boom sprayer.	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT		C46
			2 lb A	M									
			1.25 lb A	C									

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)				Use Group: FORESTRY (con't)								
Broadcast., Fall., Granule applicator.	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: West of the Rocky Mountains in the Snowbelt region is the specific allowable geographic area. A backpack equipped with a granular applicator is the specific type of application method equipment.							
Broadcast., Fall., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains in snowbelt areas is the specific allowable geographic area for this application method.							
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains and east of the Cascades are the specific allowable geographic areas for this application method.							
Broadcast., Late winter., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: See above							
Broadcast., Late winter., Granule applicator.	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
					Geo.013: West of the Rocky Mountains in the Rainbelt region is the specific allowable geographic area. A backpack equipped with a granular applicator is the specific type of application method equipment.							
Broadcast., Late winter., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
Broadcast., Postplant., Aircraft.	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.							
Broadcast., Postplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: See above							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: See above							
Broadcast., Posttransplant., Aircraft.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year /cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year /cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)				Use Group: FORESTRY (con't)							
	G	NA	1.25 lb A 1 lb A .75 lb A	F M C	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method.
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.
Broadcast., Posttransplant., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
Broadcast., Posttransplant., Ground.	G	NA	1.25 lb A 1 lb A .75 lb A	F M C	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method.
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.
Broadcast., Preplant., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46 Geo.013: See above
	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
	G	NA	4 lb A 3.5 lb A 3 lb A	F M C	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: East and west of the Rocky Mountains is the specific allowable geographic area for this application method. Maximum dosage for areas west of the Rocky Mountains is 20 pounds per acre.
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30) Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.
Broadcast., Preplant., Boom sprayer.	EC	NA	3 lb A 2 lb A 1.25 lb A	F M C	NS	NS	NS	NS	NS	NS	MT	C46
Broadcast., Preplant., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46 Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)				Use Group: FORESTRY (con't)								
	G	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013	G01(30)
			3.5 lb A	M	Geo.013: East and west of the Rocky Mountains is the specific allowable geographic area							
			3 lb A	C	for this application method. Maximum dosage for areas west of the Rocky Mountains is 20 pounds per acre.							
	G	NA	2 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.							
Broadcast., Pretransplant., Aircraft.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013	G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this							
			.75 lb A	C	application method.							
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.							
Broadcast., Pretransplant., Ground.	G	NA	1.25 lb A	F	NS	NS	NS	NS	NS	NS	013	G01(30)
			1 lb A	M	Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this							
			.75 lb A	C	application method.							
	G	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	G01(30)
					Geo.013: West of the Rocky Mountains is the specific allowable geographic area for this application method.							
Broadcast., Spring., Aircraft.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT	C46
			2 lb A	M								
			1.25 lb A	C								
	G	NA	3 lb A	F	NS	NS	NS	NS	NS	NS		G01(30)
			2.2 lb A	M								
			1.5 lb A	C								
	G	NA	6 lb A	F	NS	NS	NS	NS	NS	NS	013	C46, G01(60),
			3.998 lb A	M								H12(60)
			3 lb A	C	Geo.013: Areas east of the Rocky Mountains with greater than 20 inches of annual rainfall are the specific allowable geographic areas on label. Product may be applied at a rate of 4 pounds per acre west of the Rocky Mountains.							

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)				Use Group: FORESTRY (con't)								
	G	NA	4.5 lb A	F	NS	NS	NS	NS	NS	NS	013, 014	G01(30)
			4 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall, and east and west of the Cascades are the specific allowable geographic areas for this application method. Maximum dosage for east and west of the Cascades is 12 pounds per acre.							
			3 lb A	C								
	P/T	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013	
			3 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall is the specific allowable geographic area for this site on label.							
			2 lb A	C								
Broadcast., Spring., Boom sprayer.	EC	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	MT	C46
			2 lb A	M								
			1.25 lb A	C								
Broadcast., Spring., Granule applicator.	G	NA	6 lb A	F	NS	NS	NS	NS	NS	NS	013	C46, G01(60), H12(60)
			3.998 lb A	M								
			3 lb A	C	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall are the specific allowable geographic areas for this application method. Product may be applied at a rate of 4 pounds per acre west of the Rocky Mountains. A backpack equipped with a granular applicator is the specific type of application method equipment.							
Broadcast., Spring., Ground.	G	NA	4.5 lb A	F	NS	NS	NS	NS	NS	NS	013, 014	G01(30)
			4 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall, and east and west of the Cascades are the specific allowable geographic areas for this application method. Maximum dosage for east and west of the Cascades is 12 pounds per acre.							
			3 lb A	C								
	G	NA	3 lb A	F	NS	NS	NS	NS	NS	NS	014, 013	G01(30)
			2.2 lb A	M	Geo.013: East of the Rocky Mountains and east and west of the Cascades are the specific allowable geographic areas for this application method.							
			1.5 lb A	C								
	P/T	NA	4 lb A	F	NS	NS	NS	NS	NS	NS	013	
			3 lb A	M	Geo.013: East of the Rocky Mountains in areas with greater than 20 inches of annual rainfall is the specific allowable geographic area for this site on label.							
			2 lb A	C								
Directed spray., Late winter., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt areas is the specific allowable geographic area for this application method.							
Directed spray., Spring., Ground.	EC	NA	3 lb A	*	NS	NS	NS	NS	NS	NS	013	C46, G01(30)
					Geo.013: West of the Rocky Mountains in rainbelt and snowbelt areas is the specific allowable geographic area for this application method.							
Ground spray., Early summer., Boom sprayer.	SC/S	NA	5.4 lb A	*	NS	NS	NS	NS	NS	NS	013	C46
					Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method.							

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year /cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year /cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)						Use Group: FORESTRY (con't)					
Ground spray., Early summer., Sprayer.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: See above						
Ground spray., Late spring., Boom sprayer.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: See above						
Ground spray., Late spring., Sprayer.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: See above						
Ground spray., When needed., Boom sprayer.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	ME, MI, MN, NH, NY, VT, WI	C46
Ground spray., When needed., Sprayer.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	ME, MI, MN, NH, NY, VT, WI	C46
Soil treatment., Early summer., By hand.	P/T	NA	5.754 lb A	*	NS NS	NS	NS	NS	NS		G01(30)
Soil treatment., Late winter., By hand.	P/T	NA	5.754 lb A	*	NS NS	NS	NS	NS	NS		G01(30)
Soil treatment., Preharvest., By hand.	P/T	NA	5.754 lb A	*	NS NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Early summer., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Late winter., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Preharvest., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		G01(30)
Spray., Delayed dormant., Aircraft.	EC	NA	6 lb A	*	NS NS	NS	NS	NS	NS	ME, MI, MN, NH, NY, VT, WI	C46
Spray., Delayed dormant., Boom sprayer.	EC	NA	6 lb A	*	NS NS	NS	NS	NS	NS	ME, MI, MN, NH, NY, VT, WI	C46
Spray., Early summer., Aircraft.	EC	NA	6 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: East of the Rocky Mountains is the specific allowable geographic area for this application method.						
	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: See above						
Spray., Early summer., Boom sprayer.	EC	NA	6 lb A	*	NS NS	NS	NS	NS	NS	013	C46
					Geo.013: See above						

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
FOREST PLANTINGS (REFORESTATION PROGRAMS) (con't)				Use Group: FORESTRY (con't)							
Spray., Late spring., Aircraft.	EC	NA	6 lb A	*	NS NS Geo.013:	NS See above	NS	NS	NS	013	C46
	SC/S	NA	5.4 lb A	*	NS NS Geo.013:	NS See above	NS	NS	NS	013	C46
Spray., Late spring., Boom sprayer.	EC	NA	6 lb A	*	NS NS Geo.013:	NS See above	NS	NS	NS	013	C46
Spray., When needed., Aircraft.	SC/S	NA	5.4 lb A	*	NS NS	NS	NS	NS	NS	ME, MI, MN, NH, NY, VT, WI	C46
Tree injection treatment., Summer., Injection.	EC	NA	1.321E-04 lb in. interval	*	NS NS	NS	NS	NS	NS		C46
Tree injection treatment., Summer., Tree injection equipment.	EC	NA	1.321E-04 lb in. interval	*	NS NS	NS	NS	NS	NS		C46
FOREST TREES (ALL OR UNSPECIFIED)				Use Group: FORESTRY							
Soil treatment., Early summer., By hand.	P/T	NA	5.754 lb A	*	NS NS	NS	NS	NS	NS		G01(30)
Soil treatment., Late winter., By hand.	P/T	NA	5.754 lb A	*	NS NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Early summer., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		G01(30)
Spot soil treatment., Late winter., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		G01(30)
Tree injection treatment., When needed., Tree injection equipment.	P/T	NA	UC	*	NS NS	NS	NS	NS	NS		
HOUSEHOLD/DOMESTIC DWELLINGS OUTDOOR PREMISES				Use Group: OUTDOOR RESIDENTIAL							
Tree injection treatment., When needed., Tree injection equipment.	P/T	NA	UC	*	NS NS	NS	NS	NS	NS		
INDUSTRIAL AREAS (OUTDOOR)				Use Group: TERRESTRIAL NON-FOOD CROP							
Basal spray., Early summer., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS NS	NS	NS	NS	NS		C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

INDUSTRIAL AREAS (OUTDOOR) (con't) — Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Basal spray., Fall., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., Late winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., When needed., Hand held sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., When needed., Power sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., Winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Early summer., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Fall., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Fall., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS		C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION													
NON-FOOD/NON-FEED (con't)													
INDUSTRIAL AREAS (OUTDOOR) (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)									
Broadcast., Not on label., By hand.	P/T	NA	6.945 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Spring., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Spring., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Aircraft.	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Boom sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL, AR, FL, GA, LA, MS, OK, NC, SC, TN, TX		C46
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Granule applicator.	G	NA	11.25 lb A	*	NS	NS	NS	NS	NS	NS			C46, G01(60), H12(60)
Broadcast., When needed., Ground.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., When needed., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Winter., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Winter., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Directed spray., Early summer., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
INDUSTRIAL AREAS (OUTDOOR) (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)							
Directed spray., Fall., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS	C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS	C46
Directed spray., Late winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS	C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS	C46
Directed spray., When needed., Sprayer.	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX C46
Directed spray., Winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS	C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS	C46
Soil treatment (specialized)., Early summer., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS	C46
Soil treatment (specialized)., Late winter., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS	C46
Spot soil treatment., Early summer., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
Spot soil treatment., Fall., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
Spot soil treatment., Late winter., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
Spot soil treatment., Not on label., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS	
Spot soil treatment., Spring., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
Spot soil treatment., Winter., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS	
Spray., When needed., Boom sprayer.	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL C46
Tree injection treatment., When needed., Tree injection equipment.	P/T	NA	UC	*	NS	NS	NS	NS	NS	NS	
NONAGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS				Use Group: TERRESTRIAL NON-FOOD CROP							

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS (con't) Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year cycle		Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Basal spray., Early summer., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., Fall., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., Late winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Basal spray., When needed., Hand held sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., When needed., Power sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., Winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Early summer., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Fall., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Fall., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS (con't) Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Broadcast., Late winter., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Late winter., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Not on label., By hand.	P/T	NA	6.945 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Spring., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., Spring., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Aircraft.	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
Broadcast., When needed., Boom sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL, AR, FL, GA, LA, MS, OK, NC, SC, TN, TX		C46
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Granule applicator.	G	NA	11.25 lb A	*	NS	NS	NS	NS	NS	NS			C46, G01(60), H12(60)
Broadcast., When needed., Ground.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., When needed., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Broadcast., When needed., Sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS			C46
Broadcast., Winter., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS (con't) Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	Max. Rate /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Broadcast., Winter., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			
Directed spray., Early summer., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Fall., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Late winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., When needed., Sprayer.	SC/S	NA	13.5 lb A	*	NS	NS	NS	NS	NS	NS	TX		C46
Directed spray., Winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., Early summer., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., Late winter., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
Spot soil treatment., Early summer., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Fall., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Late winter., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Not on label., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Spring., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Winter., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spray., When needed., Boom sprayer.	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL		C46

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop /year cycle	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION											
NON-FOOD/NON-FEED (con't)											
NONAGRICULTURAL RIGHTS-OF-WAY/FENCEROWS/HEDGEROWS (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)							
Tree injection treatment., When needed., Tree injection equipment.	P/T	NA		UC	* NS	NS	NS	NS	NS	NS	
NONAGRICULTURAL UNCULTIVATED AREAS/SOILS				Use Group: TERRESTRIAL NON-FOOD CROP							
Bark cut treatment., April., Sprayer.	EC	NA		UC	* NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., February., Sprayer.	EC	NA		UC	* NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., June., Sprayer.	EC	NA		UC	* NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., March., Sprayer.	EC	NA		UC	* NS	NS	NS	NS	NS	FL	C46
Bark cut treatment., May., Sprayer.	EC	NA		UC	* NS	NS	NS	NS	NS	FL	C46
Basal spray., April., Hand held sprayer.	EC	NA	.002114 lb in. DBH		* NS	NS	NS	NS	NS	FL	C46
Basal spray., Early summer., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia		* NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft		* NS	NS	NS	NS	NS		C46
Basal spray., Fall., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia		* NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft		* NS	NS	NS	NS	NS		C46
Basal spray., February., Hand held sprayer.	EC	NA	.002114 lb in. DBH		* NS	NS	NS	NS	NS	FL	C46
Basal spray., June., Hand held sprayer.	EC	NA	.002114 lb in. DBH		* NS	NS	NS	NS	NS	FL	C46
Basal spray., Late winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia		* NS	NS	NS	NS	NS		C46
	RTU	NA	3.000E-04 lb sq.ft		* NS	NS	NS	NS	NS		C46
Basal spray., March., Hand held sprayer.	EC	NA	.002114 lb in. DBH		* NS	NS	NS	NS	NS	FL	C46
Basal spray., May., Hand held sprayer.	EC	NA	.002114 lb in. DBH		* NS	NS	NS	NS	NS	FL	C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL UNCULTIVATED AREAS/SOILS (con't) Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Dose	Max. # Apps @ Max. Rate Max. /crop /year cycle	Max. Dose [(AI unless noted otherwise)/A] /crop	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Basal spray., When needed., Hand held sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., When needed., Power sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Basal spray., Winter., Hand held sprayer.	EC	NA	.002114 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	3.113E-04 lb sq.ft	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., April., Aircraft.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., April., Sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., Early summer., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Early summer., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Fall., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Fall., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., February., Aircraft.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., February., Sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., June., Aircraft.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., June., Sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., Late winter., Aircraft.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Ground.	G	NA	5 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Late winter., Sprayer.	SC/S	NA	7.2 lb A	*	NS	NS	NS	NS	NS	NS		C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL UNCULTIVATED AREAS/SOILS (con't) — Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Broadcast., March., Aircraft.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., March., Sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., May., Aircraft.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., May., Sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL	C46
Broadcast., Not on label., By hand.	P/T	NA	6.945 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Spring., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Spring., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., When needed., Aircraft.	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., When needed., Boom sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS		C46
	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL, AR, FL, GA, LA, MS, OK, NC, SC, TN, TX	C46
Broadcast., When needed., Ground.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		C46
	G	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		
	P/T	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., When needed., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS		C46
	SC/S	NA	10.8 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., When needed., Sprayer.	RTU	NA	12.45 lb A	*	NS	NS	NS	NS	NS	NS		C46
Broadcast., Winter., Aircraft.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Broadcast., Winter., Ground.	P/T	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		
Directed spray., Early summer., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS		C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS		C46

USES ELIGIBLE FOR REREGISTRATION

NON-FOOD/NON-FEED (con't)

NONAGRICULTURAL UNCULTIVATED AREAS/SOILS (con't) Use Group: TERRESTRIAL NON-FOOD CROP (con't)

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop cycle	/year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
Directed spray., Fall., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Late winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Directed spray., Winter., Sprayer.	EC	NA	8 lb A	*	NS	NS	NS	NS	NS	NS			C46
	RTU	NA	8.3 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., April., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., Early summer., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., February., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., June., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., Late winter., Hand held sprayer.	EC	NA	12 lb A	*	NS	NS	NS	NS	NS	NS			C46
Soil treatment (specialized)., March., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Soil treatment (specialized)., May., Hand held sprayer.	EC	NA	6 lb A	*	NS	NS	NS	NS	NS	NS	FL		C46
Spot soil treatment., Early summer., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Fall., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Late winter., By hand.	G	NA	.004688 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS			
Spot soil treatment., Not on label., By hand.	P/T	NA	.001984 lb in. of stem dia	*	NS	NS	NS	NS	NS	NS			

SITE Application Type, Application Timing, Application Equipment - Surface Type (Antimicrobial only) & Efficacy Influencing Factor (Antimicrobial only)	Form(s)	Min. Appl. Rate (AI unless noted otherwise)	Max. Appl. Rate (AI unless noted otherwise)	Soil Tex. Max. Dose	Max. # Apps @ Max. Rate /crop /year	Max. Dose [(AI unless noted otherwise)/A] /crop cycle	/year	Min. Interv (days)	Restr. Entry Interv [day(s)]	Geographic Limitations Allowed	Disallowed	Use Limitations Codes
USES ELIGIBLE FOR REREGISTRATION												
NON-FOOD/NON-FEED (con't)												
NONAGRICULTURAL UNCULTIVATED AREAS/SOILS (con't)				Use Group: TERRESTRIAL NON-FOOD CROP (con't)								
Spot soil treatment., Spring., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spot soil treatment., Winter., By hand.	P/T	NA	.00475 lb in. DBH	*	NS	NS	NS	NS	NS	NS		
Spray., When needed., Boom sprayer.	SC/S	NA	1.125 lb A	*	NS	1/1 yr	NS	NS	NS	NS	AL	C46
Tree injection treatment., April., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., April., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., February., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., February., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., June., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., June., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., March., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., March., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., May., Injection.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
Tree injection treatment., May., Tree injection equipment.	EC	NA	5.284E-04 lb in. DBH	*	NS	NS	NS	NS	NS	NS	FL	C46
RECREATIONAL AREAS				Use Group: TERRESTRIAL NON-FOOD CROP								
Tree injection treatment., When needed., Tree injection equipment.	P/T	NA	UC	*	NS	NS	NS	NS	NS	NS		

LEGEND

HEADER ABBREVIATIONS

Min. Appl. Rate (AI unless noted otherwise) : Minimum dose for a single application to a single site. System calculated. Microbial claims only.

Max. Appl. Rate (AI unless noted otherwise) : Maximum dose for a single application to a single site. System calculated.

Soil Tex. Max. Dose : Maximum dose for a single application to a single site as related to soil texture (Herbicide claims only).

Max. # Apps @ Max. Rate : Maximum number of Applications at Maximum Dosage Rate. Example: "4 applications per year" is expressed as "4/1 yr"; "4 applications per 3 years" is expressed as "4/3 yr"

Max. Dose [(AI unless noted otherwise)/A] : Maximum dose applied to a site over a single crop cycle or year. System calculated.

Min. Interv (days) : Minimum Interval between Applications (days)

Restr. Entry Interv (days) : Restricted Entry Interval (days)

SOIL TEXTURE FOR MAX APP. RATE

* : Non-specific
C : Coarse
M : Medium
F : Fine
O : Others

FORMULATION CODES

EC : EMULSIFIABLE CONCENTRATE
G : GRANULAR
P/T : PELLETED/TABLETED
RTU : LIQUID-READY TO USE
SC/S : SOLUBLE CONCENTRATE/SOLID

ABBREVIATIONS

AN : As Needed
NA : Not Applicable
NS : Not Specified (on label)
UC : Unconverted due to lack of data (on label), or with one of following units: bag, bait, bait block, bait pack, bait station, bait station(s), block, briquet, briquets, bursts, cake, can, canister, capsule, cartridges, coil, collar, container, dispenser, drop, eartag, grains, lure, pack, packet, packets, pad, part, parts, pellets, piece, pieces, pill, pumps, sec, sec burst, sheet, spike, stake, stick, strip, tab, tablet, tablets, tag, tape, towelette, tray, unit, --

APPLICATION RATE

DCNC : Dosage Can Not be Calculated
No Calc : No Calculation can be made
W : PPM calculated by weight
V : PPM Calculated by volume
cwt : Hundred Weight
nnE-xx : nn times (10 power -xx); for instance, "1.234E-04" is equivalent to ".0001234"

USE LIMITATIONS CODES

C14 : Grown for seed only.
C46 : Do not apply through any type of irrigation system.
G01 : __ day(s) pregrazing interval.
GA4 : Do not feed treated forage to livestock.
H01 : __ day(s) preharvest interval.
* NUMBER IN PARENTHESES REPRESENTS THE NUMBER OF TIME UNITS (HOURS,DAYS, ETC.) DESCRIBED IN THE LIMITATION.

GEOGRAPHIC CODES

001 : Northeast
008 : Southern States
013 : Other
014 : OR West of the Cascade Mountains
016 : Northern States
AL : Alabama
AR : Arkansas
CA : California
CT : Connecticut
DE : Delaware
FL : Florida
GA : Georgia
HI : Hawaii
IA : Iowa
IL : Illinois
IN : Indiana
KY : Kentucky
LA : Louisiana
MA : Massachussets

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MD  : Maryland
ME  : Maine
MI  : Michigan
MN  : Minnesota
MO  : Missouri
MS  : Mississippi
MT  : Montana
NC  : North Carolina
ND  : North Dakota
NH  : New Hampshire
NJ  : New Jersey
NM  : New Mexico
NY  : New York
OH  : Ohio
OK  : Oklahoma
PA  : Pennsylvania
PR  : Puerto Rico
RI  : Rhode Island
SC  : South Carolina
SD  : South Dakota
TN  : Tennessee
TX  : Texas
VA  : Virginia
VT  : Vermont
WI  : Wisconsin
WV  : West Virginia
WY  : Wyoming
```

APPENDIX B. Table of the Generic Data Requirements and Studies Used to Make the Reregistration Decision

GUIDE TO APPENDIX B

Appendix B contains listings of data requirements which support the reregistration for active ingredients within the case Hexazinone covered by this Reregistration Eligibility Decision Document. It contains generic data requirements that apply to Hexazinone in all products, including data requirements for which a "typical formulation" is the test substance.

The data table is organized in the following format:

1. Data Requirement (Column 1). The data requirements are listed in the order in which they appear in 40 CFR Part 158. the reference numbers accompanying each test refer to the test protocols set in the Pesticide Assessment Guidelines, which are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (703) 487-4650.

2. Use Pattern (Column 2). This column indicates the use patterns for which the data requirements apply. The following letter designations are used for the given use patterns:

A	Terrestrial food
B	Terrestrial feed
C	Terrestrial non-food
D	Aquatic food
E	Aquatic non-food outdoor
F	Aquatic non-food industrial
G	Aquatic non-food residential
H	Greenhouse food
I	Greenhouse non-food
J	Forestry
K	Residential
L	Indoor food
M	Indoor non-food
N	Indoor medical
O	Indoor residential

3. Bibliographic citation (Column 3). If the Agency has acceptable data in its files, this column lists the identifying number of each study. This normally is the Master Record Identification (MRID) number, but may be a "GS" number if no MRID number has been assigned. Refer to the Bibliography\appendix for a complete citation of the study.

APPENDIX B

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
PRODUCT CHEMISTRY			
61-1	**Chemical Identity**	All	41172501, 42345701
61-2A	**Starting Materials & Manufacturing Process**	All	41172501, 42345701
61-2B	**Formation of Impurities**	All	41172501, 42345701
62-1	**Preliminary Analysis**	All	41309001, 42345702
62-2	**Certification of limits**	All	41309001, 42345702
62-3	**Analytical Method**	All	41309001, 42345702
63-2	**Color**	All	41203201
63-3	**Physical State**	All	41203201
63-4	**Odor**	All	41203201
63-5	**Melting Point**	All	41203201, 42292801
63-6	**Boiling Point**	N/A	
63-7	**Density**	All	41203201, 42292801
63-8	**Solubility**	All	41203201, 42292801
63-9	**Vapor Pressure**	All	41203201, 42741801
63-10	**Dissociation Constant**	All	41203201, 42292801
63-11	**Octanol/Water Partition**	All	41203201, 42292801
63-12	**pH**	All	00118509, 41203201, 42292801
63-13	**Stability**	All	41203201, 42292801

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
63-14	**Oxidizing/Reducing Action**	All	41203201, 42292801
63-15	**Flammability**	N/A	
63-16	**Explodability**	All	41203201, 42292801
63-17	**Storage stability**	All	41203201, 42292801
63-18	**Viscosity**	N/A	
63-19	**Miscibility**	N/A	
63-20	**Corrosion characteristics**	All	41203201, 42292801
ECOLOGICAL EFFECTS			
71-1A	**Acute Avian Oral - Quail/Duck**	A, B, C, J	00073988
71-2A	**Avian Dietary - Quail**	A, B, C, J	00072663, 00107878
71-2B	**Avian Dietary - Duck**	A, B, C, J	00104981
71-4A	**Avian Reproduction - Quail**	A, B, C, J	41764901, 41938001
71-4B	**Avian Reproduction - Duck**	A, B, C, J	41764902
72-1A	**Fish Toxicity Bluegill**	A, B, C, J	00076959, 00104980
72-1B	**Fish Toxicity Bluegill - TEP**	J	41235001
72-1C	**Fish Toxicity Rainbow Trout**	A, B, C, J	00104980
72-1D	**Fish Toxicity Rainbow Trout- TEP**	J	41235002
72-2A	**Invertebrate Toxicity**	A, B, C, J	00116269
72-2B	**Invertebrate Toxicity - TEP**	J	41235003
72-3A	**Estuarine/Marine Toxicity - Fish**	A, B, C, J	**Waived**

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
72-3B	**Estuarine/Marine Toxicity - Mollusk**	A, B, C, J	00047164
72-3C	**Estuarine/Marine Toxicity - Shrimp**	A, B, C, J	00047164
72-4A	**Early Life Stage Fish**	A, B, C, J	41406001
72-4B	**Life Cycle Invertebrate**	A, B, C, J	00078041, 41406002
123-1A	**Seed Germination/Seedling Emergence**	A, B, C, J	43162501
123-1B	**Vegetative Vigor**	A, B, C, J	43162501
123-2	**Aquatic Plant Growth**	A, B, C, J	41287001, 43225101, 43225102, 43302701
141-1	**Honey Bee Acute Contact**	A, B, C, J	41216502
TOXICOLOGY			
81-1	**Acute Oral Toxicity - Rat**	A, B	41235004
81-2	**Acute Dermal Toxicity - Rabbit/Rat**	A, B	00104974
81-3	**Acute Inhalation Toxicity - Rat**	A, B	41756701
81-4	**Primary Eye Irritation - Rabbit**	A, B	00106003
81-5	**Primary Dermal Irritation - Rabbit**	A, B	00106004
81-6	**Dermal Sensitization - Guinea Pig**	A, B	41235005
82-1A	**90-Day Feeding - Rodent**	A, B	00104977
82-1B	**90-Day Feeding - Non-rodent**	A, B	00114484
82-2	**21-Day Dermal - Rabbit/Rat**	A, B	41309005
83-1B	**Chronic Toxicity - Non-Rodent**	A, B	42162301
83-2B	**Oncogenicity - Mouse**	A, B	00079203, 41359301, 42509301

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
83-3A	**Developmental Toxicity - Rat**	A, B	40397501
83-3B	**Developmental Toxicity - Rabbit**	A, B	00028863
83-4	**2-Generation Reproduction - Rat**	A, B	42066501
83-5	**Chronic Feeding/Carcinogenicity Rat**	A, B	00108638
84-2A	**Gene Mutation (Ames Test)**	A, B	00098982, 00076956
84-2B	**Structural Chromosomal Aberration**	A, B	00130709, 00131355
84-4	**Other Genotoxic Effects**	A, B	00130708
85-1	**General Metabolism**	A, B	00247874
ENVIRONMENTAL FATE			
161-1	**Hydrolysis**	A, B, C, J	00064260, 41587301
161-2	**Photodegradation - Water**	A, B, C, J	41300801
161-3	**Photodegradation - Soil**	A, B	41300802
162-1	**Aerobic Soil Metabolism**	A, B, C, J	41807401, 42635001
162-3	**Anaerobic Aquatic Metabolism**	A, B	41807402, 42657301
162-4	**Aerobic Aquatic Metabolism**	E	41811801
163-1	**Leaching/Adsorption/Desorption**	A, B, C, J	00064262, 41528101 **(DATA GAP; Due 4/3/95)**
164-1	**Terrestrial Field Dissipation**	A, B, C	42377901, 42379201
164-2	**Aquatic Field Dissipation**	E	**DATA GAP (Waived if all aquatic uses are dropped)**
164-3	**Forest Field Dissipation**	J	00072664, 42336401

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
165-1	**Confined Rotational Crop**	A, B	41008401, 42824001 **(DATA GAP; Due 5/31/95)**
165-2	**Field Rotational Crop**	A, B	**RESERVED**
165-3	**Accumulation - Irrigated Crop**	E	**RESERVED (Waived if all aquatic uses are dropped)**
165-4	**Bioaccumulation in Fish**	A, B, C, J	00078032, 00064265
166-1	**Ground Water - Small Prospective**		**DATA GAP**
201-1	**Droplet Size Spectrum**		**DATA GAP; Due 12/31/94**
202-1	**Drift Field Evaluation**		**DATA GAP; Due 12/31/94**
RESIDUE CHEMISTRY			
171-4A	**Nature of Residue - Plants**		00078047, 00104846, 00126127
171-4B	**Nature of Residue - Livestock**		00104843, 41524801, 42187901, 42219301 42248901, 42690601
171-4C	**Residue Analytical Method - Plants**		00038868, 00101574, 00126127, 41572101 41572102, 41572103, 41572104, 41572105 41572106, 41964101, 41964102, 42987201 43025401
171-4D	**Residue Analytical Method - Animal**		00038868, 00101574, 00126127, 41572101 41572102, 41572103, 41572104, 41572105 41572106, 41964101, 41964102, 43074201
171-4E	**Storage Stability**		42276001, 42322701, 42418001, 42423001 42492101, 42535601, 42867501 **(DATA GAP for Alfalfa and Metabolite C for Grass)**

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT		USE PATTERN	CITATION(S)
171-4J	**Magnitude of Residues - Meat/Milk**		**DATA GAP; Due 5/31/95**
171-4K	**Crop Field Trials**		
	Berries Group		
	- Blueberries		00101574, 41964101, 41964102
	Grass Forage, Fodder, and Hay Group		
	- Grasses, Pasture, and Rangeland		00138226, 41898301, 42419101**(DATA GAP for hay)**

Data Supporting Guideline Requirements for the Reregistration of Hexazinone

REQUIREMENT	USE PATTERN	CITATION(S)
	Non-Grass Animal Feeds (forage, fodder, straw, and hay) Group	
	- Alfalfa	00118050, 43074401, 43074402 **(DATA GAP for alfalfa seed screenings)**
	Miscellaneous Commodities	
	- Pineapple	00126127, 42535601
	- Sugarcane	00028733, 00114039, 42322701
171-4L	**Processed Food**	
	- Alfalfa	**Feed additive tolerance of 8.0 ppm required for alfalfa meal**
	- Sugarcane	**Feed additive tolerance required for molasses** 42276001, 42417901
	- Pineapple	**Feed additive tolerance required for pineapple processing residue** 42492101

APPENDIX C. Citations Considered to be Part of the Data Base Supporting the Reregistration of Hexazinone

GUIDE TO APPENDIX C

1. CONTENTS OF BIBLIOGRAPHY. This bibliography contains citations of all studies considered relevant by EPA in arriving at the positions and conclusions stated elsewhere in the Reregistration Eligibility Document. Primary sources for studies in this bibliography have been the body of data submitted to EPA and its predecessor agencies in support of past regulatory decisions. Selections from other sources including the published literature, in those instances where they have been considered, are included.

2. UNITS OF ENTRY. The unit of entry in this bibliography is called a "study". In the case of published materials, this corresponds closely to an article. In the case of unpublished materials submitted to the Agency, the Agency has sought to identify documents at a level parallel to the published article from within the typically larger volumes in which they were submitted. The resulting "studies" generally have a distinct title (or at least a single subject), can stand alone for purposes of review and can be described with a conventional bibliographic citation. The Agency has also attempted to unite basic documents and commentaries upon them, treating them as a single study.

3. IDENTIFICATION OF ENTRIES. The entries in this bibliography are sorted numerically by Master Record Identifier, or "MRID number". This number is unique to the citation, and should be used whenever a specific reference is required. It is not related to the six-digit "Accession Number" which has been used to identify volumes of submitted studies (see paragraph 4(d)(4) below for further explanation). In a few cases, entries added to the bibliography late in the review may be preceded by a nine character temporary identifier. These entries are listed after all MRID entries. This temporary identifying number is also to be used whenever specific reference is needed.

4. FORM OF ENTRY. In addition to the Master Record Identifier (MRID), each entry consists of a citation containing standard elements followed, in the case of material submitted to EPA, by a description of the earliest known submission. Bibliographic conventions used reflect the standard of the American National Standards Institute (ANSI), expanded to provide for certain special needs.

   a Author. Whenever the author could confidently be identified, the Agency has chosen to show a personal author. When no individual was identified, the Agency has shown an identifiable laboratory or testing facility as the author. When no author or laboratory could be identified, the Agency has shown the first submitter as the author.

   b. Document date. The date of the study is taken directly from the document. When the date is followed by a question mark, the bibliographer has deduced the date from the evidence contained in the document. When the date appears

as (19??), the Agency was unable to determine or estimate the date of the document.

c. Title. In some cases, it has been necessary for the Agency bibliographers to create or enhance a document title. Any such editorial insertions are contained between square brackets.

d. Trailing parentheses. For studies submitted to the Agency in the past, the trailing parentheses include (in addition to any self-explanatory text) the following elements describing the earliest known submission:

(1) Submission date. The date of the earliest known submission appears immediately following the word "received."

(2) Administrative number. The next element immediately following the word "under" is the registration number, experimental use permit number, petition number, or other administrative number associated with the earliest known submission.

(3) Submitter. The third element is the submitter. When authorship is defaulted to the submitter, this element is omitted.

(4) Volume Identification (Accession Numbers). The final element in the trailing parentheses identifies the EPA accession number of the volume in which the original submission of the study appears. The six-digit accession number follows the symbol "CDL," which stands for "Company Data Library." This accession number is in turn followed by an alphabetic suffix which shows the relative position of the study within the volume.

BIBLIOGRAPHY

MRID	CITATION
00028733	E.I. du Pont de Nemours & Company (1976) Determination of Hexazinone Metabolite C. Undated method. (Unpublished study received Jan 21, 1980 under 352-378; CDL:099225-A)
00028863	Serota, D.G.; Wolfe, G.W.; Cole, S.S.; et al. (1980) Teratology Study in Rabbits: H-12932: Project No. 201-522. Final rept. (Unpublished study including project no. 201-521, received Mar 14, 1980 under 352-378; prepared by Hazleton Laboratories America, Inc., submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:099298-A)
00038868	Holt, R.F. (1980) Determination of Hexazinone and Metabolite Residues Using Nitrogen Selective Gas Chromatography. Undated method. (Unpublished study received Jul 1, 1980 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:099514-E)
00047164	Heitmuller, T. (1976) Acute Toxicity of H-9877 to Embryos of Eastern Oysters (Crassostrea virginica), to Grass Shrimp (Palaemonetes pugio), and to Fiddler Crabs (Uca pugila tor). (Unpublished study received Jul 25, 1979 under 352378; prepared by EG&G Bionomics, submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:099674-B)
00064260	Rhodes, R.C. (1974) Studies with Velpar Weed Killer in Water. (Unpublished study received May 7, 1975 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL: 110699-E)
00064262	Rhodes, R.C. (1974?) Mobility and Adsorption Studies with Velpar Weed Killer on Soils. (Unpublished study received May 7, 1975 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:110699-G)
00064265	Rhodes, R.C. (1974?) Four Week Residue Studies with Velpar Weed Killer and Bluegill Sunfish. (Unpublished study received May 7, 1975 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:110699-J)

BIBLIOGRAPHY

MRID	CITATION
00072663	Dudeck, S.H.; Bristol, K.L. (1980) Avian Dietary Toxicity (LC50) Study in Bobwhite Quail: Project No. 201-547. Final rept. (Unpublished study received Jan 23, 1981 under 352-387; prepared by Hazleton Laboratories America, Inc., submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:244106-A)
00072664	Neary, D.G.; Douglass, J.E.; Bush, P.B.; et al. (1980) Movement of Hexazinone in Forest Watersheds after a Hand Application of Velpar Gridball Pellets for Site Preparation. Progress rept., Nov 1980. By U.S. Forest Service, Southeastern Experiment Station, Coweeta Hydrologic Laboratory and Univ. of Georgia, Extension Poultry Science Dept. and Institute of Ecology. ?: USFS, SE. (FS-SE-1651-26(1); available from: U.S. Government Printing Office; published study; CDL:244106-B)
00073988	Fink, R.; Beavers, J.B.; Brown, R. (1978) Final Report: Acute Oral LD50--Bobwhite Quail: Project No. 112-121. (Unpublished study received May 23, 1978 under 352-387; prepared by Wildlife International, Ltd., and Washington College, submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:233989-A)
00076956	Krahn, D.F.; McCooey, K.T. (1981) Chinese Hamster Ovary Cell Assay for Mutagenicity: Haskell Laboratory Report No. 56-81. (Unpublished study received May 20, 1981 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:245117-A)
00076959	Schneider, P.W., Jr. (1976) 96-hour LC50 to Bluegill Sunfish: Haskell Laboratory No. 408-76. (Unpublished study received May 20, 1981 under 352-378; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:245117-D)
00078047	Rhodes, R.C. (1975) Letter sent to 324 File dated Aug 12, 1975: Uptake and metabolism studies with 14C-DPX-3674 on sugarcane in the greenhouse. (Unpublished study received Mar 22, 1976 under 352-EX-91; submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:095980-E)
00079203	Goldenthal, E.I.; Trumball, R.R. (1981) Two-year Feeding Study in Mice: IRDC No. 125-026. (Unpublished study received Jul 30, 1981 under 352-378; prepared by International Research and Development Corp., submitted by E.I. du Pont de Nemours & Co., Wilmington, Del.; CDL:245676-A; 245677)

BIBLIOGRAPHY

MRID	CITATION
00101574	Interregional Research Project No. 4 (1982) Residue Studies of Hexazinone on Blueberries and Methomyl on Sugarcane. (Compilation; unpublished study received May 17, 1982 under 2E2687; CDL:070861-A)
00104846	Rapisarda, C. (19??) Metabolism of 14C-labeled Hexazinone in Alfalfa: Doc. No. HME 12-79. (Unpublished study received May 24, 1979 under 9G2214; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:098309-D)
00104974	Morrow, R. (1973) Skin Absorption Toxicity ALD and Skin Irritancy Test: Haskell Laboratory Report No. 503-73. (Unpublished study received Dec 5, 1973 under 352-EX-85; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:223386-F)
00104980	Sleight, B. (1973) Acute Toxicity of H-7759, MR-581 to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri) and Fathead Minnow (Pimephales promelas). (Unpublished study received Dec 5, 1973 under 352-EX-85; prepared by Bionomics, Inc., submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:223386-L)
00104981	Fletcher, D. (1973) Report to…: 8-day Dietary LC50 Study with H-7759; MR-581 in Mallard Ducklings: IBT No. 651-03194. (Unpublished study received Dec 5, 1973 under 352-EX-85; prepared by Industrial Bio-Test Laboratories, Inc., submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:223386-N)
00106003	Dashiell, O.; Henry, J. (1982) Eye Irritation Test in Rabbits-EPA Pesticide Registration INA-3674-122: Haskell Laboratory Report No. 251-82. (Unpublished study received Jul 7, 1982 under 352-399; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:247801-A)
00106004	Dashiell, O.; Hinckle, L. (1982) Skin Irritation Test on Rabbits for EPA Pesticide Registration: Haskell Laboratory Report No. 203-82. (Unpublished study received Jul 7, 1982 under 352399; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:247802-A)

BIBLIOGRAPHY

MRID	CITATION
00107878	Fletcher, D. (1973) Report to E.I. du Pont de Nemours & Company: 8 day Dietary LC50 Study with H-7759; MR-581 in Bobwhite Quail: IBT No. 651-03199. (Unpublished study received Dec 5, 1973 under 352-EX-85; prepared by Industrial Bio-Test Laboratories, Inc., submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:223386-M)
00108638	Kaplan, A.; Frazier, C.; Adams, L.; et al. (1977) Long-term Feeding Study in Rats with … (INA-3674): Haskell Laboratory Report No. 353-77. (Unpublished study received Aug 29, 1978 under 352-378; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:097323-C)
00114039	E.I. du Pont de Nemours & Co., Inc. (1978) Investigations Made with Respect to Residue Chemistry: Velpar. (Compilation; unpublished study received Aug 29, 1978 under 352-378; CDL: 097321-E)
00114484	Sherman, H.; Dale, N.; Adams, L.; et al. (1973) Three-month Feeding Study in Dogs with Sym Triazine-2,4(1H,3H)-dione, 3-cyclohexyl1-methyl-6-dimethylamino-INA-3674: Haskell Laboratory Report No. 408-73. (Unpublished study received Apr 3, 1980 under 352378; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:140051-A)
00116269	Schneider, P. (1976) 48-hour LC50 to Daphnia magna: Haskell Laboratory Report No. 262-76. (Unpublished study received Dec 30, 1977; under 352-387; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:232556-A; 235401)
00118050	E.I. du Pont de Nemours & Co., Inc. (1982) Data Supporting Amendment of Velpar Weed Killer Use on Alfalfa and Adding Velpar L Weed Killer Use on Alfalfa. (Unpublished study received Nov 15, 1982 under 352-378; CDL:248831-A)
00118509	E.I. du Pont de Nemours & Co., Inc. (1982) Product Chemistry: Hexazinone. (Compilation; unpublished study received Dec 17, 1982 under 352-399; CDL:071264-A)
00126127	E.I. du Pont de Nemours & Co., Inc. (1983) Results of Tests on the Amount of Residue Remaining on Treated Crop: Hexazinone. (Compilation; unpublished study received Feb 28, 1983 under 352-378; CDL:071438-A)

BIBLIOGRAPHY

MRID	CITATION
00130708	Ford, L. (1983) Unscheduled DNA Synthesis/Rat Hepatocytes in vitro: INA-3674-112: Haskell Lab Report No. 766-82. (Unpublished study received Jul 11, 1983 under 352-378; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:251041-A)
00130709	Vlachos, D.; Martenis, J.; Horst, A. (1982) In vitro Assay for Chromosome Aberrations in Chinese Hamster Ovary (CHO) Cells: Haskell Lab Report No. 768-82. (Unpublished study received Jul 11, 1983 under 352-378; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:251042-A)
00131355	Farrow, M.; Cortina, T.; Zito, M.; et al. (1982) In vivo Bone Marrow Cytogenetic Assay In Rats: HLA Project No. 201-573. Final rept. (Unpublished study received Jul 11, 1983 under 352-378; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, DE; CDL:251043-A)
00138226	E.I. du Pont de Nemours & Co., Inc. (1984) Residue Chemistry Data Supporting the Use of Velpar L Weed Killer for Control of Undesirable Woody Plants in Rangeland. (Compilation; unpublished study received Apr 4, 1984 under 352-392; CDL:252954-A)
40397501	Mullin, L. (1987) Teratogenicity Study of INA-3674 in Rats: Haskell Laboratory Report No. 748-86. Unpublished study prepared by E.I. du Pont de Nemours and Co., Inc. 186 p.
41008401	Rapisarda, C. (1980) Rotational Crop Studies with Carbon 14-Labeled-hexazinone: Proj. ID AMR-26-80. Unpublished study prepared by E.I. du Pont de Nemours and Co., Inc. 25 p.
41172501	Adams, C. (1989) Velpar (Hexazinone): Product Identity and Composition: Project ID A3674.E. Unpublished study prepared by E. I. du Pont de Nemours and Co., Inc. 50 p.
41203201	Silveira, E. (1989) Hexazinone: Physical and Chemical Characteristics: Laboratory Project ID A3674.D. Unpublished study prepared by E.I. du Pone de Nemours and Co., Inc. 60 p.
41216502	Hoxter, K.; Thompson, M.; Jaber, M. (1989) An Acute Contact Toxicity with the Honey Bee: Project ID 112-217. Unpublished study prepared by Wildlife International Ltd. 15 p.

BIBLIOGRAPHY

MRID	CITATION
41235001	Hutton, D. (1989) Static Acute 96-Hour LC50 of IN A3674-208 to Bluegill Sunfish (Lepomis macrochirus): Project ID 462-89. Unpublished study prepared by E. I. du Pont de Nemours and Co., Inc. 17 p.
41235002	Hutton, D. (1989) Static Acute 96-Hour LC50 of IN A3674-208 to Rainbow Trout (Salmo gairdneri): Project ID 463-89. Unpublished study prepared by E. I. du Pont de Nemours and Co. 18 p.
41235003	Hutton, D. (1989) Static Acute 48-Hour EC50 of IN A3674-208 to Daphnia magna: Project ID 452-89. Unpublished study prepared by E. I. du Pont de Nemours and Co. 17 p.
41235004	Hutton, J. (1989) Acute Oral Toxicity Study with IN A3674-207 in Male and Female Rats: Project ID 347-89. Unpublished study prepared by E. I. du Pont de Nemours and Co. 34 p.
41235005	Pharmakon Research International, Inc. (1989) Closed Patch Repeated Insult Dermal Sensitization Study (Buehler Method) with IN A3674 -207 in Guinea Pigs: Project ID 446-89. Unpublished study prepared by E. I. du Pont de Nemours and Co., Inc. 35 p.
41287001	Forbis, A. (1989) Acute Toxicity of Hexazinone to Selenastrum capricornutum Printz: Lab Project Number 38069; AMR-1446-89. Unpublished study prepared by Analytical Bio-Chemistry Laboratories, Inc. 31 p.
41300801	Hawkins, D.; Elsom, L.; Gray, S. (1989) The Photodegradation of Carbon-14-hexazinone in water: HRC Report No. HRC/DPT 196/ 891351; Du Pont Doc. No. AMR-1412-89. Unpublished study prepared by Huntingdon Research Centre, Ltd., Dept. of Chemical Metabolism and Radiosynthesis. 55 p.
41300802	Hawkins, D.; Elsom, L.; Gray, S. (1989) The Photodegradation of Carbon-14-hexazinone on Soil: HRC Report No. HRC/DPT 197/ 891455; Du Pont Document No. AMR-1413-89. Unpublished study prepared by Huntingdon Research Centre Ltd., Dept. of Chemical Metabolism and Radiosynthesis. 63 p.

BIBLIOGRAPHY

MRID	CITATION
41309001	Silveira, E. (1989) Technical Hexazinone: Analysis and Certification of Product Ingredients: Lab Project Number: A3674/F. Unpublished study prepared by E. I. du Pont de Nemours and Co. 122 p.
41309005	Malek, D. (1989) Repeated Dose Dermal Toxicity: 21-Day Study with DPX-A3674-207 (Hexazinone) in Rabbits: Lab Project Number: 8705/001 : 673/89. Unpublished study prepared by du Pont de Nemours and Co. 206 p.
41359301	Goldenthal, E. (1989) Supplement 1 to: Two-Year Feeding Study in Mice with Hexazinone: Lab Project Number: HLO/141/81. Unpublished study prepared by International Research and Development Corp. 41 p.
41406001	Pierson, K. (1990) Effects of IN A3674-207 on the Embryos and Larvae of Fathead Minnows (Pimephales promelas): Lab Project Number HLR 656-89: MR-8705-001. Unpublished study prepared by E. I. du Pont de Nemours and Co., Inc. 221 p.
41406002	Pierson, K. (1990) Chronic Toxicity of IN A3674-207 to Daphnia magna: Lab Project Number: HLR 68-90: MR-8705-001. Unpublished study prepared by E. I. du Pont de Nemours and Co., Inc. 198 p.
41524801	Hawkins, W.; Elsom, L.; Gray, S., et al. (1990) The Metabolism of Carbon 14-Hexazinone in Laying Hens: Lab Project Number: 203/ 90454: AMR-1517-89. Unpublished study prepared by Huntingdon Research Centre, Ltd. 80 p.
41528101	Priester, T.; Sheftic, G. (1990) Batch Equilibrium (Adsorption/Desorption)of Carbon 14Hexazinone and Soil Thin-Layer Chromatography Studies of Carbon 14Hexazinone and Its Major Soil Degrades: Lab Project Number: AMR-1421-89. Unpublished study prepared by E. I. du Pont de Nemours and Co. 85 p.
41572101	Fomenko, J. (1990) Testing of DPX-A3674 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1489-89: DP001-01. Unpublished study prepared by Spectralytix. 67 p.
41572102	Fomenko, J. (1990) Testing of IN-T3937 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1490-89: DP001-02. Unpublished study prepared by Sprectalytix Inc. 57 p.

BIBLIOGRAPHY

MRID	CITATION
41572103	Fomenko, J. (1990) Testing of IN-A3928 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1491-89: DP001-03. Unpublished study prepared by Spectralytix, Inc. 67 p.
41572104	Fomenko, J. (1990) Testing of IN-T3935 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1492-89: DP001-04. Unpublished study prepared by Spectralytix Inc. 57 p.
41572105	Fomenko, J. (1990) Testing of IN-B2838 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1493-89: DP001-05. Unpublished study prepared by Spectralytix Inc. 67 p.
41572106	Fomenko, J. (1990) Testing of IN-B3936 through FDA Multi-Residue Protocols A-E: Lab Project Number: AMR-1494-89: DP001-06. Unpublished study prepared by Spectralytix Inc. 67 p.
41587301	Chrzanowski, R. (1990) Hydrolysis of carbon 14 Hexazinone in pH 5, 7 and 9 Buffer Solutions: Lab Project Number: AMR 1643-90. Unpublished study prepared by E. I. Du Pont de Nemours and Co., Ag Products Dept. 51 p.
41756701	Shapiro, R. (1990) Acute Inhalation-Limit Test: Hexazinone, Batch # GG1-15: Lab Project Number: T-452. Unpublished study prepared by Product Safety Labs. 24 p.
41764901	Beavers, J.; Campbell, S.; Smith, G.; (1991) H 17,705: A One Generation Reproduction Study With the Northern Bobwhite (Colinus virginianus): Lab Project Number: 112-225: 772-90. Unpublished Study prepared by Wildlife International Ltd. 168 p.
41764902	Beavers, J.; Campbell, S.; Smith, G.; (1991) H 17,705: A One Generation Reproduction Study With the Mallard (Anus platyrhynchos) Lab Project Number: 112-226: 773-90. Unpublished study prepared by Wildlife International Ltd. 167 p.
41807401	Hawkins, D.; Elsom, L.; Kane, T.; et al. (1990) The Metabolism of carbon 14-Hexazinone in a California Type Soil Under Aerobic Conditions: Lab Project Number: HRC/DPT 194/901364: AMR-1329-88. Unpublished study prepared by Huntingdon Research Centre Ltd. 68 p.

BIBLIOGRAPHY

MRID	CITATION
41807402	Hawkins, D.; Elson, L.; Kane, T.; et al. (1990) The Anaerobic Aquatic Metabolism of carbon 14-Hexazinone: Lab Project Number: AMR-1328-88: HRC/DPT 193/901475. Unpublished study prepared by Huntingdon Research Centre Ltd. 80 p.
41811801	Chrzanowski, R. (1991) Aerobic Aquatic Metabolism of Carbonylcarbon 14 Hexazinone in Madera, California Field Water and Sediment: Lab Project Number: AMR 1690-90. Unpublished study prepared by E.I. du Pont de Nemours and Co. 64 p.
41898301	Bollin, E. (1991) Magnitude of Residues of Velpar Herbicide in Pasture and Range Grasses: Lab Project Number: AMR-1429-89. Unpublished study prepared by E. I. du Pont de Nemours and Co. 241 p.
41938001	Beavers, J.; Campbell, S.; Smith, G.; et al. (1991) Supplement to H 17,705: A One-Generation Reproduction Study with the Mallard (Anas platyrhynchos): Lab Project Number: 112-226: HLO-773-90. Unpublished study prepared by Wildlife International Ltd. 9 p.
41964101	Bollin, E.; Hay, R. (1991) Magnitude of Residues of Velpar and Velpar L Herbicide in Lowbush Blueberries: Lab Project Number: AMR1431-89. Unpublished study prepared by E.I. du Pont de Nemours and Co. 46 p.
41964102	Bollin, E.; Hay, R. (1991) Magnitude of Residues of Velpar and Velpar L Herbicide in Highbush Blueberries: Lab Project Number: AMR-1434-89. Unpublished study prepared by E.I. du Pont de Nemours and Co. 46 p.
42066501	Mebus, C. (1991) Reproductive and Fertility Effects with IN A3674207 Multigeneration Reproduction Study in Rats: Lab Project Number: 404-91: 8873-001. Unpublished study prepared by E.I. du Pont Nemours and Co., Haskell Lab. 1218 p.
42162301	Dalgard, D. (1991) Chronic Toxicity Study in Dogs with DPXA3674-207 (Hexazinone): Lab Project Number: 8754-001: 201905: HLO 164-91. Unpublished study prepared by E. I. du Pont de Nemours and Co. 526 p.
42187901	Hawkins, D.; Elsom, L.; Dighton, M.; et al. (1992) The Metabolism of carbon 14-Hexazinone in the Goat: Lab Project Number: 245/91718: AMR-1906-90. Unpublished study prepared by Huntingdon Research Centre Ltd. 105 p.

BIBLIOGRAPHY

MRID	CITATION
42219301	Hawkins, D.; Elsom, L.; Dighton, M.; (1992) The Metabolism of carbon 14-Hexazinone in Laying Hens: The Freezer Storage Stability of Tissues, Eggs and Excreta from Laying Hens Dosed with carbon 14-Hexazinone: Supplement to: Lab Project Number: HRC/203/90454; AMR-1517-89. Unpublished study prepared by Huntingdon Research Centre Ltd. 33 p.
42248901	Hawkins, D.; Elsom, L.; Dighton, M. (1992) The Metabolism of Carbon-14 Hexazinone in the Goat, Supplement 1: The Freezer Storage Stability of Carbon-14 Residues in Tissues and Milk from a Lactating Goat Dosed with Carbon 14 Hexazinone: Lab Project Number: HRC/DPT 245/91718: AMR-1906-90. Unpublished study prepared by Huntingdon Research Centre. 36 p.
42276001	Powley, C.; Tomic, D. (1992) Magnitude of the Residue of Velpar Herbicide in Sugarcane and its Processed Fractions: Lab Project Number: AMR 1473-89: 35-5300: 14-5308. Unpublished study prepared by Dupont and Hawaiian Sugar Planters Association. 151 p.
42292801	Silveira, E. (1992) Hexazinone: Physical and Chemical Characteristics: A Supplement: Lab Project Number: A3674.D. Unpublished study prepared by E.I. du Pont de Nemours & Co., Inc. 13 p.
42322701	Powley, C.; Tomic, D. (1992) Magnitude of Residues of Velpar Herbicide in Sugarcane: Lab Project Number: AMR 1472-89: 14-5308. Unpublished study prepared by E.I. DuPont de Nemours and Co. and Hawaiian Sugar Planters Assoc. 180 p.
42336401	Michael, J. (1992) Fate of Hexazinone After Application for Pine Planting Site Preparation: Lab Project Number: 1786-90. Unpublished study prepared by Auburn University. 700 p.
42345701	Adams, C. (1989) Velpar (Hexazinone): Product Identity and Composition: Supplement to: Lab Project Number: A3674. E. Unpublished study prepared by E. I. du Pont de Nemours & Co. 178 p.
42345702	Silveira, E. (1992) Technical Hexazinone Analysis and Certification of Product Ingredients: Supplement to: Lab Project Number: A3674.F. Unpublished study prepared by E. I. du Pont de Nemours and Co. 72 p.

BIBLIOGRAPHY

MRID	CITATION
42377901	Bollin, E. (1992) Field Soil Dissipation of Hexazinone Herbicide: Lab Project Number: AMR 1474-89: 9045258: 9140414. Unpublished study prepared by E. I. du Pont de Nemours and Comp., Harris Environemntal Tech., Inc. and Enviro Test Laboratories. 419 p.
42379201	Bollin, E. (1992) Dissipation of Hexazinone in California Soil Following Application of Velpar L Herbicide: Lab Project Number: AMR 1923-91: 9100226: 91-P1368. Unpublished study prepared by E. I. du Pont de Nemours and Comp., Harris Environmental Technologies, Inc., Enviro-Test Laboratories. 272 p.
42417901	Mulcahey, L. (1992) Magnitude of the Residues of Velpar Herbicide in Sugarcane and its Processed Fractions (Supplemental): Lab Project Number: AMR 1473-89 (SUPP 1): 35-5300: 14-5308. Unpublished study prepared by E. I. DuPont de Nemours and Co. in coop with the Hawaiian Sugar Planters' Assoc. 40 p.
42418001	Klemens, A.; Tomic, D. (1992) Freezer Storage Stability of Hexazinone and Metabolites in Pasture and Range Grasses. Lab Project Number: AMR 1582-90: A022.005. Unpublished study prepared by E. I. DuPont de Nemours and Co. in coop with Huntingdon Analytical Services. 54 p.
42419101	Mulcahey, L. (1992) Magnitude of Residues of Velpar Herbicide in Pasture and Range Grasses: A Supplement: Lab Project Number: AMR 1429-89: 1022.004: 91012. Unpublished study prepared by E.I. du Pont de Nemours and Co. 89 p.
42423001	Klemens, A.; Devine, P. (1992) Freezer Storage Stability of Velpar Herbicide and Metabolites on Blueberries: Lab Project Number: AMR 1911-90. Unpublished study prepared by E. I. DuPont de Nemours and Co. 47 p.
42492101	Powley, C.; Tomic, D. (1992) Magnitude of Residues of Velpar Herbicide in the Processed Fractions of Pineapples: Lab Project Number: AMR 1471-89: MP 90-03.01: 36-5309. Unpublished study prepared by E.I. du Pont de Nemours & Co. 114 p.
42509301	Slone, T. (1992) Two-year Feeding Study in Mice with Hexazinone: Supplement No. 1: Lab Project Number: 9463-001: HLO 414-81. Unpublished study prepared by E. I. du Pont de Nemours & Co. 56 p.

BIBLIOGRAPHY

MRID	CITATION
42535601	Powley, C.; Tomic, D. (1992) Magnitude of Residues of Velpar Herbicide in Pineapples: Lab Project Number: AMR 1570-89: 36-5309. Unpublished study prepared by E.I. du Pont de Nemours and Co.; Hawaiian Sugar Planters' Association. 81 p.
42635001	Hawkins, D.; Elsom, L.; Kane, T.; et al. (1993) The Metabolism of (carbon 14)-Hexazinone in a California Type Soil under Aerobic Conditions: Supplement 1: Lab Project Number: HRC/DPT 194/901364. Unpublished study prepared by Huntingdon Research Centre Ltd. 17 p.
42657301	Hawkins, D.; Elsom, L.; Kane, T.; et al. (1993) The Anaerobic Aquatic Metabolism of (carbon 14)-Hexazinone: Supplement 1: Analysis of 2 Additional Non-Sterile Anaerobic Water-Sediment Systems after 365 Days Incubation and Structural Assignment of Metabolite 2: Lab Project Number: HRC/DPT 193/901475: AMR-1328-88. Unpublished study prepared by Huntingdon Research Centre Ltd. 20 p.
42690601	Hawkins, D.; Elsom, L.; Kitmitto, A. (1993) The Metabolism of (carbon 14)-Hexazinone in Laying Hens: Supplement 2 (Comparison of (carbon 14)-Hexazinone Metabolites in Excreta, Tissues and Eggs of Hens with Reference Compounds Metabolites A-1, C-1 and E-1): Lab Project Number: HRC/DPT 203/90454: AMR-1517-89. Unpublished study prepared by Huntingdon Research Centre Ltd. 32 p.
42741801	Morrissey, M. (1993) Series 63 Vapor Pressure Determination of Hexazinone Pure Active Ingredient: Final Report: Lab Project Number: HWI 6324-109: AMR 2632-93. Unpublished study prepared by Hazleton Wisconsin, Inc. 42 p.
42824001	Rapisarda, C. (1993) Rotational Crop Studies with (carbon 14)-Labeled Hexazinone: Supplement No. 1: Lab Project Number: AMR 26-80. Unpublished study prepared by E. I. du Pont de Nemours and Co. 11 p.
42867501	Klemens, A.; Devine, P. (1993) Freezer Storage Stability of Hexazinone and Metabolites in Pasture and Range Grasses: Supplement No. 1: Lab Project Number: AMR 1582-90: A022.005. Unpublished study prepared by E. I. du Pont de Nemours and Co. and Huntingdon Analytical Services. 72 p.

BIBLIOGRAPHY

MRID	CITATION
42987201	Powley, C.; Zhou, M.; DeBernard, P. (1993) Method for the Determination of Hexazinone in Sugarcane and Processed Fractions: Lab Project Number: AMR 2654-93. Unpublished study prepared by DuPont Agricultural Products. 30 p.
43025401	Bruns, G. (1993) Independent Laboratory Validation of the Analytical Enforcement Method for the Determination of Hexazinone in Sugarcane, Molasses, and Bagasse by Gas Chromatography: Lab Project Number: DUP69/REP: AMR/2804/93. Unpublished study prepared by Enviro-Test Labs. 34 p.
43074201	Hawkins, D.; Elsom, L.; Dighton, M.; et al. (1993) A Comparison of (carbon 14)-Hexazinone Metabolites in Hen Tissues and Eggs and Goat Tissues and Milk Synthesised Metabolite Standards: Lab Project Number: 294/932331: DPT/294/932331: HRC/DPT/294/932331. Unpublished study prepared by Huntingdon Research Centre Ltd. 110 p.
43074401	Djanegara, T.; Devine, P. (1993) Magnitude of Residues of Hexazinone in Alfalfa Forage, Hay, and Seed Grown in the Western United States Following Application of Velpar Herbicide: Lab Project Number: AMR 1924-91: 92013. Unpublished study prepared by E.I. du Pont de Nemours & Co. and Spectralytix, Inc. 330 p.
43074402	Djanegara, T.; Devine, P. (1993) Magnitude of Residues of Hexazinone in Alfalfa Forage and Hay Grown in the Eastern United States Following Application of Velpar Herbicide: Lab Project Number: AMR 2010-91: 92025. Unpublished study prepared by E.I. du Pont de Nemours & Co. and Spectralytix, Inc. 316 p.
43162501	McKelvey, R.; Heldreth, K. (1994) Influence of Hexazinone on Seed Germination, Seedling Emergence, and Vegetative Vigor of Several Terrestrial Plants: Lab Project Number: AMR 2678-93: AMR 2736-93. Unpublished study prepared by DuPont Agricultural Products. 351 p.
43225101	Kannuck, R.; Sloman, T. (1994) Hexazinone (DPX-A3674): Influence on Growth and Reproduction of Lemna gibba G3: Lab Project Number: AMR 2874-93: MR 9785-001. Unpublished study prepared by Stine-Haskell Research Center, DuPont Agricultural Products. 41 p.

BIBLIOGRAPHY

MRID	CITATION
43225102	Baer, K. (1994) Hexazinone (DPX-A3674): Influence on Growth and Reproduction of Skeletonema costatum: Lab Project Number: 241-94: AMR 2884-93: MR 8785. Unpublished study prepared by Stine-Haskell Research Center, DuPont Agricultural Products. 38 p.
43302701	Thompson, S. (1994) Hexazinone (DPX-A3674): Influence on Growth and Reproduction of Two Select Algal Species: Lab Project Number: AMR 3011-94: 335-94: 9785. Unpublished study prepared by Wildlife International Ltd. and E.I. du Pont de Nemours & Co. 75 p.

APPENDIX D. List of Available Related Documents

The following is a list of available documents related to Hexazinone. It's purpose is to provide a path to more detailed information if it is needed. These accompanying documents are part of the Administrative Record for Hexazinone and are included in the EPA's Office of Pesticide Programs Public Docket.

1. Health and Environmental Effects Science Chapters

2. Detailed Label Usage Information System (LUIS) Report

3. Hexazinone RED Fact Sheet

4. PR Notice 86-5 (included in this appendix)

5. PR Notice 91-2 (included in this appendix) pertains to the Label Ingredient Statement

APPENDIX E. PR Notices 86-5 and 91-2

PR Notice 86-5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

July 29, 1986

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

PR NOTICE 86-5

NOTICE TO PRODUCERS, FORMULATORS, DISTRIBUTORS
AND REGISTRANTS

Attention: Persons responsible for Federal registration of pesticides.

Subject: Standard format for data submitted under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and certain provisions of the Federal Food, Drug, and Cosmetic Act (FFDCA).

I. Purpose

To require data to be submitted to the Environmental Protection Agency (EPA) in a standard format. This Notice also provides additional guidance about, and illustrations of, the required formats.

II. Applicability

This PR Notice applies to all data that are submitted to EPA to satisfy data requirements for granting or maintaining pesticide registrations, experimental use permits, tolerances, and related approvals under certain provisions of FIFRA and FFDCA. These data are defined in FIFRA §10(d)(1). This Notice does not apply to commercial, financial, or production information, which are, and must continue to be, submitted differently under separate cover.

III. Effective Date

This notice is effective on November 1, 1986. Data formatted according to this notice may be submitted prior to the effective date. As of the effective date, submitted data packages that do not conform to these requirements may be returned to the submitter for necessary revision.

IV. Background

On September 26, 1984, EPA published proposed regulations in the Federal Register (49 FR 37956) which include Requirements for Data Submission (40 CFR §158.32), and Procedures for Claims of Confidentiality of Data (40 CFR §158.33). These regulations specify the format for data submitted to EPA under Section 3 of FIFRA and Sections 408 and 409 of FFDCA, and procedures which must be followed to make and substantiate claims of confidentiality. No entitlements to data confidentiality are changed, either by the proposed regulation or by this notice.

OPP is making these requirements mandatory through this Notice to gain resource-saving benefits from their use before the

entire proposed regulation becomes final. Adequate lead time is being provided for submitters to comply with the new requirements.

V. Relationship of this Notice to Other OPP Policy and Guidance

While this Notice contains requirements for organizing and formatting submittals of supporting data, it does not address the substance of test reports themselves. "Data reporting" guidance is now under development in OPP, and will specify how the study objectives, protocol, observations, findings, and conclusions are organized and presented within the study report. The data reporting guidance will be compatible with submittal format requirements described in this Notice.

OPP has also promulgated a policy (PR Notice 86-4 dated April 15, 1986) that provides for early screening of certain applications for registration under FIFRA §3. The objective of the screen is to avoid the additional costs and prolonged delays associated with handling significantly incomplete application packages. As of the effective date of this Notice, the screen will include in its criteria for acceptance of application packages the data formatting requirements described herein.

OPP has also established a public docket which imposes deadlines for inserting into the docket documents submitted in connection with Special Reviews and Registration Standards (see 40 CFR §154.15 and §155.32). To meet these deadlines, OPP is requiring an additional copy of any data submitted to the docket. Please refer to Page 10 for more information about this requirement.

For several years, OPP has required that each application for registration or other action include a list of all applicable data requirements and an indication of how each is satisfied--the statement of the method of support for the application. Typically, many requirements are satisfied by reference to data previously submitted--either by the applicant or by another party. That requirement is not altered by this notice, which applies only to data submitted with an application.

VI. Format Requirements

A more detailed discussion of these format requirements follows the index on the next page, and samples of some of the requirements are attached. Except for the language of the two alternative forms of the Statement of Data Confidentiality Claims (shown in Attachment 3) which cannot be altered, these samples are illustrative. As long as the required information is included and clearly identifiable, the form of the samples may be altered to reflect the submitter's preference.

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G. Special Requirements for Submitting Data to the Docket 10

A. Organization of Submittal Package

A "submittal package" consists of all studies submitted at the same time for review in support of a single regulatory action, along with a transmittal document and other related administrative material (e.g. the method of support statement, EPA Forms 8570-1, 8570-4, 8570-20, etc.) as appropriate.

Data submitters must organize each submittal package as described in this Notice. The transmittal and any other administrative material must be grouped together in the first physical volume. Each study included in the submittal package must then be bound separately.

Submitters sometimes provide additional materials that are intended to clarify, emphasize, or otherwise comment to help Product Managers and reviewers better understand the submittal.

- If such materials relate to one study, they should be included as an appendix to that study.

- If such materials relate to more than one study (as for example a summary of all studies in a discipline) or to the submittal in general, they must be included in the submittal package as a separate study (with title page and statement of confidentiality claims).

B. Transmittal Document

The first item in each submittal package must be a transmittal document. This document identifies the submitter or all joint submitters; the regulatory action in support of which the package is being submitted--i.e., a registration application, petition, experimental use permit (EUP), §3(c)(2)(B) data call-in, §6(a)(2) submittal, or a special review; the transmittal date; and a list of all individual studies included in the package in the order of their appearance, showing (usually by Guideline reference number) the data requirement(s) addressed by each one. The EPA-assigned number for the regulatory action (e.g. the registration, EUP, or tolerance petition number) should be included in the transmittal document as well, if it is known to the submitter. See Attachment 1 for an example of an acceptable transmittal document.

The list of included studies in the transmittal of a data submittal package supporting a registration application should be subdivided by discipline, reflecting the order in which data requirements appear in 40 CFR 158.

The list of included studies in the transmittal of a data submittal package supporting a petition for tolerance or an

application for an EUP should be subdivided into sections A, B, C,... of the petition or application, as defined in 40 CFR 180.7 and 158.125, (petitions) or Pesticide Assessment Guidelines, Subdivision I (EUPs) as appropriate.

When a submittal package supports a tolerance petition and an application for a registration or an EUP, list the petition studies first, then the balance of the studies. Within these two groups of studies follow the instructions above.

C. Individual Studies

A study is the report of a single scientific investigation, including all supporting analyses required for logical completeness. A study should be identifiable and distinguishable by a conventional bibliographic citation including author, date, and title. Studies generally correspond in scope to a single Guideline requirement for supporting data, with some exceptions discussed in section C.1. Each study included in a submittal package must be bound as a separate entity. (See comments on binding studies on page 9.)

Each study must be consecutively paginated, beginning from the title page as page 1. The total number of pages in the complete study must be shown on the study title page. In addition (to ensure that inadvertently separated pages can be reassociated with the proper study during handling or review) use either of the following:

- Include the total number of pages in the complete study on each page (i.e., 1 of 250, 2 of 250, ...250 of 250).

- Include a company name or mark and study number on each page of the study, e g , Company Name-1986-23. Never reuse a study number for marking the pages of subsequent studies.

When a single study is extremely long, binding it in multiple volumes is permissible so long as the entire study is paginated in a single series, and each volume is plainly identified by the study title and its position in the multi-volume sequence.

C.1 Special Considerations for Identifying Studies

Some studies raise special problems in study identification, because they address Guidelines of broader than normal scope or for other reasons.

a. Safety Studies. Several Guidelines require testing for safety in more than one species. In these cases each species tested should be reported as a separate study, and bound separately.

Extensive supplemental reports of pathology reviews, feed analyses, historical control data, and the like are often associated with safety studies. Whenever possible these should be submitted with primary reports of the study, and bound with the primary study as appendices. When such supplemental reports are submitted independently of the primary report, take care to fully identify the primary report to which they pertain.

Batteries of acute toxicity tests, performed on the same end use product and covered by a single title page, may be bound together and reported as a single study.

b. Product Chemistry Studies. All product chemistry data within a submittal package submitted in support of an end-use product produced from registered manufacturing-use products should be bound as a single study under a single title page.

Product chemistry data submitted in support of a technical product, other manufacturing-use product, an experimental use permit, an import tolerance petition, or an end-use product

produced from unregistered source ingredients, should be bound as a single study for each Guideline series (61, 62, and 63) for conventional pesticides, or for the equivalent subject range for biorational pesticides. The first of the three studies in a complete product chemistry submittal for a biochemical pesticide would cover Guidelines 151-10, 151-11, and 151-12; the second would cover Guidelines 151-13, 151-15, and 151-16; the third would cover Guideline 151-17. The first study for a microbial pesticide would cover Guidelines 151-20, 151-21, and 151-22; the second would cover Guidelines 151-23 and 151-25; the third would cover Guideline 151-26.

Note particularly that product chemistry studies are likely to contain Confidential Business Information as defined in FIFRA §10(d)(1)(A), (B), or (C), and if so must be handled as described in section D.3. of this notice.

c. Residue Chemistry Studies. Guidelines 171-4, 153-3, and 153-4 are extremely broad in scope; studies addressing residue chemistry requirements must thus be defined at a level below that of the Guideline code. The general principle, however, of limiting a study to the report of a single investigation still applies fully. Data should be treated as a single study and bound separately for each analytical method, each report of the nature of the residue in a single crop or animal species, and for each report of the magnitude of residues resulting from treatment of a single crop or from processing a single crop. When more than one commodity is derived from a single crop (such as beet tops and beet roots) residue data on all such commodities should be reported as a single study. When multiple field trials are associated with a single crop, all such trials should be reported as a single study.

D. Organization of Each Study Volume

Each complete study must include all applicable elements in the list below, in the order indicated. (Also see Page 17.) Several of these elements are further explained in the following paragraphs. Entries in the column headed "example" cite the page number of this notice where the element is illustrated.

Element	When Required	Example
Study Title Page	Always	Page 12
Statement of Data Confidentiality Claims	One of the two alternative forms of this statement is always required	Page 13
Certification of Good Laboratory Practice	If study reports laboratory work subject to GLP requirements	Page 16
Flagging statements	For certain toxicology studies (When flagging requirements are finalized.)	
Body of Study	Always - with an English language translation if required.	
Study Appendices	At submitter's option	
Cover Sheet to Confidential Attachment	If CBI is claimed under FIFRA §10(d)(1)(A), (B), or (C)	
CBI Attachment	If CBI is claimed under FIFRA §10(d)(1)(A), (B), or (C)	Page 15
Supplemental Statement of Data Confidentiality Claims	Only if confidentiality is claimed on a basis other than FIFRA §10(d)(1)(A), (B), or (C)	Page 14

D.1. Title Page

A title page is always required for each submitted study, published or unpublished. The title page must always be freely releasable to requestors; **DO NOT INCLUDE CBI ON THE TITLE PAGE**. An example of an acceptable title page is on page 12 of this notice. The following information must appear on the title page:

a. Study title. The study title should be as descriptive as possible It must clearly identify the substance(s) tested and correspond to the name of the data requirement as it appears in the Guidelines.

b. Data requirement addressed. Include on the title page the Guideline number(s) of the specific requirement(s) addressed by the study.

c. Author(s). Cite only individuals with primary intellectual responsibility for the content of the study. Identify them plainly as authors, to distinguish them from the performing laboratory, study sponsor, or other names that may also appear on the title page.

d. Study Date. The title page must include a single date for the study. If parts of the study were performed at different times, use only the date of the latest element in the study.

e. Performing Laboratory Identification. If the study reports work done by one or more laboratories, include on the title page the name and address of the performing laboratory or laboratories, and the laboratory's internal project number(s) for the work. Clearly distinguish the laboratory's project identifier from any other reference numbers provided by the study sponsor or submitter.

f. Supplemental Submissions. If the study is a commentary on or supplement to another previously submitted study, or if it responds to EPA questions raised with respect to an earlier study, include on the title page elements a. through d. for the previously submitted study, along with the EPA Master Record Identifier (MRID) or Accession number of the earlier study if you know these numbers. (Supplements submitted in the same submittal package as the primary study should be appended to and bound with the primary study. Do not include supplements to more than one study under a single title page).

g. Facts of Publication. If the study is a reprint of a published document, identity on the title page all relevant facts of publication, such as the journal title, volume, issue, inclusive page numbers, and publication date.

D.2. Statements of Data Confidentiality Claims Under FIFRA §10(d)(1).

Each submitted study must be accompanied by one of the two alternative forms of the statement of Data Confidentiality Claims specified in the proposed regulation in §158.33 (b) and (c) (See Attachment 3). These statements apply only to claims of data confidentiality based on FIFRA §10(d)(1)(A), (B), or (C). Use the appropriate alternative form of the statement either to assert a claim of §10(d)(1) data confidentiality (§158.33(b)) or to waive such a claim (§158.33(c)). In either case, the statement must be signed and dated, and must include the typed name and title of the official who signs it. Do not make CBI claims with respect to analytical methods associated with pet-

itions for tolerances or emergency exemptions (see NOTE Pg 13).

D.3. Confidential Attachment

If the claim is made that a study includes confidential business information as defined by the criteria of FIFRA §10(D)(1)(A), (B), or (C) (as described in D.2. above) all such information must be excised from the body of the study and confined to a separate study-specific Confidential Attachment. Each passage of CBI so isolated must be identified by a reference number cited within the body of the study at the point from which the passage was excised (See Attachment 5).

The Confidential Attachment to a study must be identified by a cover sheet fully identifying the parent study, and must be clearly marked "Confidential Attachment." An appropriately annotated photocopy of the parent study title page may be used as this cover sheet. Paginate the Confidential Attachment separately from the body of the study, beginning with page 1 of X on the title page. Each passage confined to the Confidential Attachment must be associated with a specific cross reference to the page(s) in the main body of the study on which it is cited, and with a reference to the applicable passage(s) of FIFRA §10(d)(1) on which the confidentiality claim is based.

D.4. Supplemental Statement of Data Confidentiality Claims (See Attachment 4)

If you wish to make a claim of confidentiality for any portion of a submitted study other than described by FIFRA §10(d)(1)(A), (B), or (C), the following provisions apply:

- The specific information to which the claim applies must be clearly marked in the body of the study as subject to a claim of confidentiality.

- A Supplemental Statement of Data Confidentiality Claims must be submitted, identifying each passage claimed confidential and describing in detail the basis for the claim. A list of the points to address in such a statement is included in Attachment 4 on Pg 14.

- The Supplemental Statement of Data Confidentiality Claims must be signed and dated and must include the typed name and title of the official who signed it.

D.5. Good Laboratory Practice Compliance Statement

This statement is required if the study contains laboratory work subject to GLP requirements specified in 40 CFR 160. Samples of these statements are shown in Attachment 6.

E. Reference to Previously Submitted Data

DO NOT RESUBMIT A STUDY THAT HAS PREVIOUSLY BEEN SUBMITTED FOR ANOTHER PURPOSE unless EPA specifically requests it. A copy of the title page plus the MRID number (if known) is sufficient to allow us to retrieve the study immediately for review. This prevents duplicate entries in the Agency files, and saves you the cost of sending more copies of the study. References to previously submitted studies should not be included in the transmittal document, but should be incorporated into the statement of the method of support for the application.

F. Physical Format Requirements

All elements in the data submittal package must be on uniform 8 1/2 by 11 inch white paper, printed on one side only in black ink, with high contrast and good resolution. Bindings for individual studies must be secure, but easily removable to permit disassembly for microfilming. Check with EPA for special

instructions before submitting data in any medium other than paper, such as film or magnetic media.

Please be particularly attentive to the following points:

- Do not include frayed or torn pages.
- Do not include carbon copies, or copies in other than black ink.
- Make sure that photocopies are clear, complete, and fully readable.
- Do not include oversize computer printouts or fold-out pages.
- Do not bind any documents with glue or binding tapes.
- Make sure that all pages of each study, including any attachments or appendices, are present and in correct sequence.

Number of Copies Required - All submittal packages except those associated with a Registration Standard or Special Review (See Part G below) must be provided ln three complete, identical copies. (The proposed regulations specified two copies; three are now being required to expedite and reduce the cost of processing data into the OPP Pesticide Document Management System and getting it into review.)

G. Special Requirements for Submitting Data to the Docket

Data submittal packages associated with a Registration Standard or Special Review must be provided in four copies, from one of which all material claimed as CBI has been excised. This fourth copy will become part of the public docket for the RS or SR case. If no claims of confidentiality are made for the study, the fourth copy should be identical to the other three. When portions of a study submitted in support of an RS or SR are claimed as CBI, the first three copies will include the CBI material as provided in section D of this notice. The following special preparation is required for the fourth copy.

- Remove the "Supplemental Statement of Data Confidentiality Claims".
- Remove the "Confidential Attachment".
- Excise from the body of the study any information you claim as confidential, even if it does not fall within the scope of FIFRA §10(d)(1)(A), (B), or (C). Do not close up or paraphrase text remaining after this excision.
- Mark the fourth copy plainly on both its cover and its title page with the phrase "Public Docket Material - contains no information claimed as confidential".

V. For Further Information

For further information contact John Carley, Chief, Information Services Branch, Program Management and Support Division, (703) 305-5240.

/S/

James W. Akerman
Acting Director,
Registration Division

Attachment 1. Sample Transmittal Document
Attachment 2. Sample Title Page for a Newly Submitted Study
Attachment 3. Statements of Data Confidentiality Claims
Attachment 4. Supplemental Statement of Data Confidentiality Claims
Attachment 5. Samples of Confidential Attachments
Attachment 6. Sample Good Laboratory Practice Statements
Attachment 7. Format Diagrams for Submittal Packages and Studies

ATTACHMENT 1

ELEMENTS TO BE INCLUDED IN THE TRANSMITTAL DOCUMENT*

1. Name and address of submitter (or all joint submitters**)

†Smith Chemical Corporation 1234 West Smith Street Cincinnati, OH 98765	-and-	Jones Chemical Company 5678 Wilson Blvd Covington, KY 56789

†Smith Chemical Corp will act as sole agent for all submitters.

2. Regulatory action in support of which this package is submitted

Use the EPA identification number (e.g. 359-EUP-67) if you know it. Otherwise describe the type of request (e.g. experimental use permit, data call-in - of xx-xx-xx date).

3. Transmittal date

4. List of submitted studies

Vol 1. Administrative materials - forms, previous correspondence with Project Managers, and so forth.

Vol 2. Title of first study in the submittal (Guideline No.)

Vol n Title of nth study in the submittal (Guideline No.)

* Applicants commonly provide this information in a transmittal letter. This remains an acceptable practice so long as all four elements are included.

* Indicate which of the joint submitters is empowered to act on behalf of all joint submitters in any matter concerning data compensation or subsequent use or release of the data.

Company Official: _____ _____
Name Signature

Company Name _____

Company Contact: _____ _____
Name Phone

ATTACHMENT 2

SAMPLE STUDY TITLE PAGE FOR A NEWLY SUBMITTED STUDY

Study Title

(Chemical name) - Magnitude of Residue on Corn

Data Requirement

Guideline 171-4

Author

John C. Davis

Study Completed On

January 5, 1979

Performing Laboratory

ABC Agricultural Laboratories
940 West Bay Drive
Wilmington, CA 39897

Laboratory Project ID

ABC 47-79

Page 1 of X
(X is the total number of pages in the study)

ATTACHMENT 3

STATEMENTS OF DATA CONFIDENTIALITY CLAIMS

1. No claim of confidentiality under FIFRA §10(d)(1)(A),(B), or (C).

STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA 6§10(d)(1)(A), (B), or (C).

Company _____

Company Agent: _____Typed Name_____ Date:_____

_____Title_____ _____Signature_____

2. Claim of confidentiality under FIFRA §10(d)(1)(A), (B), or (C).

Information claimed confidential on the basis of its falling within the scope of FIFRA §10(d)(1)(A), (B), or (C) has been removed to a confidential appendix, and is cited by cross-reference number in the body of the study.

Company: _____

Company Agent: _____Typed Name_____ Date:_____

_____Title_____ Signature _____

STATEMENT OF DATA CONFIDENTIALITY CLAIMS

NOTE: Applicants for permanent or temporary tolerances should note that it is OPP policy that no permanent tolerance, temporary tolerance, or request for an emergency exemption incorporating an analytical method, can be approved unless the applicant waives all claims of confidentiality for the analytical method. These analytical methods are published in the FDA Pesticide Analytical Methods Manual, and therefore cannot be claimed as confidential. OPP implements this policy by returning submitted analytical methods, for which confidentiality claims have been made, to the submitter, to obtain the confidentiality waiver before they can be processed.

ATTACHMENT 4

SUPPLEMENTAL STATEMENT OF DATA CONFIDENTIALITY CLAIMS

For any portion of a submitted study that is not described by FIFRA §10(d)(1)(A), (B), or (C), but for which you claim confidential treatment on another basis, the following information must be included within a Supplemental Statement of Data Confidentiality Claims:

- Identify specifically by page and line number(s) each portion of the study for which you claim confidentiality.
- Cite the reasons why the cited passage qualifies for confidential treatment.
- Indicate the length of time--until a specific date or event, or permanently--for which the information should be treated as confidential.
- Identify the measures taken to guard against undesired disclosure of this information.
- Describe the extent to which the information has been disclosed, and what precautions have been taken in connection with those disclosures.
- Enclose copies of any pertinent determinations of confidentiality made by EPA, other Federal agencies, of courts concerning this information.
- If you assert that disclosure of this information would be likely to result in substantial harmful effects to you, describe those harmful effects and explain why they should be viewed as substantial.
- If you assert that the information in voluntarily submitted, indicate whether you believe disclosure of this information might tend to lessen the availability to EPA of similar information in the future, and if so, how.

ATTACHMENT 5

EXAMPLES OF SEVERAL CONFIDENTIAL ATTACHMENTS

Example 1. (Confidential word or phrase that has been deleted from the study)

CROSS REFERENCE NUMBER 1 This cross reference number is used in the study in place of the following paragraph(s) at the indicated volume and page references.

DELETED WORDS OR PHRASE: Ethylene Glycol

PAGE	LINES	REASON FOR THE DELETION	FIFRA REFERENCE
6	14	Identity of Inert Ingredient	§10(d)(C)
28	25	"	"
100	19	"	"

Example 2. (Confidential paragraph(s) that have been deleted from the study)

CROSS REFERENCE NUMBER 5 This cross reference number is used in the study in place of the following paragraph(s) at the indicated volume and page references.

DELETED PARAGRAPH(S):

( )
(Reproduce the deleted paragraph(s) here)
( )

PAGE	LINES	REASON FOR THE DELETION	FIFRA REFERENCE
20.	2-17	Description of the quality control process	§10(d)(1)(C)

Example 3. (Confidential pages that have been deleted from the study)

CROSS REFERENCE NUMBER 7 This cross reference number is used in the study in place of the following paragraph(s) at the indicated volume and page references.

DELETED PAGES(S): are attached immediately behind this page

PAGES	REASON FOR THE DELETION	FIFRA REFERENCE
35-41.	Description of product manufacturing process	§10(d)(1)(A)

ATTACHMENT 6.

SAMPLE GOOD LABORATORY PRACTICE STATEMENTS

Example 1.

```
This study meets the requirements for 40 CFR Part 160

      Submitter _____________________________________________________

      Sponsor   _____________________________________________________
```

Example 2.

```
This study does not meet the requirements of 40 CFR Part 160, and
differs in the following ways:

1._____________________________________________

2._____________________________________________

3._____________________________________________

      Submitter_____________________________________

      Sponsor_______________________________________

      Study Director_______________________________
```

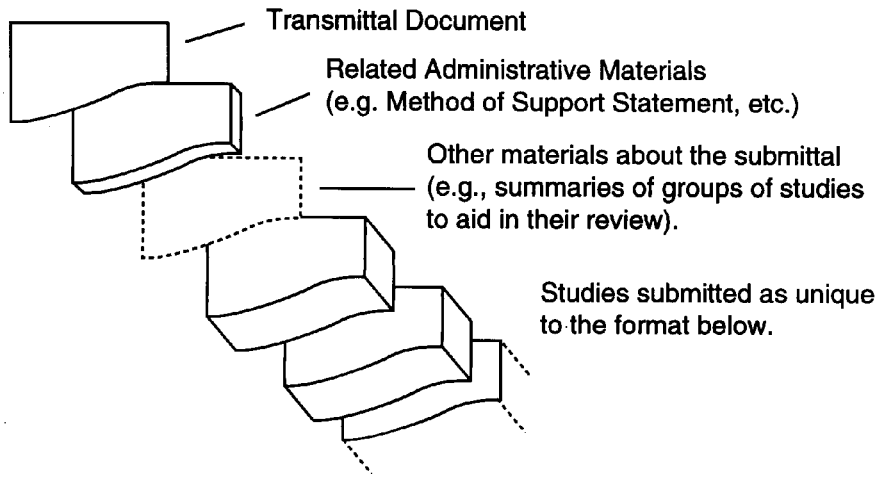
Example 3.

```
The submitter of this study was neither the sponsor of this study nor
conducted it, and does not know whether it has been conducted in
accordance with 40 CFR Part 160.

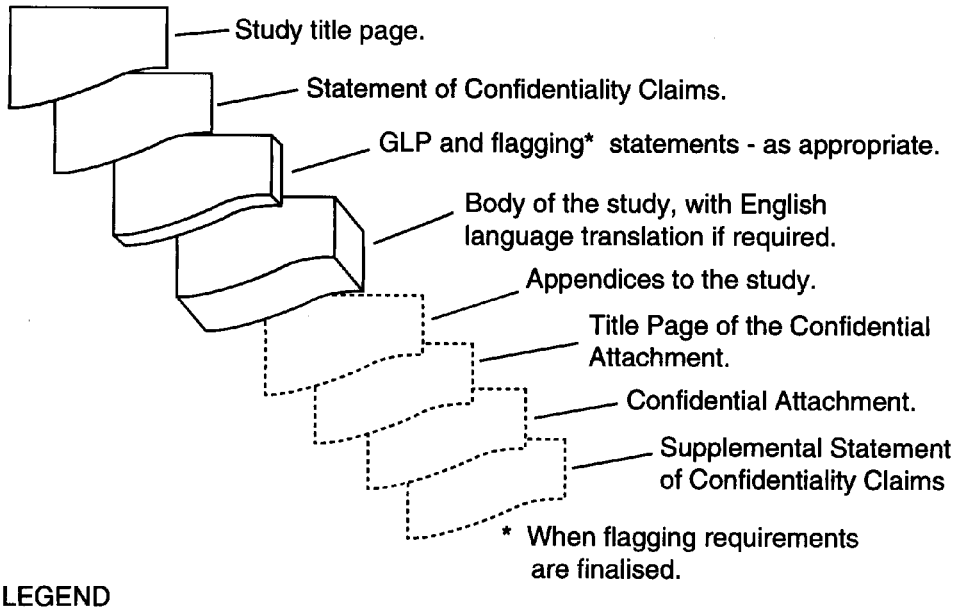
      Submitter_____________________________________________________
```

ATTACHMENT 7.

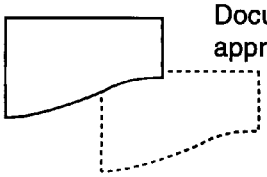
FORMAT OF THE SUBMITTAL PACKAGE



FORMAT OF SUBMITTED STUDIES



LEGEND



Documents which must be submitted as appropriate to meet established requirements.

Documents submitted at submitter's option.

PR Notice 91-2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

PR NOTICE 91-2

NOTICE TO MANUFACTURERS, PRODUCERS, FORMULATORS, AND REGISTRANTS OF PESTICIDES

ATTENTION: Persons Responsible for Federal Registration of Pesticide Products.

SUBJECT: Accuracy of Stated Percentages for Ingredients Statement

I. PURPOSE:

The purpose of this notice is to clarify the Office of Pesticide Program's policy with respect to the statement of percentages in a pesticide's label's ingredient statement. Specifically, the amount (percent by weight) of ingredient(s) specified in the ingredient statement on the label must be stated as the nominal concentration of such ingredient(s), as that term is defined in 40 CFR 158.153(i). Accordingly, the Agency has established the nominal concentration as the only acceptable label claim for the amount of active ingredient in the product.

II. BACKGROUND

For some time the Agency has accepted two different methods of identifying on the label what percentage is claimed for the ingredient(s) contained in a pesticide. Some applicants claimed a percentage which represented a level between the upper and the lower certified limits. This was referred to as the nominal concentration. Other applicants claimed the lower limit as the percentage of the ingredient(s) that would be expected to be present in their product at the end of the product's shelf-life. Unfortunately, this led to a great deal of confusion among the regulated industry, the regulators, and the consumers as to exactly how much of a given ingredient was in a given product. The Agency has established the nominal concentration as the only acceptable label claim for the amount of active ingredient in the product.

Current regulations require that the percentage listed in the active ingredient statement be as precise as possible reflecting good manufacturing practices 40 CFR 156.10(g)(5). The certified limits required for each active ingredient are intended to encompass any such "good manufacturing practice" variations 40 CFR 158.175(c)(3).

The upper and lower certified limits, which must be proposed in connection with a product's registration, represent the amounts of an ingredient that may legally be present 40 CFR 158.175. The lower certified limit is used as the enforceable lower limit for the product composition according to FIFRA section 12(a)(1)(C), while the nominal concentration appearing on the label would be the routinely achieved concentration used for calculation of dosages and dilutions.

The nominal concentration would in fact state the greatest degree of accuracy that is warranted with respect to actual

product composition because the nominal concentration would be the amount of active ingredient typically found in the product.

It is important for registrants to note that certified limits for active ingredients are not considered to be trade secret information under FIFRA section l0(b). In this respect the certified limits will be routinely provided by EPA to States for enforcement purposes, since the nominal concentration appearing on the label may not represent the enforceable composition for purposes of section 12(a)(1)(C).

III. REQUIREMENTS

As described below under Unit V. " **COMPLIANCE SCHEDULE,"** all currently registered products as well as all applications for new registration must comply with this Notice by specifying the nominal concentration expressed as a percentage by weight as the label claim in the ingredient(s) statement and equivalence statements if applicable (e.g., elemental arsenic, metallic zinc, salt of an acid). In addition, the requirement for performing sample analyses of five or more representative samples must be fulfilled. Copies of the raw analytical data must be submitted with the nominal ingredient label claim. Further information about the analysis requirement may be found in the 40 CFR 158.170. All products are required to provide certified limits for each active, inert ingredient, impurities of toxicological significance(i.e., upper limit(s) only) and on a case by case basis as specified by EPA. These limits are to be **set based on representative sampling** and chemical analysis(i.e., quality control) of the product.

The format of the ingredient statement must conform to 40 CFR 156-Labeling Requirements For Pesticides and Devices.

After July 1, 1997, all pesticide ingredient StatementS must be changed to nominal concentration.

IV. PRODUCTS THAT REQUIRE EFFICACY DATA

All pesticides are required to be efficacious. Therefore, the certified lower limits may not be lower then the minimum level to achieve efficacy. This is extremely important for products which are intended to control pests which threaten the public health, e.g., certain antimicrobial and rodenticide products. Refer to 40 CFR 153.640.

In those cases where efficacy limits have been established, the Agency will not accept certified lower limits which are below that level for the shelf life of the product.

V. COMPLIANCE SCHEDULE

As described earlier, the purpose of this Notice is to make the registration process more uniform and more manageable for both the agency and the regulated community. It is the Agency's intention to implement the requirements of this notice as smoothly as possible so as not to disrupt or delay the Agency's high priority programs, i.e., reregistration, new chemical, or fast track (FIFRA section 3(c)(3)(B). Therefore, applicants/registrants are expected to comply with the requirements of this Notice as follows:

(1) Beginning July 1, 1991, all new product registrations submitted to the Agency are to comply with the requirements of this Notice.

(2) Registrants having products subject to reregistration under FIFRA section 4(a) are to comply with the requirements of this Notice when specific products are called in by the Agency under Phase V of the Reregistration Program.

(3) All other products/applications that are not subject to (1) and (2) above will have until July 1, 1997, to comply with this Notice. Such applications should note "Conversion to Nominal Concentrations on the application form. These types Or amendments will not be handled as "Fast Track" applications but will be handled as routine requests.

VI. FOR FURTHER INFORMATION

Contact Tyrone Aiken for information or questions concerning this notice on (703) 308-7031.

/s/
Anne E. Lindsay, Director
Registration Division (H-7505C)

APPENDIX F. Combined Generic and Product Specific Data Call-In

GENERIC AND PRODUCT SPECIFIC
DATA CALL-IN NOTICE

CERTIFIED MAIL

Dear Sir or Madam:

This Notice requires you and other registrants of pesticide products containing the active ingredient identified in Attachment A of this Notice, the Data Call-In Chemical Status Sheet, to submit certain data as noted herein to the U.S. Environmental Protection Agency (EPA, the Agency). These data are necessary to maintain the continued registration of your product(s) containing this active ingredient. Within 90 days after you receive this Notice you must respond as set forth in Section III below. Your response must state:

1. How you will comply with the requirements set forth in this Notice and its Attachments 1 through 7; or

2. Why you believe you are exempt from the requirements listed in this Notice and in Attachment 3 (for both generic and product specific data), the Requirements Status and Registrant's Response Form, (see section III-B); or

3. Why you believe EPA should not require your submission of data in the manner specified by this Notice (see section III-D).

If you do not respond to this Notice, or if you do not satisfy EPA that you will comply with its requirements or should be exempt or excused from doing so, then the registration of your product(s) subject to this Notice will be subject to suspension. We have provided a list of all of your products subject to this Notice in Attachment 2. All products are listed on both the generic and product specific Data Call-In Response Forms. Also included is a list of all registrants who were sent this Notice (Attachment 6).

The authority for this Notice is section 3(c)(2)(B) of the Federal Insecticide, Fungicide and Rodenticide Act as amended (FIFRA), 7 U.S.C. section 136a(c)(2)(B). Collection of this information is authorized under the Paperwork Reduction Act by OMB Approval No. 2070-0107 and 2070-0057 (expiration date 3-31-96).

This Notice is divided into six sections and seven Attachments. The Notice itself contains information and instructions applicable to all Data Call-In Notices. The Attachments contain specific chemical information and instructions. The six sections of the Notice are:

Section I	-	Why You are Receiving this Notice
Section II	-	Data Required by this Notice
Section III	-	Compliance with Requirements of this Notice
Section IV	-	Consequences of Failure to Comply with this Notice
Section V	-	Registrants' Obligation to Report Possible Unreasonable Adverse Effects
Section VI	-	Inquiries and Responses to this Notice

The Attachments to this Notice are:

1 - Data Call-In Chemical Status Sheet

2 - Generic Data Call-In and Product Specific Data Call-In Response Forms with Instructions
3 - Generic Data Call-In and Product Specific Data Call-In Requirements Status and Registrant's Response Forms with Instructions
4 - EPA Grouping of End-Use Products for Meeting Acute Toxicology Data Requirements for Reregistration
5 - EPA Acceptance Criteria
6 - List of Registrants Receiving This Notice
7 - Cost Share and Data Compensation Forms

SECTION I. WHY YOU ARE RECEIVING THIS NOTICE

The Agency has reviewed existing data for this active ingredient(s) and reevaluated the data needed to support continued registration of the subject active ingredient(s). This reevaluation identified additional data necessary to assess the health and safety of the continued use of products containing this active ingredient(s). You have been sent this Notice because you have product(s) containing the subject active ingredients.

SECTION II. DATA REQUIRED BY THIS NOTICE

II-A. DATA REQUIRED

The data required by this Notice are specified in the Requirements Status and Registrant's Response Forms: Attachment 3 (for both generic and product specific data requirements). Depending on the results of the studies required in this Notice, additional studies/testing may be required.

II-B. SCHEDULE FOR SUBMISSION OF DATA

You are required to submit the data or otherwise satisfy the data requirements specified in the Requirements Status and Registrant's Response Forms (Attachment 3) within the timeframes provided.

II-C. TESTING PROTOCOL

All studies required under this Notice must be conducted in accordance with test standards outlined in the Pesticide Assessment Guidelines for those studies for which guidelines have been established.

These EPA Guidelines are available from the National Technical Information Service (NTIS), Attn: Order Desk, 5285 Port Royal Road, Springfield, Va 22161 (Telephone number: 703-487-4650).

Protocols approved by the Organization for Economic Cooperation and Development (OECD) are also acceptable if the OECD recommended test standards conform to those specified in the Pesticide Data Requirements regulation (40 CFR § 158.70). When using the OECD protocols, they should be modified as appropriate so that the data generated by the study will satisfy the requirements of 40 CFR § 158. Normally, the Agency will not extend deadlines for complying with data requirements when the studies were not conducted in accordance with acceptable standards. The OECD protocols are available from OECD, 2001 L Street, N.W., Washington, D.C. 20036 (Telephone number 202-785-6323; Fax telephone number 202-785-0350).

All new studies and proposed protocols submitted in response to this Data Call-In Notice must be in accordance with Good Laboratory Practices [40 CFR Part 160].

II-D. REGISTRANTS RECEIVING PREVIOUS SECTION 3(c)(2)(B) NOTICES ISSUED BY THE AGENCY

Unless otherwise noted herein, this Data Call-In does not in any way supersede or change the requirements of any previous Data Call-In(s), or any other agreements entered into with the Agency pertaining to such prior Notice. Registrants must comply with the requirements of all Notices to avoid issuance of a Notice of Intent to Suspend their affected products.

SECTION III. COMPLIANCE WITH REQUIREMENTS OF THIS NOTICE

You must use the correct forms and instructions when completing your response to this Notice. The type of Data Call-In you must comply with (Generic or Product Specific) is specified in item number 3 on the four Data Call-In forms (Attachments 2 and 3).

III-A. SCHEDULE FOR RESPONDING TO THE AGENCY

The appropriate responses initially required by this Notice for generic and product specific data must be submitted to the Agency within 90 days after your receipt of this Notice. Failure to adequately respond to this Notice within 90 days of your receipt will be a basis for issuing a Notice of Intent to Suspend (NOIS) affecting your products. This and other bases for issuance of NOIS due to failure to comply with this Notice are presented in Section IV-A and IV-B.

III-B. OPTIONS FOR RESPONDING TO THE AGENCY

1. Generic Data Requirements

The options for responding to this Notice for generic data requirements are: (a) voluntary cancellation, (b) delete use(s), (c) claim generic data exemption, (d) agree to satisfy the generic data requirements imposed by this Notice or (e) request a data waiver(s).

A discussion of how to respond if you choose the Voluntary Cancellation option, the Delete Use(s) option or the Generic Data Exemption option is presented below. A discussion of the various options available for satisfying the generic data requirements of this Notice is contained in Section III-C. A discussion of options relating to requests for data waivers is contained in Section III-D.

Two forms apply to generic data requirements, one or both of which must be used in responding to the Agency, depending upon your response. These two forms are the Data-Call-In Response Form, and the Requirements Status and Registrant's Response Form, (contained in Attachments 2 and 3, respectively).

The Data Call-In Response Forms must be submitted as part of every response to this Notice. The Requirements Status and Registrant's Response Forms also must be submitted if you do not qualify for a Generic Data Exemption or are not requesting voluntary cancellation of your registration(s). Please note that the company's authorized representative is required to sign the first page of both Data Call-In Response Forms and the Requirements Status and Registrant's Response Forms (if this form is required) and initial any subsequent pages. The forms contain separate detailed instructions on the response options. Do not alter the printed material. If you have questions or need assistance in preparing your response, call or write the contact person(s) identified in Attachment 1.

a. Voluntary Cancellation -

You may avoid the requirements of this Notice by requesting voluntary cancellation of your product(s) containing the active ingredient that is the subject of this Notice. If you wish to voluntarily cancel your product, you must submit completed Generic and Product Specific

Data Call-In Response Forms (Attachment 2), indicating your election of this option. Voluntary cancellation is item number 5 on both Data Call-In Response Form(s). If you choose this option, these are the only forms that you are required to complete.

If you chose to voluntarily cancel your product, further sale and distribution of your product after the effective date of cancellation must be in accordance with the Existing Stocks provisions of this Notice, which are contained in Section IV-C.

b. Use Deletion -

You may avoid the requirements of this Notice by eliminating the uses of your product to which the requirements apply. If you wish to amend your registration to delete uses, you must submit the Requirements Status and Registrant's Response Form (Attachment 3), a completed application for amendment, a copy of your proposed amended labeling, and all other information required for processing the application. Use deletion is option number 7 under item 9 in the instructions for the Requirements Status and Registrant's Response Forms. You must also complete a Data Call-In Response Form by signing the certification, item number 8. Application forms for amending registrations may be obtained from the Registration Support Branch, Registration Division, Office of Pesticide Programs, EPA, by calling (703) 308-8358.

If you choose to delete the use(s) subject to this Notice or uses subject to specific data requirements, further sale, distribution, or use of your product after one year from the due date of your 90 day response, is allowed only if the product bears an amended label.

c. Generic Data Exemption -

Under section 3(c)(2)(D) of FIFRA, an applicant for registration of a product is exempt from the requirement to submit or cite generic data concerning an active ingredient if the active ingredient in the product is derived exclusively from purchased, registered pesticide products containing the active ingredient. EPA has concluded, as an exercise of its discretion, that it normally will not suspend the registration of a product which would qualify and continue to qualify for the generic data exemption in section 3(c)(2)(D) of FIFRA. To qualify, all of the following requirements must be met:

(i). The active ingredient in your registered product must be present solely because of incorporation of another registered product which contains the subject active ingredient and is purchased from a source not connected with you;

(ii). Every registrant who is the ultimate source of the active ingredient in your product subject to this DCI must be in compliance with the requirements of this Notice and must remain in compliance; and

(iii). You must have provided to EPA an accurate and current "Confidential Statement of Formula" for each of your products to which this Notice applies.

To apply for the Generic Data Exemption you must submit a completed Data Call-In Response Form, Attachment 2 and all supporting documentation. The Generic Data Exemption is item number 6a on the Data Call-In Response Form. If you claim a generic data exemption you are not required to complete the Requirements Status and Registrant's Response Form. Generic Data Exemption cannot be selected as an option for responding to product specific data requirements.

If you are granted a Generic Data Exemption, you rely on the efforts of other persons to provide the Agency with the required data. If the registrant(s) who have committed to generate and submit the required data fail to take appropriate steps to meet requirements or are no longer in compliance with this Data Call-In Notice, the Agency will consider that both they and you are not compliance and will normally initiate proceedings to suspend the registrations

of both your and their product(s), unless you commit to submit and do submit the required data within the specified time. In such cases the Agency generally will not grant a time extension for submitting the data.

d. Satisfying the Generic Data Requirements of this Notice

There are various options available to satisfy the generic data requirements of this Notice. These options are discussed in Section III-C.1. of this Notice and comprise options 1 through 6 of item 9 in the instructions for the Requirements Status and Registrant's Response Form and item 6b on the Data Call-In Response Form. If you choose item 6b (agree to satisfy the generic data requirements), you must submit the Data Call-In Response Form and the Requirements Status and Registrant's Response Form as well as any other information/data pertaining to the option chosen to address the data requirement. Your response must be on the forms marked "GENERIC" in item number 3.

e. Request for Generic Data Waivers.

Waivers for generic data are discussed in Section III-D.1. of this Notice and are covered by options 8 and 9 of item 9 in the instructions for the Requirements Status and Registrant's Response Form. If you choose one of these options, you must submit both forms as well as any other information/data pertaining to the option chosen to address the data requirement.

2. Product Specific Data Requirements

The options for responding to this Notice for product specific data are: (a) voluntary cancellation, (b) agree to satisfy the product specific data requirements imposed by this Notice or (c) request a data waiver(s).

A discussion of how to respond if you choose the Voluntary Cancellation option is presented below. A discussion of the various options available for satisfying the product specific data requirements of this Notice is contained in Section III-C.2. A discussion of options relating to requests for data waivers is contained in Section III-D.2.

Two forms apply to the product specific data requirements one or both of which must be used in responding to the Agency, depending upon your response. These forms are the Data-Call-In Response Form, and the Requirements Status and Registrant's Response Form, for product specific data (contained in Attachments 2 and 3, respectively). The Data Call-In Response Form must be submitted as part of every response to this Notice. In addition, one copy of the Requirements Status and Registrant's Response Form also must be submitted for each product listed on the Data Call-In Response Form unless the voluntary cancellation option is selected. Please note that the company's authorized representative is required to sign the first page of the Data Call-In Response Form and Requirements Status and Registrant's Response Form (if this form is required) and initial any subsequent pages. The forms contain separate detailed instructions on the response options. Do not alter the printed material. If you have questions or need assistance in preparing your response, call or write the contact person(s) identified in Attachment 1.

a. Voluntary Cancellation

You may avoid the requirements of this Notice by requesting voluntary cancellation of your product(s) containing the active ingredient that is the subject of this Notice. If you wish to voluntarily cancel your product, you must submit a completed Data Call-In Response Form, indicating your election of this option. Voluntary cancellation is item number 5 on both the Generic and Product Specific Data Call-In Response Forms. If you choose this option, you must complete both Data Call-In response forms. These are the only forms that you are required to complete.

If you choose to voluntarily cancel your product, further sale and distribution of your product after the effective date of cancellation must be in accordance with the Existing Stocks provisions of this Notice which are contained in Section IV-C.

b. Satisfying the Product Specific Data Requirements of this Notice.

There are various options available to satisfy the product specific data requirements of this Notice. These options are discussed in Section III-C.2. of this Notice and comprise options 1 through 6 of item 9 in the instructions for the product specific Requirements Status and Registrant's Response Form and item numbers 7a and 7b (agree to satisfy the product specific data requirements for an MUP or EUP as applicable) on the product specific Data Call-In Response Form. Note that the options available for addressing product specific data requirements differ slightly from those options for fulfilling generic data requirements. Deletion of a use(s) and the low volume/minor use option are not valid options for fulfilling product specific data requirements. It is important to ensure that you are using the correct forms and instructions when completing your response to the Reregistration Eligibility Decision document.

c. Request for Product Specific Data Waivers.

Waivers for product specific data are discussed in Section III-D.2. of this Notice and are covered by option 7 of item 9 in the instructions for the Requirements Status and Registrant's Response Form. If you choose this option, you must submit the Data Call-In Response Form and the Requirements Status and Registrant's Response Form as well as any other information/data pertaining to the option chosen to address the data requirement. Your response must be on the forms marked "PRODUCT SPECIFIC" in item number 3.

III-C SATISFYING THE DATA REQUIREMENTS OF THIS NOTICE

1. Generic Data

If you acknowledge on the Generic Data Call-In Response Form that you agree to satisfy the generic data requirements (i.e. you select item number 6b), then you must select one of the six options on the Generic Requirements Status and Registrant's Response Form related to data production for each data requirement. Your option selection should be entered under item number 9, "Registrant Response." The six options related to data production are the first six options discussed under item 9 in the instructions for completing the Requirements Status and Registrant's Response Form. These six options are listed immediately below with information in parentheses to guide you to additional instructions provided in this Section. The options are:

(1) I will generate and submit data within the specified timeframe (Developing Data)
(2) I have entered into an agreement with one or more registrants to develop data jointly (Cost Sharing)
(3) I have made offers to cost-share (Offers to Cost Share)
(4) I am submitting an existing study that has not been submitted previously to the Agency by anyone (Submitting an Existing Study)
(5) I am submitting or citing data to upgrade a study classified by EPA as partially acceptable and upgradeable (Upgrading a Study)
(6) I am citing an existing study that EPA has classified as acceptable or an existing study that has been submitted but not reviewed by the Agency (Citing an Existing Study)

Option 1. Developing Data

If you choose to develop the required data it must be in conformance with Agency deadlines and with other Agency requirements as referenced herein and in the attachments. All data generated and submitted must comply with the Good Laboratory Practice (GLP) rule (40

CFR Part 160), be conducted according to the Pesticide Assessment Guidelines (PAG) and be in conformance with the requirements of PR Notice 86-5. In addition, certain studies require Agency approval of test protocols in advance of study initiation. Those studies for which a protocol must be submitted have been identified in the Requirements Status and Registrant's Response Form and/or footnotes to the form. If you wish to use a protocol which differs from the options discussed in Section II-C of this Notice, you must submit a detailed description of the proposed protocol and your reason for wishing to use it. The Agency may choose to reject a protocol not specified in Section II-C. If the Agency rejects your protocol you will be notified in writing, however, you should be aware that rejection of a proposed protocol will not be a basis for extending the deadline for submission of data.

A progress report must be submitted for each study within 90 days from the date you are required to commit to generate or undertake some other means to address that study requirement, such as making an offer to cost share or agreeing to share in the cost of developing that study. This 90-day progress report must include the date the study was or will be initiated and, for studies to be started within 12 months of commitment, the name and address of the laboratory(ies) or individuals who are or will be conducting the study.

In addition, if the time frame for submission of a final report is more than 1 year, interim reports must be submitted at 12 month intervals from the date you are required to commit to generate or otherwise address the requirement for the study. In addition to the other information specified in the preceding paragraph, at a minimum, a brief description of current activity on and the status of the study must be included as well as a full description of any problems encountered since the last progress report.

The time frames in the Requirements Status and Registrant's Response Form are the time frames that the Agency is allowing for the submission of completed study reports or protocols. The noted deadlines run from the date of the receipt of this Notice by the registrant. If the data are not submitted by the deadline, each registrant is subject to receipt of a Notice of Intent to Suspend the affected registration(s).

If you cannot submit the data/reports to the Agency in the time required by this Notice and intend to seek additional time to meet the requirements(s), you must submit a request to the Agency which includes: (1) a detailed description of the expected difficulty and (2) a proposed schedule including alternative dates for meeting such requirements on a step-by-step basis. You must explain any technical or laboratory difficulties and provide documentation from the laboratory performing the testing. While EPA is considering your request, the original deadline remains. The Agency will respond to your request in writing. If EPA does not grant your request, the original deadline remains. Normally, extensions can be requested only in cases of extraordinary testing problems beyond the expectation or control of the registrant. Extensions will not be given in submitting the 90-day responses. Extensions will not be considered if the request for extension is not made in a timely fashion; in no event shall an extension request be considered if it is submitted at or after the lapse of the subject deadline.

Option 2. Agreement to Share in Cost to Develop Data

If you choose to enter into an agreement to share in the cost of producing the required data but will not be submitting the data yourself, you must provide the name of the registrant who will be submitting the data. You must also provide EPA with documentary evidence that an agreement has been formed. Such evidence may be your letter offering to join in an agreement and the other registrant's acceptance of your offer, or a written statement by the parties that an agreement exists. The agreement to produce the data need not specify all of the terms of the final arrangement between the parties or the mechanism to resolve the terms. Section 3(c)(2)(B) provides that if the parties cannot resolve the terms of the agreement they may resolve their differences through binding arbitration.

Option 3. Offer to Share in the Cost of Data Development

If you have made an offer to pay in an attempt to enter into an agreement or amend an existing agreement to meet the requirements of this Notice and have been unsuccessful, you may request EPA (by selecting this option) to exercise its discretion not to suspend your registration(s), although you do not comply with the data submission requirements of this Notice. EPA has determined that as a general policy, absent other relevant considerations, it will not suspend the registration of a product of a registrant who has in good faith sought and continues to seek to enter into a joint data development/cost sharing program, but the other registrant(s) developing the data has refused to accept the offer. To qualify for this option, you must submit documentation to the Agency proving that you have made an offer to another registrant (who has an obligation to submit data) to share in the burden of developing that data. You must also submit to the Agency a completed EPA Form 8570-32, Certification of Offer to Cost Share in the Development of Data, Attachment 7. In addition, you must demonstrate that the other registrant to whom the offer was made has not accepted your offer to enter into a cost-sharing agreement by including a copy of your offer and proof of the other registrant's receipt of that offer (such as a certified mail receipt). Your offer must, in addition to anything else, offer to share in the burden of producing the data upon terms to be agreed to or, failing agreement, to be bound by binding arbitration as provided by FIFRA section 3(c)(2)(B)(iii) and must not qualify this offer. The other registrant must also inform EPA of its election of an option to develop and submit the data required by this Notice by submitting a Data Call-In Response Form and a Requirements Status and Registrant's Response Form committing to develop and submit the data required by this Notice.

In order for you to avoid suspension under this option, you may not withdraw your offer to share in the burden of developing the data. In addition, the other registrant must fulfill its commitment to develop and submit the data as required by this Notice. If the other registrant fails to develop the data or for some other reason is subject to suspension, your registration as well as that of the other registrant normally will be subject to initiation of suspension proceedings, unless you commit to submit, and do submit, the required data in the specified time frame. In such cases, the Agency generally will not grant a time extension for submitting the data.

Option 4. Submitting an Existing Study

If you choose to submit an existing study in response to this Notice, you must determine that the study satisfies the requirements imposed by this Notice. You may only submit a study that has not been previously submitted to the Agency or previously cited by anyone. Existing studies are studies which predate issuance of this Notice. Do not use this option if you are submitting data to upgrade a study. (See Option 5).

You should be aware that if the Agency determines that the study is not acceptable, the Agency will require you to comply with this Notice, normally without an extension of the required date of submission. The Agency may determine at any time that a study is not valid and needs to be repeated.

To meet the requirements of the DCI Notice for submitting an existing study, all of the following three criteria must be clearly Met:

a. You must certify at the time that the existing study is submitted that the raw data and specimens from the study are available for audit and review and you must identify where they are available. This must be done in accordance with the requirements of the Good Laboratory Practice (GLP) regulation, 40 CFR Part 160. As stated in 40 CFR 160.3 'Raw data' means any laboratory worksheets, records, memoranda, notes, or exact copies thereof, that are the result of original observations and activities of a study and are necessary for the reconstruction and evaluation of the report of that study. In the event that exact transcripts of raw data have been prepared (e.g., tapes which have been

transcribed verbatim, dated, and verified accurate by signature), the exact copy or exact transcript may be substituted for the original source as raw data. 'Raw data' may include photographs, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments." The term "specimens", according to 40 CFR 160.3, means "any material derived from a test system for examination or analysis."

b. Health and safety studies completed after May 1984 also must also contain all GLP-required quality assurance and quality control information, pursuant to the requirements of 40 CFR Part 160. Registrants also must certify at the time of submitting the existing study that such GLP information is available for post May 1984 studies by including an appropriate statement on or attached to the study signed by an authorized official or representative of the registrant.

c. You must certify that each study fulfills the acceptance criteria for the Guideline relevant to the study provided in the FIFRA Accelerated Reregistration Phase 3 Technical Guidance and that the study has been conducted according to the Pesticide Assessment Guidelines (PAG) or meets the purpose of the PAG (both available from NTIS). A study not conducted according to the PAG may be submitted to the Agency for consideration if the registrant believes that the study clearly meets the purpose of the PAG. The registrant is referred to 40 CFR 158.70 which states the Agency's policy regarding acceptable protocols. If you wish to submit the study, you must, in addition to certifying that the purposes of the PAG are met by the study, clearly articulate the rationale why you believe the study meets the purpose of the PAG, including copies of any supporting information or data. It has been the Agency's experience that studies completed prior to January 1970 rarely satisfied the purpose of the PAG and that necessary raw data usually are not available for such studies.

If you submit an existing study, you must certify that the study meets all requirements of the criteria outlined above.

If EPA has previously reviewed a protocol for a study you are submitting, you must identify any action taken by the Agency on the protocol and must indicate, as part of your certification, the manner in which all Agency comments, concerns, or issues were addressed in the final protocol and study.

If you know of a study pertaining to any requirement in this Notice which does not meet the criteria outlined above but does contain factual information regarding unreasonable adverse effects, you must notify the Agency of such a study. If such study is in the Agency's files, you need only cite it along with the notification. If not in the Agency's files, you must submit a summary and copies as required by PR Notice 86-5.

Option 5. Upgrading a Study

If a study has been classified as partially acceptable and upgradeable, you may submit data to upgrade that study. The Agency will review the data submitted and determine if the requirement is satisfied. If the Agency decides the requirement is not satisfied, you may still be required to submit new data normally without any time extension. Deficient, but upgradeable studies will normally be classified as supplemental. However, it is important to note that not all studies classified as supplemental are upgradeable. If you have questions regarding the classification of a study or whether a study may be upgraded, call or write the contact person listed in Attachment 1. If you submit data to upgrade an existing study you must satisfy or supply information to correct all deficiencies in the study identified by EPA. You must provide a clearly articulated rationale of how the deficiencies have been remedied or corrected and why the study should be rated as acceptable to EPA. Your submission must also specify the MRID number(s) of the study which you are attempting to upgrade and must be in conformance with PR Notice 86-5.

Do not submit additional data for the purpose of upgrading a study classified as unacceptable and determined by the Agency as not capable of being upgraded.

This option also should be used to cite data that has been previously submitted to upgrade a study, but has not yet been reviewed by the Agency. You must provide the MRID number of the data submission as well as the MRID number of the study being upgraded.

The criteria for submitting an existing study, as specified in Option 4 above, apply to all data submissions intended to upgrade studies. Additionally, your submission of data intended to upgrade studies must be accompanied by a certification that you comply with each of those criteria, as well as a certification regarding protocol compliance with Agency requirements.

Option 6. Citing Existing Studies

If you choose to cite a study that has been previously submitted to EPA, that study must have been previously classified by EPA as acceptable, or it must be a study which has not yet been reviewed by the Agency. Acceptable toxicology studies generally will have been classified as "core-guideline" or "core-minimum." For ecological effects studies, the classification generally would be a rating of "core." For all other disciplines the classification would be "acceptable." With respect to any studies for which you wish to select this option, you must provide the MRID number of the study you are citing and, if the study has been reviewed by the Agency, you must provide the Agency's classification of the study.

If you are citing a study of which you are not the original data submitter, you must submit a completed copy of EPA Form 8570-31, Certification with Respect to Data Compensation Requirements.

2. Product Specific Data

If you acknowledge on the product specific Data Call-In Response Form that you agree to satisfy the product specific data requirements (i.e. you select option 7a or 7b), then you must select one of the six options on the Requirements Status and Registrant's Response Form related to data production for each data requirement. Your option selection should be entered under item number 9, "Registrant Response." The six options related to data production are the first six options discussed under item 9 in the instructions for completing the Requirements Status and Registrant's Response Form. These six options are listed immediately below with information in parentheses to guide registrants to additional instructions provided in this Section. The options are:

(1) I will generate and submit data within the specified time-frame (Developing Data)
(2) I have entered into an agreement with one or more registrants to develop data

jointly (Cost Sharing)

(3) I have made offers to cost-share (Offers to Cost Share)

(4) I am submitting an existing study that has not been submitted previously to the Agency by anyone (Submitting an Existing Study)

(5) I am submitting or citing data to upgrade a study classified by EPA as partially acceptable and upgradeable (Upgrading a Study)

(6) I am citing an existing study that EPA has classified as acceptable or an existing study that has been submitted but not reviewed by the Agency (Citing an Existing Study)

Option 1. Developing Data -- The requirements for developing product specific data are the same as those described for generic data (see Section III.C.1, Option 1) except that normally no protocols or progress reports are required.

Option 2. Agree to Share in Cost to Develop Data -- If you enter into an agreement to cost share, the same requirements apply to product specific data as to generic data (see Section III.C.1, Option 2). However, registrants may only choose this option for acute toxicity data and certain efficacy data and only if EPA has indicated in the attached data tables that your product and at least one other product are similar for purposes of depending on the same data. If this is the case, data may be generated for just one of the products in the group. The registration number of the product for which data will be submitted must be noted in the agreement to cost share by the registrant selecting this option.

Option 3. Offer to Share in the Cost of Data Development --The same requirements for generic data (Section III.C.I., Option 3) apply to this option. This option only applies to acute toxicity and certain efficacy data as described in option 2 above.

Option 4. Submitting an Existing Study -- The same requirements described for generic data (see Section III.C.1., Option 4) apply to this option for product specific data.

Option 5. Upgrading a Study -- The same requirements described for generic data (see Section III.C.1., Option 5) apply to this option for product specific data.

Option 6. Citing Existing Studies -- The same requirements described for generic data (see Section III.C.1., Option 6) apply to this option for product specific data.

Registrants who select one of the above 6 options must meet all of the requirements described in the instructions for completing the Data Call-In Response Form and the Requirements Status and Registrant's Response Form, and in the generic data requirements section (III.C.1.), as appropriate.

III-D REQUESTS FOR DATA WAIVERS

1. Generic Data

There are two types of data waiver responses to this Notice. The first is a request for a low volume/minor use waiver and the second is a waiver request based on your belief that the data requirement(s) are not appropriate for your product.

a. Low Volume/Minor Use Waiver

Option 8 under item 9 on the Requirements Status and Registrant's Response Form. Section 3(c)(2)(A) of FIFRA requires EPA to consider the appropriateness of requiring data for low volume, minor use pesticides. In implementing this provision, EPA considers low volume pesticides to be only those active ingredients whose total production volume for all pesticide registrants is small. In determining whether to grant a low volume, minor use waiver, the Agency will consider the extent, pattern and volume of use, the economic incentive to conduct the testing, the importance of the

pesticide, and the exposure and risk from use of the pesticide. If an active ingredient is used for both high volume and low volume uses, a low volume exemption will not be approved. If all uses of an active ingredient are low volume and the combined volumes for all uses are also low, then an exemption may be granted, depending on review of other information outlined below. An exemption will not be granted if any registrant of the active ingredient elects to conduct the testing. Any registrant receiving a low volume minor use waiver must remain within the sales figures in their forecast supporting the waiver request in order to remain qualified for such waiver. If granted a waiver, a registrant will be required, as a condition of the waiver, to submit annual sales reports. The Agency will respond to requests for waivers in writing.

To apply for a low volume, minor use waiver, you must submit the following information, as applicable to your product(s), as part of your 90-day response to this Notice:

(i). Total company sales (pounds and dollars) of all registered product(s) containing the active ingredient. If applicable to the active ingredient, include foreign sales for those products that are not registered in this country but are applied to sugar (cane or beet), coffee, bananas, cocoa, and other such crops. Present the above information by year for each of the past five years.

(ii) Provide an estimate of the sales (pounds and dollars) of the active ingredient for each major use site. Present the above information by year for each of the past five years.

(iii) Total direct production cost of product(s) containing the active ingredient by year for the past five years. Include information on raw material cost, direct labor cost, advertising, sales and marketing, and any other significant costs listed separately.

(iv) Total indirect production cost (e.g. plant overhead, amortized plant and equipment) charged to product(s) containing the active ingredient by year for the past five years. Exclude all non-recurring costs that were directly related to the active ingredient, such as costs of initial registration and any data development.

(v) A list of each data requirement for which you seek a waiver. Indicate the type of waiver sought and the estimated cost to you (listed separately for each data requirement and associated test) of conducting the testing needed to fulfill each of these data requirements.

(vi) A list of each data requirement for which you are not seeking any waiver and the estimated cost to you (listed separately for each data requirement and associated test) of conducting the testing needed to fulfill each of these data requirements.

(vii) For each of the next ten years, a year-by-year forecast of company sales (pounds and dollars) of the active ingredient, direct production costs of product(s) containing the active ingredient (following the parameters in item 2 above), indirect production costs of product(s) containing the active ingredient (following the parameters in item 3 above), and costs of data development pertaining to the active ingredient.

(viii) A description of the importance and unique benefits of the active ingredient to users. Discuss the use patterns and the effectiveness of the active ingredient relative to registered alternative chemicals and non-chemical control strategies. Focus on benefits unique to the active ingredient, providing information that is as quantitative as possible. If you do not have quantitative data upon which to base your estimates, then present the reasoning used to derive your estimates. To assist the Agency in determining the degree of importance of the active ingredient in terms of its benefits, you should provide information on any of the following factors, as applicable to your product(s): (a) documentation of the usefulness of the active ingredient in Integrated Pest Management, (b) description of the beneficial impacts on the environment of use of the active ingredient, as opposed to its registered alternatives, (c) information on the breakdown of the active ingredient after use and on its persistence in the environment, and (d) description of its usefulness against a pest(s) of public health significance.

Failure to submit sufficient information for the Agency to make a determination regarding a request for a low volume/minor use waiver will result in denial of the request for a waiver.

b. Request for Waiver of Data

Option 9, under Item 9, on the Requirements Status and Registrant's Response Form. This option may be used if you believe that a particular data requirement should not apply because the requirement is inappropriate. You must submit a rationale explaining why you believe the data requirements should not apply. You also must submit the current label(s) of your product(s) and, if a current copy of your Confidential Statement of Formula is not already on file you must submit a current copy.

You will be informed of the Agency's decision in writing. If the Agency determines that the data requirements of this Notice are not appropriate to your product(s), you will not be required to supply the data pursuant to section 3(c)(2)(B). If EPA determines that the data are required for your product(s), you must choose a method of meeting the requirements of this Notice within the time frame provided by this Notice. Within 30 days of your receipt of the Agency's written decision, you must submit a revised Requirements Status and Registrant's Response Form indicating the option chosen.

2. Product Specific Data

If you request a waiver for product specific data because you believe it is inappropriate, you must attach a complete justification for the request including technical reasons, data and references to relevant EPA regulations, guidelines or policies. (Note: any supplemental data must be submitted in the format required by PR Notice 86-5). This will be the only opportunity to state the reasons or provide information in support of your request. If the Agency approves your waiver request, you will not be required to supply the data pursuant to section 3(c)(2)(B) of FIFRA. If the Agency denies your waiver request, you must choose an option for meeting the data requirements of this Notice within 30 days of the receipt of the Agency's decision. You must indicate and submit the option chosen on the product specific Requirements Status and Registrant's Response Form. Product specific data requirements for product chemistry, acute toxicity and efficacy (where appropriate) are required for all products and the Agency would grant a waiver only under extraordinary circumstances. You should also be aware that submitting a waiver request will not automatically extend the due date for the study in question. Waiver requests submitted without adequate supporting rationale will be denied and the original due date will remain in force.

SECTION IV. CONSEQUENCES OF FAILURE TO COMPLY WITH THIS NOTICE

IV-A NOTICE OF INTENT TO SUSPEND

The Agency may issue a Notice of Intent to Suspend products subject to this Notice due to failure by a registrant to comply with the requirements of this Data Call-In Notice, pursuant to FIFRA section 3(c)(2)(B). Events which may be the basis for issuance of a Notice of Intent to Suspend include, but are not limited to, the following:

1. Failure to respond as required by this Notice within 90 days of your receipt of this Notice.

2. Failure to submit on the required schedule an acceptable proposed or final protocol when such is required to be submitted to the Agency for review.

3. Failure to submit on the required schedule an adequate progress report on a study as required by this Notice.

4. Failure to submit on the required schedule acceptable data as required by this Notice.

5. Failure to take a required action or submit adequate information pertaining to any option chosen to address the data requirements (e.g., any required action or information pertaining to submission or citation of existing studies or offers, arrangements, or arbitration on the sharing of costs or the formation of Task Forces, failure to comply with the terms of an agreement or arbitration concerning joint data development or failure to comply with any terms of a data waiver).

6. Failure to submit supportable certifications as to the conditions of submitted studies, as required by Section III-C of this Notice.

7. Withdrawal of an offer to share in the cost of developing required data.

8. Failure of the registrant to whom you have tendered an offer to share in the cost of developing data and provided proof of the registrant's receipt of such offer or failure of a registrant on whom you rely for a generic data exemption either to:

   i. Inform EPA of intent to develop and submit the data required by this Notice on a Data Call-In Response Form and a Requirements Status and Registrant's Response Form.

   ii. Fulfill the commitment to develop and submit the data as required by this Notice; or

   iii. Otherwise take appropriate steps to meet the requirements stated in this Notice,

   unless you commit to submit and do submit the required data in the specified time frame.

9. Failure to take any required or appropriate steps, not mentioned above, at any time following the issuance of this Notice.

IV-B. BASIS FOR DETERMINATION THAT SUBMITTED STUDY IS UNACCEPTABLE

The Agency may determine that a study (even if submitted within the required time) is unacceptable and constitutes a basis for issuance of a Notice of Intent to Suspend. The grounds for suspension include, but are not limited to, failure to meet any of the following:

1) EPA requirements specified in the Data Call-In Notice or other documents incorporated by reference (including, as applicable, EPA Pesticide Assessment Guidelines, Data Reporting Guidelines, and GeneTox Health Effects Test Guidelines) regarding the design, conduct, and reporting of required studies. Such requirements include, but are not limited to, those relating to test material, test procedures, selection of species, number of animals, sex and distribution of animals, dose and effect levels to be tested or attained, duration of test, and, as applicable, Good Laboratory Practices.

2) EPA requirements regarding the submission of protocols, including the incorporation of any changes required by the Agency following review.

3) EPA requirements regarding the reporting of data, including the manner of reporting, the completeness of results, and the adequacy of any required supporting (or raw) data, including, but not limited to, requirements referenced or included in this Notice or contained in PR 86-5. All studies must be submitted in the form of a final report; a preliminary report will not be considered to fulfill the submission requirement.

IV-C EXISTING STOCKS OF SUSPENDED OR CANCELLED PRODUCTS

EPA has statutory authority to permit continued sale, distribution and use of existing stocks of a pesticide product which has been suspended or cancelled if doing so would be consistent with the purposes of the Act.

The Agency has determined that such disposition by registrants of existing stocks for a suspended registration when a section 3(c)(2)(B) data request is outstanding generally would not be consistent with the Act's purposes. Accordingly, the Agency anticipates granting registrants permission to sell, distribute, or use existing stocks of suspended product(s) only in exceptional circumstances. If you believe such disposition of existing stocks of your product(s) which may be suspended for failure to comply with this Notice should be permitted, you have the burden of clearly demonstrating to EPA that granting such permission would be consistent with the Act. You also must explain why an "existing stocks" provision is necessary, including a statement of the quantity of existing stocks and your estimate of the time required for their sale, distribution, and use. Unless you meet this burden, the Agency will not consider any request pertaining to the continued sale, distribution, or use of your existing stocks after suspension.

If you request a voluntary cancellation of your product(s) as a response to this Notice and your product is in full compliance with all Agency requirements, you will have, under most circumstances, one year from the date your 90 day response to this Notice is due, to sell, distribute, or use existing stocks. Normally, the Agency will allow persons other than the registrant such as independent distributors, retailers and end users to sell, distribute or use such existing stocks until the stocks are exhausted. Any sale, distribution or use of stocks of voluntarily cancelled products containing an active ingredient for which the Agency has particular risk concerns will be determined on a case-by-case basis.

Requests for voluntary cancellation received after the 90 day response period required by this Notice will not result in the agency granting any additional time to sell, distribute, or use existing stocks beyond a year from the date the 90 day response was due, unless you demonstrate to the Agency that you are in full compliance with all Agency requirements, including the requirements of this Notice. For example, if you decide to voluntarily cancel your registration six months before a 3-year study is scheduled to be submitted, all progress

reports and other information necessary to establish that you have been conducting the study in an acceptable and good faith manner must have been submitted to the Agency, before EPA will consider granting an existing stocks provision.

SECTION V. REGISTRANTS' OBLIGATION TO REPORT POSSIBLE UNREASONABLE ADVERSE EFFECTS

Registrants are reminded that FIFRA section 6(a)(2) states that if at any time after a pesticide is registered a registrant has additional factual information regarding unreasonable adverse effects on the environment by the pesticide, the registrant shall submit the information to the Agency. Registrants must notify the Agency of any factual information they have, from whatever source, including but not limited to interim or preliminary results of studies, regarding unreasonable adverse effects on man or the environment. This requirement continues as long as the products are registered by the Agency.

SECTION VI. INQUIRIES AND RESPONSES TO THIS NOTICE

If you have any questions regarding the requirements and procedures established by this Notice, call the contact person(s) listed in Attachment 1, the Data Call-In Chemical Status Sheet.

All responses to this Notice must include completed Data Call-In Response Forms (Attachment 2)and completed Requirements Status and Registrant's Response Forms (Attachment 3), for both (generic and product specific data) and any other documents required by this Notice, and should be submitted to the contact person(s) identified in Attachment 1. If the voluntary cancellation or generic data exemption option is chosen, only the Generic and Product Specific Data Call-In Response Forms need be submitted.

The Office of Compliance (OC) of the Office of Enforcement and Compliance Assurance (OECA), EPA, will be monitoring the data being generated in response to this Notice.

Sincerely yours,

Louis P. True, Jr., Acting Director
Special Review and
Reregistration Division

Attachments

The Attachments to this Notice are:

1 - Data Call-In Chemical Status Sheet
2 - Generic Data Call-In and Product Specific Data Call-In Response Forms with Instructions
3 - Generic Data Call-In and Product Specific Data Call-In Requirements Status and Registrant's Response Forms with Instructions
4 - EPA Grouping of End-Use Products for Meeting Acute Toxicology Data Requirements for Reregistration
5 - EPA Acceptance Criteria
6 - List of Registrants Receiving This Notice
7 - Confidential Statement of Formula, Cost Share and Data Compensation Forms

Attachment 1. Chemical Status Sheets

Hexazinone DATA CALL-IN CHEMICAL STATUS SHEET

INTRODUCTION

You have been sent this Generic Data Call-In Notice because you have product(s) containing Hexazinone.

This Generic Data Call-In Chemical Status Sheet, contains an overview of data required by this notice, and point of contact for inquiries pertaining to the reregistration of Hexazinone. This attachment is to be used in conjunction with (1) the Generic Data Call-In Notice, (2) the Generic Data Call-In Response Form (Attachment 2), (3) the Requirements Status and Registrant's Form (Attachment 2), (4) a list of registrants receiving this DCI (Attachment 4), (5) the EPA Acceptance Criteria (Attachment 5), and (6) the Cost Share and Data Compensation Forms in replying to this Hexazinone Generic Data Call-In (Attachment F). Instructions and guidance accompany each form.

DATA REQUIRED BY THIS NOTICE

The additional data requirements needed to complete the generic database for Hexazinone are contained in the Requirements Status and Registrant's Response, Attachment C. The Agency has concluded that additional product chemistry data on Hexazinone are needed. These data are needed to fully complete the reregistration of all eligible Hexazinone products.

INQUIRIES AND RESPONSES TO THIS NOTICE

If you have any questions regarding the generic data requirements and procedures established by this Notice, please contact Andrew Ertman at (703) 308-8063.

All responses to this Notice for the generic data requirements should be submitted to:

Andrew Ertman, Chemical Review Manager
Reregistration Branch
Special Review and Registration Division (H7508W)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460
RE: Hexazinone

HEXAZINONE DATA CALL-IN CHEMICAL STATUS SHEET

INTRODUCTION

You have been sent this Product Specific Data Call-In Notice because you have product(s) containing Hexazinone.

This Product Specific Data Call-In Chemical Status Sheet, contains an overview of data required by this notice, and point of contact for inquiries pertaining to the reregistration of Hexazinone. This attachment is to be used in conjunction with (1) the Product Specific Data Call-In Notice, (2) the Product Specific Data Call-In Response Form (Attachment 2), (3) the Requirements Status and Registrant's Form (Attachment 3), (4) EPA's Grouping of End-Use Products for Meeting Acute Toxicology Data Requirement (Attachment 4), (5) the EPA Acceptance Criteria (Attachment 5), (6) a list of registrants receiving this DCI (Attachment 6) and (7) the Cost Share and Data Compensation Forms in replying to this Hexazinone Product Specific Data Call-In (Attachment 7). Instructions and guidance accompany each form.

DATA REQUIRED BY THIS NOTICE

The additional data requirements needed to complete the database for Hexazinone are contained in the Requirements Status and Registrant's Response, Attachment 3. The Agency has concluded that additional data on Hexazinone are needed for specific products. These data are required to be submitted to the Agency within the time frame listed. These data are needed to fully complete the reregistration of all eligible Hexazinone products.

INQUIRIES AND RESPONSES TO THIS NOTICE

If you have any questions regarding the generic database of Hexazinone, please contact Andrew Ertman at (703) 308-8063.

If you have any questions regarding the product specific data requirements and procedures established by this Notice, please contact Franklin Gee at (703) 308-8008. (703) 305-8590.

All responses to this Notice for the Product Specific data requirements should be submitted to:

C.P. Moran
Chemical Review Manager Team 81
Product Reregistration Branch
Special Review and Reregistration Branch 7508W
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460

RE: **Hexazinone**

Attachment 2. Combined Generic and Product Specific Data Call-In Response Forms (Form A inserts) Plus Instructions

Instructions For Completing The "Data Call-In Response Forms" For The Generic And Product Specific Data Call-In

INTRODUCTION

These instructions apply to the Generic and Product Specific "Data Call-In Response Forms" and are to be used by registrants to respond to generic and product specific Data Call-Ins as part of EPA's Reregistration Program under the Federal Insecticide, Fungicide, and Rodenticide Act. **The type of data call-in (generic or product specific) is indicated in item number 3 ("Date and Type of DCI") on each form**. **BOTH** "Data Call-In Response" forms must be completed.

Although the form is the same for both generic and product specific data, instructions for completing these forms are different. Please read these instructions carefully before filling out the forms.

EPA has developed these forms individually for each registrant, and has pre-printed these forms with a number of items. DO NOT use these forms for any other active ingredient.

Items 1 through 4 have been pre-printed on the form. Items 5 through 7 must be completed by the registrant as appropriate. Items 8 through 11 must be completed by the registrant before submitting a response to the Agency.

The public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, Mail Code 2136, U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460; and to the Office of Management and Budget, Paperwork Reduction Project 2070-0107, Washington, D.C. 20503.

INSTRUCTIONS FOR COMPLETING THE DATA CALL-IN RESPONSE FORMS
Generic and Product Specific Data Call-In

Item 1.**ON BOTH FORMS**: This item identifies your company name, number and address.

Item 2.**ON BOTH FORMS:** This item identifies the case number, case name, EPA chemical number and chemical name.

Item 3.**ON BOTH FORMS:** This item identifies the type of Data Call-In. The date of issuance is date stamped.

Item 4.**ON BOTH FORMS:** This item identifies the EPA product registrations relevant to the data call-in. Please note that you are also responsible for informing the Agency of your response regarding any product that you believe may be covered by this Data Call-In but that is not listed by the Agency in Item 4. You must bring any such apparent omission to the Agency's attention within the period required for submission of this response form.

Item 5.**ON BOTH FORMS:** Check this item for each product registration you wish to cancel voluntarily. If a registration number is listed for a product for which you previously requested voluntary cancellation, indicate in Item 5 the date of that request. Since this Data Call-In requires both generic and product specific data, you must complete item 5 on both Data Call-In response forms. You do not need to complete any item on the Requirements Status and Registrant's Response Forms.

Item 6a.**ON THE GENERIC DATA FORM:** Check this Item if the Data Call-In is for generic data as indicated in Item 3 and you are eligible for a Generic Data Exemption for the chemical listed in Item 2 and used in the subject product. By electing this exemption, you agree to the terms and conditions of a Generic Data Exemption as explained in the Data Call-In Notice.

If you are eligible for or claim a Generic Data Exemption, enter the EPA registration Number of each registered source of that active ingredient that you use in your product.

Typically, if you purchase an EPA-registered product from one or more other producers (who, with respect to the incorporated product, are in compliance with this and any other outstanding Data Call-In Notice), and

INSTRUCTIONS FOR COMPLETING THE DATA CALL-IN RESPONSE FORMS
Generic and Product Specific Data Call-In

incorporate that product into all your products, you may complete this item for all products listed on this form. If, however, you produce the active ingredient yourself, or use any unregistered product (regardless of the fact that some of your sources are registered), you may not claim a Generic Data Exemption and you may not select this item.

Item 6b.**ON THE GENERIC DATA FORM:** Check this Item if the Data Call-In is for generic data as indicated in Item 3 and if you are agreeing to satisfy the generic data requirements of this Data Call-In. Attach the Requirements Status and Registrant's Response Form that indicates how you will satisfy those requirements.

NOTE: **Item 6a and 6b are not applicable for Product Specific Data.**

Item 7a. **ON THE PRODUCT SPECIFIC DATA FORM:** For each manufacturing use product (MUP) for which you wish to maintain registration, you must agree to satisfy the data requirements by responding "yes."

Item 7b. For each end use product (EUP) for which you wish to maintain registration, you must agree to satisfy the data requirements by responding "yes."

FOR BOTH MUP and EUP products

You should also respond "yes" to this item (7a for MUP's and 7b for EUP's) if your product is identical to another product and you qualify for a data exemption. You must provide the EPA registration numbers of your source(s); do not complete the Requirements Status and Registrant's Response form. Examples of such products include repackaged products and Special Local Needs (Section 24c) products which are identical to federally registered products.

If you are requesting a data waiver, answer "yes" here; in addition, on the "Requirements Status and Registrant's Response" form under Item 9, you must respond with option 7 (Waiver Request) for each study for which you are requesting a waiver.

NOTE: **Item 7a and 7b are not applicable for Generic Data.**

INSTRUCTIONS FOR COMPLETING THE DATA CALL-IN RESPONSE FORMS
Generic and Product Specific Data Call-In

Item 8. **ON BOTH FORMS:** This certification statement must be signed by an authorized representative of your company and the person signing must include his/her title. Additional pages used in your response must be initialled and dated in the space provided for the certification.

Item 9. **ON BOTH FORMS:** Enter the date of signature.

Item 10. **ON BOTH FORMS:** Enter the name of the person EPA should contact with questions regarding your response.

Item 11. **ON BOTH FORMS:** Enter the phone number of your company contact.

Note: You may provide additional information that does not fit on this form in a signed letter that accompanies your response. For example, you may wish to report that your product has already been transferred to another company or that you have already voluntarily cancelled this product. For these cases, please supply all relevant details so that EPA can ensure that its records are correct.

Attachment 3. Generic and Product Specific Requirement Status and Registrant's Response Forms (Form B inserts) and Instructions

Instructions For Completing
The
"Requirements Status and Registrant's Response Forms"
For The Generic and Product Specific Data Call-In

INTRODUCTION

These instructions apply to the Generic and Product Specific "Requirements Status and Registrant's Response Forms" and are to be used by registrants to respond to generic and product specific Data Call-In's as part of EPA's reregistration program under the Federal Insecticide, Fungicide, and Rodenticide Act. **The type of Data Call-In (generic or product specific) is indicated in item number 3 ("Date and Type of DCI") on each form.** Both "Requirements Status and Registrant's Response" forms must be completed.

Although the form is the same for both product specific and generic data, instructions for completing the forms differ slightly. Specifically, options for satisfying product specific data requirements do not include (1) deletion of uses or (2) request for a low volume/minor use waiver. Please read these instructions carefully before filling out the forms.

EPA has developed these forms individually for each registrant, and has pre-printed these forms to include certain information unique to this chemical. DO NOT use these forms for any other active ingredient.

Items 1 through 8 have been pre-printed on the form. Item 9 must be completed by the registrant as appropriate. Items 10 through 13 must be completed by the registrant before submitting a response to the Agency.

The public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, Mail Code 2136, U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460; and to the Office of Management and Budget, Paperwork Reduction Project 2070-0107, Washington, D.C. 20503.

INSTRUCTIONS FOR COMPLETING THE "REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE FORMS"
Generic and Product Specific Data Call-In

Item 1. **ON BOTH FORMS:** This item identifies your company name, number and address.

Item 2. **ON THE GENERIC DATA FORM:** This item identifies the case number, case name, EPA chemical number and chemical name.

ON THE PRODUCT SPECIFIC DATA FORM: This item identifies the case number, case name, and the EPA Registration Number of the product for which the Agency is requesting product specific data.

Item 3. **ON THE GENERIC DATA FORM:** This item identifies the type of Data Call-In. The date of issuance is date stamped.

ON THE PRODUCT SPECIFIC DATA FORM: This item identifies the type of Data Call-In. The date of issuance is also date stamped. Note the unique identifier number (ID#) assigned by the Agency. This ID number must be used in the transmittal document for any data submissions in response to this Data Call-In Notice.

Item 4. **ON BOTH FORMS:** This item identifies the guideline reference number of studies required. These guidelines, in addition to the requirements specified in the Data Call-In Notice, govern the conduct of the required studies. Note that series 61 and 62 in product chemistry are now listed under 40 CFR 158.155 through 158.180, Subpart c.

Item 5. **ON BOTH FORMS:** This item identifies the study title associated with the guideline reference number and whether protocols and 1, 2, or 3-year progress reports are required to be submitted in connection with the study. As noted in Section III of the Data Call-In Notice, 90-day progress reports are required for all studies.

If an asterisk appears in Item 5, EPA has attached information relevant to this guideline reference number to the Requirements Status and Registrant's Response Form.

INSTRUCTIONS FOR COMPLETING THE "REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE FORMS"
Generic and Product Specific Data Call-In

Item 6. **ON BOTH FORMS:** This item identifies the code associated with the use pattern of the pesticide. In the case of efficacy data (product specific requirement), the required study only pertains to products which have the use sites and/or pests indicated. A brief description of each code follows:

A Terrestrial food
B Terrestrial feed
C Terrestrial non-food

D	Aquatic food
E	Aquatic non-food outdoor
F	Aquatic non-food industrial
G	Aquatic non-food residential
H	Greenhouse food
I	Greenhouse non-food crop
J	Forestry
K	Residential
L	Indoor food
M	Indoor non-food
N	Indoor medical
O	Indoor residential

Item 7. **ON BOTH FORMS:** This item identifies the code assigned to the substance that must be used for testing. A brief description of each code follows:

EUP	End-Use Product
MP	Manufacturing-Use Product
MP/TGAI	Manufacturing-Use Product and Technical Grade Active Ingredient
PAI	Pure Active Ingredient
PAI/M	Pure Active Ingredient and Metabolites
PAI/PAIRA	Pure Active Ingredient or Pure Active Ingredient Radiolabelled
PAIRA	Pure Active Ingredient Radiolabelled
PAIRA/M	Pure Active Ingredient Radiolabelled and Metabolites
PAIRA/PM	Pure Active Ingredient Radiolabelled and Plant Metabolites
TEP	Typical End-Use Product
TEP ___%	Typical End-Use Product, Percent Active Ingredient Specified
TEP/MET	Typical End-Use Product and Metabolites
TEP/PAI/M	Typical End-Use Product or Pure Active Ingredient and Metabolites
TGAI	Technical Grade Active Ingredient
TGAI/PAI	Technical Grade Active Ingredient or Pure Active Ingredient
TGAI/PAIRA	Technical Grade Active Ingredient or Pure Active Ingredient Radiolabelled
TGAI/TEP	Technical Grade Active Ingredient or Typical End-Use Product
MET	Metabolites
IMP	Impurities
DEGR	Degradates
*	See: guideline comment

Item 8. This item completed by the Agency identifies the time frame allowed for submission of the study or protocol identified in item 5.

ON THE GENERIC DATA FORM: The time frame runs from the date of your receipt of the Data Call-In notice.

ON THE PRODUCT SPECIFIC DATA FORM: The due date for submission of product specific studies begins from the date stamped on the letter transmitting the Reregistration Eligibility Decision document, and not from the

date of receipt. However, your response to the Data Call-In itself is due 90 days from the date of receipt.

Item 9. **ON BOTH FORMS:** Enter the appropriate Response Code or Codes to show how you intend to comply with each data requirement. Brief descriptions of each code follow. The Data Call-In Notice contains a fuller description of each of these options.

Option 1. **ON BOTH FORMS:** (Developing Data) I will conduct a new study and submit it within the time frames specified in item 8 above. By indicating that I have chosen this option, I certify that I will comply with all the requirements pertaining to the conditions for submittal of this study as outlined in the Data Call-In Notice and that I will provide the protocols and progress reports required in item 5 above.

Option 2. **ON BOTH FORMS:** (Agreement to Cost Share) I have entered into an agreement with one or more registrants to develop data jointly. By indicating that I have chosen this option, I certify that I will comply with all the requirements pertaining to sharing in the cost of developing data as outlined in the Data Call-In Notice.

However, for Product Specific Data, I understand that this option is available for acute toxicity or certain efficacy data **ONLY** if the Agency indicates in an attachment to this notice that my product is similar enough to another product to qualify for this option. I certify that another party in the agreement is committing to submit or provide the required data; if the required study is not submitted on time, my product may be subject to suspension.

Option 3. **ON BOTH FORMS:** (Offer to Cost Share) I have made an offer to enter into an agreement with one or more registrants to develop data jointly. I am also submitting a completed "Certification of offer to Cost Share in the Development of Data" form. I am submitting evidence that I have made an offer to another registrant (who has an obligation to submit data) to share in the cost of that data. I am including a copy of my offer and proof of the other registrant's receipt of that offer. I am identifying the party which is committing to submit or provide the required data; if the required study is not submitted on time, my product may be subject to suspension. I understand that other terms under Option 3 in the Data Call-In Notice apply as well.

However, for Product Specific Data, I understand that this option is available only for acute toxicity or certain efficacy data and only if the Agency indicates in an attachment to this Data Call-In Notice that my product is similar enough to another product to qualify for this option.

Option 4. **ON BOTH FORMS:** (Submitting Existing Data) I will submit an existing study by the specified due date that has never before been submitted to EPA. By indicating that I have chosen this option, I certify that this study meets all the requirements pertaining to the conditions for submittal of existing data outlined in the Data Call-In Notice and I have attached the needed supporting information along with this response.

Option 5. **ON BOTH FORMS:** (Upgrading a Study) I will submit by the specified due date, or will cite data to upgrade a study that EPA has classified as partially acceptable and potentially upgradeable. By indicating that I have chosen this option, I certify that I have met all the requirements pertaining to the conditions for submitting or citing existing data to upgrade a study described in the Data Call-In Notice. I am indicating on attached correspondence the Master Record Identification Number (MRID) that EPA has assigned to the data that I am citing as well as the MRID of the study I am attempting to upgrade.

Option 6. **ON BOTH FORMS:** (Citing a Study) I am citing an existing study that has been previously classified by EPA as acceptable, core, core minimum, or a study that has not yet been reviewed by the Agency. If reviewed, I am providing the Agency's classification of the study.

However, for Product Specific Data, I am citing another registrant's study. I understand that this option is available **ONLY** for acute toxicity or certain efficacy data and **ONLY** if the cited study was conducted on my product, an identical product or a product which the Agency has "grouped" with one or more other products for purposes of depending on the same data. I may also choose this option if I am citing my own data. In either case, I will provide the MRID or Accession number (s). If I cite another registrant's data, I will submit a completed "Certification With Respect To Data Compensation Requirements" form.

FOR THE GENERIC DATA FORM ONLY: The following three options (Numbers 7, 8, and 9) are responses that apply only to the "Requirements Status and Registrant's Response Form" for generic data.

Option 7. (Deleting Uses) I am attaching an application for amendment to my registration deleting the uses for which the data are required.

Option 8. (Low Volume/Minor Use Waiver Request) I have read the statements concerning low volume-minor use data waivers in the Data Call-In Notice and I request a low-volume minor use waiver of the data requirement. I am attaching a detailed justification to support this waiver request including, among other things, all information required to support the request. I understand that, unless modified by the Agency in writing, the data requirement as stated in the Notice governs.

Option 9. (Request for Waiver of Data) I have read the statements concerning data waivers other than low-volume minor-use data waivers in the Data Call-In Notice and I request a waiver of the data requirement. I am attaching a rationale explaining why I believe the data requirements do not apply. I am also submitting a copy of my current labels. (You must also submit a copy of your Confidential Statement of Formula if not already on file with EPA). I understand that, unless modified by the Agency in writing, the data requirement as stated in the Notice governs.

FOR PRODUCT SPECIFIC DATA: The following option (number 7) is a response that applies to the "Requirements Status and Registrant's Response Form" for product specific data.

Option 7. (Waiver Request) I request a waiver for this study because it is inappropriate for my product. I am attaching a complete justification for this request, including technical reasons, data and references to relevant EPA regulations, guidelines or policies. [Note: any supplemental data must be submitted in the format required by P.R. Notice 86-5]. I understand that this is my only opportunity to state the reasons or provide information in support of my request. If the Agency approves my waiver request, I will not be required to supply the data pursuant to Section 3(c) (2) (B) of FIFRA. If the Agency denies my waiver request, I must choose a method of meeting the data requirements of this Notice by the due date stated by this Notice. In this case, I must, within 30 days-of my receipt of the Agency's written decision, submit a revised "Requirements Status" form specifying the option chosen. I also understand that the deadline for submission of data as specified by the original Data Call-In notice will not change.

Item 10. **ON BOTH FORMS:** This item must be signed by an authorized representative of your company. The person signing must include his/her title, and must initial and date all other pages of this form.

Item 11. **ON BOTH FORMS:** Enter the date of signature.

Item 12. **ON BOTH FORMS:** Enter the name of the person EPA should contact with questions regarding your response.

Item 13. **ON BOTH FORMS:** Enter the phone number of your company contact.

NOTE: You may provide additional information that does not fit on this form in a signed letter that accompanies this your response. For example, you may wish to report that your product has already been transferred to another company or that you have already voluntarily cancelled this product. For these

Attachment 4. EPA Batching of End-Use Products for Meeting Data Requirements for Reregistration

EPA'S DECISION ON BATCHING PRODUCTS CONTAINING HEXAZINONE FOR PURPOSES OF MEETING ACUTE TOXICITY DATA REQUIREMENTS FOR REREGISTRATION

In an effort to reduce the time, resources and number of animals needed to fulfill the acute toxicity data requirements for reregistration of products containing the active ingredient hexazinone, the Agency considered batching products. This process involves grouping similar products for purposes of acute toxicity. Factors considered in the sorting process include each product's active and inert ingredients (identity, percent composition and biological activity), type of formulation (e.g., emulsifiable concentrate, aerosol, wettable powder, granular, etc.), and labeling (e.g., signal word, use classification, precautionary labeling, etc.). Note that the Agency is not describing batched products as "substantially similar" since some products within a batch may not be considered chemically similar or have identical use patterns.

Using available information, batching has been accomplished by the process described in the preceding paragraph. Acute toxicity data on individual products has frequently been found to be incomplete. Notwithstanding the batching process, the Agency reserves the right to require, at any time, acute toxicity data for an individual product should the need arise.

Registrants of products within a batch may choose to cooperatively generate, submit or cite a single battery of six acute toxicological studies to represent all the products within that batch. It is the registrants' option to participate in the process with all other registrants, only some of the other registrants, or only their own products within a batch, or to generate all the required acute toxicological studies for each of their own products. If a registrant chooses to rely upon previously submitted acute toxicity data, he/she may do so provided that the data base is complete and valid by today's standards (see acceptance criteria attached), the formulation tested is considered by EPA to be similar for acute toxicity, and the formulation has not been significantly altered since submission and acceptance of the acute toxicity data. Regardless of whether new data is generated or existing data is cited, the registrant must clearly identify the material tested by its EPA registration number. If more than one Confidential Statement of Formula (CSF) exists for a product, the registrant must indicate the formulation actually tested by identifying the corresponding CSF.

In deciding how to meet the product specific data requirements, registrants must follow the directions given in the Data Call-In Notice and its attachments appended to the RED. The DCI Notice contains two response forms which are to be completed and submitted to the Agency within 90 days of receipt. The first form, "Data Call-In Response", asks whether the registrant will meet the data requirements for each product. The second form, "Requirements Status and Registrant's Response", lists the product specific data required for each product, including the standard six acute toxicity tests. A registrant who wishes to participate in a batch must decide whether he/she will provide the data or depend on someone else to do so. If a registrant supplies the data to support a batch of products, he/she must select one of the following options: Developing Data (Option 1), Submitting an Existing Study (Option 4), Upgrading an Existing Study (Option 5), or Citing an Existing Study (Option 6). If a registrant depends on another's data, he/she must choose among: Cost Sharing (Option 2), Offers to Cost Share (Option 3) or Citing an Existing Study (Option 6). If a registrant does not want to participate in a batch, the choices are Options 1, 4, 5 or 6. However, a registrant should know that choosing not to participate in a batch does not preclude other registrants in the batch from citing his/her studies and offering to cost share (Option 3) those studies.

Table I lists the registered products, their active ingredient(s) and formulation type included in the batches identified for hexazinone.

Table 1: Hexazinone Batching

Batch No.	EPA Reg. No.	% of Hexazinone	Formulation Type
1	352-421	1.0	liquid
	352-422	1.25	liquid
2	352-392	25.0	liquid
	FL86000900	25.0	liquid
	MT82001200	25.0	liquid
	NC83001200	25.0	liquid
	NM82002300	25.0	liquid
	TX83000200	25.0	liquid
	WY92000100	25.0	liquid
3	352-378	90.0	wettable powder
	62802-1	90.0	wettable powder in plugs
	FL80001800	90.0	wettable powder
	TX80002000	90.0	wettable powder

Table II lists the registered products which could not be batched. For the purposes of acute toxicity batching, these products were not considered similar, or their similarity could not be determined with the information available. The registrants of these products are responsible for meeting the acute toxicity data requirements specified in the data matrix for end-use products.

Table II: Non-Batched Hexazinone Registrations		
EPA Reg. No.	% of Hexazinone & other Active Ingredients	Formulation Type
228-220	1.25	liquid
352-450	75.0	granular
352-399	98.7	technical
7234-76	10.0	pellet
33560-21	10.0	granular
33560-41	75.0	pellet
33560-45	25.0	granular
62802-2	72.0	tablet

Attachment 1. EPA Acceptance Criteria

SUBDIVISION D

Guideline	Study Title
Series 61	Product Identity and Composition
Series 62	Analysis and Certification of Product Ingredients
Series 63	Physical and Chemical Characteristics

61 Product Identity and Composition

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.____ Name of technical material tested (include product name and trade name, if appropriate).

2.____ Name, nominal concentration, and certified limits (upper and lower) for each active ingredient and each intentionally-added inert ingredient.

3.____ Name and upper certified limit for each impurity or each group of impurities present at $\geq$ 0.1% by weight and for certain toxicologically significant impurities (e.g., dioxins, nitrosamines) present at $<$ 0.1%.

4.____ Purpose of each active ingredient and each intentionally-added inert.

5.____ Chemical name from Chemical Abstracts index of Nomenclature and Chemical Abstracts Service (CAS) Registry Number for each active ingredient and, if available, for each intentionally-added inert.

6.____ Molecular, structural, and empirical formulas, molecular weight or weight range, and any company assigned experimental or internal code numbers for each active ingredient.

7.____ Description of each beginning material in the manufacturing process.
- ____ EPA Registration Number if registered;
  for other beginning materials, the following:
- ____ Name and address of manufacturer or supplier.
- ____ Brand name, trade name or commercial designation.
- ____ Technical specifications or data sheets by which manufacturer or supplier describes composition, properties or toxicity.

8.____Description of manufacturing process.
- ____ Statement of whether batch or continuous process.
- ____ Relative amounts of beginning materials and order in which they are added.
- ____ Description of equipment.
- ____ Description of physical conditions (temperature, pressure, humidity) controlled in each step and the parameters that are maintained.
- ____ Statement of whether process involves intended chemical reactions.
- ____ Flow chart with chemical equations for each intended chemical reaction.
- ____ Duration of each step of process.
- ____ Description of purification procedures.
- ____ Description of measures taken to assure quality of final product.

9.____ Discussion of formation of impurities based on established chemical theory addressing (1) each impurity which may be present at $\geq$ 0.1% or was found at $\geq$ 0.1% by product analyses and (2) certain toxicologically significant impurities (see #3).

62 Analysis and Certification of Product Ingredients

ACCEPTANCE CRITERIA

The following criteria apply to the technical grade of the active ingredient being reregistered. Use a table to present the information in items 6, 7, and 8.

Does your study meet the following acceptance criteria?

1.____ Five or more representative samples (batches in case of batch process) analyzed for each active ingredient and all impurities present at $\geq$ 0.1%.
2.____ Degree of accountability or closure $\geq$ ca 98%.
3.____ Analyses conducted for certain trace toxic impurities at lower than 0.1% (examples, nitrosamines in the case of products containing dinitroanilines or containing secondary or tertiary amines/alkanolamines plus nitrites; polyhalogenated dibenzodioxins and dibenzofurans). [Note that in the case of nitrosamines both fresh and stored samples must be analyzed.].
4.____ Complete and detailed description of each step in analytical method used to analyze above samples.
5.____ Statement of precision and accuracy of analytical method used to analyze above samples.
6.____ Identities and quantities (including mean and standard deviation) provided for each analyzed ingredient.
7.____ Upper and lower certified limits proposed for each active ingredient and intentionally added inert along with explanation of how the limits were determined.
8.____ Upper certified limit proposed for each impurity present at $\geq$ 0.1% and for certain toxicologically significant impurities at $<$ 0.1% along with explanation of how limit determined.
9.____ Analytical methods to verify certified limits of each active ingredient and impurities (latter not required if exempt from requirement of tolerance or if generally recognized as safe by FDA) are fully described.
10.____ Analytical methods (as discussed in #9) to verify certified limits validated as to their precision and accuracy.

63 Physical and Chemical Characteristics

ACCEPTANCE CRITERIA

The following criteria apply to the technical grade of the active ingredient being reregistered.

Does your study meet the following acceptance criteria?

63-2 Color
____ Verbal description of coloration (or lack of it)
____ Any intentional coloration also reported in terms of Munsell color system

63-3 Physical State
____ Verbal description of physical state provided using terms such as "solid, granular, volatile liquid"
____ Based on visual inspection at about 20-25° C

63-4 Odor
____ Verbal description of odor (or lack of it) using terms such as "garlic-like, characteristic of aromatic compounds"
____ Observed at room temperature

63-5 Melting Point
____ Reported in °C
____ Any observed decomposition reported

63-6 Boiling Point
____ Reported in °C
____ Pressure under which B.P. measured reported
____ Any observed decomposition reported

63-7 Density, Bulk Density, Specific Gravity
____ Measured at about 20-25° C
____ Density of technical grade active ingredient reported in g/ml or the specific gravity of liquids reported with reference to water at 20° C. [Note: Bulk density of registered products may be reported in lbs/ft^3 or lbs/gallon.]

63-8 Solubility
____ Determined in distilled water and representative polar and non-polar solvents, including those used in formulations and analytical methods for the pesticide
____ Measured at about 20-25° C
____ Reported in g/100 ml (other units like ppm acceptable if sparingly soluble)

63-9 Vapor Pressure
____ Measured at 25° C (or calculated by extrapolation from measurements made at higher temperature if pressure too low to measure at 25° C)
____ Experimental procedure described
____ Reported in mm Hg (torr) or other conventional units

63-10 Dissociation Constant
____ Experimental method described
____ Temperature of measurement specified (preferably about 20-25°C)

63-11 Octanol/water Partition Coefficient
____ Measured at about 20-25° C
____ Experimentally determined and description of procedure provided (preferred method-45 Fed. Register 77350)
____ Data supporting reported value provided

63-12 pH
____ Measured at about 20-25° C
____ Measured following dilution or dispersion in distilled water

63-13 Stability
____ Sensitivity to metal ions and metal determined
____ Stability at normal and elevated temperatures
____ Sensitivity to sunlight determined

SUBDIVISION F

Guideline	Study Title
81-1	Acute Oral Toxicity in the Rat
81-2	Acute Dermal Toxicity in the Rat, Rabbit or Guinea Pig
81-3	Acute Inhalation Toxicity in the Rat
81-4	Primary Eye Irritation in the Rabbit
81-5	Primary Dermal Irritation Study
81-6	Dermal Sensitization in the Guinea Pig

81-1 Acute Oral Toxicity in the Rat

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.____ Identify material tested (technical, end-use product, etc).
2.____ At least 5 young adult rats/sex/group.
3.____ Dosing, single oral may be administered over 24 hrs.
4.*___ Vehicle control if other than water.
5.____ Doses tested, sufficient to determine a toxicity category or a limit dose (5000 mg/kg).
6.____ Individual observations at least once a day.
7.____ Observation period to last at least 14 days, or until all test animals appear normal whichever is longer.
8.____ Individual daily observations.
9.____ Individual body weights.
10.____ Gross necropsy on all animals.

Criteria marked with an * are supplemental and may not be required for every study.

81-2 Acute Dermal toxicity in the Rat, Rabbit or Guinea Pig

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1._____ Identify material tested (technical, end-use product, etc).
2._____ At least 5 animals/sex/group.
3.*____ Rats 200-300 gm, rabbits 2.0-3.0 kg or guinea pigs 350-450 gm.
4._____ Dosing, single dermal.
5._____ Dosing duration at least 24 hours.
6.*____ Vehicle control, only if toxicity of vehicle is unknown.
7._____ Doses tested, sufficient to determine a toxicity category or a limit dose (2000 mg/kg).
8._____ Application site clipped or shaved at least 24 hours before dosing.
9._____ Application site at least 10% of body surface area.
10._____ Application site covered with a porous nonirritating cover to retain test material and to prevent ingestion.
11._____ Individual observations at least once a day.
12._____ Observation period to last at least 14 days.
13._____ Individual body weights.
14._____ Gross necropsy on all animals.

Criteria marked with an * are supplemental and may not be required for every study.

81-3 Acute Inhalation Toxicity in the Rat

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.____ Identify material tested (technical, end-use product, etc).
2.____ Product is a gas, a solid which may produce a significant vapor hazard based on toxicity and expected use or contains particles of inhalable size for man (aerodynamic diameter 15 µm or less).
3.____ At least 5 young adult rats/sex/group.
4.____ Dosing, at least 4 hours by inhalation.
5.____ Chamber air flow dynamic, at least 10 air changes/hour, at least 19% oxygen content.
6.____ Chamber temperature, 22° C (±2°), relative humidity 40-60%.
7.____ Monitor rate of air flow.
8.____ Monitor actual concentrations of test material in breathing zone.
9.____ Monitor aerodynamic particle size for aerosols.
10.___ Doses tested, sufficient to determine a toxicity category or a limit dose (5 mg/L actual concentration of respirable substance).
11.___ Individual observations at least once a day.
12.___ Observation period to last at least 14 days.
13.___ Individual body weights.
14.___ Gross necropsy on all animals.

81-4 Primary Eye Irritation in the Rabbit

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.____ Identify material tested (technical, end-use product, etc).
2.____ Study not required if material is corrosive, causes severe dermal irritation or has a pH of ≤ 2 or ≥ 11.5.
3.____ 6 adult rabbits.
4.____ Dosing, instillation into the conjunctival sac of one eye per animal.
5.____ Dose, 0.1 ml if a liquid; 0.1 ml or not more than 100 mg if a solid, paste or particulate substance.
6.____ Solid or granular test material ground to a fine dust.
7.____ Eyes not washed for at least 24 hours.
8.____ Eyes examined and graded for irritation before dosing and at 1, 24, 48 and 72 hr, then daily until eyes are normal or 21 days (whichever is shorter).
9.*___ Individual daily observations.

Criteria marked with an * are supplemental and may not be required for every study.

81-5 Primary Dermal Irritation Study

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.____ Identify material tested (technical, end-use product, etc).
2.____ Study not required if material is corrosive or has a pH of ≤ 2 or ≥ 11.5.
3.____ 6 adult animals.
4.____ Dosing, single dermal.
5.____ Dosing duration 4 hours.
6.____ Application site shaved or clipped at least 24 hours prior to dosing.
7.____ Application site approximately 6 cm^2.
8.____ Application site covered with a gauze patch held in place with nonirritating tape.
9.____ Material removed, washed with water, without trauma to application site.
10.___ Application site examined and graded for irritation at 1, 24, 48 and 72 hr, then daily until normal or 14 days (whichever is shorter).
11.*__ Individual daily observations.

Criteria marked with an * are supplemental and may not be required for every study.

81-6 Dermal Sensitization in the Guinea Pig

ACCEPTANCE CRITERIA

Does your study meet the following acceptance criteria?

1.___ Identify material tested (technical, end-use product, etc).
2.___ Study not required if material is corrosive or has a pH of <2 or >11.5.
3.___ One of the following methods is utilized:
_____ Freund's complete adjuvant test
_____ Guinea pig maximization test
_____ Split adjuvant technique
_____ Buehler test
_____ Open epicutaneous test
_____ Mauer optimization test
_____ Footpad technique in guinea pig.
4.___ Complete description of test.
5.*___ Reference for test.
6.___ Test followed essentially as described in reference document.
7.___ Positive control included (may provide historical data conducted within the last 6 months).

Criteria marked with an * are supplemental and may not be required for every study.

Attachment 2. List of All Registrants Sent This Data Call-In (insert) Notice

Attachment 3. Cost Share Data Compensation Forms, Confidential Statement of Formula Form and Instructions

Confidential Business Information: Does Not Contain National Security Information (E.O. 12065) Form Approved. OMB No. 2070-0060. Approval Expires 2/28/94

EPA

United States Environmental Protection Agency
Office of Pesticide Programs (TS-767)
Washington, DC 20460

Confidential Statement of Formula

A. ☐ Basic Formulation ☐ Alternate Formulation

B. Page of

See Instructions on Back

1. Name and Address of Applicant/Registrant *(Include ZIP Code)*

2. Name and Address of Producer *(Include ZIP Code)*

3. Product Name

4. Registration No./File Symbol

5. EPA Product Mgr/Team No.

6. Country Where Formulated

7. Pounds/Gal or Bulk Density

8. pH

9. Flash Point/Flame Extension

EPA USE ONLY	10. Components in Formulation *(List as actually introduced into the formulation. Give commonly accepted chemical name, trade name, and CAS number.)*	11. Supplier Name & Address	12. EPA Reg. No.	13. Each Component in Formulation a. Amount	b. % by Weight	14. Certified Limits % by Weight a. Upper Limit	b. Lower Limit	15. Purpose in Formulation

16. Typed Name of Approving Official

17. Total Weight 100%

18. Signature of Approving Official

19. Title

20. Phone No. *(Include Area Code)*

21. Date

EPA Form 8570-4 (Rev. 12-90) **Previous editions are obsolete.** If you can photocopy this, please submit an additional copy. White - EPA File Copy (original) Yellow - Applicant copy

Instructions for Completing the Confidential Statement of Formula

The Confidential Statement of Formula (CSF) Form 8570-4 must be used. Two legible, signed copies of the form are required. Following are basic instructions:

a. All the blocks on the form must be filled in and answered completely.

b. If any block is not applicable, mark it N/A.

c. The CSF must be signed, dated and the telephone number of the responsible party must be provided.

d. All applicable information which is on the product specific data submission must also be reported on the CSF.

e. All weights reported under item 7 must be in pounds per gallon for liquids and pounds per cubic feet for solids.

f. Flashpoint must be in degrees Fahrenheit and flame extension in inches.

g. For all active ingredients, the EPA Registration Numbers for the currently registered source products must be reported under column 12.

h. The Chemical Abstracts Service (CAS) Numbers for all actives and inerts and all common names for the trade names must be reported.

i. For the active ingredients, the percent purity of the source products must be reported under column 10 and must be exactly the same as on the source product's label.

j. All the weights in columns 13.a. and 13.b. must be in pounds, kilograms, or grams. In no case will volumes be accepted. Do not mix English and metric system units (i.e., pounds and kilograms).

k. All the items under column 13.b. must total 100 percent.

1. All items under columns 14.a. and 14.b. for the active ingredients must represent pure active form.

m. The upper and lower certified limits for ail active and inert ingredients must follow the 40 CFR 158.175 instructions. An explanation must be provided if the proposed limits are different than standard certified limits.

n. When new CSFs are submitted and approved, all previously submitted CSFs become obsolete for that specific formulation.

United States Environmental Protection Agency
Washington, DC 20460

CERTIFICATION OF OFFER TO COST SHARE IN THE DEVELOPMENT OF DATA

Form Approved
OMB No. 2070-0106
2070-0057
Approval Expires 3-31-96

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M St., S.W., Washington, DC 20460; and to the Office of Management and Budget, Paperwork Reduction Project (2070-0106), Washington, DC 20503.

Please fill in blanks below.

Company Name	Company Number
Product Name	EPA Reg. No.

I Certify that:

My company is willing to develop and submit the data required by EPA under the authority of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), if necessary. However, my company would prefer to enter into an agreement with one or more registrants to develop jointly or share in the cost of developing data.

My firm has offered in writing to enter into such an agreement. That offer was irrevocable and included an offer to be bound by arbitration decision under section 3(c)(2)(B)(iii) of FIFRA if final agreement on all terms could not be reached otherwise. This offer was made to the following firm(s) on the following date(s):

Name of Firm(s)	Date of Offer

Certification:

I certify that I am duly authorized to represent the company named above, and that the statements that I have made on this form and all attachments therein are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

Signature of Company's Authorized Representative	Date
Name and Title (Please Type or Print)	

EPA Form 8570-32 (5/91) Replaces EPA Form 8580, which is obsolete

United States Environmental Protection Agency
Washington, DC 20460

CERTIFICATION WITH RESPECT TO DATA COMPENSATION REQUIREMENTS

Form Approved
OMB No. 2070-0107
2070-0057
Approval Expires 3-31-96

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M St., S.W., Washington, DC 20460; and to the Office of Management and Budget, Paperwork Reduction Project (2070-0106), Washington, DC 20503.

Please fill in blanks below.

Company Name	Company Number
Product Name	EPA Reg. No.

I Certify that:

1. For each study cited in support of registration or reregistration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) that is an exclusive use study, I am the original data submitter, or I have obtained the written permission of the original data submitter to cite that study.

2. That for each study cited in support of registration or reregistration under FIFRA that is NOT an exclusive use study, I am the original data submitter, or I have obtained the written permission of the original data submitter, or I have notified in writing the company(ies) that submitted data I have cited and have offered to: (a) Pay compensation for those data in accordance with sections 3(c)(1)(D) and 3(c)(2)(D) of FIFRA; and (b) Commence negotiation to determine which data are subject to the compensation requirement of FIFRA and the amount of compensation due, if any. The companies I have notified are: (check one)

   [ ] The companies who have submitted the studies listed on the back of this form or attached sheets, or indicated on the attached "Requirements Status and Registrants' Response Form,"

3. That I have previously complied with section 3(c)(1)(D) of FIFRA for the studies I have cited in support of registration or reregistration under FIFRA.

Signature	Date
Name and Title (Please Type or Print)	

GENERAL OFFER TO PAY: I hereby offer and agree to pay compensation to other persons, with regard to the registration or reregistration of my products, to the extent required by FIFRA sections 3(c)(1)(D) and 3(c)(2)(D).

Signature	Date
Name and Title (Please Type or Print)	

EPA Form 8570-31 (4-90)

APPENDIX G. FACT SHEET

United States
Environmental Protection
Agency

Prevention, Pesticides
And Toxic Substances
(7508W)

EPA-738-F-94-019
September 1994

R.E.D. FACTS

Hexazinone

Pesticide Reregistration

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 0266, hexazinone.

Use Profile

Hexazinone is a herbicide used to control a broad spectrum of weeds including undesirable woody plants in alfalfa, rangeland and pasture, woodland, pineapples, sugarcane and blueberries. It is also used on ornamental plants, forest trees and other non-crop areas. Hexazinone is registered for pre-emergent, post-emergence, layby, directed spray and basal soil applications. It is used as a non-selective herbicide in non-cropland areas and as a selective herbicide in reforestation practices.

Hexazinone products are formulated as granulars, pellets/tablets, emulsifiable concentrates, ready-to-use liquids, soluble concentrates/solids and a technical grade active ingredient. Products are applied using aerial or ground equipment or by hand, or using a hand-held, boom, knapsack or power sprayer.

Use practice limitations prohibit application of hexazinone through any type of irrigation system. The pesticide also cannot be applied within 30 to 60 days before grazing, harvest or feeding.

Regulatory History

Hexazinone is the common name for 3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5 triazine-2,4(1H,3H)-dione. Hexazinone was first registered as a pesticide in the U.S. in 1975 for general weed control in non-cropland areas. Use in the culture of Christmas and forest trees was added in 1977, and uses

on sugarcane and alfalfa were conditionally registered in 1980 and 1981, respectively.

EPA issued one Registration Standard for hexazinone in February 1982 (NTIS #PB87-110292), and a second in September 1988 (NTIS #PB89-126080). These documents summarized available data supporting the registration of hexazinone products, and required additional product chemistry, residue chemistry, toxicology, ecological effects and environmental fate data.

EPA's Office of Drinking Water issued a drinking water Health Advisory (HA) for hexazinone in August 1988. A lifetime HA was established at 200 ppb for an adult consuming 2 liters of water per day. For a 10 kg child, a one- and ten-day HA was determined to be 2 mg/L.

Currently, 20 end-use pesticide products and one technical grade, manufacturing use product containing hexazinone are registered.

Human Health Assessment

Toxicity

Hexazinone is classified as a Group D carcinogen--a chemical that is not classifiable as to human carcinogenicity. Animal data presented to EPA is equivocal--it is not entirely negative, but not convincingly positive. The Agency has concluded that the evidence cannot be interpreted as showing either the presence or absence of a carcinogenic effect. Since hexazinone has not been found to induce cancer, food and feed additive regulations are not prohibited by the Delaney Clause of the Federal Food, Drug, and Cosmetic Act (FFDCA). The Reference Dose (RfD) approach was used to assess human risk from exposure to hexazinone.

In acute toxicity studies using laboratory animals, hexazinone has been shown to be a severe eye irritant and has been placed in Toxicity Category I (the highest of four levels) for primary eye irritation. It is slightly toxic through the acute oral route (Toxicity Category III) and very mildly toxic through the acute dermal and acute inhalation routes (Toxicity Category IV). Hexazinone is only mildly toxic for skin irritation potential (Toxicity Category IV) and is not a skin sensitizer.

Some treatment-related effects were found in developmental toxicity studies using rats and rabbits, at the high dose levels. Similarly, some effects were noted in a reproductive toxicity study at the mid- and high dose levels. Hexazinone was positive in one mutagenicity study but negative in the remaining studies. There are no other acute or chronic toxicological endpoints of concern.

Dietary Exposure

People may be exposed to residues of hexazinone through their diet. EPA reassessed existing tolerances or maximum residue limits (please see 40 CFR 180.396) for blueberries, pineapple and sugarcane at the time of this RED. Tolerances for meat, meat byproducts and milk cannot be reassessed until a cattle feeding study is completed. However, sufficient data were available to conduct a risk assessment, and the Agency believes that the existing tolerances are protective until data are available for reassessment.

The Reference Dose (RfD) or amount believed not to cause adverse effects if consumed daily over a 70-year lifetime is 0.05 mg/kg/day based upon

a No Observable Effect Level (NOEL) of 5 mg/kg/day in a one-year feeding study in dogs. EPA calculated that the Anticipated Residue Contribution (ARC) for the overall U.S. population from all hexazinone tolerances equals 7% of the RfD. The ARC for the subgroup most highly exposed, non-nursing infants age less than 1 year, represents 40% of the RfD, while the ARC for children age 1 to 6 years is 20% of the RfD. EPA's calculations overestimate exposure, however, by assuming 100% of crop treated for all commodities. Actual dietary risk from hexazinone is believed to be minimal. When current residue chemistry data gaps are filled, however, dietary exposure estimates for hexazinone could change.

Hexazinone concentrates in certain processed fractions of alfalfa, pineapple and sugarcane. EPA has determined that establishing food and feed additive tolerances for these commodities is appropriate and consistent with the Delaney Clause of the FFDCA, and that such tolerances must be established for alfalfa meal, pineapple processing residue and sugarcane molasses.

EPA's Office of Water has issued a lifetime Health Advisory (HA) which sets a maximum level of 0.21 mg/L, or 200 ppb allowable in drinking water. No international CODEX Maximum Residue Limits are established for hexazinone so compatibility with U.S. tolerances is not an issue.

Occupational and Residential Exposure

Based on current use patterns, workers may be exposed to hexazinone during and after applications in agricultural and other settings. In assessing handler and post-application exposure, Agency concerns are predominantly related to skin contact. Hexazinone is poorly absorbed through the skin, so little or no absorption is anticipated. Therefore, no changes in personal protective equipment (PPE) required by the Worker Protection Standard (WPS) are being imposed at this time. However, the Restricted Entry Interval (REI) is being changed from 24 to 48 hours because hexazinone is in Toxicity Category I for primary eye irritation.

There are no residential uses of hexazinone, so residential exposure is not expected.

Human Risk Assessment

Hexazinone generally is of relatively low acute toxicity but is a severe eye irritant (Toxicity Category I). It is not classifiable as to human carcinogenicity (Group D carcinogen) and does not cause other toxic effects of concern.

The dietary risk posed by hexazinone is expected to be minimal. Most tolerances were reassessed and other existing tolerances are considered protective until confirmatory data are available for reassessment. A lifetime Health Advisory sets a maximum level of exposure to hexazinone from drinking water.

Exposure to workers and other applicators generally is not expected to pose undue risks, due to hexazinone's overall low acute toxicity. However, based on toxicity concerns regarding primary eye irritation, a 48-hour rather than a 24-hour REI is required.

Environmental Assessment

Environmental Fate

Based on laboratory data and confirmed by field and forestry data, hexazinone appears to be persistent and mobile in soil and aquatic environments. The degradates of hexazinone also are believed to be persistent and mobile. Hexazinone was reported in runoff water up to 6 months post-treatment in a forestry dissipation study. Therefore, field and laboratory data indicate that hexazinone may be of concern for both groundwater and surface water contamination.

Hexazinone has been detected in ground water (at levels well below the Health Advisory) in Hawaii, Florida, Maine and North Carolina. Hexazinone also can contaminate surface water by spray drift at application, and for several months post-application via runoff. It is not expected to accumulate in fish but does accumulate in crops grown on treated soil.

Ecological Effects

Hexazinone is practically non-toxic to birds on an acute oral and subacute dietary basis. It is practically non-toxic to freshwater fish and freshwater invertebrates in acute exposures. Hexazinone is practically nontoxic to mollusks, slightly toxic to crustaceans, and relatively non-toxic to honey bees.

Ecological Effects Risk Assessment

Exposure of non-target organisms to hexazinone can result from direct application, spray drift from treated areas, and runoff from treated areas. Such exposure would be chronic as well as acute.

Hexazinone exceeds the levels of concern (LOC) for terrestrial and aquatic plants, at all application rates, using aerial and ground equipment. Contamination of aquatic sites adjacent to treated areas could be of great ecological significance and may be exacerbated by the persistence and mobility of hexazinone.

Aquatic plants are an important component of the ecosystem. Algae are the link between solar radiation, aquatic animals and humans, which are dependent on the oxygen produced by algae during photosynthesis. Algae are responsible for maintaining the quality of the aquatic habitat for fish, while at the same time providing food for fish either directly or indirectly. Effects to aquatic plants expected from the use of hexazinone may alter aquatic ecosystems, the severity of which is dependent on the frequency of application and the nature of the receiving body of water.

Hexazinone also exceeds the LOC for small mammals at several of the higher application rates.

Risk to Endangered Species

Hexazinone exceeds the endangered species LOCs for grass- and insect-eating mammals at use rates of 3.6 pounds active ingredient per acre (lb ai/acre) or greater. It also exceeds the LOCs for both aquatic and terrestrial plants at all use rates.

Risk Mitigation Measures

Hexazinone exceeds the levels of concern for both aquatic and terrestrial plants, and exceeds levels of concern for small mammals at several of the higher application rates. Hexazinone also is likely to have a significant impact on ground water quality. In areas where irrigation water is contaminated with hexazinone or where ground water discharges to surface water, hexazinone residues in water could pose a threat to plants. Therefore, the following risk mitigation measures are required:

- All hexazinone product labels must carry a ground water advisory;
- Registrants must report any domestic hexazinone ground water detections at any levels to EPA;
- The registrant must prepare a report summarizing ongoing research regarding ground water detections in the State of Maine;
- The registrant also must submit to EPA the educational materials under development regarding product stewardship and addressing the potential for ground water contamination from use of hexazinone;
- A prospective ground water monitoring study must be conducted to determine the potential for hexazinone to leach to ground water;
- To address surface water concerns, precautionary label language will be required;
- To address the risk to nontarget plants and small mammals, the maximum application rate must be reduced from 13.5 lb ai/acre to 8 lb ai/acre.
- To inform the user of best management practices to minimize spray drift, EPA is preparing labeling statements that may be required in the future for all aerially-applied hexazinone products;
- To address endangered aquatic and terrestrial plant species as well as endangered small mammal concerns, endangered species precautionary labeling will be required in the future;
- Hexazinone may be classified as a Restricted Use Pesticide for ground water concerns once the Agency's Ground Water Restricted Use Rule is finalized.

Additional Data Required

The Agency is requiring additional generic data on hexazinone's residue chemistry, ecological effects and environmental fate. The following confirmatory generic studies are required: residue analytical methods (ruminant only), magnitude of the residue on grass hay and alfalfa seed screenings, magnitude of the residue in meat/milk, storage stability (alfalfa and Metabolite C for grass), rotational crops (sorghum and leafy vegetable), seed germination/seedling emergence (cucumber, onion, pea), vegetative vigor (cucumber), batch equilibrium, aquatic sediment dissipation, spray drift, and a prospective groundwater monitoring study.

The Agency also is requiring product-specific data including product chemistry and acute toxicity studies, revised Confidential Statements of Formula (CSFs) and revised labeling for reregistration.

Product Labeling Changes Required

All hexazinone end-use products must comply with EPA's current pesticide product labeling requirements, and with the following:

Worker Protection Standard (WPS) - EPA has evaluated the 24-hour interim REI established by the WPS and concluded that it should be changed to 48 hours because hexazinone is in Toxicity Category I for primary eye irritation. The new 48-hour REI must be inserted into the standardized REI statement required by PR Notice 93-7.

The PPE for early entry under the 48-hour REI for hexazinone is coveralls, chemical resistant gloves, shoes plus socks, and protective eyewear. These PPE must be inserted into the early entry PPE statement required by PR Notice 93-7.

Ground Water Labeling Advisory - All products must carry the following advisory:

> "This chemical is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination."

Surface Water Labeling - The technical manufacturer of hexazinone is in the process of consolidating label language relating to surface and ground water for all of their hexazinone products. After the Agency has reviewed and approved these label amendments, all hexazinone labels must carry this labeling.

Other Ground Water Requirements

- Registrants must report any domestic hexazinone ground water detections at any levels to the Agency.
- The registrant must prepare and submit a report summarizing the ongoing research in Maine regarding ground water detections in blueberry use areas. This report must be submitted within one year from receipt of the RED document. The registrant also must prepare a one year follow-up to the original report.
- The registrant also must submit an analytical method or immuno assay for detection of hexazinone in ground water, within one year after receipt of the RED document.
- The registrant is required to submit educational materials that are currently being developed to the Agency. These materials should be in specific regard to product stewardship and should address the potential for ground water contamination from use of hexazinone.

Risk to Non-Target Plants and Small Mammals - To mitigate the risk to non-target plants and small mammals, registrants must reduce the maximum application rate from 13.5 lb ai/acre to 8 lb ai/acre.

Spray Drift Label Advisory - The Agency is preparing spray drift labeling statements to inform users of management practices that would minimize spray drift from the target site. This future labeling may be required for all hexazinone products that may be applied aerially to agricultural crops.

Endangered Species Statement - EPA is working with the Fish and Wildlife Service and other Federal and State agencies to develop a program to avoid jeopardizing the continued existence of identified species by the use

Attachment 1. EPA Acceptance Criteria

of pesticides. When this program goes into effect, endangered species precautionary labeling will be required.

Regulatory Conclusion

The use of currently registered products containing hexazinone in accordance with approved labeling will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration.

Hexazinone products will be reregistered once the required product specific data, revised Confidential Statements of Formula and revised labeling are received and accepted by EPA.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for hexazinone during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Electronic copies of the RED and this fact sheet can be downloaded from the Pesticide Special Review and Reregistration Information System at 703-308-7224, and also can be reached on the Internet via *FEDWORLD.GOV* and EPA's gopher server, *EARTH1.EPA.GOV*.

Printed copies of the RED and fact sheet can be obtained from EPA's National Center for Environmental Publications and Information (EPA/NCEPI), PO Box 42419, Cincinnati, OH 45242-0419, telephone 513-489-8190, fax 513-489-8695.

Following the comment period, the hexazinone RED document will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the hexazinone RED, or reregistration of individual products containing hexazinone, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 6:00 pm Central Time, Monday through Friday.

Decision Documents for Atrazine

Combined PDF document consists of the following:

- Finalization of Atrazine IRED, and Completion of Tolerance Reassessment and Reregistration Eligibility Process (April 6, 2006)
- Revised Atrazine IRED (October 31, 2003)
- Atrazine IRED (January 2003)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C., 20460

OFFICE OF
PREVENTION, PESTICIDES AND TOXIC
SUBSTANCES

MEMORANDUM

DATE: April 6, 2006

SUBJECT: **Atrazine:** Finalization of Interim Reregistration Eligibility Decision and Completion of Tolerance Reassessment and Reregistration Eligibility Process

FROM: Diane Sherman, Chemical Review Manager
Special Review Branch
Special Review and Reregistration Division (7508P)
Office of Pesticide Programs

THRU: Anne Overstreet, Team Leader
Special Review Branch
Special Review and Reregistration Division (7508P)
Office of Pesticide Programs

TO: Robert McNally, Branch Chief
Special Review Branch
Special Review and Reregistration Division (7508P)
Office of Pesticide Programs

CC: Debbie Edwards, Director
Special Review and Reregistration Division (7508P)
Office of Pesticide Programs

Catherine Eiden, Branch Chief
Reregistration Branch II
Health Effects Division (7509P)
Office of Pesticide Programs

Robert Perlis, Assistant General Counsel
Andrea Medici, Attorney
Pesticides and Toxic Substances Law Office (2333A)
Office of General Counsel

On January 31, 2003 EPA issued an Interim Reregistration Eligibility Decision (IRED) for the herbicide atrazine. On October 31, 2003 EPA issued a Revised IRED for atrazine. In these documents, the Agency assessed whether pesticide products containing atrazine as an active ingredient were eligible for reregistration considering all relevant issues except those relating to cumulative risks associated with potential exposures to atrazine and other structurally-related members of the chlorinated triazine class of pesticides, including simazine, propazine, and their three chlorinated degradates. These pesticides share a common neuroendocrine mechanism of toxicity which results in both reproductive and developmental consequences. Before tolerances can be considered fully reassessed or the Agency can make a final determination of reregistration eligibility, the Food Quality Protection Act (FQPA) requires the Agency to evaluate food tolerances on the basis of cumulative risk from substances sharing a common mechanism of toxicity.

The Agency recently completed its cumulative risk assessment for the chlorinated triazine class of pesticides and has concluded that, with the mitigation measures in the 2006 simazine Reregistration Eligibility Decision and the 2003 atrazine IREDs, the cumulative risks associated with these pesticides are below the Agency's level of concern. The cumulative risk assessment and supporting documents are available in the public docket EPA-HQ-OPP-2005-0481 located on-line in the Federal Docket Management System (FDMS) http://www.regulations.gov. Based on that assessment, EPA has now concluded, after taking into account the cumulative risks associated with exposures to all of the triazines, that all of the established tolerances for the triazine herbicides propazine, simazine, and atrazine meet the safety standard under Section 408(b)(2)(A) of the FFDCA, taking into account the provisions of Sections 408(b)(2)(C) and 408(b)(2)(D).

In other words, the Agency has found that there is a reasonable certainty that no harm will result to the general U.S. population, infants, children, or other major identifiable subgroups of consumers from aggregate exposure (from food, drinking water, and non-occupational sources) to cumulative residues of atrazine and the other chlorinated triazine pesticides. With that finding, and the earlier findings contained in the 2003 IREDs for atrazine, the Agency has now completed its task under section 4(g) of FIFRA of determining whether products containing atrazine are eligible for reregistration, and it has completed its reassessment of atrazine tolerances under section 408(q) of the FFDCA. Please note that individual registrations of products containing atrazine will not be considered reregistered until they have successfully completed product-specific reregistration.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

CERTIFIED MAIL

Dear Registrants:

This is to inform you that the Environmental Protection Agency (hereafter referred to as EPA or the Agency) has completed its revised Atrazine Interim Reregistration Eligibility Decision (IRED), consistent with the Consent Decree, as amended, entered in Natural Resources Defense Council v. Whitman, Case Number C -99-3701 CAL, N. D. California (2002)). It does not alter the conclusions of the January 31, 2003 IRED document except as described below. There will be a 90-day public comment period for this document. At a later date, the Agency will publish a comprehensive atrazine IRED incorporating changes, if any, resulting from public comment and combining the January and October documents into one document.

In August 2002, the court supervising the implementation of the Consent Decree granted a request from EPA and Natural Resources Defense Council (NRDC) that the Decree's deadline for the atrazine IRED be extended. The new schedule included the completion of an IRED by January 31, 2003, and a revised IRED by October 31, 2003. The amended Consent Decree states that the revised Interim RED for atrazine must address the following: (1) data received by EPA prior to February 28, 2003, relating to the potential effects of atrazine on amphibian species; and (2) to the extent not addressed in the January 31, 2003 Interim RED, data, received prior to February 28, 2003, relating to the association between atrazine exposure and the incidence of prostate or other cancer in humans. The amended Consent Decree also specifies that EPA is to hold FIFRA Science Advisory Panel (SAP) meetings on these two issues.

Ecological monitoring of watersheds was required in the January IRED due to the potential for community-level and population-level risk to aquatic ecosystems from atrazine. The January IRED states that to mitigate these ecological risks to aquatic communities, the Agency is requiring that atrazine registrants, in consultation with EPA, develop a program under which the registrants monitor for atrazine concentrations and mitigate environmental exposures if EPA determines that mitigation is necessary. The program will focus on watershed impacts of atrazine use.

This revision to the January 31, 2003 IRED consists of three sections: 1) potential

association between atrazine exposure and the incidence of prostate cancer and other cancers in humans; 2) potential effects of atrazine on amphibian endocrinology and development; and 3) ecological monitoring and mitigation of atrazine in watersheds. In each section, this document summarizes the conclusions in the January IRED pertaining to the section, developments since the IRED, and next steps, as appropriate. The technical documents supporting these revisions are listed below and appended to this IRED.

A. Review of Atrazine Cancer Epidemiology,
B. Potential Effects of Atrazine on Amphibian Gonadal Development,
C. Final Reports of the Atrazine Ecological and Monitoring Subgroups,
D. Atrazine Ecological Subgroup Final Report: Recommendations for aquatic community Level of Concern (LOC) and method to apply LOC(s) to monitoring data,
E. Microcosm and Mesocosm Data,
F. Atrazine Toxicity Data for CASM Simulations,
G. CASM Results: Steinhaus Similarity Toxicity Scenario,
H. Comparison of Annual Average CASM Steinhaus Similarity for a Series of Chemographs Calculated with the Logistic Regression vs. Actual CASM Simulations,
I. Comparison of Simulated Change in Annual Production for Phytoplankton, Periphyton, Macrophytes, Zooplankton, Benthic Invertebrates, and Fish for CASM Parameterizations,
J. Decrease in Annual Total Production,
K. Atrazine Ecological Monitoring Program Subgroup: Recommendations for Monitoring Design, and
L. Assessment of Potential Mitigation Measures for Atrazine, February 13, 2003.

Potential Association Between Atrazine Exposure and Prostate Cancer and Other Cancers in Humans

January 31, 2003 IRED

The Agency's human health risk assessment for the January 31, 2003, IRED did not include a quantitative risk assessment for cancer due to a determination by the EPA, consistent with conclusions reached by the SAP (June 2000), that it is unlikely that atrazine's cancer mode of action in the Sprague-Dawley rat is operative in humans. EPA's Cancer Assessment Review Committee (CARC), in accordance with the 1999 Draft Guidelines for Carcinogen Risk Assessment, classified atrazine as "not likely to be carcinogenic to humans."

The review of the cancer epidemiology study for the January 31, 2003, IRED did, however, include epidemiological data on workers at the Syngenta St. Gabriel Louisiana plant where atrazine is manufactured. The study reported a statistically significant increase in the incidence of prostate cancer among plant workers. The Agency, upon review of this study, requested additional information on the exposure profile of the employees diagnosed with

prostate cancer and this information was provided and reviewed. Based on this review, it appeared that most of the increase in prostate cancer incidence at the St. Gabriel plant was likely due to intensive prostate specific antigen (PSA) screening of employees. The study was insufficiently large and had limitations that prevent ruling out atrazine as a potential contributor to the increase observed. On balance, however, a role for atrazine seemed unlikely because prostate cancer was found primarily in current employees who received intensive PSA screening; there was no increase in advanced tumors or mortality; and proximity to atrazine manufacturing did not appear to be correlated with risk.

Other cancers besides prostate were found to have an elevated, though not statistically significant, increase in risk at the St. Gabriel plant. Other studies have suggested an increased risk for ovarian, breast, and other cancers, including non-Hodgkin's lymphoma (NHL). However, EPA had previously concluded that these studies were at best preliminary and should not serve as a basis for implicating atrazine as a human carcinogen due to their methodological limitations.

July 17, 2003 SAP

To further analyze the question of exposure to atrazine and prostate cancer, an SAP meeting was held on July 17, 2003 (http://www.epa.gov/scipoly/sap/index.htm). Given the limited nature of the new cancer data that stimulated the request for a second SAP meeting, EPA's submission to the SAP focused primarily on the new prostate cancer data rather than the epidemiological data that the SAP in 2000 had judged inconclusive or later studies received since 2000 that EPA found to be inconclusive. EPA asked the Panel to comment on the Agency's conclusion regarding prostate cancer and particularly the preliminary results from a nested case-control study of the St. Gabriel manufacturing plant in Louisiana. In addition to this study, the SAP was provided with other epidemiological studies on atrazine exposure and prostate cancer, a review by the Agency discussing the St. Gabriel data and epidemiological data bearing on prostate cancers, comments from four external peer reviewers, a Syngenta-sponsored expert panel review, and comments by the Natural Resources Defense Council. As stated in the January IRED, EPA's view of the study was that the increase in PSA screening for the St. Gabriel workers could explain the increase in prostate cancer observed in these workers and therefore a role for atrazine seemed unlikely. EPA acknowledged, however, that due to limitations in the St. Gabriel study, atrazine could not be ruled out as a potential causal factor.

The SAP's analysis of the St. Gabriel study differed to a degree from the Agency's conclusion. The SAP did conclude that "the increase in Prostate Specific Antigen (PSA) screening at the St. Gabriel plant likely led to an increase in the detection of cases of prostate cancer." Further, the Panel noted that "[s]ubstantive and persuasive arguments have been made to support the EPA's conclusion that PSA screening could explain the observed increase in prostate cancer incidence in the workers." Nonetheless, the Panel did not believe there was sufficient evidence to conclude that it was "unlikely" that atrazine had a role in the increased prostate cancer cases seen in the St. Gabriel study "given the severe limitations of the St. Gabriel study, particularly those pertaining to small sample size, questionable exposure assessment and

lack of an appropriate comparison group." According to the SAP, PSA screening may be only a "partial explanation" for the increase in prostate cancer seen in the St. Gabriel study and that "atrazine cannot be ruled out as a potential cause."

The Agency agrees with the SAP's analysis and has rewritten its conclusion as follows:

> The increase in prostate cancer incidence at the St. Gabriel plant in Louisiana is consistent with the intensive PSA screening. This is because prostate cancer was found primarily in active employees who received intensive PSA screening, there was no increase in advanced tumors or mortality, and proximity to atrazine manufacturing did not appear to be correlated with risk. No evidence was identified, such as dose-response evidence, that permit a determination that some of the increase was likely due to exposure to atrazine although atrazine exposure cannot be ruled out at this time as a cause. However, the study was insufficiently large and suffered from other limitations that prevent a determination that all of the increase in prostate cancer was probably due to the intensive screening program. Therefore, EPA concludes that the St. Gabriel study does not contribute any evidence supporting atrazine as a likely human carcinogen. (see Appendix A)

The SAP suggested that the Agency consider additional analysis of the St. Gabriel cohort. However, the resulting sample size would still limit the opportunity to draw further conclusions. The Agency questions whether additional analysis is warranted for other potential risk factors (such as smoking, diet and previous work history, and non-occupational or pre-employment exposure to triazine herbicides). Because of the way the study was designed, this information is not available to investigators and it may not be feasible to obtain such information for the St. Gabriel workers.

The other epidemiologic studies investigating the relationship between atrazine exposure and prostate cancer did not alter the Panel's opinion that the evidence presented is inadequate to support the Agency's conclusion of atrazine as an "unlikely" cause of prostate cancer seen in the St. Gabriel study. One study by Mills (1998) found a borderline statistically significant positive association between atrazine use by county with prostate cancer incidence rates in African American males. A second study by Alavanja et al. (2003) showed no association of self-reported atrazine exposure with prostate cancer in cohort analysis of pesticide applicators.

Epidemiological Data on Other Cancers

EPA has re-reviewed the epidemiological data regarding atrazine and cancer that were examined for the SAP meetings on atrazine in 2000 and 2003. EPA has also reviewed data that have become available since the latest meeting of the SAP in 2003. The results of those reviews are also summarized in Appendix A to this document. In brief, the Agency does not find any results among the available studies that would lead us to conclude that a potential cancer risk is likely from exposure to atrazine.

Even though the epidemiological evidence and animal data, when viewed separately, do not support a positive cancer finding for atrazine, EPA examined the totality of animal and human data to determine if that approach showed that atrazine was likely to cause a carcinogenic response in humans. Specifically, EPA reviewed the available animal data to determine if a mechanism could be identified which supports the biological plausibility of atrazine as a human carcinogen taking into account the tumors that were identified in the epidemiological data. This review showed that (1) lymphomas, including NHL, were generally not seen in atrazine animal bioassays; (2) a mechanistic role for atrazine contributing to NHL has not been identified in laboratory studies; (3) tumors at any endocrine site other than mammary gland tumors in female SD rats (e.g., prostate, ovarian tumors) have not been identified in atrazine bioassays; (4) the SAP concluded in 2000 that the mammary gland tumors in rats caused by atrazine are produced via a mechanism not relevant to humans; and (5) the endocrine tumors that have been raised in epidemiological studies (other than mammary gland tumors) can not be biologically tied to atrazine's mode of action (i.e., decrease prolactin, decrease luteinizing hormone (LH) and suppression of ovulation). Thus, at this time, joint consideration of the available animal cancer and mode of action data and epidemiological studies, does not indicate that atrazine is likely to cause cancer in humans.

Conclusion

In the January 31, 2003 IRED, EPA concluded that, considering the animal data and the human epidemiological data, atrazine is "not likely to be carcinogenic in humans". That conclusion allowed EPA to find that there is a reasonable certainty of no harm from exposure to atrazine so far as cancer risk is concerned. Results in the St. Gabriel study and other recent epidemiological studies regarding atrazine's potential link to cancer do not alter that conclusion. Further, any weight attributable to these data is weakened by the data in animals that fail to reveal any mechanism of action for atrazine consistent with the cancers observed in the studies. Accordingly, EPA concludes that atrazine is not likely to be a human carcinogen."

Next Steps

Since the July 2003 SAP meeting, EPA has received two new pieces of information: (1) a report from the National Cancer Institute (NCI) re-analyzing previous epidemiologic studies of atrazine and non-Hodgkin's lymphoma using hierarchical techniques to adjust for the effects of multiple exposures; and (2) a nested case-control study conducted for Syngenta of workers at the St. Gabriel plant using more detailed job histories to evaluate exposure indices. The Agency plans to conduct a comprehensive review of both studies. EPA's preliminary view of these studies is discussed in Appendix A. EPA is also expecting to receive additional epidemiological studies and analyses concerning atrazine and cancer from the NCI's Agricultural Health Study in the next one to two years. These studies and analyses include the following: an update of the Agricultural Health Study on prostate cancer capturing additional prostate cancer cases; an analysis of all the non-Hodgkin's lymphoma cases reported in the Agricultural Health Study; and a special analysis of all cancers related to atrazine exposure in the same Agricultural Health Study cohort. The latest projection is that the NCI will complete these studies and analyses in

mid-2005.

After all of the information has been submitted and reviewed, the Agency plans to convene another SAP meeting concerning atrazine and its possible association with carcinogenic effects. At that meeting, EPA intends to present the SAP with all of the data bearing on atrazine and cancer, including the old and new epidemiology studies. In the meantime, EPA will continue its review of all new data submissions. If at any time, results from any of the new data submissions raise significant questions that would benefit substantially from SAP review prior to submission of all of the data, the Agency will hold a SAP meeting before all aspects of the Agricultural Health Study are completed.

EPA intends to thoroughly review any SAP report from any future meeting, once issued, and to revise its determinations regarding the cancer potential of atrazine, as necessary. Any revisions will be included in either a revision to the October 31, 2003 IRED or the final reregistration decision for atrazine depending on the timing of the future SAP meeting relative to issuance of the final atrazine reregistration decision.

Potential Effects of Atrazine on Amphibian Endocrinology and Development

January 31, 2003 IRED

In the ecological risk assessment for the January 31, 2003 IRED, the Agency did not suggest that endocrine disruption, or potential effects on endocrine-mediated pathways, was regarded as a regulatory endpoint for ecological effects. Nor did the Agency have reliable evidence at that time to state that atrazine caused endocrine effects in the environment. The IRED stated that based on the existing uncertainties in the available database, atrazine should be subject to more definitive testing once the appropriate testing protocols have been established. The Agency was aware that several pertinent studies were being performed by researchers that may reduce some of the uncertainties in understanding potential atrazine effects on amphibian endocrinology and reproductive and developmental responses.

June 17-20, 2003 SAP

Since the January IRED, the Agency has conducted a comprehensive evaluation of the available data regarding the potential effects of atrazine on amphibian gonadal development and presented its assessment for external peer review to a SAP in June 2003. In a May 29, 2003 white paper, the Agency summarized seventeen studies consisting of both open literature and registrant-submitted laboratory and field studies involving both native and non-native species of frogs (see Appendix B). In its white paper the Agency concluded that none of the studies fully accounted for environmental and animal husbandry factors capable of influencing endpoints that the studies were attempting to measure. The Agency also concluded that the current lines-of-evidence did not show that atrazine produced consistent effects across a range of exposure concentrations and amphibian species tested.

Based upon this assessment, the Agency concluded and the SAP agreed that there is sufficient evidence to formulate a hypothesis that atrazine exposure may impact gonadal development in amphibians, but there are currently insufficient data to confirm or refute the hypothesis (http://www.epa.gov/oscpmont/sap/2003/June/junemeetingreport.pdf). Because of the inconsistency and lack of reproducibility across studies and an absence of a dose-response relationship in the currently available data, the Agency has determined that it does not change the conclusions reached in the January 31, 2003 IRED regarding atrazine's effects on amphibians.

Next Steps

Based on the conclusions from the Agency's white paper and recommendations of the SAP, the Agency will seek additional data to reduce uncertainty regarding the potential risk to amphibians (http://www.epa.gov/oscpmont/sap/2003/june/dataevaluationreports.htm). This data collection will follow the multi-tiered process outlined in the Agency's white paper. This approach to collecting additional information through further studies, which was endorsed by the SAP, can be used to address uncertainties associated with the potential causal relationships between atrazine exposure and gonadal development and characterize the nature of any concentration-response relationship.

Ecological Monitoring and Mitigation of Atrazine in Watersheds

January 31, 2003 IRED

The ecological risk assessment for the January IRED stated that the Agency has ecological risk concerns from the use of atrazine and identified the potential for community-level and population-level risk to aquatic ecosystems at prolonged concentrations of atrazine from 10 to 20 ppb. To mitigate these ecological risks to aquatic communities and to determine that atrazine is eligible for reregistration, the Agency required that atrazine registrants, in consultation with EPA, develop a program under which the registrants monitor for atrazine concentrations and mitigate environmental exposures if EPA determined that mitigation is necessary. This program would focus on watershed impacts of atrazine use.

The January IRED further stated that the program will include an appropriate ecological level of concern (LOC), identified by EPA; development of a protocol for a monitoring program that specifies the frequency, location, and timing of sampling, as well as an appropriate coordination with Total Maximum Daily Load (TMDL) programs; triggers for mitigation measures; and description of mitigation measures that will be taken if triggers are exceeded. This monitoring and mitigation program would be designed, conducted and implemented on a tiered watershed level and must be consistent with existing state and federal water quality programs.

Follow-up to January 31, 2003 IRED

The following description highlights how EPA developed the specifics of the ecological monitoring and mitigation program consistent with the January 2003 IRED. The Office of Pesticide Programs, the Office of Research and Development, and the Office of Water collaborated to integrate and develop this program.

Level of Concern (LOC)

The sensitive endpoint in the ecological assessment for atrazine is a change in the structure and function of primary producers in the aquatic community. Concentrations of atrazine that affect plant productivity and community structure typically occur at levels lower than those that directly intoxicate fish and aquatic invertebrates. By focusing on aquatic plant community structural changes, the most sensitive endpoint, the Agency intends to protect fish and invertebrates from the direct effects of atrazine as well as the effects that atrazine could have on the habitat and food sources of aquatic animals (see Appendices C- K).

The Level of Concern (LOC) was derived to ensure that the atrazine concentrations in watersheds will not cause significant changes in aquatic plant community structure. The LOC is based on an analysis of 25 microcosm and mesocosm studies cited in the Final Report of a report provided in Appendix D. To establish the LOC, it was necessary to quantify the results of the mesocosm and microcosm studies by rating their reported results based on the significance of the effects on aquatic plant productivity and community structure. Each study was analyzed to establish the reported effect(s) and the atrazine exposure profile, which reflects the magnitude, frequency and duration of atrazine concentrations in the study. This analysis revealed a wide range of study designs and quality and also indicated that a wide range of atrazine exposure profiles could result in significant change in aquatic community productivity and structure. A method was developed to separate the reported results on plant community productivity and structure observed in these studies into those that were significant versus those with slight to no-effects.

Since atrazine exposure profiles in natural systems, in this case streams, will typically be complex, it was necessary to develop a method to analyze monitoring data to determine when monitored exposure profiles are functionally-equivalent to those profiles observed in mesocosm and microcosm studies showing significant changes when the monitored profiles are functionally-equivalent to those studies that showed no significant effects.

Using a range of atrazine exposure profiles representative of those that caused significant effects in the microcosm and mesocosm studies, as well as those that did not result in significant effects, an ecological food chain model that predicts changes in aquatic communities in streams (in this case, Comprehensive Aquatic Systems Model, CASM), was used to develop the means of interpreting whether or not any atrazine exposure profile observed in the monitoring study would likely be associated with a significant effect on aquatic communities. These analyses determined that a community similarity index (CSI) that quantifies the average changes in biomass for plant species of the modeled aquatic community, is the most useful model parameter to segregate those mesocosm and microcosm studies that exhibited significant effects from those

that did not. Conceptually, this index is consistent with the observed effects of atrazine on primary producers in aquatic ecosystems. More specifically, through this analysis it was determined that an average CSI change of 5% or greater over the course of a study reasonably discriminated micro- and mesocosm exposure profiles associated with significant effects (i.e., irreparable changes to ecosystems) from those that did not show significant effects.

Consequently, these analyses establish the LOC as any measured atrazine exposure profile obtained through a monitoring study that would result in a predicted 5% or greater average change in the CSI through the use of CASM. Additional analyses over the duration of the three year monitoring study will evaluate the use of additional aquatic community models (e.g., Aquatox), and comparable modeled indices, to provide additional model options for States, Tribes or other parties to evaluate data that may be collected in other monitoring programs.

Monitoring Program Protocol

The monitoring protocol is initially focused on flowing water bodies (i.e., streams) associated with corn and sorghum production (see Appendix K). Future efforts (see below) will address the need to monitor estuaries and water bodies associated with sugarcane production. In addition, results of raw water monitoring from the on-going atrazine monitoring program for drinking water, as described in the January 31, 2003 IRED, will be analyzed to determine its potential utility in evaluating potential ecological effects in static water bodies.

The purpose of the monitoring program in flowing waters is to estimate the magnitude and extent to which water bodies with the greatest potential vulnerability to atrazine exposure (primarily based on atrazine use and runoff potential) are exceeding the level of concern consistent with the atrazine ecological risk assessment, which was described above. The initial analyses identified three tiers of watersheds relevant to atrazine use in corn and sorghum. The first tier of approximately 10,000 watersheds had some level of atrazine use on corn and sorghum. The watersheds identified in this assessment were primarily at the 5th, or Hydrologic Unit Code (HUC)-10/11, level of a hierarchal system of mapping watersheds established by the United States Geological Survey (USGS). At this level, watersheds are typically 40,000 to 250,000 acres in size. From this first tier, a second tier of 5,860 HUC-10/11 watersheds was identified based on use intensities of 0.25 lb active ingredient (ai)/county acre or higher. From this second tier of watersheds, a third tier of 1,172 watersheds was identified based on their predicted potential to be among the most vulnerable to atrazine surface water loading from use on corn and sorghum. Through the development of a statistically-based survey design, EPA then selected 40 HUC-10/11 watersheds which will give a statistical representation of the third tier of 1,172 such watersheds predicted to be most potentially vulnerable. These 40 monitored watersheds are located in 10 states: Ohio, Indiana, Kentucky, Illinois, Iowa, Missouri, Nebraska, Minnesota, Tennessee, and Louisiana. The selected watersheds averaged 129 square miles in size, with a median size of 121 square miles. Monitoring sites (index sites) will be located in flowing water bodies within the 40 watersheds. Two years of monitoring results from these sites will be compared to the LOC values. The registrant shall collect monitoring samples every 4 days prior to, during, and following the growing season. In addition, the registrant is required to

monitor 10 watershed sites daily following flow events to better estimate temporal variability for the data collected in the remaining 30 watersheds. Based on the results from the two-year monitoring study in each watershed, as interpreted by the LOC, the Agency will evaluate the need for more monitoring and/or mitigation actions in the 40 HUC-10/11 watersheds and the implications, if any, for the larger set of 1,172 most potentially vulnerable watersheds.

Future Monitoring Decisions for Other Water Bodies

Estuaries will not be monitored in 2004. Discussions will be conducted with the Oceans and Coastal Protection Division in the Office of Wetlands, Oceans, and Watersheds (OWOW) to review all relevant data to determine whether and to what extent monitoring for levels of atrazine should be undertaken for estuaries. The role of dilution and transport in estuaries must be determined. It may be possible to gather some information on these parameters by looking at nitrate concentrations or other chemical as a marker to ascertain how to approach an estuary monitoring program. This analysis will be completed by March 2004. If it is determined a monitoring study is required, it is recognized additional efforts will be necessary to develop a monitoring program.

To evaluate the potential for ecological concerns in static water bodies (i.e., lakes and reservoirs), raw water data on atrazine concentrations collected from the approximately 140 Community Water Systems that are being monitored for human health concerns will initially be used. In addition, the registrant will provide historical data from the Voluntary Monitoring Program (VMP) sites. The methods used to determine the LOC for flowing water bodies are amenable for use in static water bodies. The EPA must determine on a statistical and ecosystem basis to what extent the monitoring data from the drinking water monitoring program should be interpreted for a given water body and how statistical inferences from the results of this set of static water bodies can be made to a larger population of potentially vulnerable static water bodies. This information will provide the basis for developing a monitoring strategy for static water bodies.

A strategy will be developed to select the most appropriate locations and number of sites for monitoring atrazine in sugarcane growing areas. The sugarcane use area is a unique situation which has clear freshwater and estuarine issues. As a pilot, the registrant has offered to monitor four additional sites distributed between Louisiana and Florida with one being the Iberville Community Water System already designated for increased monitoring in the drinking water program. The selection of these pilot sites for evaluating potential ecological effects and the protocol for monitoring will be completed by March 2004.

Triggers for Mitigation Measures in Flowing Water Bodies

For the 40 watersheds, the registrant shall monitor an index site within the watershed for two years, regardless if a decision to initiate remediation occurs in the first year. If monitoring within a watershed indicates exceedences of the 5% average CSI threshold, based on CASM model results, in each of the two years, the registrant will initiate and conduct a TMDL or

comparable watershed management program within the particular watershed where the exceedence occurred, consistent with the state's ongoing TMDL or watershed program. If a TMDL or comparable watershed management program is already in place by USDA, state, or other entity in a given watershed, the registrant will then work with these existing programs to address the atrazine exceedence. If an exceedence occurred in the first year of sampling within a watershed, the registrant will, at a minimum initiate stewardship outreach, preferably through an existing USDA or state-sponsored watershed management program if one exists.

If an index site in a watershed has exceeded the similarity threshold over a two year period, the registrant shall initiate and conduct a TMDL (or similar) program to reduce atrazine concentrations associated with the stream reach at the index site by additional monitoring and managing atrazine uses in those portions of the watershed that feed into the index site and result in the exceedences. At the same time, the registrant shall conduct additional monitoring at other sites in the watershed suspected to be similar to the index site in order to determine if other water bodies in the watershed also exceed the 5% similarity threshold. If these areas are determined to exceed the similarity threshold, then the registrant shall initiate and conduct TMDL (or similar) mitigation in those areas.

The registrant must also initiate and conduct remediation immediately in any watershed which shows an exceedence of $ 15% of the CSI rather than wait for a second year of data. However, monitoring will still continue at the original index site in the second year.

If monitoring results indicate an exceedence in one of the two years for a given index site within a watershed, a decision regarding additional monitoring or other watershed management activities will be based on the specific data for the location and the results of the overall study. The data derived from all of the 40 watersheds will provide information needed to better quantify and interpret sampling variability in the context of the exceedence threshold. These future analyses will inform decision criteria for those cases where variability in monitoring data overlaps uncertainties in the LOC derivation.

For an index site within a watershed, if monitoring results indicate no exceedences of the 5% average similarity threshold index based on CASM model results in each of the two years, then no further action will be required in the watershed.

For all of the data collected in the 40 watersheds, interpretation of monitoring data after two years would include an assessment as to whether or not unusual meterological conditions (e.g., high or low rainfall) existed during the monitoring period. This could require a third year of sampling to make an informed decision on a watershed's condition.

In addition, if States or Tribes use the same or comparable LOC and monitoring protocols (e.g., comparable sampling frequencies and analytical techniques) at a selected stream reach outside of the 40 watersheds, as described in the ecological and atrazine monitoring subgroup reports (Appendix C-J), as well as, employ decision criteria comparable to those described above, the registrant will initiate and conduct a TMDL or comparable watershed management

program within that watershed if the State or Tribal data shows an exceedence of the LOC for two years, consistent with the state's ongoing TMDL or watershed program.

After the Agency receives the data from the 40 watersheds, it will be analyzed to interpret the status of the 1,172 Tier 2 watersheds. Due to the nature of this monitoring design it will be possible to make statistical inferences with the data collected from the 40 watersheds as to the magnitude and extent to which LOC exceedences could be occurring in the remaining tier of 1,172 watersheds considered to be the most potentially vulnerable. After these statistical inferences are completed, a decision about monitoring in the remaining 1,172 vulnerable watersheds will be made, with the understanding it is possible that further monitoring and/or mitigation may be required of the registrant in these other watersheds.

Description of Mitigation Measures

The specific techniques to be employed by the registrant to reduce atrazine loads in a watershed that has atrazine concentrations that exceed the LOC will be watershed specific and undertaken in partnership with any existing watershed management programs. The registrant will follow steps that are typically employed in the Clean Water Act TMDL program or similar management programs as follows:

1. Problem Identification -
   Identify pollutant causing impairment and impaired water body and determine the pollutant reductions needed to achieve water quality standards (note that in this specific situation exceedence of the atrazine LOC will have already established an impairment and a cause, with the understanding that for a given water body additional pollutants could also be contributing to biological impairment).

2. Current Situation and Desired Objective -
   Indicate desired outcome of TMDL process.

3. Source Assessment -
   Identify pollution source and contribution to impairment.

4. Allocation of loads -
   Allocate the pollutant loadings among the various pollutant sources.

5. Implementation -
   Describe actions to mitigate the sources of pollution (e.g., best management practices).

6. Follow-up Monitoring -
   Determine effectiveness of implemented mitigation measures.

7. Feedback Mechanism -

Review of mitigation measures during implementation period to determine if adjustments are needed.

The Clean Water Act requires that States identify waters that fail to attain water quality standards and establish TMDLs at levels that attain or maintain their water quality standards. EPA is required to review and approve or disapprove the list of impaired waters and TMDLs. If EPA disapproves the State's list or the TMDL, EPA is required to identify the impaired waters or establish TMDLs. The States and EPA establish TMDLs in a particular watershed by determining pollutant loads that will allow the attainment of water quality standards, analyzing existing pollutant loads and sources, and specifying the pollutant load reductions necessary to attain water quality standards. TMDLs are implemented through existing Federal, State or local requirements and programs. EPA encourages TMDLs that are established and implemented as part of an overall watershed strategy for improving water quality.

The Agency expects that the TMDL process (or similar watershed management program) will result in mitigation measures that, when implemented, will effectively lower the level of atrazine to below the level of concern. These mitigation measures could include: buffer zones, different application or incorporation methods, restrictions on the timing of application due to rain, and lower application rates. Implementation of these controls also will include confirmatory follow up monitoring to insure that the atrazine levels are below the LOC. Given the rapid progress the States have made by incorporating TMDL approaches in watershed management programs, EPA is confident that management activities undertaken by the registrant consistent with meeting the loading reductions identified in a TMDL are expected to be successful in reducing loadings of atrazine. Since 1996, more than 9000 TMDLs have been established and approved, leading to activities that have improved water quality. Pollutant loadings have been reduced and water quality improved as reported by the Office of Water's Office of Wetlands, Oceans and Watersheds (see http://www.epa.gov/owow/tmdl/). In the unlikely event that implementation of loading reductions identified in TMDLs is not effective, the Agency reserves the right to take further action under FIFRA to mitigate this risk from atrazine and will consider, as appropriate, the benefits of atrazine use in the particular watershed.

Benefits of Atrazine Use

The total or national economic impact resulting from the loss of atrazine to control grass and broadleafed weeds in corn, sorghum and sugarcane would be in excess of 2.0 billion dollars per year if atrazine were unavailable to growers (Appendix L, "Assessment of Potential Mitigation Measures for Atrazine", February 13, 2003).

A watershed-specific analysis has not been factored into this assessment because of the uncertainty surrounding potentially impacted watersheds and any required mitigation. However, economic impacts could be expected to parallel those for drinking water as described below.

Specifically, EPA analyzed what would be the impact to the corn industry in areas in

watersheds contributing to Community Water Systems which find atrazine concentrations exceeding the Agency's level of concern, and found that growers would incur an average loss of 9 bushels per acre (nationwide corn yield averaged 138 bushels per acre in 2001), as well as an increased cost for a replacement herbicide. This yield loss plus increased herbicide cost may result in an average estimated loss of $28 per acre. This translates to a yearly loss of 1.6 billion dollars of lost revenue annually nationwide.

Likewise, the impact to the sugarcane industry would also be substantial. If growers in the watersheds contributing to the Community Water Systems which find atrazine concentrations exceeding the Agency's level of concern, no longer had atrazine available to them, a 10 to 40 percent crop loss would be incurred along with an increase in alternative herbicide cost. This translates to a yearly loss of $89.5 million but could be as much as $343.6 million if a 40 percent loss were realized.

Finally, if atrazine were eliminated from the market, the most likely chemical broadleaf weed control options would be post-emergence applied herbicides (dicamba, 2,4-D, bromoxynil, and prosulfuron). Post-emergence application of herbicides carries certain risks. These include: 1) greater competition of the weeds with the crop early in the season as weed control is delayed into the growing season; 2) crop injury from herbicides applied directly to the emerged crop and weeds; and 3) if the opportunity to apply the herbicide is missed due to weather or some other factor, there are fewer or no emergency remedies for weed control. Thus, there are non-monetary costs that would be associated with the loss of atrazine as well as the substantial financial impacts.

Determination of Interim Reregistration Eligibility

The Agency has determined that atrazine products are eligible for reregistration provided that: (i) the circumstances described in this document (including implementation of any ecological risk mitigation measures identified through the monitoring program) are realized; (ii) any current data gaps and additional data needs are addressed; and, (iii) the consideration of the cumulative risk for the triazines supports a final reregistration eligibility decision. Further we have concluded that during the period of data collection and risk mitigation measures called for in this document, the benefits of continued use of atrazine will outweigh any potential ecological risk.

Although the Agency has not considered the cumulative risk for all the triazines, the Agency is issuing this amendment to the interim reregistration eligibility decision now in order to identify risk reduction measures that are necessary to support the continued use of atrazine. Based on the current evaluation of atrazine, the Agency has determined that atrazine products, unless used in accordance with the conditions of this document, would present risks inconsistent with FIFRA. Accordingly, should a registrant fail to implement any of the risk mitigation measures identified in this document, the Agency may take further regulatory action to address the risk concerns from the use of atrazine products.

Because the Agency has not yet considered cumulative risk for all of the triazines, this reregistration eligibility decision does not fully satisfy the reassessment of the existing atrazine food residue tolerances as called for by the Food Quality Protection Act (FQPA). When the Agency has completed the cumulative assessment, atrazine tolerances will be reassessed in that light. At that time, the Agency will reassess atrazine along with the other triazine pesticides to complete the FQPA requirements and make a final reregistration eligibility determination. By publishing this interim decision on reregistration eligibility and requesting mitigation measures now for the individual chemical atrazine, the Agency is not deferring or postponing FQPA requirements; rather, EPA is taking steps to assure that uses which exceed FIFRA's unreasonable risk standard do not remain on the label indefinitely, pending completion of assessment required under the FQPA. This decision does not preclude the Agency from making further FQPA determinations or tolerance-related rulemakings that may be required on this pesticide or any other in the future.

What Registrants Need to Do

In order to be eligible for reregistration, registrants need to implement the risk mitigation measures outlined above, which include, among other things, development and submission of the following:

<u>Potential Effects of Atrazine on Amphibian Endocrinology and Development</u>

Phase I:	Response of larval *Xenopus laevis* to estradiol: assessment of development and gonadal morphology. Response of larval *Xenopus laevis* to atrazine: assessment of development and gonadal morphology.
Phase II:*	Response of larval *Xenopus laevis* to atrazine: assessment of gonadal and plasma sex steroid concentrations.
Phase III:*	Response of larval *Xenopus laevis* to atrazine: assessment of gonadal aromatase activity.
Phase IV:*	Response of larval *Xenopus laevis* to atrazine and an aromatase inhibitor: assessment of development, gonadal morphology, sex steroid concentrations and aromatase activity.
Phase V:*	Response of *Rana pipiens* to atrazine: assessment of reproductive fitness.

* Conducting the studies in phases II through V are conditional on the results from the previous phase indicating an effect. For example, if morphological abnormalities are observed in the gonads of larval *Xenopus laevis* after exposure to atrazine (Phase I) then the Phase II studies on gonadal and plasma sex steroid concentrations would be conducted. However, if the Phase I studies show negative results then the registrant does not need to proceed with the subsequent

study. EPA requests to review all of the protocols before the studies are initiated.

Ecological Monitoring and Mitigation of Atrazine in Watersheds

Atrazine Monitoring For Potential Ecological Effects on Aquatic Communities: Part 1. Flowing Water Bodies in Corn and Sorghum Use Areas.

Atrazine Monitoring For Potential Ecological Effects on Aquatic Communities: Part 2. Water Bodies in Sugarcane Use Areas.

Atrazine Monitoring For Potential Ecological Effects on Aquatic Communities: Part 3. Static Water Bodies.

Atrazine Monitoring For Potential Ecological Effects on Aquatic Communities: Part 4. Estuarine Water Bodies.

Data Call-In data for the ecological monitoring of watersheds will be sent to Office of Pesticide Programs (OPP) and Office of Water (OW), as well as the State or Tribe where the data are collected. Once the monitoring data has been quality controlled it will be posted in OW's publically available STORET database.

If you have questions on this document, please contact the Chemical Review Manager, Eric R. Olson at (703) 308-8067.

Sincerely,

Betty Shackleford, Acting Director
Special Review and Reregistration Division

12 Attachments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES
OFFICE OF PESTICIDE PROGRAMS
SPECIAL REVIEW and REREGISTRATION
DIVISION
(7508C)

Debra Edwards, Ph.D., Director

Correction to the Existing Stocks Section in the January 2003 Atrazine IRED

The October 1, 2003 deadline for distribution of product by persons other than the registrant in Existing Stocks provision in Chapter V, Section C of the January 2003 Atrazine IRED is incorrect. The new Existing Stocks policy for products containing atrazine is as follows:

The Agency has determined atrazine products (other than product containing 4% or less atrazine active ingredient) bearing old labels/labeling cannot be sold to end users after January 1, 2005 unless these products have a sticker label attached which refers to supplemental labeling. The supplemental label must also be given out when it is sold to an end user. The products containing 4% or less atrazine active ingredient are not required to follow the January 1, 2005 date for sticker labels or supplemental labels. However, any product with less than 4% active ingredient that is manufactured six months after receiving new EPA approved label must bear the revised labeling. The residential turf products; 829-268, 7401-318, 9404-72, 11715-347, and 51036-363 are also exempt from this January 1, 2005 requirement. However, any of these products that are manufactured after January 1, 2005 must bear the revised labeling.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Errata/Addendum Sheet for Changes to the Atrazine Interim Reregistration Eligibility Decision.

FROM: Anne Overstreet
Special Review Branch
Special Review and Reregistration Divsion

TO: Public Docket for Atrazine

Listed below are changes/clarifications added to the Atrazine Interim Reregistration Eligibility Decision (IRED) which was published in January, 2003. The regulatory decision of the IRED did not change as a result of these clarifications.

1) The occupational and non-occupational mitigation areas were updated to reflect more recent data. Because the Agency recently updated several scenarios using ORTEF data, a respirator is no longer necessary for backpack sprayers.
2) Appendices A-H were added to the IRED. They are as follows:

- Appendix A: Atrazine Use Patterns Eligible for Reregistration
- Appendix B: Studies Used to Support the Reregistration of Atrazine
- Appendix C: Technical Support Documents
- Appendix D: Citations Considered to Be Part of the Database Supporting the Interim Reregistration Decision (Bibliography)
- Appendix E: Generic Data Call-In
- Appendix F: Product Specific Data Call-In
- Appendix G: EPA's Batching of Atrazine Products for Meeting Acute Toxicity Data Requirements For Reregistration
- Appendix H: Atrazine Monitored Watersheds

Appendix B was previously posted on the web. It has been subsequently been amended to accurately reflect the data gaps and studies used in support of reregistration.
3) The Label Table in Section IV has been added to the IRED. In order to be eligible for

reregistration, all product labels are to be amended to incorporate the risk mitigation measures outlined in Section IV. Table 29 has been added to the IRED and describes how language on the labels should be amended

4) Clarification was made relating to the atrazine cancer assessment language. The findings of the 2000 SAP meeting were included.

5) Corrections were made pertaining to the baseline attire for occupational scenarios. Baseline clothing typically includes: long-sleeved shirt and long pants, shoes and socks. For scenario 5 (Table 14 of the IRED), application of liquids via groundboom, baseline assessments also included gloves. This clarification was made in both the text and footnotes of Table 14.

6) In Table 15, for scenarios 10&11 (application of liquids via backpack sprayer and low-pressure handwand), the number of acres treated changed from 1 to 5 based on further refinements to input parameters.

7) In Table 15 for the following scenarios:

- -12(a) - application of liquid via handgun and compressed air sprayer
- - 12(b) - WDG via lawn handgun
- - 12(c) - WSP via lawn handgun
- -13 - application of granular via push-type spreader
- - 7 - application of liquids via handgun

A footnote was added which specified that these scenarios considered baseline attire plus gloves.

8) There has been harmonization between Sections IV and V with the MOA.

9) The Atrazine Water Management Information Center (AWMIC) has been changed to the Atrazine Water Information Center (AWIC). It has been changed in Chapters four and five of the IRED.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

CERTIFIED MAIL

Dear Registrants:

This is to inform you that the Environmental Protection Agency (hereafter referred to as EPA or the Agency) has completed its review of the available data and public comments received related to the preliminary and revised risk assessments for the pesticide atrazine. The public comment period on the revised risk assessment phase of the reregistration process is closed. Based on comments received during the public comment period and additional data received from the registrants, the Agency revised the human health and environmental effects risk assessments and made them available to the public on May 6, 2002. Additionally, the Agency held a Technical Briefing on April 16, 2002, where the results of the revised human health and environmental effects risk assessments were presented to the general public. This Technical Briefing concluded Phase 4 of the Public Participation Pilot Process developed by the Tolerance Reassessment Advisory Committee (TRAC), and initiated Phase 5 of that process. During Phase 5, all interested parties were invited to participate and provide comments and suggestions on ways the Agency might mitigate the estimated risks presented in the revised risk assessments. This public participation and comment period commenced on May 6, 2002, and closed on July 5, 2002.

Based on its review, EPA has identified risk mitigation measures that the Agency believes are necessary to address the human health and environmental risks associated with the current use of atrazine. The EPA is now publishing its interim decision on the reregistration eligibility of and risk management decision for the current uses of atrazine and associated human health and environmental risks. The reregistration eligibility and tolerance reassessment decisions for atrazine will be finalized once the cumulative assessment for all of the triazine herbicides is complete. The enclosed "Interim Reregistration Eligibility Decision for Atrazine" was approved on January 31, 2003, and contains the Agency's decision on the individual chemical atrazine.

The Agency is aware that several pertinent studies are being performed at this time by

researchers that may reduce some of the uncertainties in understanding potential atrazine effects on amphibian endocrinology and reproductive and developmental responses. The Agency has committed to provide these studies along with other available studies, a summary of the available data and methodologies and various data analyses for an external scientific review by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Science Advisory Panel (SAP) at a public meeting which is scheduled for June, 2003. The Agency anticipates that the results from this SAP meeting will provide significant input to enable it publish an amendment to this IRED in October 2003 which will address the issue of the potential effects of atrazine on amphibian endocrinology and development.

A Notice of Availability for this Interim Reregistration Eligibility Decision (interim RED) is being published in the *Federal Register*. To obtain a copy of the interim RED document, please contact the OPP Public Regulatory Docket (7502C), US EPA, Ariel Rios Building, 1200 Pennsylvania Avenue NW, Washington, DC 20460, telephone (703) 305-5805. Electronic copies of the interim RED and all supporting documents are available on the Internet. See http:www.epa.gov/pesticides.

The interim RED is based on the updated technical information found in the atrazine public docket. The docket includes background information and comments on the Agency's preliminary risk assessments, the Agency's April 2002 revised risk assessments for atrazine, and a document summarizing the Agency's Response to Comments. The Response to Comments document addresses corrections to the preliminary risk assessments submitted by chemical registrants and responds to comments submitted by the general public and stakeholders during the comment period on the risk assessment. The docket also includes comments on the revised risk assessment, and any risk mitigation proposals submitted during Phase 5. For atrazine, a proposal was submitted by Syngenta Crop Protection, Inc. (Syngenta), a technical registrant. Comments on mitigation or mitigation suggestions were submitted by growers, agricultural extension agents, environmental organizations, university scientists, and various other organizations.

This document and the process used to develop it are the result of a pilot process to facilitate greater public involvement and participation in the reregistration and/or tolerance reassessment decisions for pesticides. As part of the Agency's effort to involve the public in the implementation of the Food Quality Protection Act of 1996 (FQPA)**,** the Agency is undertaking a special effort to maintain open public dockets on pesticides and to engage the public in the reregistration and tolerance reassessment processes for these chemicals. This open process follows the guidance developed by TRAC, a large multi-stakeholder advisory body that advised the Agency on implementing the new provisions of the FQPA. The reregistration and tolerance reassessment reviews for atrazine are following this new process.

Please note that the atrazine risk assessment and the attached interim RED concern only this particular triazine. This interim RED presents the Agency's conclusions on the dietary and

residential risks posed by exposure to atrazine alone. The Agency has also concluded its assessment of the ecological risk, with the exception of the potential atrazine effects on amphibian endocrinology and reproductive and developmental responses, and worker risks associated with the use of atrazine. Because the FQPA directs the Agency to consider available information on cumulative risk from substances sharing a common mechanism of toxicity, such as the toxicity expressed by the triazine herbicides through a common biochemical mechanism, the Agency will evaluate the cumulative risk posed by the entire triazine class of chemicals after considering the risks for the individual triazines. The Agency is working towards completion of a methodology to assess cumulative risk and the individual risk assessments for each triazine are likely to be necessary elements of any cumulative assessment. The Agency has decided to move forward with individual assessments and to identify mitigation measures necessary to address those human health and environmental risks associated with the current uses of atrazine. The Agency will issue the final tolerance reassessment decision for atrazine and finalize decisions on reregistration eligibility once the cumulative risks for all of the triazines are considered.

This document contains a generic and/or a product-specific Data Call-In(s) (DCI) that outline(s) further data requirements for this chemical. Note that a complete DCI, with all pertinent instructions, is being sent to registrants under a separate cover. Additionally, for product-specific DCIs, the first set of required responses is due 90 days from the receipt of the DCI letter. The second set of required responses is due eight months from the date of the DCI.

The Agency has determined that atrazine is eligible for reregistration provided that all the conditions identified in this document are satisfied, including implementation of the interim risk mitigation measures outlined in Section IV of the document. This determination does not include consideration of the cumulative risk from the use of the triazines. The Agency believes that certain current uses of atrazine pose unreasonable adverse effects to human health and the environment, and that such effects can be mitigated with the risk mitigation measures identified in this interim RED. Accordingly, the Agency recommends that registrants implement these interim risk mitigation measures immediately. Section V of this interim RED describes labeling amendments for end-use products and data requirements necessary to implement these interim mitigation measures. Instructions for registrants on submitting revised labeling and the time frame established to do so can be found in Section VI of this document.

Should a registrant fail to implement any of the risk mitigation measures outlined in this document, the Agency will undertake appropriate action to address concerns about the risks posed by atrazine. Where the Agency has identified any unreasonable adverse effect to human health or the environment, the Agency must take action to address this concern. At that time, any affected person(s) may challenge the Agency's action.

If you have questions on this document or the label changes necessary for reregistration, please contact the Chemical Review Manager, Kimberly Nesci at (703) 308-8059. For questions about product reregistration and/or the Product DCI that accompanies this document, please contact Bonnie Adler at (703) 308-8523.

Sincerely,

Lois A. Rossi, Director
Special Review and
Reregistration Division

Attachment

Interim Reregistration Eligibility Decision
for
Atrazine

Case No. 0062

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Glossary of Terms and Abbreviations

AE	Acid Equivalent
a.i.	Active Ingredient
AGDCI	Agricultural Data Call-In
ai	Active Ingredient
aPAD	Acute Population Adjusted Dose
AR	Anticipated Residue
ARC	Anticipated Residue Contribution
BCF	Bioconcentration Factor
CAS	Chemical Abstracts Service
CI	Cation
CNS	Central Nervous System
cPAD	Chronic Population Adjusted Dose
CSF	Confidential Statement of Formula
CFR	Code of Federal Regulations
CSFII	USDA Continuing Surveys for Food Intake by Individuals
DCI	Data Call-In
DEEM	Dietary Exposure Evaluation Model
DFR	Dislodgeable Foliar Residue
DRES	Dietary Risk Evaluation System
DWEL	Drinking Water Equivalent Level (DWEL) The DWEL represents a medium specific (i.e., drinking water) lifetime exposure at which adverse, noncarcinogenic health effects are not anticipated to occur.
DWLOC	Drinking Water Level of Comparison.
EC	Emulsifiable Concentrate Formulation
EEC	Estimated Environmental Concentration. The estimated pesticide concentration in an environment, such as a terrestrial ecosystem.
EP	End-Use Product
EPA	U.S. Environmental Protection Agency
FAO	Food and Agriculture Organization
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FFDCA	Federal Food, Drug, and Cosmetic Act
FQPA	Food Quality Protection Act
FOB	Functional Observation Battery
G	Granular Formulation
GENEEC	Tier I Surface Water Computer Model
GLC	Gas Liquid Chromatography
GLN	Guideline Number
GM	Geometric Mean
GRAS	Generally Recognized as Safe as Designated by FDA
HA	Health Advisory (HA). The HA values are used as informal guidance to

	municipalities and other organizations when emergency spills or contamination situations occur.
HAFT	Highest Average Field Trial
HDT	Highest Dose Tested
IR	Index Reservoir
LC_{50}	Median Lethal Concentration. A statistically derived concentration of a substance that can be expected to cause death in 50% of test animals. It is usually expressed as the weight of substance per weight or volume of water, air or feed, e.g., mg/l, mg/kg or ppm.
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation). It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LEL	Lowest Effect Level
LOC	Level of Concern
LOD	Limit of Detection
LOAEL	Lowest Observed Adverse Effect Level
MATC	Maximum Acceptable Toxicant Concentration
MCLG	Maximum Contaminant Level Goal. The MCLG is used by the Agency to regulate contaminants in drinking water under the Safe Drinking Water Act.
mg/kg/day	Milligram Per Kilogram Per Day
mg/L	Milligrams Per Liter
MOE	Margin of Exposure
MP	Manufacturing-Use Product
MPI	Maximum Permissible Intake
MRID	Master Record Identification (number). EPA's system of recording and tracking studies submitted.
NA	Not Applicable
N/A	Not Applicable
NAWQA	USGS National Water Quality Assessment
NOEC	No Observable Effect Concentration
NOEL	No Observed Effect Level
NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NR	Not Required
OP	Organophosphate
OPP	EPA Office of Pesticide Programs
OPPTS	EPA Office of Prevention, Pesticides and Toxic Substances
Pa	Pascal, the pressure exerted by a force of one newton acting on an area of one square meter.
PAD	Population Adjusted Dose
PADI	Provisional Acceptable Daily Intake
PAG	Pesticide Assessment Guideline
PAM	Pesticide Analytical Method

PCA	Percent Crop Area
PCO	Pest Control Operator
PDP	USDA Pesticide Data Program
PHED	Pesticide Handler's Exposure Data
PHI	Preharvest Interval
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PRN	Pesticide Registration Notice
PRZM/ EXAMS	Tier II Surface Water Computer Model
Q_1*	The Carcinogenic Potential of a Compound, Quantified by the EPA's Cancer Risk Model
RAC	Raw Agriculture Commodity
RBC	Red Blood Cell
RED	Reregistration Eligibility Decision
REI	Restricted Entry Interval
RfD	Reference Dose
RQ	Risk Quotient
RS	Registration Standard
RUP	Restricted Use Pesticide
SAP	Science Advisory Panel
SCI-GROW	Tier I Ground Water Computer Model
SF	Safety Factor
SLC	Single Layer Clothing
SLN	Special Local Need (Registrations Under Section 24(c) of FIFRA)
TC	Toxic Concentration. The concentration at which a substance produces a toxic effect.
TD	Toxic Dose. The dose at which a substance produces a toxic effect.
TEP	Typical End-Use Product
TGAI	Technical Grade Active Ingredient
TLC	Thin Layer Chromatography
TMRC	Theoretical Maximum Residue Contribution
torr	A unit of pressure needed to support a column of mercury 1 mm high under standard conditions.
TRR	Total Radioactive Residue
UF	Uncertainty Factor
μg/g	Micrograms Per Gram
μg/L	Micrograms Per Liter
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UV	Ultraviolet
WHO	World Health Organization
WP	Wettable Powder

WPS	Worker Protection Standard

Executive Summary

EPA has completed its review of public comments concerning the revised atrazine risk assessments and is issuing its interim risk management decision for atrazine. The revised risk assessments are based on the Agency's review of available data on the currently registered uses of atrazine and public comments received during the reregistration process. The Agency invited stakeholders to provide proposals, ideas or suggestions on appropriate mitigation measures before the Agency issued its risk mitigation decision for atrazine. After considering the risks identified, public comments, and mitigation options proposed by several entities, the Agency developed its interim risk management decision for atrazine. This decision is discussed fully in this document and in a January 31, 2003, Memorandum of Agreement between the Agency and the primary technical registrant, Syngenta Crop Protection, Inc. The Agency expects the atrazine technical registrants to agree to adopt the risk management measures presented in the IRED and in the MOA. Neither the risk assessments nor the interim risk management measures include consideration of cumulative risks posed by all of the triazines and amphibian risk issues.

Atrazine is a triazine herbicide currently registered for use against broadleaf and some grassy weeds. Atrazine is currently registered for use on corn (field and sweet); guavas; macadamia nuts; sorghum; sugarcane; range grasses for the establishment of permanent grass cover on rangelands and pastures under USDA's Conservation Reserve Program (CRP) in OK, NE, TX, and OR; wheat (where application is to wheat stubble on fallow land following wheat harvests; wheat is not the target crop); conifer forests; Christmas tree farms; sod farms; golf courses and residential lawns (Southern turfgrasses). Given the specific nature of the lawn uses, much of atrazine's use on lawns is confined to Florida and the Southeast. Atrazine degrades into hydroxy compounds and chlorotriazine degradates. Atrazine was first registered in 1958 as an herbicide. Use data from 1990 to 1997 indicate that approximately 76.5 million pounds of atrazine active ingredient are used domestically each year.

The Food Quality Protection Act of 1996 (FQPA) requires that, when considering whether to establish, modify, or revoke a tolerance, the Agency consider "available information" concerning the cumulative effects of a particular pesticide's residues and other substances that have a common mechanism of toxicity with other pesticides. The Agency has classified the triazine herbicides (atrazine, simazine, and propazine) and their common chlorinated degradates as having a common mechanism of toxicity. The Agency has not yet completed its cumulative risk assessment for the triazine class, but the cumulative risks of these chemicals will be considered in the future. At that time, the Agency's final tolerance reassessment decision for atrazine and the other triazines will be issued. The Agency may need to pursue further risk mitigation for atrazine to address any risks identified in the cumulative assessment for the triazines.

Overall Risk Summary

The Agency's human health risk and ecological risk assessments for atrazine indicate risks of concern. Intermediate-term (seasonal) dietary risk from drinking water exceeds the Agency's level of concern (>100% cPAD) at the 99.9th exposure percentile for infants, children 1-6 years of age, and adults in 34 community water systems (CWS) primarily in the Midwest. Acute dietary drinking water risks, and acute and chronic dietary food risks (alone) are below the Agency's level of concern for the U.S. population and all population subgroups.

Further, there are some concerns for workers who mix, load and apply atrazine to agricultural and turf sites and for homeowners who apply atrazine products to home lawns. In addition, there are risks of concern for adults and children exposed to atrazine treated lawns after applications.

For ecological effects, the Agency has conducted a screening level assessment for terrestrial impacts and a refined exposure assessment for aquatic impacts of atrazine use. These assessments indicate that atrazine is likely to result in community- and population-level risk at 10 to 20 ppb. The ecological assessment does not address the potential for effects on amphibians endocrinology and reproductive and developmental responses. The Agency will consider amphibian risk after the Agency obtains further data and will address any risks identified in a revision to the IRED to be published by October 31, 2003.

To mitigate risks of concern posed by the uses of atrazine, the Agency considered the mitigation proposal submitted by the technical registrants, as well as comments and mitigation ideas from other interested parties, and has decided on a number of label amendments to address the dietary (drinking water), worker, and residential concerns. In addition, to further address drinking water concerns and to address ecological concerns, the Agency and the technical registrants have agreed to a performance standard for atrazine that must be met in community water systems, prohibition of use in watersheds if the standard is not met, and monitoring data requirements as described in the Memorandum of Agreement. Results of the risk assessments, the necessary label amendments to mitigate those risks, and information on the Agreement between the Agency and the technical registrants are presented in this IRED.

Dietary Risk (Food)

Acute risk estimates for food and drinking water and chronic food risk estimates do not exceed the Agency's level of concern; therefore, mitigation measures are not needed to address acute dietary risks or chronic food risk estimates.

Dietary Risk (Drinking Water)

Intermediate-term (seasonal) drinking water risk estimates do exceed the Agency's level of concern in 34 CWS primarily in the Midwest. The registrant has added three CWS to these 34 to make a total of 37 CWS that are of concern. To mitigate these risks, the Agency has determined that a performance standard that must be met in these CWS and prohibiting use in the watershed if the performance standard is not met is necessary to avoid unreasonable adverse

effects. In addition, the Agency is requiring extensive monitoring data on these CWS and other CWS that are in atrazine use areas.

To confirm that risks from atrazine in rural wells is not a concern, the Agency is requiring monitoring data for atrazine levels in rural wells in atrazine use areas.

Residential Risk

Residential and turf use results in risks of concern for children reentering treated atrazine turf and for homeowners applying product to turf using a bellygrinder.

Restrict the application of granular lawn products when using hand-held devices (e.g. belly grinder) to spot applications only.

- Prohibit applications of granular lawn products by hand
- Reduce the maximum single application rate for liquid formulations on residential lawns and turf to 1 lb ai/A from 2 lb ai/A (liquid products containing >4% ai are restricted use)
- Require that granular lawn products be watered in

Occupational Risk

Occupational exposure to atrazine is of concern to the Agency. For agricultural and turf lawn care operator uses of atrazine, several mixer/loader/applicator risk scenarios currently exceed the Agency's level of concern at baseline PPE or label PPE. The Agency has determined that a number of measures are needed to mitigate these risks, as follows:

Agricultural Uses

1) **Mixing/Loading Scenarios:**

Liquids:

- require closed systems for mixing/loading to support aerial applications at greater than 3 lb ai/A
- all mixers/loaders (including using engineering controls) must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

Wettable Powders:

- require water-soluble packaging for all WP formulations
- all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

Dry Flowables:

- water-soluble packaging optional
- if in water-soluble packaging, all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron
- if not in water-soluble packaging, mixers/loaders must wear coveralls over

long-sleeve shirt and long pants, chemical-resistant gloves, chemical-resistant footwear, and chemical-resistant apron plus a NIOSH-approved dust/mist filtering respirator with any N, R, P, or HE filter.

- if not in water-soluble packaging, aerial application is prohibited.

Granular Products:

- Loaders must wear long-sleeve shirt, long pants, shoes, and socks.

2) **Applicator and Flagger Scenarios:**

- Pilots must use enclosed cockpits (40 CFR 170.240(d)(6)) for aerial applications.
- Human flaggers supporting aerial applications must used enclosed cabs (40 CFR 170.240(d)(5)).
- Applicators applying sprays with motorized ground equipment (i.e., groundboom or rights-of-way sprayers) must wear long-sleeve shirt, long pants, shoes, socks, and chemical-resistant gloves.
- Applicators applying granular products or impregnated fertilizer must wear long-sleeve shirt, long pants, shoes, and socks.
- Restrict the impregnation of bulk fertilizer to commercial facilities (prohibit on-farm impregnation)
- Restrict the impregnation of dry bulk fertilizer to 500 tons per day for no more than 30 days per calendar year per facility
- Reduce the maximum application rate for handlers applying liquids with rights-of-way sprayers to 1.0 lb ai/A
- Reduce the maximum application rate for liquids for chemical follow to 2.25 lb ai/A
- Require a 60-day PHI for field corn forage uses
- Require a 45-day PHI for sweet corn forage uses
- Require a 60-day PHI for preemergent uses and a 45-day PHI for postemergent sorghum forage uses

Non-Agricultural Products including Lawns and Turf (not Sod Farms)

- Require that all wettable powder products be packaged in water soluble bags.
- Granular formulations: loaders, applicators, and other handlers must wear long-sleeve shirt, long pants, shoes, and socks.
- Liquid, wettable powder, dry flowable (water-dispersible granule) formulations:
  - applicators using spray equipment mounted on their backs must wear coveralls worn over long sleeved shirt and long pants, chemical-resistant gloves and chemical-resistant footwear plus socks.
  - all other mixers, loaders, applicators, and other handlers must wear long-sleeved shirt and long pants, shoes and socks, and chemical resistant gloves.
- Reduce the maximum single application rate for liquid formulations on residential lawns and turf to 1 lb ai/A from 2 lb ai/A (liquid products containing >4% ai are restricted use)
- Require that granular lawn products be watered in

The Agency does not have risks of concern for workers reentering treated fields; therefore, no mitigation is needed.

Ecological Risk

Ecological risks are also of concern to the Agency. The environmental risk assessment suggests that exposure to atrazine could result in community-level and population-level effects in aquatic communities at concentrations of 10-20 ppb atrazine.

To address these risks, the Agency has determined that an ecological assessment process to identify waterbodies at risk and monitor these waterbodies for atrazine concentrations. In addition, it may be necessary to undertake mitigation in these vulnerable ecosystems. The specifics of this ecological program will be negotiated with the technical registrants and agreed to by April 30, 2003.

The ecological assessment does not address the potential for effects on amphibian endocrinology and reproductive and developmental responses. The Agency will consider amphibian risk after the Agency obtains further data on this issue. Any risks identified will be addressed by the Agency in a revision to the IRED to be published by October 31, 2003.

Conclusions

The Agency is issuing this interim Reregistration Eligibility Decision (IRED) for atrazine, as announced in a Notice of Availability published in the Federal Register. This IRED includes guidance and time frames for implementing label changes for products containing atrazine. Note that the Agency has shortened the time period for implementation of risk mitigation measures outlined in this document and to establish monitoring programs so that the risks identified herein are addressed as quickly as possible. There is a 60-day comment period on this document. With the mitigation measures detailed in this document, the Agency has determined that, until the cumulative risks from all the triazines has been considered, most of the currently registered uses of atrazine may continue. Neither the tolerance reassessment nor the reregistration eligibility decision for atrazine can be considered final until the cumulative risk for all triazines is considered.

I. Introduction

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was amended in 1988 to accelerate the reregistration of products containing active ingredients originally registered prior to November 1, 1984. The amended Act calls for the development and submission of data to support the reregistration of an active ingredient, as well as a review of all submitted data by the U.S. Environmental Protection Agency (EPA or "the Agency"). Reregistration involves a thorough review of the scientific database supporting a pesticide's registration. The purpose of the Agency's review is to reassess the potential hazards and benefits arising from the currently registered uses of the pesticide; to determine if there is a need for additional data on benefits, health and environmental effects; and to determine whether the pesticide meets the "no unreasonable adverse effects" criteria of FIFRA.

On August 3, 1996, the Food Quality Protection Act of 1996 (FQPA) was signed into law. This Act amends the Federal Food, Drug and Cosmetics Act (FFDCA) to require reassessment of all existing tolerances. The Agency had decided that, for those chemicals that have tolerances and are undergoing reregistration, the tolerance reassessment will be initiated through this reregistration process. It also requires that by 2006, EPA must review all tolerances in effect as of August 2, 1996 (the day before FQPA was enacted). FQPA also amends the FFDCA to require a safety finding in tolerance reassessment based on several factors, including an assessment of cumulative effects of chemicals with a common mechanism of toxicity. Atrazine belongs to a group of systemic herbicides called triazines that share a common mechanism of toxicity. Agency is continuing its reregistration program while it resolves the remaining issues associated with the implementation of FQPA.

This document presents the Agency's revised human health and ecological risk assessments; its progress toward tolerance reassessment; and the interim decision on the reregistration eligibility of atrazine. It is intended to be only the first phase in the reregistration process for atrazine. The Agency will eventually proceed with its assessment of the cumulative risk of the triazine pesticides and issue a final reregistration eligibility decision for atrazine.

The implementation of FQPA has required the Agency to revisit some of its existing views relating to the determination and regulation of dietary risk, and has also raised a number of new issues that need to be addressed. These issues were refined and developed through collaboration between the Agency and the Tolerance Reassessment Advisory Committee (TRAC), a committee that was composed of representatives from industry, environmental groups, and other interested parties.

This interim Reregistration Eligibility Decision document consists of six sections. Section I contains the regulatory framework for reregistration/tolerance reassessment. Section II provides a profile of the use and usage of the chemical. Section III gives an overview of the revised human health and environmental effects risk assessments resulting from public comments and other information. Section IV presents the Agency's interim decision on reregistration eligibility and risk management decisions. Section V summarizes the label

changes necessary to implement the risk mitigation measures outlined in Section IV. Section VI provides information on how to access related documents. Finally, the Appendices list Data Call-In (DCI) information. The revised risk assessments and related addenda are not included in this document, but are available on the Agency's web page: "www.epa.gov/pesticides/reregistration," and in the Public Docket.

II. Chemical Overview

A. Regulatory History

Atrazine was first registered in 1958 as an herbicide. On November 10, 1983, a Registration Standard for atrazine was issued. This document noted the Agency's concern about the dietary carcinogenic risk from ground and surface water contamination. The Registration Standard also required the submission of generic and product-specific data to support the continued registration of atrazine products. Since the Registration Standard was issued in 1983, there have been a total of 4 DCIs issued (September 1990, September 1992, March 1995, October 1995).

In 1988, EPA issued a preliminary notification of the Agency's intention to initiate Special Review under FIFRA based on concerns regarding the carcinogenic potential of atrazine and possible risks resulting from exposure to atrazine in the diet from treated food and drinking water.

In the early 1990s, atrazine's occurrence in the environment prompted the Environmental Protection Agency's Office of Water (OW) to regulate atrazine under the Safe Drinking Water Act (SDWA). In 1991 OW established a Maximum Contaminant Level (MCL) of 3 parts per billion (ppb) for atrazine. Under the SDWA, atrazine has been subject to compliance monitoring. OW has also established a one-day Health Advisory Level (HAL) for atrazine of 100 ppb.

In the early 1990s, the registrant voluntarily instituted several risk reduction measures to address concerns raised about surface water and groundwater contamination by atrazine. In 1990, the following measures were undertaken by the registrant to address groundwater exposure concerns:

- Reduction of the application rate for corn and sorghum to 3.0 lbs ai/acre from 4.0 lbs ai/acre.
- Reduction of the maximum rate for non-cropland and total vegetation control to 10 lbs ai/acre from 40 lbs ai/acre.
- Require that postemergence applications to corn and sorghum be made before they reach 12 inches in height.
- Deletion of rangeland, proso millet, and pineapple uses.
- Prohibition of chemigation (applying atrazine through irrigation systems).
- Institution of a well-head protection plan requiring 50 foot setbacks around all wells for mixing, loading, or applying atrazine-containing products.
- Institution of construction requirements for bulk storage facilities to prevent point source contamination from spills
- Classification of all atrazine-containing products (except for the lawn care, turf, and conifer uses) as Restricted Use Pesticides (RUPs).

In 1992, the following additional measures were undertaken to address concerns about atrazine contamination of surface water sources:

- Further reduction of the total seasonal application rates for corn and sorghum to 2.5 lbs ai/acre per year. This rate includes a 1.5 lbs ai/acre per year pre-emergence use and a 1.0 lbs ai/acre per year post-emergence use.
- Deletion of all uses for total vegetation control in non-cropland.
- Expansion of restricted use criteria to include surface water concerns.
- Expansion of the setback requirements, including: a 50 foot setback around surface water sources when workers are mixing and loading atrazine-containing products; a 66 foot application (ground and aerial) setback from points of entry where field surface water runoff enters surface water sources; and, a 200 foot application setback around lakes and reservoirs.

In November 1994, EPA initiated a Special Review for the triazine pesticides (atrazine, simazine and cyanazine; 59 *FR* 60412) based on cancer risk concerns for people potentially exposed to atrazine through consumption of food and drinking water, and lawn treatments. The basis for the Special Review also included cancer risk concerns for workers exposed to atrazine in various agricultural settings and application scenarios. At the time that the Special Review was initiated, atrazine and the other triazines were classified as Group C carcinogens (possible human carcinogens).

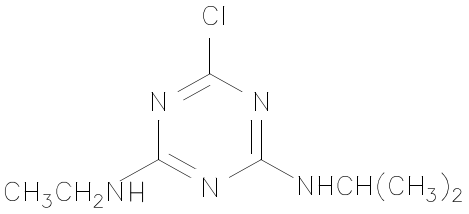
Further labeled use restrictions in 1996 reduced environmental exposure from tile-terraced fields containing standpipes, as follows:

- Restrictions against application within 66 feet of standpipes.
- A requirement that applications be incorporated to a depth of 2 to 3 inches.
- Restrictions against application to no-till fields unless practicing high crop residue management.

In August 2002, the Agency and NRDC jointly agreed to request that the court extend the deadline for the IRED to January 31, 2003 (Consent Decree (as amended) entered in Natural Resources Defense Council v. Whitman, Case Number C -99-3701 CAL, N. D. California (2002)). The new schedule includes the completion of an IRED by January 31, 2003 (this document), and a revised IRED by October 31, 2003, to consider a number of additional new studies on potential amphibian risk. The Agency also agreed to bring to the FIFRA Scientific Advisory Panel issues regarding amphibian effects and carcinogenicity.

B. Chemical Identification

- **Chemical Structure:**



- **Common name:** Atrazine
- **Chemical name:** 6-chloro-N2-ethyl-N4-isopropyl-1,3,5-triazine-2,4-diamine
- **Chemical family:** Triazines
- **Case number:** 0062
- **CAS registry number:** 1912-24-9
- **OPP chemical code:** 080803
- **Empirical formula:** $C_8H_{14}ClN_5$
- **Molecular weight:** 215.7
- **Vapor Pressure:** 40 *u*Pa at 20 °C
- **Technical registrants:** Agan Chemical Manufacturing, LTD.
  Dow AgroSciences
  Drexel Chemical Company
  Oxon Italia S.P.A.
  Platte Chemical Company Inc.
  Syngenta Crop Protection Inc.

Atrazine is a white crystalline solid with a melting point of 172-175° C, density of 0.35 g/mL, octanol/water partition coefficient (log P_{ow}) of 2.7645, and vapor pressure of 40 μPa at 20° C. Atrazine is moderately soluble in water (33 ppm at 25° C), and is soluble in octanol (0.82 g/100 mL), ether (0.86 g/100 mL), methanol (1.4 g/100 mL), ethyl acetate (2.5 g/100 mL), and chloroform (7.8 g/100 mL) at 20° C. Atrazine has four hydroxyatrazine compounds and three chlorinated atrazine compounds as metabolites. The three chlorinated metabolites are desethylated atrazine, desisopropyl atrazine, and diaminochlorotriazine (DACT).

C. Use Profile

Atrazine is a systemic triazine herbicide registered for the control of broadleaf weeds and some grassy weeds. Currently, atrazine is one of the two most widely used agricultural pesticides in the United States. An estimated average of approximately 64 to 76 million pounds of active ingredient are applied per year. Annually, 75% of all field corn, 58.5% of all sorghum, and 76% of all sugarcane grown are treated with atrazine. Most of atrazine applied to corn and sorghum is applied pre-emergence. The following information is based on the currently registered uses of atrazine that were originally being supported for reregistration. Appendix A at the end of this document presents a summary of eligible uses and revised use conditions.

Type of Pesticide: Triazine Herbicide

Summary of Use Sites:

Food: Atrazine is used on corn (field and sweet), guavas, macadamia nuts, sorghum, sugarcane, range grasses under USDA's Conservation Reserve Program (CRP), and wheat (where application is to wheat stubble on fallow land following wheat harvests; wheat is not the target crop)

Other Agricultural Sites: Atrazine is also used in conifer forests, on Christmas tree farms and on sod farms.

Residential: Atrazine is used on golf courses and residential lawns. Given the specific nature of the lawn uses, much of atrazine's use on lawns is confined to Florida and the Southeast.

Other Sites: Atrazine in used on range grasses for the establishment of permanent grass cover on rangelands and pastures under the Conservation Reserve Program (CRP) in four states: OK, NE, TX, and OR.

Public Health: None

Target Pests: Broadleaf and some grassy weeds.

Formulation Types Registered:

Formulated as a flowable concentrate, a water dispersable granular (dry flowable), a ready-to-use product, and a granular.

Method and Rates of Application:

Equipment: Atrazine may be applied by groundboom sprayer, aircraft, tractor-drawn spreader, rights-of-way sprayer, low pressure handwand, backpack sprayer, lawn handgun, push-type spreader, and bellygrinder.

Rates**:** Maximum application rates range from 0.4 lb ai/A or lb ai/gal to 4.0 lb ai/A or lb ai/gal (conifer forests, sugarcane, Christmas tree farms, sod farms (FL), Bermuda grass highway rights-of-way). The number of maximum allowable applications ranges between 1 and 4 per season or year, when specified.

Timing:

Sugarcane: Applications to sugarcane are usually at planting (fall), in the spring after emergence, and an additional post-emergence application (often at layby (canopy closure)). However, these later applications are only used if pest pressure dictates need. Also, ratoon crops may face heavier weed pressure, and therefore additional applications are more likely during ratoon crops.

Corn: Applications to corn are most often pre-emergence (mid-April through mid-May in the major corn growing areas). Post-emergence applications are most likely to occur up to the end of June, until corn reaches 12" in height. There will be some variability in timing based on geographical regions.

Sorghum: Applications to corn are most often pre-emergence (mid-June to mid-July in the major sorghum growing areas). Post-emergence applications are most likely to occur up to the end of August. There will be some variability in timing based on geographical regions.

Use Classification: Most atrazine products are restricted use pesticides.

D. Estimated Usage of Pesticide

This section summarizes the best estimates of available pesticide usage information for atrazine from 1990 to 1997. A full listing of all uses of atrazine, with the corresponding use and usage data for each site, has been completed and is in the January 10, 2001 "Quantitative Usage Analysis for Atrazine" document available in the public docket and on the internet. The data, reported on an aggregate and site basis, reflect annual fluctuations in use patterns as well as the variability in using data from various information sources.

Estimates for total annual domestic use of atrazine averages approximately 76.5 million pounds of active ingredient. Crops with the highest weighted average percent crop treated are corn (75%), sugarcane (76%), sorghum (58.5%), sweet corn (processed) (58%) and sweet corn (fresh) (49%). In terms of pounds applied, corn (83%), sorghum (10%), and sugarcane (3%) account for the greatest use. Less than 2% of atrazine is believed to be applied in forestry, turf or other non-agricultural uses.

Table 1. Atrazine Estimated Usage for Representative Sites

Crop	Pounds Active Ingredient Applied (000) (Wt. Avg.)[1]	Estimated Maximum % Crop Treated	Weighted Average Percent Crop Treated
Food Crops			
Sweet Corn, Fresh	160	59.9	49.5
Sweet Corn, Processed	250	64.6	58.2
Sorghum	7,790	73.7	58.5
Corn	63,800	84.0	75.0
Winter Wheat	300	1.1	0.6
Sugar Cane	2550	95	76.0
Non-Food Crops			
Hay	150	0.7	0.4
Pasture	46	0.1	0.0
Summer Fallow	8	0.1	0.1
Woody Ornamentals	140	na	na
Forestry	48	na	na
Turf - Lawn Care Operators	600	na	na
Sod	160	na	na
Golf Courses	78	na	na

[1] Weighted Average is based on data for 1990-1997; the most recent years and more reliable data are weighted more heavily. Based on USDA/NASS and EPA proprietary data.

III. Summary of Atrazine Risk Assessments

The following is a summary of EPA's revised human health and ecological risk findings and conclusions for the triazine herbicide atrazine. These findings and conclusions are fully presented in the following documents, available on EPA's web page at www.epa.gov/pesticides and in the public docket:

- Reregistration Eligibility Science Chapter for Atrazine - Environmental Fate and Effects Chapter (April 22, 2002);
- Atrazine: HED's Revised Human Health Risk Assessment for the Reregistration Eligibility Decision (April 16, 2002);
- Addendum and corrections to Occupational and Residential Exposure Chapter for Atrazine (May 23, 2002); and
- Atrazine: Addendum to Revised Human Health Risk Assessment for the Reregistration Eligibility Decision (RED) (January 31, 2003).

These risk assessments for atrazine were presented at a Technical Briefing held on April 16, 2002, and followed by an opportunity for public comment on risk management. The risk assessments presented here form the basis of the Agency's risk management decision for atrazine only; the Agency must consider a cumulative assessment of the risks of all triazine pesticides before any final decisions can be made.

A. Human Health Risk Assessment

EPA issued its preliminary human health risk assessment for atrazine and its metabolites on February 14, 2001 (Phase 3 of the TRAC process). In response to comments and studies submitted during Phase 3, the risk assessment was updated and refined, and released on May 6, 2002. In addition, any new Agency policies were incorporated as appropriate. Major revisions to the human health risk assessment are listed below:

- Revisions to the occupational and residential risk assessments to incorporate more recent data and information received in the response to comments.
- Revisions to the dietary drinking water risk assessment to include additional monitoring data received from the registrant.
- A decision not to require tolerances for hydroxyatrazine.

Exposure scenarios considered in the human health assessment are acute, intermediate-term, and chronic dietary exposure through food plus drinking water; short-term residential exposures from residential applications of atrazine; acute, chronic, and short-term aggregate exposure from all sources (food, drinking water, and residential); and short and intermediate-term occupational exposures.

In the risk assessments presented in this document, the toxicity of atrazine and its chlorinated metabolites are considered to be equivalent; therefore, the risks associated with

exposure to atrazine and its chlorinated metabolites are presented together. The toxicity of the metabolite hydroxyatrazine is considered to be independent of the effects of atrazine; thus, the risks from exposure to hydroxyatrazine are presented independently.

1. Dietary Risk From Food

a. Toxicity and Carcinogenicity

1) Atrazine and the Chlorinated Metabolites

The atrazine toxicity database is extensive. The Agency has reviewed these toxicity studies and has a high degree of confidence in the scientific quality of the toxicity studies conducted with atrazine. Special studies examining the toxicology of atrazine have been performed by the registrant in addition to the required guideline studies. Additionally, EPA's National Health and Environmental Effects Laboratory (NHEERL) has performed studies investigating atrazine's neuroendocrine mode of action and related reproductive and developmental effects.

For the purposes of this risk assessment, the toxicity of atrazine's chlorotriazine metabolites is considered to be equivalent to that of parent atrazine and exposure to those metabolites may occur. Therefore, the chlorotriazine metabolites are included in the atrazine human health risk assessment.

In accordance with the 1999 Interim Guidelines for Carcinogen Risk Assessment, EPA's Cancer Assessment Review Committee (CARC) classified atrazine as "not likely to be carcinogenic to humans". As summarized by the FIFRA Scientific Panel (SAP), "there are considerable differences between hypothalamic-pituitary-ovarian function in rats and humans, and the effects of aging on the function of the axis also is quite dissimilar. Therefore, it is unlikely that the mechanism by which atrazine induces mammary gland tumors in female SD rats could be operational in humans. Nevertheless, it is not unreasonable to expect that atrazine might cause adverse effects on hypothalamic-pituitary function in humans" (SAP, 2000). Although the cancer mode of action may not be operative in humans, the SAP further to state that the same endocrine perturbations that induce tumors also appear to play a role in at least some reproductive developmental effects (not associated with reproductive aging) which may be relevant to humans. The Agency also concluded that the cancer mode of action is not relevant to humans. Consequently, a quantitative cancer risk assessment was not conducted for atrazine. However, EPA agreed in the August 2002 amendment to the Consent Decree in *NRDC v. Whitman* to present to the SAP data concerning atrazine exposure and prostrate or other cancers in humans that had been received by EPA after the May 2002 risk assessment but prior to February 28, 2003. Any risks identified will be addressed in the revised Atrazine IRED to be issued by October 31, 2003.

As indicated above, the cascade of events triggered by atrazine leading to mammary gland tumors in female SD rats are not expected to occur in humans given the species difference

in reproductive aging. However, the potential for disruption of the hypothalamic pituitary axis and consequent attenuation of the LH surge leading to other health consequences not associated with reproductive aging (e.g., delay in pubertal development) can not be dismissed. Thus, EPA has determined that the triazine pesticides (with a common mechanism group of atrazine, propazine, simazine and their chlorometabolites) have common mechanism of suppression of LH surge and consequent developmental and reproductive effects. It is expected that EPA will complete a preliminary cumulative risk assessment in the winter of 2005; this is contingent on completion of the IREDs for the individual chemicals.

2) Hydroxyatrazine

Atrazine is metabolized to hydroxyatrazine by plants and bacteria. Animals do not metabolize atrazine to hydroxyatrazine; however, they may receive hydroxyatrazine in their diets through forages and fodders.

A limited toxicology database for hydroxyatrazine compounds is available. Hydroxyatrazine appears to be less acutely toxic than the parent atrazine. The only effects seen in any of the submitted studies that may be attributable to a single dose were developmental alterations in the developmental rat study. The developmental alterations seen in this study were seen only at the high dose, were few in number, and were deemed to be not of toxicological significance. Thus, the Agency did not select an acute endpoint for hydroxyatrazine, and concludes that no toxicologically significant endpoint to represent a single exposure can be found in the toxicology database for hydroxyatrazine. Hydroxyatrazine has not been classified as to its carcinogenic potential by the Agency.

Further details on the toxicity of atrazine and its chlorinated and hydroxy metabolites can be found in the April 16, 2002, Revised Human Health Risk Assessment; the January 31, 2002, Addendum to the Revised Human Health Risk Assessment; and all supporting documents. An overview of the studies and safety factors used for the dietary risk assessment is outlined in Table 2.

b. FQPA Safety Factor

The FQPA safety factor is intended to provide up to an additional 10-fold safety factor (10X) to account for potential pre- and post-natal toxicity and the completeness of the data with respect to exposure and toxicity to infants and children.

1) Atrazine and the Chlorinated Metabolites

The FQPA Safety Factor of 10x was retained for atrazine and its chlorinated metabolites to protect the safety of infants and children in assessing risk from dietary (food and drinking water) exposures.

The Agency concluded that, as to dietary risk, the default 10x FQPA safety factor is

required because of the absence of reliable evidence showing that a different safety factor would be protective of infants and children. The principal grounds for this conclusion are:

- residual concerns for the effects of the neuroendocrine mode of action described for atrazine on the development of the young. These concerns could not be accounted for in the determination of toxicity endpoints and traditional uncertainty factors to be used in risk assessment; and,

- residual concerns with regard to the drinking water exposure assessment. The various water monitoring data sources that exist for atrazine and its chlorinated metabolites indicate that exposure via drinking water sources is high in some of the systems that have been monitored. In addition, widespread low levels are commonly detected. Limitations in the extent, frequency, and compounds tested for in the monitoring data raise significant uncertainties regarding the level of exposure to atrazine and its metabolites.

The 10X FQPA safety factor is being applied across all aggregate risk assessments based on estimated dietary exposures for all populations considered in these risk assessments.

For residential exposures, the FQPA safety factor was reduced to 3x. This is considered adequate to protect the safety of infants and children in assessing residential exposure and risks because the exposure concerns for drinking water included in the 10x FQPA safety factor for dietary exposure do not apply to residential exposure scenarios, although the concerns for the effect of the neuroendocrine mode of action on the development of the young remain. The assumptions inherent to the Agency's residential risk estimates based on screening-level procedures are conservative and protective. The 3x FQPA safety factor is being applied across all aggregate risk assessments based on estimated residential exposures for all populations considered in these risk assessments.

2) Hydroxyatrazine

The FQPA Safety Factor of 10x was removed for atrazine's hydroxymetabolites for the following reasons:

- There was no evidence of increased susceptibility in the prenatal developmental toxicity study in rats with hydroxyatrazine;

- There is no evidence of neurotoxicity from the submitted toxicity studies;

- The neuroendocrine effects described for atrazine are postulated to be part of a cancer mode of action for atrazine. Because hydroxyatrazine is non-carcinogenic, the current belief is that the neuroendocrine effects described for atrazine are not occurring following hydroxyatrazine exposure;

- The dietary and non-dietary exposure assessments do not underestimate the potential

exposures for infants and children; and

- The drinking water exposure concerns expressed for atrazine and the chlorinated metabolites do not apply to hydroxyatrazine, given its dissimilar toxicological profile and environmental fate properties that indicate that hydroxyatrazine is less mobile in soil/water systems.

c. Population Adjusted Dose

The population adjusted dose (or PAD) is a term that characterizes the dietary risk of a chemical. The PAD reflects the Reference Dose (RfD), either acute or chronic, that has been adjusted to account for the FQPA safety factor (i.e., RfD/FQPA safety factor). The RfD is calculated by taking the no observed adverse effect level (NOAEL) from an appropriate study and dividing it by an uncertainty factor (i.e., NOAEL/UF). Acute and chronic PADs are equivalent to the acute and chronic RfDs divided by 10, respectively. A risk estimate that is less than 100% of the acute PAD (aPAD) or chronic PAD (cPAD) does not exceed the Agency's level of concern. In the case of atrazine, the FQPA safety factor of 10x was retained for dietary exposures; therefore, the RfD is ten times greater than the PAD. The PADs are presented in Tables 2 and 3 below for atrazine and hydroxyatrazine, respectively.

Table 2. Summary of Toxicological Endpoints and Other Factors Used in the Dietary Risk Assessment of Atrazine and Its Chlorinated Metabolites

Exposure Scenario	Dose (mg/kg/day)	UF	FQPA SF	Endpoint	Study
Acute Dietary (females 13 to 50 yrs old)	NOAEL= 10 LOAEL = 70	100	10	Delayed ossification of certain cranial bones in fetuses, decreased body weight gain in adult	Developmental toxicity study in rat & rabbit (weight of evidence from four studies)
	Acute RfD = 0.1 mg/kg/day **Acute PAD** = 0.01 mg/kg/day				
Intermediate and Chronic	NOAEL = 1.8 LOAEL = 3.65	100	10	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge study-Rat
	Chronic RfD = 0.018 mg/kg/day **Chronic PAD** = 0.0018 mg/kg/day				

UF = Uncertainty Factor (100 is the result of a 10x for interspecies variability and 10x for intraspecies extrapolation); SF=Safety Factor; PAD = Population Adjusted Dose

Table 3. Summary of Toxicological Endpoints and Other Factors Used in the Human Dietary (Food) Risk Assessment of Hydroxyatrazine, a Metabolite of Atrazine

Exposure Scenario	Dose (mg/kg/day)	UF[1]	FQPA SF[1]	Endpoint	Study
Acute Dietary	None selected	na	na	An appropriate endpoint attributable to a single dose was not identified (no toxic effect seen)	None selected
	Acute RfD = Not Established				
Chronic Dietary	NOAEL = 1.0 LOAEL = 7.75	100	1	Histopathological lesions of the kidneys	Combined chronic toxicity/ carcinogenicity -Rat
	Chronic RfD = 0.01 **Chronic PAD** = 0.01 mg/kg/day				

UF = Uncertainty Factor (100 is the result of a 10x for interspecies variability and 10x for intraspecies extrapolation); SF=Safety Factor; PAD = Population Adjusted Dose

d. Exposure Assumptions

The Agency conducts dietary (food) risk assessments using the Dietary Exposure Evaluation Model (DEEM™). DEEM incorporates consumption data generated in USDA's Continuing Survey of Food Intake by Individuals (CSFII), 1989-92. For the assessment of dietary exposure to residues of atrazine, monitoring data generated through the USDA Pesticide Data Program (PDP) and through the Food and Drug Administration (FDA) Surveillance Monitoring Program were used for wheat grain. Anticipated residue values from crop residue field trial studies and information from metabolism studies were used for most crops. For guava, tolerance level residues were used.

For acute probabilistic dietary (food) risk assessments, the entire distribution of single-day food consumption events is combined with a distribution of residues to obtain a distribution of exposure in mg/kg/day. Chronic dietary (food) risk assessments use the three day average of consumption for each subpopulation combined with residues in commodities to determine average exposure in mg/kg/day.

e. Food Risk Characterization

Generally, a dietary (food) risk estimate that is less than 100% of the acute or chronic PAD does not exceed the Agency's risk concern. Acute and chronic risk estimates from exposures to food associated with the use of atrazine did not exceed the Agency's level of concern.

1) Atrazine and Its Chlorinated Metabolites

The percent acute PAD value for the relevant population subgroup considered under the acute risk assessment, females 13 to 50 years old, is less than 1 at the 99.9th percentile of exposure. The percent chronic PAD values for all exposed population subgroups were less than 1, as well. These estimates of risk based on one-day and long-term exposures to atrazine and its chlorinated metabolites from residues on food alone are below the Agency's level of concern.

2) Hydroxyatrazine

No acute toxicological endpoint was identified for hydroxyatrazine; therefore, an acute risk assessment for hydroxyatrazine and the hydroxylated metabolites was not conducted. The percent chronic PAD values were less than 1 for all population subgroups considered in the risk assessment. Therefore, estimates of risk based on long-term exposures to hydroxyatrazine from residues on food alone are below the Agency's level of concern.

2. Dietary Risk from Drinking Water

Exposure to pesticides from drinking water can occur through residues in ground water and surface water. In the assessment for atrazine, EPA considers both acute (one day), intermediate-term (seasonal), and chronic (annual) exposures to residues in drinking water risks and uses actual monitoring data to characterize those risks.

Drinking water risk from the application of atrazine is assessed based on exposures to combined residues of atrazine and the chlorinated metabolites. These are the only atrazine-related compounds expected to occur in drinking water in significant quantities. Extensive monitoring data are available for atrazine parent in finished drinking water, and some monitoring data are available for the chlorinated metabolites. This monitoring data is the basis for the Agency's drinking water risk assessment. To estimate the levels of chlorinated metabolites in areas where monitoring data is not available for those metabolites, the Agency developed a model based on the available monitoring data which the Agency believes provides a reasonable estimate of the levels of the chlorinated metabolites that could be expected in drinking water.

A qualitative assessment of exposure to the hydroxy metabolites of atrazine in drinking water has been conducted by the Agency. Exposure to these compounds is expected to be significantly less than exposure to atrazine and the chlorinated metabolites based on the characteristics of these metabolites. Therefore, the Agency has not included the hydroxy metabolites in its quantitative risk assessment for drinking water

Risk estimates for exposures to residues of atrazine and its chlorinated metabolites in drinking water are provided for populations receiving their drinking water from community water systems (CWS) using surface water, CWS using groundwater; and individual rural wells located in atrazine use areas. Exposure assessments were conducted for about 33 percent of the CWS using surface water in the United States, serving approximately 65 million people in 31 atrazine use states. These CWS represent about 99% of atrazine use. The Agency uses

monitoring data for finished (i.e., treated) drinking water in the assessment presented here.

The Agency initially conducted a deterministic (screening-level) drinking water risk assessment for atrazine and its chlorinated metabolites. The initial assessment identified specific CWS and rural wells as having concentrations of atrazine and its chlorinated metabolites above the Agency's level of concern. The CWS of concern were assessed probabilistically to refine the risk estimates; insufficient data were available to refine the risk estimates for rural wells.

a. Drinking Water Levels of Comparison (DWLOC)

To determine the maximum allowable contribution of water containing pesticide residues permitted in the diet, EPA first looks at how much of the overall allowable risk is contributed by food (and if appropriate, residential uses) then determines a "drinking water level of comparison" (DWLOC) to determine whether modeled or monitoring levels exceed this level. The Agency uses the DWLOC as a surrogate to capture risk associated with exposure from pesticides in drinking water. The DWLOC is the maximum concentration in drinking water that, when considered together with dietary (food) exposure, does not exceed a level of concern. Calculated DWLOCs are presented in Table 4 below.

The results of the Agency's drinking water analysis are summarized here. Details of this analysis are found in the HED Human Health Risk Assessment dated April 16, 2002, the EFED Environmental Risk Assessment dated April 20, 2002.

Table 4. Summary of Lowest DWLOC Values for Atrazine and Its Chlorinated Metabolites

Population Subgroup	DWLOC (ppb)	
	Acute (One Day) Exposure	Intermediate (Seasonal) and Chronic (Annual) Exposure
General Population	not available	68
Infants < 1 year old	not available	12.5
Children 1 to 6	not available	23
Children 7 to 12	not available	53
Females 13 to 50	298	60
Males 13 to 19	not available	68
Males 20 and over	not available	68
Seniors	not available	68

1) Community Water Systems (CWS) Using Surface

Water

a) Acute Risk

Based on the Agency's deterministic assessment, the measured maximum one-day concentrations of atrazine plus estimates of the chlorinated metabolites in drinking water do not exceed the Agency's level of concern for acute effects, regardless of source, for any relevant population subgroup.

Based on the Agency's screening-level deterministic assessment, one-day concentrations less than the DWLOC of 298 ppb do not exceed the level of concern for acute effects. The maximum measured concentration of atrazine and its chlorinated metabolites in any CWS monitoring for atrazine from 1993 to 1998 was 89 ppb.

b) Intermediate-Term (Seasonal) and Chronic (Annual) Risk

As stated previously, the drinking water concerns expressed for atrazine and its chlorinated metabolites do not apply to hydroxyatrazine because of its toxicology profile and environmental fate profile.

Under the Agency's screening-level assessment for intermediate-term and chronic exposures to atrazine and its chlorinated metabolites, 34 out of the 3670 CWS assessed were above the Agency's level of concern based on a comparison of average seasonal concentrations to the chronic infant DWLOC of 12.5 ppb. These CWS were identified with quarterly average concentrations of chlorotriazines above levels of concern for infants in one, two, or three years between 1993 and 2001. In addition, several of the 34 had annual average concentrations above the levels of concern for children 1 to 6 years old and adults.

A probabilistic exposure assessment was conducted for 39 CWS, most of which were identified as being of concern under the screening-level assessment, as listed above. Risk estimates based on a probabilistic exposure assessment that estimated 90-day average exposures to atrazine and the chlorinated metabolites indicate that 34 CWS have seasonal concentrations that exceed levels of concern for infants at the 99.9th percentile of exposure.

In total, 34 CWS serving ~230,000 to 240,000 people had 90-day average exposures that exceeded levels of concern for infants in one, two, three, or four years between 1993 and 2001. Risk estimates for these CWS ranged from 100% to 670% of the chronic PAD for infants at the 99.9th percentile of exposure, and several exceeded levels of concern for children 1 to 6 years old and adults as well. The CWS identified and the cPADs for these systems are listed in Table 5 below.

Table 5. Risk Estimates for High Seasonal Exposures to Atrazine in Finished Drinking Water at the 99.9th Percentile of Exposure* (Calandex™)

Community Water System (City/State)	Infant % cPAD	Children 1 - 6 % cPAD	Adult % cPAD
Chariton, IA	235	<100	<100
Sorento, IL	183	<100	<100
Flora, IL	211	<100	<100
W. Salem, IL	189	100	<100
Farina, IL	189	<100	<100
White Hall, IL	278	117	<100
Carlinville, IL	128	<100	<100
Gillespie, IL	550	222	172
Hettick, IL	544	222	172
Shipman, IL	<100	<100	<100
Palmyra-Modesto, IL	350	155	111
N. Otter Twp ADGPTV, IL	189	<100	<100
Kinmundy, IL	150	<100	<100
Salem, IL	528	267	200
Centralia, IL	255	100	<100
Hillsboro, IL	272	117	<100
Louisville, IL	344	122	<100
North Vernon, IN	200	117	<100
Omaha, IL	250	111	<100
Holland, IN	244	128	<100
Batesville, IN	261	111	<100
Scottsburg, IN	267	150	105
Lewisburg, KY	317	128	<100
Marion, KY	317	128	<100
Iberville, LA	261	117	<100
Dearborn, MO	555	228	155
Bucklin, MO	250	100	<100
Vandalia, MO	189	105	<100
Sardinia, OH	667	305	205
Delaware, OH	155	<100	<100

Community Water System (City/State)	Infant % cPAD	Children 1 - 6 % cPAD	Adult % cPAD
Clermont County, OH	144	<100	<100
Williamsburg, OH	289	122	<100
Mt. Orab, OH	200	<100	<100
Newark, OH	111	<100	<100

The Agency notes that the Shipman reservoir no longer serves as a drinking water source; in 1999 the town of Shipman was switched to an alternative source of drinking water. The drinking water source at White Hall was switched from surface water to groundwater in 1997. It is the Agency's understanding that Hettick, IL is also in the process of defining a new source for their drinking water needs and will close down the Hettick reservoir in the next couple of years.

The seasonal pulses of atrazine and the chlorinated metabolites detected in monitoring data that resulted in exposures above the Agency's level of concern spanned from several weeks to several months. Typically, for the year with exposures of concern, pulses lasted from early spring through the summer and into the fall, and some CWS had high pulses almost all year long. The higher concentrations occurring in the spring and early summer influence the 90-day average concentrations all year long.

2) Groundwater

Risk estimates based on screening-level assessments for 14,500 CWS using groundwater (~33 percent of groundwater CWS in the U.S.) do not exceed the Agency's level of concern for acute or chronic effects.

Data to estimate concentrations of the chlorinated metabolites of atrazine in these CWS using groundwater in 21 major atrazine use states have been developed. The highest concentration of atrazine and the chlorinated metabolites measured in any CWS in the data set was ~11 ppb. The 99th percentile concentration value for chlorotriazines in CWS with prior detections of atrazine was 1.9 ppb. Both the maximum measured value and the 99th percentile value are less than the acute DWLOC of 298 ppb, and do not exceed the Agency's level of concern for acute effects.

The 50th percentile concentration value was 0.180 ppb for CWS with prior detections. The mean concentration value at the 95 percent upper confidence bound was 0.55 ppb for CWS with prior detections. Both are less than the lowest intermediate-term to chronic DWLOC of 12.5 ppb, and do not exceed the Agency's level of concern for chronic effects.

The Agency believes that CWS using groundwater are not impacted as heavily by atrazine use as CWS using surface water.

3) Domestic Rural Wells

Approximately 10% of the U.S. population receives their drinking water from rural wells, cisterns or springs. These sources of drinking water are not regulated under the SDWA. Acute exposures to atrazine and the chlorinated metabolites in drinking water from rural wells do not exceed the Agency's level of concern. The maximum measured concentration of atrazine plus the chlorinated metabolites in the rural drinking water wells in atrazine use areas monitored by the registrant was 18 ppb; much less than the acute DWLOC (females 13 to 50) of 298 ppb. In addition, chronic exposures of adult populations using rural wells for drinking water do not exceed the Agency's level of concern.

However, the Agency has some concerns for chronic exposures of infants and children drawing drinking water from rural wells located directly in atrazine use areas, i.e., adjacent to fields where atrazine was used. Eight wells out of 1505 wells monitored had residues of atrazine and the chlorinated metabolites approaching, equal to, or greater than the chronic DWLOC (infants <1 year old) of 12.5 ppb. The 1505 wells monitored were selected based on their location in areas with high atrazine use. Of these, eight wells were resampled in March 2001, one sample per well. All samples showed concentrations of atrazine and the chlorinated metabolites less than the DWLOC of 12.5 ppb.

Although the data indicate that levels are decreasing in these wells over time, the Agency continues to have uncertainty regarding subchronic and chronic exposures of infants using private rural wells in close proximity to atrazine use areas for the several reasons. It is difficult to interpret typical exposures in rural wells close to atrazine use areas based on two samples taken many years apart. There are approximately 13 million drinking water wells in the U.S., thus, the rural well survey (1,505 wells) is inadequate to fully assess exposures to the entire U.S. population that uses rural wells for drinking water. And finally, limited sampling from the wells in the survey results in a high level of uncertainty regarding exposures to atrazine and the chlorotriazine metabolites for the population using rural wells for drinking water.

2. Residential Risk

Atrazine is registered for use by homeowners to control weeds in turf grass. Homeowners mixing, loading, and applying atrazine products to their lawns may be exposed to atrazine through their skin and by inhaling dusts or sprays during application. Residential exposures are only applicable for those regions of the United States where atrazine is used on turf grass, generally the Southeast (including Florida).

Adults or children can also be exposed to atrazine after application has occurred through contact with treated lawns or other turf areas (i.e., golf courses). In this instance, inhalation exposures are not expected; however, post-application dermal exposures for homeowners and children (yard work, walking, playing, crawling) and incidental oral exposure for toddlers are possible. Exposure data are not available on atrazine's chlorinated metabolites and hydroxy metabolites; however, residues of the chlorinated metabolites and hydroxy metabolites are not expected to occur on the surfaces of plants. Therefore, any residential exposure to these metabolites would be minimal, and risks were not assessed.

The Agency recognizes that there may be concerns for the potential for children's exposure in the home as a result of agricultural uses of atrazine. Environmental concentrations of atrazine in homes may result from spray drift, track-in, or from redistribution of residues brought home on the farmworker's clothing. Potential routes of exposure for children may include incidental ingestion and dermal contact with residues on carpets/hard surfaces. Studies are currently being pilot-tested that will look for sources of major pesticide exposure (including exposure to atrazine) and will attempt to quantify these exposures.

Risk for all of the potentially exposed populations is measured by a Margin of Exposure (MOE). A MOE determines how close the amount of residue that individuals are exposed to come to a No Observed Adverse Effect Level (NOAEL), whether exposures are from the use of a pesticide or from pesticide residues after application. For atrazine, MOEs greater than 300 (10 interspecies uncertainty x 10 intraspecies variability x 3 FQPA) do not exceed the Agency's level of concern.

a. Toxicity

The toxicity of atrazine is integral to assessing the residential risk. The toxicological endpoints and other factors used in the residential risk assessment for atrazine are described below and summarized in Table 6.

As mentioned earlier, the FQPA safety factor for residential exposures was reduced to 3x. This is considered adequate to protect the safety of infants and children in assessing residential exposure and risks because the uncertainties relating to drinking water exposure and the existing monitoring data included in the 10x FQPA safety factor for dietary exposure do not apply to residential exposure scenarios. Concerns for the effect of the neuroendocrine mode of action on the development of the young remain. The assumptions inherent to the Agency's residential risk estimates based on screening-level procedures are conservative and protective. The 3x FQPA safety factor is being applied across all aggregate risk assessments based on estimated residential exposures for all populations considered in these risk assessments.

Table 6. Summary of Toxicological Endpoints and Other Factors Used in the Atrazine Residential Human Health Risk Assessment

Exposure Scenario	Dose (mg/kg/day)	UF[1]	FQPA Safety Factor	Endpoint	Study
Oral, Short-Term	NOAEL= 6.25 LOAEL = 12.5	100	3	Delayed preputial separation in male offspring after 30 days of dosing.	Pubertal assay (30-day) NHEERL published literature
Oral, Intermediate-Term	NOAEL = 1.8 LOAEL = 3.65	100	3	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge- Rat

Table 6. Summary of Toxicological Endpoints and Other Factors Used in the Atrazine Residential Human Health Risk Assessment

Exposure Scenario	Dose (mg/kg/day)	UF[1]	FQPA Safety Factor	Endpoint	Study
Dermal, Short-Term[a]	NOAEL= 6.25 LOAEL = 12.5	100	3	Delayed preputial separation in male offspring after 30 days of dosing. Use of the dermal penetration factor yields a dose of 104 mg/kg/day.	Pubertal assay (30-day) NHEERL published literature
Dermal, Intermediate- and Long-Term[b]	NOAEL= 1.8 LOAEL = 3.65	100	3	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge- Rat
Inhalation, Short-Term [c]	NOAEL= 6.25 LOAEL = 12.5	100	3	Delayed preputial separation in male offspring after 30 days of dosing.	Pubertal assay (30-day) NHEERL published literature
Inhalation, Intermediate and Long-Term[c]	NOAEL= 1.8 LOAEL = 3.65	100	3	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge-Rat

[1]UF = Uncertainty Factor (100 is the result of a 10x for interspecies variability and 10x for intraspecies extrapolation)
a = The NOAEL of 6.25 mg/kg/day is multiplied by a 3.6 dermal penetration factor.
b = 6% dermal absorption factor for route-to-route extrapolation.
c = 100% absorption factor for route-to-route extrapolation.
Residential = A MOE of 300 is required and includes the 3x FQPA Safety Factor

b. Exposure Assumptions

Residential exposures to atrazine are expected to be short-term in duration (1 to 30 days), based on label directions that specify no more than two applications of atrazine to home lawns. Exposures greater than 30 days are not expected because no currently registered residential use products would result in exposures of this duration due to the use pattern and turf residue dissipation data on atrazine.

Chemical-specific exposure data, including a Turf Transferable Residue study on atrazine, and data on residential handlers applying granular and liquid formulations submitted by the Outdoor Residential Exposure Task Force (ORETF) were used to assess the exposure to atrazine as a result of residential application. In addition, analyses were performed using the unit exposure values in the *Pesticide Handlers Exposure Database* (PHED), Version 1.1 (August 1998) and using standard assumptions (average body weight, work day, daily areas treated, volume of pesticide used, etc.).

The quality of the data and exposure factors represents the best sources of data currently

available to the Agency for completing these kinds of assessments. For example, if appropriate chemical-specific exposure data are available for atrazine, those data are used instead of the more generic PHED data. The quality of the data used for each scenario assessed, standard procedures, and any assumptions made are further discussed in the April 16, 2002, Revised Human Health Risk Assessment; the August 2002 Revised Occupational and Residential Risk Assessment; and the January 31, 2003, Addendum to the Revised Human Health Risk Assessment available in the public docket and online.

Anticipated use patterns and application methods, range of application rates, and area of lawn treated per day were derived directly from current atrazine labels for residential products. Application rates specified on atrazine labels for residential uses range up to 2 pounds of active ingredient per acre on residential turf.

The Agency also considered exposure to adults or children entering or playing on treated lawns or entering homes after application of atrazine products (post-application exposure). These activities are expected to result in short-term exposure (1 to 30 days), based on atrazine turf residue dissipation data and atrazine's residential use pattern. These data show that atrazine has a half-life on turf of up to 5 days after spraying or 9 days after granular application, and requires several weeks to dissipate. However, the Agency does not expect exposures greater than 30 days, even considering the slow dissipation rates, because the label prohibits application more than twice per year.

Residential post-application exposure assessments assumed residents wear the following attire: short sleeved shirt, short pants, shoes and socks, and no gloves.

c. Residential Applicator Risk

The anticipated use patterns and current labeling for atrazine homeowner products indicate 5 major exposure scenarios for residential applicators, as follows:

(1) mixing/loading/applying liquid formulations using a backpack sprayer,
(2) mixing/loading/applying liquid formulations for application with a low pressure handwand,
(3) mixing/loading/applying liquid formulations for hose-end sprayer,
(4) loading/applying granular formulations with a push type spreader, and
(5) loading/applying granular formulations with a bellygrinder.

The Agency does not believe the addition of personal protective equipment (PPE) to residential handlers (as used for assessing occupational handler risk) is appropriate for homeowner handler exposure assessments. Homeowners often lack access to PPE and do not possess expertise in the proper use of PPE. As a result, homeowner handler assessments are completed using a single scenario based on the use of short-sleeved shirts and short pants, common homeowner attire during the pesticide application season. In addition, as mentioned above, only short-term exposures were assessed, as the Agency does not believe homeowners who apply atrazine will be exposed for more than a few consecutive days.

All of the residential handler exposure scenarios considered in the risk assessment, with the exception of the scenario for application of granular formulations via a bellygrinder as a broadcast application, were below the Agency's level of concern (MOEs > 300). MOEs calculated for each homeowner handler scenario are presented in Table 7, as follows:

Table 7. Homeowner Uses and Risk Concerns (combined dermal & inhalation MOEs)

Scenario	Rate (lb ai/A)	Short-Term MOE
(1) Mixing, loading, and applying liquid formulations via backpack sprayer	2	28,000
(2) Mixing, loading, and applying liquid formulations via low pressure handwand	2	1,600
(3) Mixing, loading, and applying liquid formulations via hose-end sprayer	2	640[a]
(4) Loading and applying granular formulations via push type spreader	2	1,100[a]
(5) Loading and applying granular formulations via bellygrinder	2	65 (broadcast) 1,400 (spot treatment)

[a] Calculated using ORETF Unit Exposure Values

d. Post-Application Residential Risk

Atrazine can be used on home lawns, golf courses, and on other turf areas where exposure to adults and children may occur. Dermal exposure to atrazine may result from entering the treated area, performing yard work (e.g., mowing), playing or performing other recreational activities (e.g., golfing) on the treated areas. In addition, incidental oral post-application exposure to children may occur from "hand-to-mouth" (i.e., ingestion of grass, soil and/or granular pellets; or hand-to-mouth contact) exposure when reentering treated lawns.

The Agency does not expect post-application inhalation exposure to atrazine to occur because of low chemical vapor pressure and dilution of vapor outdoors. Thus, this exposure was not assessed. Handler study data support this conclusion.

Representative turf reentry activities include, but are not limited to:

(1) Adults involved in a low exposure activity, such as golfing or walking on treated turf.
(2) Adults mowing or other moderate contact activity, for 1-2 hours.
(3) Adults involved in a high exposure activity, such as heavy yard work (doses similar to occupational scenarios for cutting and harvesting sod).
(4) Children involved in high exposure activities on turf.

The Agency has risk concerns for post-application residential exposures to children from incidental oral contact. In children exposed to treated lawns after application of liquid atrazine

formulations, hand-to-mouth activities and combined oral exposures result in MOEs above the Agency's level of concern. MOEs are 210 for hand-to-mouth activities and 200 for combined oral exposures. In addition, for children exposed to treated lawns after granular applications, the Agency has concerns for incidental ingestion of granules. The MOEs for this scenario range from 16 to 110.

Table 8: Residential Short-Term Post-Application Risk Estimates from Atrazine Application to Lawns

Scenario		Application Rate (lb ai/A)	MOE			
			Liquid		Granular	
			GA	NC	GA[1]	FL[1]
Adult						
Dermal	Turf Contact	2	510		4300	1200
	Walking, Golfing	2	7400		62,000	17,000
	Push Mowing Lawn	2	15,000		120,000	34,000
Child						
Dermal	Turf Contact	2	310		2,600	690
Oral	Hand to Mouth Activity	2	**210**		950	
	Turfgrass/Object Mouthing	2	3300			
	Ingestion of Soil	2	62,500			
	Combined[2]	2	**200**		730	
	Ingestion of Granules	2	n/a		16-31 (1.5% ai) 57-110 (0.42% ai)	

[1] The MOEs presented here represent non-irrigated turf. As these MOEs were acceptable, irrigated turf MOEs, generally higher than non-irrigated, were not presented.

[2] Combined includes Hand-to-mouth activity, turfgrass/object mouthing; and ingestion of soil. Ingestion of granules is not included because this is considered an infrequent, episodic event.

Adults may reasonably be expected to perform more than one activity on treated lawns in a single day, but an eight-hour duration of exposure is unlikely. Therefore, it is reasonable to aggregate the exposures from playing/gardening (highest exposure rate), walking, and mowing (lower exposure rate) for a single MOE. The MOE for all post-application adult exposures combined is 460 and is above the Agency's level of concern. It is also possible that an adult would apply herbicide spray to a lawn and then play on it or mow it later that day. In such an event, the aggregated dermal MOE for the day would be slightly lower than the target 300 for that day (MOE=270), based on the liquid application study values, but not based on the granular residue data. However, this not very likely and is considered a high-end estimate of exposure.

It is likely that dermal and oral incidental exposures may occur in the same day for children playing on atrazine-treated lawn. It can be seen from the MOEs presented in Table 8 that the incidental hand-to-mouth (licking fingers) exposure estimate constitutes most of this oral exposure. The overall MOE of 200 is only slightly less than the MOE of 210 for the hand-to-mouth estimate. The individual dermal and oral routes of exposure each exceed the level of concern, and aggregating these estimates results in an even lower MOE. Ingestion of granules is not aggregated because it is considered an infrequent, episodic event.

3. Aggregate Risk

Aggregate risk assessments have been conducted for acute, short-term, and intermediate-term to chronic exposures to atrazine and the chlorinated metabolites. Aggregate risk assessments look at the combined risk from dietary exposure (food and drinking water) and non-occupational (e.g., residential, golfers, etc...). The acute aggregate risk assessment combines exposures to atrazine and the chlorinated metabolites in food and drinking water. The short-term aggregate risk assessment combines exposures to atrazine and the chlorinated metabolites in food and drinking water with residential exposures to atrazine, *per se*, occurring between 1 and 30 days after use of atrazine products at home. The intermediate-term and chronic aggregate risk assessment combines exposures to atrazine and the chlorinated metabolites in food and drinking water alone because intermediate-term (30 days to several months) and chronic (several months to lifetime) exposure scenarios for the registered non-occupational uses of atrazine are not expected.

Although a risk assessment for exposures to atrazine's hydroxylated metabolites in food was conducted, risk assessments aggregating exposures to atrazine's hydroxylated metabolites in food, drinking water, and in residential settings were not. There is limited data on hydroxyatrazine in water, and exposure to the hydroxy metabolites of atrazine in drinking water is not expected to be significant relative to the chlorinated metabolites. In addition, the Agency does not expect exposure to hydroxyatrazine from applications of atrazine to turf because hydroxyatrazine is formed within plant tissues, not on plant surfaces.

a. Acute Aggregate Exposure and Risk Estimates

The aggregate risk assessment for acute exposures to atrazine and the chlorinated metabolites combines high-end one-day exposures through food and drinking water alone. The Agency does not believe that high-end exposures through food, drinking water, and residential use will all occur on the same day. Therefore, acute aggregate risk estimates are the same as those presented for acute drinking water risks. Exposure to atrazine from food sources and drinking water do not exceed the Agency's level of concern for acute dietary risk for any relevant subgroup, as described previously in Section III.A.2.a.3.

b. Intermediate-Term and Chronic Aggregate Exposure and Risk Estimates

The aggregate risk assessment for intermediate-term and chronic exposures to atrazine

and the chlorinated metabolites combines estimates of high-end seasonal or long-term average exposures to atrazine in drinking water with long-term average exposures to atrazine in food. Neither intermediate-term nor long-term (chronic) exposures are expected to occur in the home from residential uses of atrazine. Therefore, intermediate-term and chronic aggregate risk estimates are the same as those presented for intermediate-term and chronic drinking water risks (see section III.A.2.a.3). Infants and children are potentially at risk from exposures to combined residues of atrazine plus its chlorinated metabolites from 34 CWS using surface water based on available monitoring data. Aggregate intermediate-term and chronic exposures in CWS using groundwater are not of concern.

c. Short-Term Aggregate Exposure and Risk Estimates

Short-term estimates of aggregate risk were calculated for adult applicators and children and adults exposed to residues of atrazine after application to home lawns. Short-term aggregate risk estimates that include residential exposures are only applicable for those regions of the United States where atrazine is used on turf grass (residential and golf courses), generally the Southeast (including Florida).

The theoretical upper limit in drinking water for short-term exposures is referred to as a short-term DWLOC and is based on exposure estimates for adults and children from average residues of atrazine in food and exposure to high-end atrazine residues during application or immediately after application of atrazine to lawns. If the short-term DWLOC values are greater than the measured average concentrations for atrazine residues in surface water and groundwater, there is no concern for short-term aggregate exposures to atrazine residues through food, drinking water, and non-occupational uses. Measured concentrations of atrazine residues in surface water and groundwater from monitoring data (as presented earlier in this document) were compared to the calculated short-term DWLOCs.

1) Adult Handlers

Short-term estimates of aggregate risk to adults applying atrazine products to the lawn and garden combines exposures through the dermal, dietary (food and drinking water), and inhalation routes. These exposures have a common toxic effect, delayed puberty as a biomarker for neuroendocrine effects.

Table 9 below presents the results of the Agency's short-term aggregate risk assessment for adult handlers of atrazine. Of the five exposure scenarios evaluated, only applications of granular formulations of atrazine applied over 0.5 acres with a belly-grinder results in aggregate exposures that exceed the Agency's level of concern.

Aggregate short-term DWLOC values are presented for the five adult handler scenarios in Table 9. The first four DWLOCs presented are greater than the measured maximum weekly concentration of 89 ppb atrazine and the chlorotriazines in finished drinking water; thus, these scenarios are not of concern to the Agency. A DWLOC of 0 is assigned for adults applying via belly grinder because this residential scenario alone exceeds the Agency's level of concern; thus,

this scenario is also of concern when aggregated with dietary and drinking water routes of exposure.

Table 9. Short Term Aggregate DWLOCs - Adults applying atrazine at 2 lb ai/A to lawns.

Exposure Scenario	Aggregate MOE (Dermal and Inhalation)	Short Term DWLOC (ppb)
(1) Mixing, loading, and applying liquid formulations via backpack sprayer	28,000	219
(2) Mixing, loading, and applying liquid formulations via low pressure handwand	1,600	273
(3) Mixing, loading, and applying liquid formulations via hose-end sprayer	640	105
(4) Loading and applying granular formulations via push-type spreader	11,000	159
(5) Loading and applying granular formulations via belly grinder	65	0

2) Adult Post-Application

Short-term estimates of aggregate risk for adults from post-application exposures combine dietary exposure and post-application dermal exposures after atrazine lawn treatment . Short-term dermal and dietary exposures have a common toxic effect: delayed puberty as a biomarker for neuroendocrine effects.

Table 10 summarizes the results of the Agency's aggregate risk assessment for short-term exposures of adults exposed to atrazine-treated lawns immediately after application. Short-term aggregate risk estimates do not exceed the Agency's level of concern. Weekly concentrations of atrazine and the chlorotriazine metabolites have been measured in drinking water up to 89 ppb; since this concentration is less than the remaining DWLOCs, the aggregate risk is acceptable.

Table 10. Short Term Aggregate DWLOCs - Adults exposed to atrazine after application to lawns at 2 lb ai/A.

Exposure Scenario (formulation)	Dermal MOE	Short Term DWLOC (ppb)
Dermal Turf Contact (liquid)	510	130
Dermal Turf Contact (granular)	1200	157
Dermal Contact Walking/Playing Golf (liquid)	7,800	210
Dermal Contact Walking/Playing Golf (granular)	16,000	215
Dermal Contact Pushing Lawn Mower (liquid)	16,000	214

Table 10. Short Term Aggregate DWLOCs - Adults exposed to atrazine after application to lawns at 2 lb ai/A.

Exposure Scenario (formulation)	Dermal MOE	Short Term DWLOC (ppb)
Dermal Contact Pushing Lawn Mower (granular)	35,000	217

3) Child Post-Application

Short-term estimates of aggregate risk to toddlers from post-application residential exposure to atrazine combine dietary exposures with post-application dermal and incidental oral exposures after atrazine lawn treatment.

Aggregate risk estimates for short-term exposures to toddlers playing on liquid atrazine-treated lawns exceed EPA's level of concern. Risks to children from aggregated oral residential post-application exposures (hand-to-mouth transfer of residues, grass and soil ingestion activities by toddlers on grass) are of concern for liquid formulations (MOE = 200); therefore, any aggregation through the dermal, inhalation or dietary pathways would result in risk estimates that further exceed the Agency's level of concern.

Toddlers' risk estimates from individual or aggregated (combined) pathways for incidental oral exposures based on granular formulations do not exceed the Agency's levels of concern; i.e., a MOE of 730. Toddlers' risk estimates from dermal exposures based on granular formulations also do not exceed the Agency's levels of concern; i.e., MOEs of 690 (for applications that are not watered-in immediately after application and 2000 for applications that are watered-in immediately after application). Combined dermal and incidental oral exposures for toddlers result in a MOE of 350 or greater and also do not exceed the Agency's level of concern. Short-term DWLOCs for toddlers' post application aggregate exposures, inclusive of dermal, incidental oral, and dietary (food + drinking water) exposures, do not exceed HED's level of concern for granular formulations watered-in after application to turf. Short-term DWLOCs for toddlers' post application aggregate exposures exceed the Agency's level of concern for granular formulations.

Exposure to atrazine through ingestion of granules by toddlers result in MOEs of 16 to 110. Granule ingestion by toddlers is considered an episodic event (a stand alone incident) and has not been aggregated with either other incidental oral exposures or dermal and dietary exposures.

Table 11 below presents the short-term aggregate MOEs and DWLOCs for toddlers exposed to atrazine after lawn applications.

Table 11. Short-Term Aggregate DWLOCs - Toddlers exposed to atrazine after liquid and granular applications to lawns.

Type of Exposure	Formulation/Application Rate (lbs ai/acre)	Dermal MOE	Aggregate Incidental Oral MOE	Short-Term DWLOC (ppb)
Dermal Contact on Turf	2 lb ai/acre (liquid)	310	200	zero
Dermal Contact on Turf	1 lb ai/acre (liquid)	610	390	zero
Dermal Contact on Turf	2 lb ai/acre (granular) without watering-in	690	730	12 - 14
Dermal Contact on Turf	2 lb ai/acre (granular) with watering-in	2000	730	35 - 39

4. Occupational Risk

Workers handling pesticide products can be exposed to atrazine through mixing, loading, and/or applying this pesticide, and through reentering treated sites. Occupational handlers of atrazine include: individual farmers and other growers who mix, load, and/or apply pesticides; commercial, professional, or custom agricultural applicators; commercial pest control operators; and lawn care and turf management professionals. The post-application occupational risk assessment considered exposures to workers entering treated sites in agriculture. Risk for all of these potentially exposed populations is measured by a Margin of Exposure (MOE) which determines how close the occupational or residential exposure comes to a No Observed Adverse Effect Level (NOAEL). Generally, MOEs greater than 100 do not exceed the Agency's risk concern.

a. Toxicity

The toxicity of atrazine is integral to assessing the occupational risk. The Agency has conducted short-term and intermediate-term dermal and inhalation exposure assessments for the occupational handler. In addition, the Agency has conducted short-term post-application dermal and inhalation exposure assessments. Long-term (chronic) occupational exposures are not anticipated based on atrazine's use pattern.

All risk estimates are based on the most current toxicity information available for atrazine, including a 21-day dermal toxicity study. The toxicological endpoints, and other factors used in the occupational risk assessments for atrazine are summarized in Table 12 below. Please note that the occupational dermal and inhalation endpoints are the same as those used in the dietary drinking water assessment and in the residential risk assessment.

A dermal absorption factor of 6% (rounded up from 5.6%) was selected, based on a human study in which 10 volunteers were exposed to a single topical dose of atrazine. An inhalation absorption factor of 100% is applied. The FQPA Safety Factor is not applicable to the Occupational Risk Assessment.

Table 12. Summary of Toxicological Endpoints and Other Factors Used in the Atrazine Occupational Risk Assessment

Exposure Scenario	Dose (mg/kg/day)	UF[1]	Endpoint	Study
Dermal, Short-Term[a]	NOAEL= 6.25 LOAEL = 12.5	100	Delayed preputial separation in male offspring after 30 days of dosing. Use of the dermal penetration factor yields a dose of 104 mg/kg/day.	Pubertal assay (30-day) NHEERL published literature
Dermal, Intermediate-Term[b]	NOAEL= 1.8 LOAEL = 3.65	100	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge- Rat
Inhalation, Short-Term [c]	NOAEL= 6.25 LOAEL = 12.5	100	Delayed preputial separation in male offspring after 30 days of dosing.	Pubertal assay (30-day) NHEERL published literature
Inhalation, Intermediate-Term[c]	NOAEL= 1.8 LOAEL = 3.65	100	Attenuation of pre-ovulatory lutenizing hormone (LH) surge, as a biomarker indicative of hypothalamic function disruption	Six-month LH surge-Rat

[1]UF = Uncertainty Factor (100 is the result of a 10x for interspecies variability and 10x for intraspecies extrapolation)
a = The NOAEL of 6.25 mg/kg/day is multiplied by a 3.6 dermal penetration factor.
b = 6% dermal absorption factor for route-to-route extrapolation.
c = 100% absorption factor for route-to-route extrapolation.

Atrazine has low acute dermal and inhalation toxicity. It is non-irritating to skin, minimally irritating to the eyes and is not a skin sensitizer. It is classified under Category III for acute oral toxicity. Table 13 summarizes the acute toxicity of atrazine.

Table 13. Summary of Results from Acute Toxicity Studies of Technical Atrazine

Guideline No.	Test	Results	Toxic Category
81-1	Acute Oral LD_{50} - rat	LD_{50} > 1,869 mg/kg (M&F combined)	III
81-2	Acute Dermal LD_{50} - rat	LD_{50} > 2,000 mg/kg (M&F combined)	III

Guideline No.	Test	Results	Toxic Category
81-3	Acute Inhalation LC_{50} - rat	LC_{50} > 5.8 mg/L (M&F combined)	IV
81-4	Eye Irritation - rabbit	Non-irritant	IV
81-5	Dermal Irritation - rabbit	Non-irritant	IV
81-6	Dermal Sensitization	Non-sensitizer	---

b. Occupational Exposure

Several chemical-specific studies that were submitted to the Agency by the technical registrant were used together were used to assess the occupational handler risks from use of atrazine for most exposure scenarios. Exposure studies submitted to the Agency by the Outdoor Residential Exposure Task Force (ORETF) were also used in the occupational (and non-occupational) risk assessments for applicators.

In addition, the Agency generated MOEs to assess risk to commercial handlers engaged in impregnating atrazine onto dry bulk fertilizer using dermal and inhalation unit exposure data from the *Pesticide Handlers Exposure Database* (PHED), Version 1.1 (August 1998). The PHED scenario for mixing/loading liquids using a closed system were used as a surrogate to estimate these exposures. However, such an exposure surrogate is less appropriate for estimating exposures due to transferring the treated dry bulk fertilizer from an auger truck to the application equipment. There are no data or reasonable surrogate available for this operation.

Three chemical-specific studies, one of dislodgeable foliar residue on corn, and two of transferable turf residues (TTR), were submitted to the Agency and used in the post-application occupational risk assessment. In addition, transfer coefficients used were based on data submitted by the Agricultural Reentry Task Force (ARTF), where possible. Most of the atrazine used in agriculture is applied to corn and sorghum early in the season, either before weeds emerge or when the crops are quite small, generally less than 12 inches high. This, and the degree of mechanization in cultivating these crops, leads the Agency to conclude that post-application exposure to workers is low.

Anticipated use patterns and application methods, range of application rates, and daily amounts treated were derived from current labeling. Maximum application rates specified on atrazine labels were 2.0 lb ai/A, with a few exceptions. Maximum label rates were used to estimate handler exposure. The Agency uses acres treated per day values that are thought to represent an eight-hour workday for a particular type of application equipment or a specific crop.

Occupational handler exposure assessments are conducted by the Agency using different levels of personal protection. The Agency typically evaluates all exposures with baseline protection and then adds additional protective measures using a tiered approach to obtain an appropriate MOE (i.e., going from minimal to maximum levels of protection). The lowest suite

of personal protective equipment (PPE) is baseline PPE. If required (i.e., MOEs are less than 100), increasing levels of risk mitigation PPE are applied. If MOEs are still less than 100, engineering controls (EC) are applied. The levels of protection that formed the basis for calculations of exposure from atrazine activities include:

- Baseline: Long-sleeved shirt and long pants, shoes and socks (includes gloves for the applicator in scenario 5).
- PPE: Baseline + coveralls, chemical-resistant gloves, and a dust/mist respirator (see table for specifics by scenario)
- Engineering controls: Engineering controls, such as closed cab tractor for application scenarios, or a closed mixing and loading system such as a farm closed mechanical transfer system for liquids or a package based system. Some engineering controls are not feasible for certain scenarios. Some formulation types qualify as engineering controls for the purpose of controlling exposure during mixing and loading, such as water soluble packets.

c. Occupational Handler Risk Summary

Inhalation and dermal exposure to atrazine can result from occupational use. The Agency assessed dermal and inhalation risks (MOEs) for each crop currently registered for atrazine. For atrazine, occupational MOEs greater than 100 are not of risk concern to the Agency.

1) Agricultural Handler Risk

The Agency has determined that there is potential atrazine exposure to mixers, loaders, applicators, and other handlers using atrazine in accordance with the current use patterns. Fourteen major agricultural handler exposure scenarios were identified for atrazine, as listed below. The major handler scenarios involved multiple crops and application rates, resulting in several different exposure estimates. The largest agricultural use of atrazine involves the mixing, loading and application of atrazine to row crops and results in the largest potentially exposed occupational population.

(1a) mixing/loading liquid formulations for aerial application,
(1b) mixing/loading liquid formulations for groundboom application,
(1c) mixing/loading liquid formulations for rights-of-way sprayer application to roadside,
(1e) mixing/loading/incorporating liquid formulations into liquid and dry bulk fertilizer (commercial & on-farm techniques),
(2a) mixing/loading dry flowable formulations for aerial application,
(2b) mixing/loading dry flowable formulations for groundboom application,
(2c) mixing/loading dry flowable formulations for rights-of-way sprayer application to roadside,
(3) loading granular formulations,

(4) applying liquids with aircraft,
(5) applying liquids with groundboom sprayer,
(6) applying liquids to roadsides with rights-of-way sprayer,
(8) applying impregnated dry bulk fertilizer with a tractor-drawn spreader,
(9) applying granular formulations with a tractor-drawn spreader,
(15) flagging for aerial spray applications
(16a) mixing/loading wettable powder formulations for aerial application; and
(16b) mixing/loading wettable powder formulations for groundboom application.

PPE requirements on current atrazine labels are typically long-sleeved shirt, long pants, shoes, socks and waterproof gloves. Mixers and loaders must also wear protective eyewear. (mixers/loaders).

As summarized in Table 14, occupational risks are of concern (i.e MOEs < 100) for some scenarios even when maximum PPE are utilized. Handler risks are also of concern for a few scenarios with engineering controls. Engineering controls are considered to be the maximum feasible mitigation. These involve several scenarios for the incorporation of atrazine into liquid or dry bulk fertilizer, handlers mixing and loading wettable powders for application to 350 acres of sugarcane at 4 lb ai/A, and handlers applying liquids with a right of way sprayer to 40 acres of roadsides at 2 lb ai/A.

Table 14. Occupational Handler Aggregate (Dermal plus Inhalation) Margins of Exposure (PHED)

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
Mixer/Loader									
(1a) Liquid formulations for aerial application	Conifer forests Christmas tree farms	4	350	2	0.4	248	61	520	130
	Sugarcane	4	350	2	0.4	248	61	520	130
		2.6		3	0.7	381	94	800	200
	Chemical fallow	3	1200	1	na	96	na	200	na
			350	2	0.6	330	82	690	170
		1.4	1200	1	na	206	na	430	na
			350	5	1.3	708	170	1500	370
	CRP or grasslands	2	1200	1	na	144	na	300	na
			350	4	0.9	495	120	1000	260
	Corn Sorghum	2	1200	1	na	144	na	300	na
			350	4	0.9	495	120	1000	260
		1	1200	2	na	289	na	610	na
			350	7	2	991	240	2100	520
	Sod Farms	4 (FL)	350	2	0.4	248	61	520	130
		2	350	4	1	495	120	1000	260

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
(1b) Liquid formulations for groundboom application	Macadamia nuts Guava Conifers	4	80	8	2	1084	270	2300	560
	Sugarcane	4	80	8	2	1084	270	2300	560
		2.6	80	12	3	1667	410	3500	870
	Chemical Fallow	3	450	2	na	257	na	540	na
			200	4	1	578	140	1200	300
		1.4	450	4	na	550	na	1200	na
			200	9	2	1238	310	2600	640
	CRP or grasslands	2	450	3	na	385	na	810	na
			200	6	2	867	210	1800	450
	Corn Sorghum	2	450	3	na	385	na	810	na
			200	6	2	867	210	1800	450
		1	450	6	na	771	na	1600	na
			200	12	3	1734	430	3600	900
	Roadsides	1	40	62	15	8669	2100	18,000	4500
		2		31	8	4335	1100	9100	2300
	Sod farms	4 (FL)	80	8	2	1084	270	2300	560
		2	80	16	4	2167	540	4600	1100

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
(1c) Liquid formulations for rights-of-way sprayer	Roadsides	1	40	62	15	8669	2100	18,000	4500
	Bermuda grass rights-of-way	2	40	31	8	4335	1100	9100	2300
(1e) Incorporating liquid formulations into liquid or dry bulk fertilizer	Commercial fertilizer for corn, sorghum (PHED data)	2	960 tons	see engineering controls				**64**	na
			500 tons					120	**36**
		1	960 tons					120	na
			500 tons					230	**72**
	Commercial fertilizer for corn, sorghum (Helix study data)	2	500 tons	see engineering controls				170	**67**
		1		see engineering controls				350	130
	On-farm fertilizer for corn, sorghum	2	160	8	na	700	na	1900	na
		1	160	15	na	1400	na	3800	na
(2a) Dry flowable for aerial application	Conifer forests Christmas tree farms	4	350	66	16	105	26	380	130
	Sugarcane	4	350	66	16	105	26	380	130
		2.6	350	100	25	161	40	580	140
	Chemical fallow	3	1200	26	na	41	na	150	na
			350	88	22	140	35	500	120
		1.4	1200	55	na	87	na	320	na
			350	190	47	300	74	1100	270
	CRP or grasslands	2	1200	38	na	61	na	220	na

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
			350	130	33	210	52	750	190
	Corn Sorghum	2	1200	38	na	61	na	220	na
			350	130	33	210	52	750	190
		1	1200	77	na	122	na	440	na
			350	260	65	420	100	1500	370
	Sod farms	4 (FL)	350	66	16	105	26	380	130
		2	350	130	33	210	52	750	190
(2b) Dry flowable for groundboom application	Macadamia nuts Guava Conifers	4	80	290	71	459	110	1600	410
	Sugarcane	4	80	290	71	459	110	1600	410
		2.6	80	440	110	706	170	2500	630
	Chemical fallow	3	450	68	na	109	na	400	na
			200	150	38	245	61	880	220
		1.4	450	150	na	233	na	840	na
			200	330	82	525	130	1900	470
	CRP or grasslands	2	450	100	na	163	na	580	na
			200	230	57	367	91	1300	330
	Corn Sorghum	2	450	100	na	163	na	580	na
			200	230	57	367	91	1300	330

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
		1	450	210	na	326	na	1200	na
			200	460	110	734	180	2600	650
	Roadsides	1	40	2300	570	3672	910	13,000	3300
		2	40	1200	290	1836	450	6600	1600
	Sod farms	4(FL)	80	290	71	459	110	1600	410
		2	80	580	140	918	230	3300	820
(2c)Dry flowable for rights-of-way	Roadsides	1	40	2300	570	3672	910	13,000	3300
		2	40	1200	290	1836	450	6600	1600
(3) Granular formulations	Sod farms	2	80	1200	310	5023	1200	62,000	15,000
(16a) Wettable powders for aerial application	Sugarcane	4	350	1.2	5.2	17	4.1	580	93
		2.6		1.8	3	26	6.3	380	140
	Chemical Fallow	3	1200	0.5	na	6.5	na	150	na
		1.4		1	na	14	na	310	na
	Corn, Sorghum	2	1200	0.7	na	9.7	na	220	na
			350	2.4	4	33	8.2	750	190
		1	1200	1.4	na	19	na	440	na
			350	4.7	7	66	16	1500	370

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
(16b) Wettable powders for groundboom application	Macadamia nuts	4	40	10	16	150	36	3300	820
	Sugarcane	4	200	2.1	3	29	7.2	660	160
	Sod farms (FL)	4	80	5.2	8	73	18	1600	410
Applicator									
(4) Applying liquids with aircraft	Conifer forests Christmas tree farms	4	350	See engineering controls				850	210
	Sugarcane	4	350	See engineering controls				850	210
		2.6	35					1300	320
	Chemical fallow	3	1200	See engineering controls				330	na
			350					1100	280
		1.4	1200					710	na
			350					2400	600
	CRP or grasslands	2	1200	See engineering controls				500	na
			350					1700	420
	Corn Sorghum	2	1200	See engineering controls				500	na
			350					1700	420
		1	1200					990	na
			350					3400	840
	Sod farms	4 (FL)	350	See engineering controls				850	210
		2	350					1700	420

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
(5) Applying liquids by groundboom [4]	Macadamia nuts Guava Conifers	4	80	860	210	1690	420	4000	980
	Sugarcane	4	80	860	210	1690	420	4000	980
		2.6	80	1300	330	2600	640	6100	1500
	Chemical fallow	3	450	200	na	401	99	940	na
			200	460	110	901	220	2100	520
		1.4	450	440	na	858	210	2000	na
			200	990	240	1931	480	4500	1100
	CRP or grasslands	2	450	310	na	601	150	1400	na
			200	690	170	1352	330	3200	790
	Corn Sorghum	2	450	310	na	601	150	1400	na
			200	690	170	1352	330	3200	790
		1	450	610	na	1202	300	2800	na
			200	1400	340	2704	670	6400	1600
	Roadsides	2	40	3500	850	6759	1700	16,000	3900
		1	40	6900	1700	13519	3300	32,000	7900
	Sod farms	4(FL)	80	860	210	1690	420	4000	980
		2	80	1700	430	3380	840	8000	2000

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
(6) Applying liquids with a right of way sprayer	Roadsides	2	40	67	16	300	74	not feasible	
		1	40	130	33	601	150	not feasible	
(8) Applying impregnated fertilizer with a tractor-drawn spreader	Corn Sorghum	2	320	190	na	660	na	1000	na
			160	380	na	1300	na	1900	na
		1	320	380	na	1300	na	1900	na
			160	900	na	2600	na	4000	na
(9) Applying granular product with a tractor-drawn spreader	On-farm fertilizer for corn, sorghum	2	200	610	150	2221	550	3200	790
			80	1500	380	5553	1400	7900	2000
		1	200	1200	300	4442	1100	6400	1600
			80	3000	750	11,100	2700	16,000	4000
Flagger									
(15) Flagging sprays	Conifer forest Christmas tree farms	4	350	310	76	466	120	910	220
	Sugarcane	4	350	310	76	466	120	910	220
		2.6	350	480	120	717	180	1400	350
	Chemical fallow	3	350	410	100	621	150	1200	300
		1.4	350	880	220	1331	330	2600	640
	CRP or grasslands	2	350	620	150	931	230	1800	450
	Corn Sorghum	2	350	620	150	931	230	1800	450
		1	350	1200	310	1863	460	3600	900

Scenario	Crop/Use Site	Rate[1]	Acres	Levels of Protection					
				Baseline		PPE[2]		ECs	
				Short Term	Inter-mediate Term	Short Term	Inter-mediate Term	Short Term	Inter-mediate Term
	Sod farms	4 (FL)	350	310	76	466	120	910	220
		2	350	620	150	931	230	1800	450

1 lb ai/A or lb ai/gal

2 PPE Includes long-sleeved shirt and long pants, coveralls, chemical resistant gloves, and a respirator.
(16a) and (16b) are listed using minimum ppe (single layer, gloves, dust/mist respirator).

3 pounds of fertilizer treated per day

4 Scenario #5, Applying Liquids by Groundboom: the baseline assessment includes gloves.

2) Lawn Care Operator Handler Risk

The Agency has determined that there is potential for atrazine exposure to Lawn Care Operators (LCOs) and other handlers mixing, loading and/or applying atrazine to turf in accordance with the current use pattern. Fifteen major exposure scenarios have been identified and are listed below.

(1b) mixing/loading liquid formulations for groundboom application,
(1d) mixing/loading liquid formulations for lawn handgun application (LCO),
(2b) mixing/loading dry flowable for groundboom application,
(3) loading granular formulations,
(5) applying liquids with groundboom sprayer,
(7) applying with a lawn handgun or compressed air sprayer,
(9) applying granular formulations with a tractor-drawn spreader,
(10) mixing/loading/applying with a backpack sprayer,
(11) mixing/loading/applying liquid formulations with a low pressure handwand,
(12a) mixing/loading/applying liquids with a lawn handgun or compressed air sprayer,
(12b) mixing/loading/applying WDG formulations with a lawn handgun,
(12c) mixing/loading/applying water soluble powder formulations with a lawn handgun,
(13) loading/applying granular formulations with a push type spreader, and
(14) loading/applying granular formulations with a bellygrinder.

The risk assessments for these scenarios are summarized in Table 15 below. With the use of PPE, all scenarios are acceptable.

Table 15. Lawn Care Operator Margins of Exposure

Scenario	Crop/ Use Site	Rate (lb ai/A)	Acres	Levels of Protection					
				Baseline		PPE		ECs	
				Short term	Inter-mediate term	Short term	Inter-mediate term	Short term	Inter-mediate term
Mixer/Loader									
(1b) Liquid formulations for groundboom application	golf course turf	2	40	31	8	4335	1100	9100	2300
(1d) Liquid formulations for lawn handgun application	lawn, golf courses	2	100	12	3	1734	430	3600	900
(2b) Dry flowable for groundboom application	golf course turf	2	40	1200	290	1836	450	6600	1600

Scenario	Crop/ Use Site	Rate (lb ai/A)	Acres	Levels of Protection					
				Baseline		PPE		ECs	
				Short term	Inter-mediate term	Short term	Inter-mediate term	Short term	Inter-mediate term
(3) Granular formulations (loading)	golf course turf	2	40	2500	610	10,047	2500	120K	31,000
Mixer/Loader/Applicator									
(10) Liquid via backpack sprayer	lawns, golf courses	2	5	see PPE		428	110	not feasible	
(11) Liquid via low-pressure handwand	lawns, golf courses	2	5	7	2	1549	380	not feasible	
(12a) Liquid via lawn handgun and compressed air sprayer[1]	lawns, golf courses	2	5	see PPE		1400 gloves	340 gloves	not feasible	
(12b) WDG via lawn handgun[1]	lawns, golf courses	2	5	see PPE		1100 gloves	290 gloves	not feasible	
(12c) WSP via lawn handgun[1]	lawns, golf courses	2	5	see PPE		920 gloves	230 gloves	not feasible	
(13) Granular via push type spreader (ORETF)[1]	lawns, golf courses	2	5	1500	380	2100 gloves	520 gloves	not feasible	
(14) Granular via belly grinder	lawns, golf courses	2	1	330	82	616	150	not feasible	
Applicator									
(5) Applying liquids by groundboom	golf course turf	2	40	3500	850	6759	1700	16,000	3900
(7) Applying liquids with a handgun (ORETF)[1]	lawns, golf courses	2	5	see PPE		980 gloves	240 gloves	not feasible	
(9) Applying granular formulations with a tractor-drawn spreader	golf course turf	2	40	3000	750	11,100	2700	16,000	4000

Footnote:
[1] PPE for scenarios 12(a), 12(b), 12(c), 13 and 7, include baseline (long-sleeved shirt, pants, shoes and

socks) plus gloves.

3) Post-Application Occupational Risk

Post-application exposure to workers through entry into agricultural fields treated with atrazine was also considered in the occupational risk assessment. These activities result in potential short-term exposures. All post-application risk estimates were below the Agency's level of concern. MOEs ranged from 100 to 220,000.

4) Epidemiology Data

An epidemiology study was conducted of workers at the Syngenta St. Gabriel plant where atrazine is manufactured. That study reported a statistically significant increase in the incidence of prostate cancer among plant workers. The Agency, upon review of this study, requested additional information on the exposure profile of the employees diagnosed with prostate cancer and this information was provided and reviewed. Based on this review, it appears that most of the increase in prostate cancer incidence at the St. Gabriel plant is likely due to intensive prostate specific antigen (PSA) screening of employees conducted as part of the company's "Wellness Program." The study was insufficiently large and has limitations that prevent ruling out atrazine as a potential contributor to the increase observed. On balance, however, a role for atrazine seems unlikely because prostate cancer was found primarily in active employees who received intensive PSA screening; there was no increase in advanced tumors or mortality; and proximity to atrazine manufacturing did not appear to be correlated with risk.

Atrazine has also been tied to inflammation of the prostate in laboratory animals and changes in testosterone levels at high doses. However, neither condition has been tied to the increased risk of prostate cancer and the Agency concludes the animal data do not provide biologically plausible evidence to support atrazine as a cause of prostate cancer.

Other cancers besides prostate were found to have an elevated, though not statistically significant, increase in risk at the St. Gabriel plant. Other studies have suggested an increased risk for ovarian, breast, and other cancers, including non-Hodgkin's lymphoma. However, these studies are at best preliminary and should not serve as a basis for implicating atrazine as a human carcinogen due to their methodological limitations.

In addition, the Agency understands that Syngenta will be conducting a case control study on male employees at the St. Gabriel plant to examine the relationship between atrazine exposure estimates and the presence or absence of prostate cancer among cases and controls. We expect to receive and review this study during the third quarter of 2003 and to incorporate the results into the October revision to the IRED.

Further, the National Cancer Institute's (NCI) preliminary analysis of the National Institute of Environmental Health Sciences (NIEHS) Agricultural Health Study has found no association between prostate cancer and atrazine in one of the largest and best-designed

epidemiological studies ever conducted. NCI expects to publish a final analysis this summer. The Agency will fully consider additional results from the NCI analysis when it becomes available.

B. Environmental Risk Assessment

A summary of the Agency's environmental risk assessment is presented below. For detailed discussions of all aspects of the environmental risk assessment, see the April 22, 2002, Reregistration Eligibility Science Chapter for Atrazine - Environmental Fate and Effects Chapter and the "Steeger Document" available in the public docket and on the internet at www.epa.gov/pesticides/reregistration. There were no major revisions to the ecological risk assessment.

1. Environmental Fate and Transport

Atrazine is mobile and persistent in the environment and, as such, atrazine is expected to be present in surface water and groundwater. This is confirmed by widespread detection in surface water and groundwater. The main route of dissipation is microbial degradation under aerobic conditions.

Atrazine can reach nearby non-target plants, soil, and surface water via spray drift during application. Atrazine is applied directly to target plants during foliar application or directly to soil during the more frequent pre-plant and pre-emergent applications. Atrazine can be transported indirectly to soil due to incomplete interception during foliar application and washoff subsequent to foliar application. Atrazine is unlikely to undergo rapid degradation on foliage because atrazine is resistant to abiotic hydrolysis (stable at pHs 5, 7, and 9), resistant to direct aqueous photolysis (stable under sunlight at pH 7), and is only moderately susceptible to degradation in soil (aerobic laboratory half-lives of 3-4 months). For aquatic environments reported half-lives were much longer. In an anaerobic aquatic study, atrazine's overall half-life, water half-life, and sediment half-life were given as 608, 578, and 330 days, respectively.

Atrazine is also unlikely to undergo rapid volatilization from foliage because it has a relatively low Henry's Law constant (2.6×10^{-9} atm·m^3/mol). But this may be offset by atrazine's relatively low octanol/water coefficient (Log K_{ow} = 2 .7), and soil/water partitioning coefficents (Freundlich K_{ads} values < 3 and often < 1). In addition, atrazine has relatively low adsorption characteristics; this indicates that atrazine may undergo substantial washoff from foliage.

In terrestrial field dissipation studies performed in Georgia, California, and Minnesota, atrazine dissipated with half lives of 13, 58, and 261 days, respectively. The differences between these reported half-lives could be attributed to the temperature variation between the studies in which atrazine was seen to be more persistent in colder climate. Long term field dissipation studies also indicated that atrazine could persist over a year in such climatic conditions. A forestry field dissipation study in Oregon (aerial application of 4 lb ai/A) estimated an 87 day half-life for atrazine on exposed soil, a 13 day half-life in foliage, and a 66 day half-life on leaf

litter.

Atrazine metabolites, desethylatrazine (DEA) and desisopropylatrazine (DIA) were detected in all anaerobic aquatic metabolism studies submitted, and hydroxyatrazine and diaminochloroatrazine (DACT) were detected in all but one of the anaerobic aquatic metabolism studies submitted. Desethylhydoxyatrazine (DEHA) and desisopropylhydroxyatrazine (DIHA) were also detected in one of the aerobic studies. All of the chlorinated metabolites and hydroxy compounds detected in laboratory metabolism studies were present at much less than 10% of applied atrazine; thus, are not considered by the Agency to be "major degradates."

For studies limited to several months, the relative concentrations of the metabolites in soil were generally as follows: DEA>DIA>DACT~hydroxyatrazine. However, for an aerobic soil metabolism study and an anaerobic aquatic metabolism study both lasting a year, the concentration of hydroxyatrazine was comparable to that of DEA over the last few months of the studies. In addition, some literature indicates that higher quantities of hydroxyatrazine can be formed in soil and in sediment under acidic conditions. Other hydroxy compounds have only rarely been detected in lab studies.

The soil/water partitioning of atrazine, DEA, DIA, and DACT are relatively low as shown by Freundlich adsorption coefficients of < 3 and often < 1 for 4 different soils. The Freundlich adsorption constants for hydroxyatrazine are substantially greater, being approximately 2 for sand, but 6.5, 12.1, and 390 for a sandy loam, loam, and clay soil, respectively. No adsorption/desorption data are available for other hydroxy-triazine degradates. However, the higher soil/water partitioning exhibited by hydroxyatrazine compared to atrazine suggests that the other hydoxy-triazines are likely to exhibit higher soil/water partitioning than corresponding chloro-triazine degradates.

In a limited study on atrazine and its chlorodegradates in surface water source CWS, the detection of all was relatively widespread. However, atrazine predominated with the relative order of concentrations generally being as follows: atrazine>>DEA>DIA~DACT.

In a 1999 study of rural wells, the four hydroxy compounds were detected. Hydroxyatrazine was detected the most frequently and generally at the highest level, but not to the same extent as atrazine or the chlorinated metabolites. Unlike in surface water, where atrazine concentrations were generally much greater than chlorotriazine concentrations, the DEA and DACT concentrations in rural wells were often comparable to those of atrazine. The relative order of concentrations found in rural wells was generally atrazine~DEA~DACT>DIA>hydroxyatrazine .

The relatively widespread detection of atrazine and various chlorinated metabolites in the surface water study on metabolites and in the 1999 rural well study is consistent with the widespread use of atrazine, the persistence of atrazine and the mobility of atrazine and its chlorinated metabolites. The lower frequency of detection and generally lower levels of the hydroxyatrazine in the rural well study is consistent with its higher soil/water partitioning than atrazine and the chlorinated metabolites.

The available fate and ground water data indicate that hydroxy compounds are unlikely to significantly contaminate surface water. They are not appreciably formed in soil, and they are likely to exhibit higher soil/water partitioning than corresponding chlorinated metabolites. In addition, they were detected much less frequently and at much lower levels than the chlorinated metabolites in rural wells. However, hydroxyatrazine was detected at concentrations up to 6.5 ppb in 6% of rural wells sampled. Also, there have been reported concentrations of hydroxyatrazine in soil sometimes approaching and possibly in some cases (e.g., acidic soils) exceeding that of DEA.

Atrazine should be somewhat persistent in groundwater and in surface water with relatively long hydrologic residence times where advective transport is limited. The reasons for this are the resistence of atrazine to abiotic hydrolysis and to direct aqueous photolysis, its only moderately susceptibility to biodegradation, and its limited volatilization potential as indicated by a relatively low Henry's Law constant. Atrazine has been observed to remain at elevated concentrations longer in some reservoirs than in flowing surface water or in other reservoirs with presumably much shorter hydrologic residence times in which advective transport greatly limits its persistence.

The relatively low soil/water partitioning of atrazine and chlorinated metabolites indicates that their concentrations in or on suspended and bottom sediment will be in equilibrium with the residues in the water column. However, despite relatively low soil/water partitioning, limited data indicated that activated carbon can be effective in reducing atrazine and its triazine metabolite concentrations by several fold, depending upon the frequency and conditions of its use.

Volatility as a route of field dissipation raises concerns about the atmospheric fate of atrazine, its aerial transport and whether aerial deposition poses the potential for risks to non-target terrestrial plants. The potential for adverse effects on sensitive, non-target crops and plants from atmospheric deposition is uncertain. Atrazine has been widely detected in rainfall, with the highest concentrations occurring in the Midwestern corn belt during the application season (mid-April through mid- July). In addition, DEA and DIA were also detected in rainfall together with atrazine. High ratios of DEA to atrazine were attributed to atmospheric degradation. Mass deposition of atrazine and its metabolites is higher in the midwestern corn belt, and decreases with distance away from the corn belt.

2. Risk to Terrestrial Organisms

The Agency's ecological risk assessment compares toxicity endpoints from ecological studies to estimated environmental concentrations (EECs) based on environmental fate characteristics and pesticide use data. To evaluate the potential risk to non-target organisms from the use of atrazine products, the Agency calculates a Risk Quotient (RQ) by determining the ratio of the EEC to the toxicity endpoint values, such as the median lethal dose (LD50) or the median lethal concentration (LC50). These RQ values are then compared to the Agency's levels of concern (LOCs) to determine whether or not a chemical, when used as directed, has the potential to cause adverse effects to non-target organisms. In general, the higher the RQ, the

greater the concern. When the RQ exceeds the LOC for a particular category (e.g., endangered species), the Agency presumes a risk of concern to that category of non-target organisms. The LOCs and the corresponding risk presumptions are presented in Table 16.

Table 16. LOCs and Associated Risk Presumptions

If...	Then the Agency presumes....
Birds and Mammals	
Acute RQ > LOC of 0.5	acute risk
Acute RQ > LOC of 0.2	risk that may be mitigated through restricted use classification
Endangered Species Acute RQ > LOC of 0.1	acute effects may occur in endangered species
Chronic RQ > LOC of 1	chronic risk and chronic effects may occur in non-target organisms
Aquatic Animals	
Acute RQ > LOC of 0.5	acute risk
Acute RQ > LOC of 0.1	risk that may be mitigated through restricted use classification
Endangered Species Acute RQ > LOC of 0.05	acute effects may occur in endangered species
Chronic RQ > LOC of 1	chronic risk and chronic effects may occur in non-target organisms
Terrestrial and Semi-Aquatic Plants	
Acute RQ > LOC of 1	acute risk
Acute RQ > LOC of 1	risk that may be mitigated through restricted use classification
Endangered Species Acute RQ > LOC of 1	acute effects may occur in endangered species
Chronic RQ > LOC of 1	chronic risk and chronic effects may occur in non-target organisms

a. Toxicity (Hazard) Assessment

Atrazine is practically non-toxic to slightly toxic to birds and mammals, and relatively non-toxic to honey bees.

As expected for a herbicide, atrazine is toxic to non-target plants. Terrestrial plant seedling germination tests indicate that cucumber is the most sensitive dicot and oats is the most sensitive monocot. Terrestrial plant seedling emergence tests indicate that the dicot most sensitive to atrazine is carrot, and the monocots most sensitive to atrazine are oats and ryegrass. Terrestrial plant vegetative vigor tests indicate that the most sensitive dicot is cucumber and the

most sensitive monocot is onion.

The acute and chronic toxicity values used to assess risks are presented in Tables 17 and 18 below.

Table 17. Summary of Toxicity Data for Terrestrial Animals

Species	Acute Toxicity (ppm)				Chronic Toxicity (ppm)	
	LD_{50}	Acute Oral Toxicity	5-day LD_{50}	Subacute Dietary Toxicity	NOAEC/ LOAEC	Affected Endpoints
Atrazine						
Northern bobwhite quail *Colinus virginianus*	940	slightly toxic	>5,000	practically non-toxic	225/675	decreased egg production, increase in defective eggs, decreased embryo viability, decreased body weight
Honey bee *Apis meliferus*	96.69	relatively non-toxic	--	--	--	--
Laboratory rat (mg/kg)	1,869 - 3,080	practicall y non-toxic	--	--	50	See health effects endpoints

Table 18. Summary of Toxicity Data for Non-Target Terrestrial Plants

Species	Seedling Germination Toxicity		Seedling Emergence Toxicity		Vegetative Vigor Toxicity	
	EC25/ EC05	Endpoint	EC25/ NOAEC	Endpoint	EC25/ NOAEC	Endpoint
Monocots						
Oat - *Avena sativa*	1.8/0.12	reduction in radical length	0.0004/ 0.0025	reduction in dry wt.	2.4/2.0	reduction in dry wt.
Onion - *Allium cepa*	<4.0/<4.0	no effect	0.009/ 0.005	reduction in dry wt.	0.61/0.5	reduction in dry wt.
Dicots						
Carrot - *Daucus carota*	<4.0/<4.0	no effect	0.003/ 0.0025	reduction in dry wt.	1.7/2.0	reduction in plant height
Cucumber - *Cucumis sativus*	0.80/0.60	reduction in radical length	0.013/ 0.005	reduction in dry wt.	0.008/ 0.005	reduction in dry weight

b. Exposure and Risk - Birds and Mammals

The Agency's acute ecological risk assessment for terrestrial wildlife considers exposure to atrazine from the ingestion of residues on food. Terrestrial EECs were derived for the three major crops using the maximum labeled use rates (4 lb ai/A for sugarcane and 2 lb ai/A for corn and sorghum) and the highest value measured for foliar dissipation half-life from the application of atrazine to turf in the Southeastern United States: 17 days. Since foliar dissipation half-lives are used in estimating these EECs, the EECs better represent post-emergent applications than pre-plant and pre-emergence applications made directly to soil.

No acute LOCs are exceeded for mammals; however, in some scenarios, restricted use and endangered species LOCs are exceeded. RQ values for small mammals are cited in the table below. Acute endangered species LOCs are exceeded for small herbivorous mammals (RQ range: 0.0092 - 0.13) at 1.1 and 1.2 lb ai/A. All acute avian RQs are significantly below all LOCs indicating that there is negligible potential for acute risks to birds

The chronic LOC is exceeded for birds (RQ range: 0.08 - 4.3) and mammals (RQ range: 1.6 - 96) suggesting the potential for chronic risks to mammals and birds from atrazine applied at typical and maximum use rates.

It is important to consider that exposure of birds and mammals to atrazine applied as a pre-plant or pre-emergent herbicide is primarily a result of ingestion of earthworms and other soil organisms that can serve as a food source and inadvertent ingestion of soil. Methods are not available to determine the levels of atrazine that could occur in soil and in earthworms and other soil organisms that are used as food sources by birds and mammals. The resulting levels of atrazine in soil and soil organisms that can serve as a source of food for birds and mammals are expected to be considerably lower than estimated levels in plants used as food sources. As such, risk quotients based on EECs from maximum foliar dissipation half-life data, as presented in this document, are over-estimates for birds and mammals that are exposed from ingestion of soil organisms.

The primary effects of concern for herbicides and wildlife are indirect.

Table 19. Acute and Chronic Risk Quotients for Terrestrial Organisms

Organism	Size of Organism (grams)	Range of EEC (ppm)	Acute RQ	Subacute Dietary RQ	Chronic RQ (Repro)
Sugarcane: 1 Preplant Aerial Application 4 lb ai/A (maximum labeled use rate)					
Mammalian Herbivores	15	60 - 960	0.031 - 0.49	--	1.2 - 19.2
Mammalian Insectivores	15	60 - 540	0.031 - 0.27		
Mammalian Granivores	15	60	0.0067		

Table 19. Acute and Chronic Risk Quotients for Terrestrial Organisms

Organism	Size of Organism (grams)	Range of EEC (ppm)	Acute RQ	Subacute Dietary RQ	Chronic RQ (Repro)
Avian Species		60 - 960	--	<0.012 - <0.19	0.27 - 4.3
Sugarcane: 1 Preplant Aerial Application 2.6 lb ai/A (typical use rate)					
Mammalian Herbivores	15	39 - 624	0.020 - 0.32	–	0.78 - 12.48
Mammalian Insectivores	15	39 - 151	0.020 - 0.08		
Mammalian Granivores	15	39	0.0044		
Avian Species		39 - 624	--	<0.0078 - <0.12	0.17 - 2.8
Corn and Sorghum: 1 Preplant Aerial Application at 2.0 lb ai/A (maximum labeled rate)					
Mammalian Herbivores	15	30 - 480	0.015 - 0.24	--	0.6 - 9.6
Mammalian Insectivores	15	30 - 270	0.015 - 0.14		
Mammalian Granivores	15	30	0.34		
Avian Species		30 - 480	--	<0.0060 - <0.096	0.13 - 2.1
Corn: 1 Preplant Aerial Application at 1.1 lb ai/A (typical use rate)					
Mammalian Herbivores	15	16.5 - 264	0.0084 - 0.13	--	0.3 - 5.28
Mammalian Insectivores	15	16.5 - 148.5	0.0084 - 0.075		
Mammalian Granivores	15	16.5	0.0019		
Avian Species		16.5 - 264	--	<0.0033 - <0.053	0.73 - 1.2

Table 19. Acute and Chronic Risk Quotients for Terrestrial Organisms

Organism	Size of Organism (grams)	Range of EEC (ppm)	Acute RQ	Subacute Dietary RQ	Chronic RQ (Repro)
Sorghum: 1 Preplant Aerial Application at 1.2 lb ai/A (typical use rate)					
Mammalian Herbivores	15	18 -288	0.0092 - 0.15	--	0.36 - 5.76
Mammalian Insectivores	15	18 - 162	0.0092 - 0.082		
Mammalian Granivores	15	18	0.0020		
Avian Species		18 - 288	--	<0.0036 - <0.058	0.08 - 1.1

c. Exposure and Risk - Terrestrial Plants

Atrazine applications to crop and non-crop areas result in exposure to non-target plants in areas adjacent to treated fields via spray drift and/or runoff. The Agency's assessment compares standard residue values for runoff and drift for exposure and compares these exposure values to toxicity data available for non-target species. Spray drift levels for ground and aerial applications are 1 and 5 percent, respectively. Atrazine is highly mobile in soils and has a low soil-water partitioning coefficient and a water solubility value of about 33 ppm. Its runoff is estimated at 2 percent. The scenario for plants growing in dry areas receive runoff from 1 hectare to 1 hectare, while a 1-hectare wet area receives runoff from 10 hectares. All plant toxicity values are present as pounds active ingredient per acre (lbs ai/A). The EC25 values are used to calculate risk quotients for the typical non-target plants and the NOAEC values are used for endangered and threatened plant species. Although the Agency currently only has data on crop species, the results are assumed to represent a range of wild plants. The assessment assumes that terrestrial plants living in wetter habitats are at greater risk because they are exposed to runoff more than drier areas. The assessment resulted in exceedences for ground and aerial applications of atrazine at typical and maximum labeled rates. RQs based on the maximum labeled use rate are presented in Table 20 below.

RQs from three test species exceed the typical plant LOC from spray drift alone (cucumber, soybeans, and cabbage), 8 test species (in dry areas) or 9 test species (in wetter areas) exceeded the LOC from spray drift plus runoff. Both monocot and dicot species have exceeded the level of concern.

Endangered species exceedences for direct effects on terrestrial plants indicate potential risks to endangered species. RQs from 9 test species exceeded the endangered species LOC from spray drift alone or from spray drift plus runoff. The level of concern for endangered terrestrial plant species is exceeded for both monocots and dicots. These results indicate concern for endangered plant species growing in areas adjacent to atrazine-treated fields from combined spray drift and runoff.

A ground application of 2 lbs ai/A poses a diminished risk to adjacent crops compared to 4 lb ai/A applications, but only one of these species (i.e., soybeans from spray drift) would no longer exceed the acute level of concern. At the typical corn use rate of 1.1 lbs ai/A, the non-target crops at risk are cucumbers from spray drift, 7 out of 9 non-target species growing in dry habitats, and all 9 non-target species, if grown in semi-aquatic habitats. Risk quotients for endangered plant species indicate concern for endangered species growing in areas adjacent to atrazine-treated fields from combined spray drift and runoff.

Table 20. Risk Quotients for Terrestrial Plants

Crop	4 lbs ai./A; Aerial Application						4 lbs ai./A; Ground Application					
	Spray Drift (5%)		Spray Drift + Runoff				Spray Drift (1%)		Spray Drift + Runoff			
	Typ	ES[1]	Dry Areas		Wet Areas		Typ	ES	Dry Areas		Wet Areas	
			Typ	ES	Typ	ES			Typ	ES	Typ	ES
Carrot	0.12	0.10	83	99	230	270	0.024	0.02	40	48	280	340
Oats	0.083	0.10	62	99	170	270	0.017	0.02	30	48	210	340
Ryegrass	<0.05	<0.05	62	50	170	140	<0.01	<0.01	30	24	210	170
Lettuce	0.61	0.80	50	50	140	140	0.12	0.16	24	24	170	170
Onion	0.33	0.40	28	50	76	140	0.066	0.08	13	24	93	170
Cucumber	25	40	19	50	52	140	5.0	8.0	9.2	24	65	170
Soybean	7.7	10	1.3	9.9	3.5	27	1.5	2.0	0.63	4.8	4.4	34
Cabbage	14	40	18	25	49	68	2.9	8.0	8.6	12	60	84
Tomato	0.28	0.40	7.3	25	20	68	0.056	0.08	3.5	12	25	84
Corn	<0.05	<0.05	<0.06	<0.06	<0.17	<0.17	<0.01	<0.01	<0.03	<0.03	<0.21	<0.21

1 ES - Endangered Species; Typ. - Typical Species

3. Risk to Aquatic Species

To assess the risks to aquatic plants and animals from the use of atrazine, the Agency first conducted a screening-level RQ assessment similar to that described above for terrestrial organisms. This screening-level assessment was conducted only for freshwater species. The Agency also conducted a refined assessment to further evaluate the potential risks to aquatic organisms and local communities and populations. Estuarine and saltwater species were assessed as part of the refined assessment.

a. Toxicity (Hazard) Assessment

Atrazine is slightly to moderately toxic to freshwater fish and slightly to highly toxic to

freshwater invertebrates. Atrazine is slightly to moderately toxic to estuarine/marine fish and slightly to very highly toxic to estuarine/marine invertebrates. Tables 21 and 22 summarizes the endpoints used in the screening-level risk assessment of aquatic animals and plants.

Table 21. Summary of Toxicity Data for Aquatic Organisms

Species	Acute Toxicity (ppb)		Chronic Toxicity (ppb)	
	96-hr LC_{50}	Acute Toxicity	NOAEC/ LOAEC	Affected Endpoints
Freshwater Fish				
Rainbow trout - *Oncorhynchus mykiss*	5,300	moderately toxic	--	--
Brook trout - *Salvelinus tontinalis*	6,300	moderately toxic	65/120	reduced mean length, mean body weight
Freshwater Invertebrates				
Midge - *Chironomus tentans*	720	highly toxic	110/230	reduction in pupation and adult emergence
Scud - *Gammarus fasciatus*	5700	moderately toxic	60/140	reduction in development
Mysid shrimp - *Americamysis bahia*	1000	highly toxic	80/190	reduction in adult survival
	5400	moderately toxic		

Table 22. Summary of Toxicity Data for Non-Target Aquatic Plants

Species	Short Term Exposure (10 days or less)		Longer Term Exposure (>10 days)	
	Concen-tration (ppb)	Response	Concen-tration (ppb)	Response
Freshwater Vascular Plants				
Duckweed - *Lemna gibba*	170	50% reduction in growth	37	50% reductio in growth (LOAEC = 3.4, 19% reduction in growth; NOAEC < 3.4)
			43	50% reduction in growth (NOAEC = 10)
Freshwater Non-Vascular Plants				
Chlorophyceae - *Kirchneria subcapitata (Selenastrum capricornutum)*	49	50% reduction in cell growth (NOAEC = 16)	--	--

b. Exposure and Risk

For the screening-level assessment, to assess potential risk to aquatic animals and plants in ponds, the Agency uses a computer model to predict the EECs of atrazine in water. Peak EECs are compared to acute toxicity endpoints to derive acute RQs. Normally, chronic RQs are derived using 96-hour and 21- to 90-day EECs, corresponding to the duration of the test. For atrazine, 21-day EECs were generally used for chronic exposures, because the difference in EEC values is small. To estimate chronic risk to fish, both 21-day and 90-day EECs were used. EECs are presented in Table 23 below. Calculated RQs of concern are summarized below and presented in Table 23.

Table 23. EECs Used in the Atrazine Aquatic Risk Assessment for Ponds

Crop	Use Rates (lb ai/A)	Atrazine EEC Values ppb (μg/L)				
		Peak Conc.	96-hour Average	21-day Average	60-day Average	90-day Average
Sugarcane	4.0	205	204	202	198	194
	2.6	133	133	131	129	126
Corn	2.0	38.2	38.0	37.2	35.5	34.2
	1.1	21.0	20.9	20.5	17.7	18.8
Sorghum	2.0	72.7	72.3	70.6	67.7	65.9
	1.2	43.6	43.4	42.4	40.6	39.5

For the sugarcane scenarios, atrazine applied at either the 2.6 lbs/ai/A or 4.0 lbs ai/A rate exceeds the levels of concern for acute toxicity to aquatic plants, restricted use for aquatic invertebrates, and endangered species for aquatic invertebrates and aquatic vascular plants. In addition, the chronic LOC is exceeded for aquatic plants, fish and aquatic invertebrates resulting from both the maximum use rate and the typical use rate for sugarcane.

For the 2.0 lb rate corn scenario, atrazine exceeds the levels of concern for acute toxicity for aquatic plants and for endangered species for aquatic invertebrates and aquatic vascular plants. The acute RQs for freshwater fish, and the chronic RQs for freshwater fish and aquatic invertebrates do not exceed levels of concern. For the 1.1 lb. rate corn scenario, atrazine exceeds the LOC for endangered species for aquatic vascular plants. The remaining calculated RQs do not exceed levels of concern.

For the 2.0 lb rate sorghum scenario, atrazine exceeds the LOC for acute toxicity for aquatic plants, restricted use for aquatic invertebrates, endangered species for aquatic invertebrates, and aquatic vascular plant species. The levels of concern for chronic effects are exceeded by chronic RQs for aquatic plants, fish and aquatic invertebrates. For the 1.2 lb. Rate sorghum scenario, atrazine exceeds the LOC for acute toxicity for vascular plants, endangered species for aquatic invertebrates, and endangered species for aquatic vascular plants. The acute and chronic RQs for freshwater fish and aquatic invertebrates do not exceed levels of concern.

Table 24. Acute and Chronic Risk Quotients for Freshwater Aquatic Species

Organism	Acute		Chronic	
	EEC (ppb)	RQ	EEC (ppb)	RQ
Sugarcane: 1 Preplant Aerial Application at 4.0 lb ai/A				
Freshwater Fish	205	0.039	194 - 202	2.9 - 3.1
Aquatic Invertebrate		0.28	202	3.4
Freshwater Vascular Plant		5.5	--	--
Freshwater Vascular Plant (NOEC)*		>60.3	--	--
Freshwater Algae		4.2	--	--
Sugarcane: 1 Preplant Aerial Appliation at 2.6 lb ai/A				
Freshwater Fish	133	0.025	126 - 133	1.9 - 2.0
Aquatic Invertebrate		0.18	131	2.2
Freshwater Vascular Plant		3.6	--	--
Freshwater Vascular Plant (NOEC)*		>39.1	--	--
Freshwater Algae		2.7	--	--
Corn: 1 Preplant Aerial Application at 2.0 lb ai/A				
Freshwater Fish	38.2	0.0072	34.2 - 37.2	0.53 - 0.58
Aquatic Invertebrate	38.2	0.053	37.2	0.63
Freshwater Vascular Plant	37.2	1.0		
Freshwater Vascular Plant (NOEC)*	37.2	>11	--	--
Freshwater Algae	38.2	0.78	--	--
Corn: 1 Preplant Aerial Application at 1.1 lb ai/A				
Freshwater Fish	21.0	0.0040	18.8 - 20.5	0.29 - 0.32
Aquatic Invertebrate	21.0	0.029	20.5	0.34
Freshwater Vascular Plant	20.5	0.56	--	--
Freshwater Vascular Plant (NOEC)*	20.5	>6.0	--	--

Table 24. Acute and Chronic Risk Quotients for Freshwater Aquatic Species

Organism	Acute		Chronic	
	EEC (ppb)	RQ	EEC (ppb)	RQ
Freshwater Algae	21.0	0.43	--	--
Sorghum: 1 Preplant Aerial Application at 2.0 lb ai/A				
Freshwater Fish	72.7	0.014	65.9 - 70.6	1.0 - 1.1
Aquatic Invertebrate	72.7	0.10	70.6	1.2
Freshwater Vascular Plant	72.7	2.0	--	--
Freshwater Vascular Plant (NOEC)*	72.7	>21	--	--
Freshwater Algae	72.7	1.5	--	--
Sorghum: 1 Preplant Aerial Application at 1.2 lb ai/A				
Freshwater Fish	43.6	0.0082	39.5 - 42.4	0.61 - 0.65
Aquatic Invertebrate	43.6	0.061	42.4	0.71
Freshwater Vascular Plant	43.6	1.2	--	--
Freshwater Vascular Plant (NOEC)*	43.6	>13	--	--
Freshwater Algae	43.6	0.89	--	--

* Endangered species RQ calculation

In addition to the risks described above, indirect effects on fish and aquatic invertebrates may be severe due to the loss of up to 60 to 95 percent of the vegetative cover, which provides habitat to conceal young fish and aquatic invertebrates from predators. Numerous studies have described atrazine's ability to inhibit photosynthesis, change community structure, and cause the mortality of aquatic flora at concentrations between 20 and 500 ppm.

5. Refined Aquatic Assessment

The refined atrazine aquatic risk assessment focuses on aquatic plants and invertebrates and the potential for effects on sensitive plant species to result in community-level impacts that affect a range of aquatic organisms. The assessment is broken down by the type of water body (i.e., small static fresh water bodies such as ponds, flowing fresh water such as streams and rivers, larger bodies of fresh water such as lakes and reservoirs, and estuarine and marine habitats). Exposure for these three types of aquatic environments was estimated using PRZM-EXAMS modeling simulations (ponds) and monitoring data (streams, lakes and reservoirs, and estuarine/marine environments - refined aquatic assessment). The April 22, 2002, Environmental Fate and Effects Chapter presents figures that plot atrazine concentrations against

exceedence probabilities to illustrate the effects that are likely or estimated to occur in these aquatic environments.

The Agency's refined aquatic risk assessment is based on ecotoxicological data, microcosm and mesocosm studies, and the monitoring data described above. A large number of laboratory, microcosm, mesocosm, and actual field studies found in the literature suggest that atrazine concentrations measured in the environment could reach levels that are likely to have negative impact on sensitive aquatic species and communities.

Tables 25, 26 and 27 summarize the toxicological endpoints used in the refined risk assessment.

Table 25. Key Endpoints for the Lentic Freshwater Environment (e.g., reservoirs, lakes). The Endpoints Chosen for Use in the Refined Risk Assessment are Bolded.

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
Fish	Lab	Acute Fish (96-hours) LC50 = 5,300 μg/L	Rainbow trout / Mortality	Fish Mortality Estimated to Occur at **5,300 μg/L**
	Lab	Chronic Fish (44-weeks) NOAEC = 65 μg/L; LOAEC= 120 μg/L; MATC= 88 μg/L	Brook trout / [7.2 % red. mean length, 16 % red. mean body weight]	Reduction in Fish Growth Estimated to Occur at **88 μg/L**
	Distribution of Lab Data	10th centile value = 62 μg/L	Freshwater Aquatic Animal Chronic Data	**Fish Population Reductions Estimated to Occur at 62 μg/L**
	Field (mesocosms)	96% Reduction in # of Young Fish Occurred at 20 μg/L (Caused by Loss of Food and Habitat)	Bluegill sunfish	**Fish Populations Likely to be Reduced at 20 μg/L due to Loss of Food and Habitat**
Invertebrates	Lab	Acute Invertebrate (48-hour) LC_{50} = 720 μg/L	Midge / Mortality	Invertebrate Mortality Estimated to Occur at **720 μg/L**
	Lab	Chronic Invertebrate (48-hour) NOAEC = 60 μg/L; LOAEC= 140 μg/L; MATC= 92 μg/L	Scud / [25 % red. in development of F_1 to seventh instar]	Reduction in Invertebrate Populations Estimated to Occur at **92 μg/L**
	Distribution of Lab Data	10th centile value = 62 μg/L	Freshwater Aquatic Animal Chronic Data	**Reduction in Invertebrate Populations Estimated to Occur at 62 μg/L**
	Field	59-65% Reduction in Daphnid population growth occurred at 10 μg/L over 18-days	Daphnids	**Invertebrate Populations Likely to be Reduced at 10 μg/L**
Non-Vascular Plants	Lab	Acute Algae (1-week) EC_{50} = 1 μg/L	Four species [41-93% reduction in chlorophyll production]	Reduction in Primary Production Estimated to Occur at **1 μg/L**

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
	Distribution of Lab Data	10th centile value = 32 μg/L for acute effects on phytoplankton, and 2.3 μg/L for chronic effects on plants	Freshwater Aquatic Plant Data	**Acute Effects on Phytoplankton Estimated at 32 μg/L and Reductions in Primary Production Estimated to Occur at 2.3 μg/L**
	Microcosm	23% Reduction in gross primary production 10 μg/L (at day 2); recovery by day 7	phytoplankton	Reduction in Primary Production Estimated to Occur at **10 μg/L**
	Field	42% Reduction in phytoplankton biomass (at days 2-7) occurred at 20 μg/L	phytoplankton	**Reduction in Primary Production Likely to Occur at 20 μg/L**
Vascular Plants	Lab	Acute (14-days) EC_{50} = 37 μg/L	Duckweed [50% reduction in growth]	Reduction in Macrophytes Estimated to Occur at **37 μg/L**
	Distribution of Data	10th centile value = 18 μg/L for acute effects on macrophytes, and 2.3 μg/L for chronic effects on plants	Freshwater Aquatic Plant Data	**Acute Effects on Macrophytes Estimated at 18 μg/L and Reductions in Macrophyte Populations Estimated to Occur at 2.3 μg/L**
	Mesocosm	60% Reduction of macrophyte vegetation occurred at 20 μg/L; by May of following year, 95% Reduction of macrophytes	Macrophytes	**Reduction in Macrophytes (number & diversity) Likely to Occur at 20 μg/L**

Table 26. Key Endpoints for the Lotic Freshwater Environment (e.g., streams). The Endpoints Chosen for Use in the Refined Risk Assessment are Bolded.

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
Fish	Lab	Acute Fish (96-hours) LC50 = 5,300 μg/L	Rainbow trout / Mortality	Fish Mortality Estimated to Occur at **5,300** μg/L
	Lab	Chronic Fish (44-weeks) NOAEC = 65 μg/L; LOAEC= 120 μg/L; MATC= 88 μg/L	Brook trout / [7.2 % red. mean length, 16 % red. mean body weight]	Reduction in Fish Growth Estimated to Occur at **88 μg/L**
	Distribution of Lab Data	10th centile value = 62 μg/L	Freshwater Aquatic Animal Chronic Data	**Fish Population Reductions Estimated to Occur at 62 μg/L**
Invertebrates	Lab	Acute Invertebrate (48-hour) LC_{50} = 720 μg/L	Midge / Mortality	Invertebrate Mortality Estimated to Occur at **720 μg/L**
	Lab	Chronic Invertebrate (48-hour) NOAEC = 60 μg/L; LOAEC= 140 μg/L; MATC= 92 μg/L	Scud / [25 % red. in development of F_1 to seventh instar]	Reduction in Invertebrate Populations Estimated to Occur at **92 μg/L**
	Distribution of Lab Data	10th centile value = 62 μg/L	Freshwater Aquatic Animal Chronic Data	**Invertebrate Population Reductions Estimated to Occur at 62 μg/L**

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
	Outdoor Stream	Significant Increase in daytime and nighttime invertebrate drift occurred at 22 μg/L due to increased predation	various species of stream dwelling invertebrates	**Invertebrate Populations Likely to be Reduced at 22 μg/L**
Non-Vascular Plants	Lab	Acute Algae (1-week) EC_{50} = 1 μg/L	Four species [41-93% reduction in chlorophyll production]	Reduction in Primary Production Estimated to Occur at **1 μg/L**
	Distribution of Lab Data	10th centile value = 32 μg/L for acute effects on phytoplankton, and 2.3 μg/L for chronic effects on plants	Freshwater Aquatic Plant Data	**Acute Effects on Phytoplankton Estimated at 32 μg/L and reductions in primary production estimated to occur at 2.3 μg/L**
	Stream (first order adjacent to corn field in Canada)	79% (mean) Reduction in Total Phytoplankton Counts at 2.62 μg/L (mean; range = 0.211 - 13.9)	phytoplankton	**Reduction in Primary Production Likely to Occur at 2.62 (0.211 - 13.9) μg/L**
	Outdoor Artificial Streams	Depression of Photosynthesis at 10 μg/L	Various species of stream algae. Photosynthesis reduction measured by open water oxygen methods.	**Reduction in Primary Production Likely to Occur at 10 μg/L**
Vascular Plants	Lab	Acute (14-days) EC_{50} = 37 μg/L	Duckweed [50% reduction in growth]	Reduction in Macrophytes Estimated to Occur at **37 μg/L**
	Distribution of Lab Data	10th centile value = 18 μg/L for acute effects on macrophytes, and 2.3 μg/L for chronic effects on plants	Freshwater Aquatic Plant Data	**Acute Effects on Macrophytes Estimated at 18 μg/L and Reductions in Macrophytes Estimated to Occur at 2.3 μg/L**

Table 27. Key Endpoints for the Estuarine/Marine Environment (e.g., estuaries, tidal , marshes). Endpoints Chosen for Use in the Refined Risk Assessment are Bolded.

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
Fish	Lab	Acute Fish (96-hours) LC50 = 2,000 μg/L	Sheepshead minnow / Mortality	Fish Mortality Estimated to Occur at **2,000 μg/L**
	Lab	Chronic Fish NOAEC = 1,900 μg/L; LOAEC= 3400 μg/L; MATC= 2542 μg/L	Sheepshead minnow [89 % red. Juv. survival]	Reduction in Fish Populations Estimated to Occur at **2542 μg/L**
	Distribution of Lab Data	10th centile value = 23 μg/L	Saltwater Aquatic Animal Chronic Data	**Fish Population Reductions Estimated to Occur at 23 μg/L**
Invertebrates	Lab	Acute Invertebrate LC_{50} = 94 μg/L	Copepod (*Acartia tonsa*)	Invertebrate Mortality Estimated to Occur at **94 μg/L**

Key Group of Non-target Organisms	Type of Study	Measurement Endpoint	Test Organisms / Effect	Assessment Endpoint
	Distribution of Lab Data	10th centile value = 23 μg/L	Saltwater Aquatic Animal Chronic Data	**Invertebrate Population Reductions Estimated to Occur at 23 μg/L**
	Lab	Chronic Invertebrate NOAEC = 80 μg/L; LOAEC= 190 μg/L; MATC= 123 μg/L	Mysid [37 % red. Adult survival]	Reduction in Invertebrate Populations Estimated to Occur at **123 μg/L**
Non-Vascular Plants	Lab	Acute (120-hours) Algae LC_{50} = 22 μg/L	Algae (Chrysophyceae; *Isochrysis galbana*)	Algae Mortality Estimated to Occur at **22 μg/L**
	Distribution of Lab Data	10th centile value = 27 μg/L for acute effects on phytoplankton, and 9.1 μg/L for chronic effects on plants	Saltwater Aquatic Plant Data	**Acute Effects on Phytoplankton Estimated at 27 μg/L and Reductions in Primary Production Estimated to Occur at 9.1 μg/L**
Vascular Plants	Lab	Significant reduction in dry weight occurred at 10 μg/L (calculated MATC from NOAEC=7.5 and LOAEC=14.3)	Sago Pondweed	Reduction in Macrophytes Estimated to Occur at **10 μg/L**
	Distribution of Lab Data	10th centile value = 9.1 μg/L for chronic effects on plants	Saltwater Aquatic Plant Data	**Reductions in Macrophytes Estimated to Occur at 9.1 μg/L**
	Microcosm	16% Reduction in Tuber formation; 55% Reduction in Biomass over reproductive season at 4 μg/L	Wild Celery (*Vallisneria Americana*)	**Reduction in Macrophytes Likely to Occur at 4 μg/L**

a. Ponds

Based on modeling simulations, it is possible that for months every year, atrazine concentrations in ponds from use on sorghum and sugarcane exceed the levels at which studies have shown reductions in fish and invertebrate populations, macrophytes, and primary production (>20ppb). For corn, modeling simulations indicate that atrazine concentrations in ponds exceed the levels at which studies have shown reductions in fish populations, invertebrate populations, macrophytes, and primary production in 70 to 83% of the years. From 70 to 75% of the years, atrazine concentrations in ponds from use on sugarcane exceed the levels at which reproduction studies have shown reductions in invertebrate populations and fish growth. For sorghum, the percentage of exceedences are from 2.8 and <5% of the years.

b. Lakes and Reservoirs

Monitoring data in lakes and reservoirs have indicated that a number of drinking water sites have atrazine concentrations greater than 20 ppb in the finished water. This is the level at which reductions in fish populations, invertebrate populations, macrophytes, and primary production has been observed in simulated field studies.

c. Streams

The highest atrazine concentrations occur in brief pulses following rain events and are usually associated with the next rain event after an application. Atrazine concentrations in streams vary frequently, depending on usage and rainfall patterns, and vary from watershed to watershed, depending on the size of the watershed, the intensity of agricultural activity, and the flow volume and location of the watershed.

Reductions in invertebrate populations and primary production were likely to occur in 12 to 34% of the 129 Midwestern streams sampled following atrazine applications in 1989. In addition, based on simulated field testing and laboratory testing macrophytes may be reduced in 52 to 63% of the streams sampled in the weeks following atrazine applications. Reduction in primary production is also possible at these levels. Later in the season, concentrations that would affect primary production and macrophytes were seen in only 1% of the 143 streams sampled. Based on sampling in 1995, reduction in invertebrate populations are primary production are likely to occur in 17 to 35% of the 50 Midwestern streams sampled following atrazine applications. In addition, based on laboratory testing, macrophytes may be reduced in 64% of the streams sampled following atrazine applications.

The highest pulse concentrations seen in streams exceed many of the assessment endpoints for non-target organisms. While the duration of these high concentrations is not likely to be long since pulses of runoff tend to move quickly downstream, they may last for hours, especially during the Spring and during runoff events when many fields in a watershed are being treated with atrazine around the same time. Thus, it is possible that reductions in invertebrate populations and primary production could occur as a result of post-application stream contamination from the Spring application of atrazine. The frequency of such reductions occurring may be low considering the frequency of the pulses above 10 ppb and depending upon the flow volume of each stream. The frequency of similar reductions occurring in rivers is probably lower than for streams since the peaks and average concentrations of atrazine are lower in rivers.

Based on NAWQA monitoring data for 40 agricultural sites, 11 to 35% of the 40 sites exceed atrazine concentrations at which invertebrate populations and primary production occur, based on the maximum atrazine concentrations seen. NAWQA monitoring data, however, were not designed to time monitoring to correspond with atrazine treatment and may underestimate concentrations likely to be present in streams.

d. Estuaries

Based on maximum atrazine concentrations in Louisiana, 77% of the sites sampled exceed concentrations at which reductions in macrophytes occur. This falls to 26 to 61% for the mean concentration. About 30% of the sites based on maximum concentrations and about 7% based on mean concentrations exceed the concentrations at which reductions in fish and invertebrate populations occur.

Maximum atrazine concentrations in the Chesapeake Bay exceed levels that are likely to reduce macrophytes for 8% of the site and year combinations sampled. Atrazine could be contributing to reductions in submerged aquatic vegetation at certain sites in the Bay. It is possible that atrazine and other herbicides are a source of stress to aquatic vegetation. This, combined with eroding sediment could negatively affect estuarine ecosystems.

6. Risk to Endangered Species

Endangered species LOCs are exceeded for terrestrial plants, birds and small mammals from the agricultural uses of atrazine. However, risks to endangered birds and mammals are not anticipated from the dietary residues based on the methods and timing of atrazine applications. The risk exceedences for endangered terrestrial plants are based on spray drift and runoff into the habitats for terrestrial and semi-aquatic plants.

Endangered aquatic species LOCs are exceeded for some agricultural uses of atrazine. Acute risks to endangered freshwater invertebrates and aquatic vascular plants are exceeded for all crop uses except for the typical use rate on corn (1.1 lb ai/A.) Chronic levels of concern for endangered species are exceeded for fish and aquatic invertebrate reproduction for all use rates, except for corn and the typical use rate on sorghum.

Atrazine was included in the formal Section 7 consultations with FWS for the rangeland/pastureland and the forest cluster reviews in 1984. The Biological Opinions for both reviews stated that these uses of atrazine would jeopardize the continued existence of over 60 species of plants associated with rangeland and ten species of plants associated with forests. Atrazine was also included in the sorghum cluster review in 1983, and the Biological Opinion found possible jeopardy to several species of fish plus one insect (loss of habitat) and one plant species.

In addition, atrazine was one of 109 active ingredients included in the reinitiated Biological Opinion of 1989 from the FWS. This Opinion was primarily for aquatic species. In this Opinion, FWS found jeopardy to nine species of freshwater fish, two freshwater crustaceans, four amphibians and twelve species of plants for its uses on field crops, rangeland and forests. FWS provided “Reasonable and Prudent Alternatives” (RPAs) for each jeopardized species and “Reasonable and Prudent Measures” (RPMs) for 43 non-jeopardized species to minimize incidental take of these latter species. These consultations and the findings expressed in the Opinions, however, are based on old labels and application methods, less refined risk assessment procedures and an older approach to consultation which is currently being revised through interagency collaboration.

When the regulatory changes recommended in this IRED are implemented and the ecological effects and environmental fate data are submitted and accepted by the Agency, the Reasonable and Prudent Alternatives and Reasonable and Prudent Measures in the Biological Opinion(s) may need to be reassessed and modified based on the new information.

The Agency is currently engaged in a Proactive Conservation Review with FWS and the

National Marine Fisheries Service under section 7(a)(1) of the Endangered Species Act. The objective of this review is to clarify and develop consistent processes for endangered species risk assessments and consultations. Subsequent to the completion of this process, the Agency will reassess the potential effects of atrazine use to federally listed threatened and endangered species. At that time the Agency will also consider any regulatory changes recommended in the IRED that are being implemented. Until such time as this analysis is completed, the overall environmental effects mitigation strategy articulated in this document and any County Specific Pamphlets described in Section IV which address atrazine, will serve as interim protection measures to reduce the likelihood that endangered and threatened species may be exposed to atrazine at levels of concern.

The potential adverse effects of atrazine on homing and reproduction in endangered salmon and other anadromous fish species is currently uncertain. The laboratory study of olfactory function in mature Atlantic salmon parr and the effect of atrazine in the range of 0.5 μg/L for sensing female hormones in urine and behavior to ground salmon skin is notable. This is so especially if the effects are significant on salmon reproduction at such a low atrazine concentration, because existing concentrations in streams inhabited by endangered salmonids may exceed this level for prolonged periods. Atrazine concentrations are likely to be their highest in the late spring and early summer following applications, at a time when salmon are returning from the ocean to spawn. It is unclear from the results of the test by Moore and Waring (1998) whether the effect on olfactory function is manifested in mature adult salmon and what effect it might have on reproduction and recruitment. These data are preliminary and additional studies are necessary to determine if there are adverse atrazine effects on adult salmon homing and adult male milt production responses to female hormones in ovulating female urine. Further study is also needed on whether those effects could be significant to reproduction and recruitment.

7. Ecological Incident Reports

The Agency received 109 ecological incident reports on atrazine between 1991 and 2001. Of the 109 incidents, thirteen are classified as "Unlikely," 50 are listed as "Possible," and two are "Unrelated." In only one case, a 1996 cotton use in Louisiana, were casualties (fish) analyzed for atrazine residues. Shad and carp tested positive for atrazine, but the conclusion was that atrazine was unlikely to be the cause of mortality. Forty of the 109 incidents are considered "Probable," and four incidents are listed as "Highly Probable." The 4 incidents listed as "Highly Probable" include 3 home lawn use incidents and 1 corn use incident. The corn use incident reported affecting 100 bass and 100 bream resulting from a registered use. The three home lawn incidents were lawn applications that affected the turf itself; two were concluded to be accidental misuse, and the third was a registered use that affected grass and non-target plants.

The forty "Probable" incidents include: 16 cases affecting corn; 11 affecting grass; 11 fish kills; 1 bird kill; and affects on ornamentals, fruit trees, berries, garden, oats, vegetation around an atrazine/cyanazine-treated field (runoff), and greenhouse plants (pond irrigation water). Four "probable" incidents are classified as accidental misuse: two cases from corn use, pears, raspberry and oats and grass and ornamentals; and two lawn misuse cases affecting grass

and bluegrass.

Atrazine alone is not very toxic to the birds, mammals, and aquatic animals cited in most of these incidents. In none of these cases has evidence been provided that firmly demonstrate that atrazine has produced the reported effects. In many cases, the inference of these reported incidents to atrazine effects is likely due to the wide spread use of atrazine and the proximity of the atrazine application and timing to the occurrence to the incident. About 60 percent of the reported fish kills listed under atrazine in the incident record occur during the Spring when atrazine is applied, soils are saturated and heavy rainfall is frequent. Heavy runoff may carry atrazine, other pesticides and organic loads into surface waters. The high volume and wide-spread use of atrazine increases the probability of co-occurrence of fish kills with atrazine applications.

8. Endocrine Disruption

Atrazine has been associated with sub-lethal effects in aquatic organisms and amphibians in research presented in the open, peer-reviewed literature. These include potential effects on endocrine-mediated processes in frogs at ~ 0.1 μg/L and in largemouth bass at ~ 50 μg/L, as well as olfactory effects in salmon at ~ 0.5 μg/L. In addition, some studies have been conducted to address this issue and found that these effects were not demonstrated.

The Agency's ecological risk assessment does not suggest that endocrine disruption, or potential effects on endocrine-mediated pathways, be regarded as an regulatory endpoint at this time. Nor does the Agency have evidence to state that there is no reliable evidence that atrazine causes endocrine effects in the environment. Based on the existing uncertainties in the available database, atrazine should be subject to more definitive testing once the appropriate testing protocols have been established. The Agency is aware that several pertinent studies are being performed at this time by researchers that may to reduce some of the uncertainties in understanding potential atrazine effects on amphibian endocrinology and reproductive and developmental responses. The Agency has committed to provide these studies along with other available studies, a summary of the available data and methodologies and various data analyses for an external scientific review by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Science Advisory Panel (SAP) at a public meeting which is scheduled for June, 2003. The Agency anticipates that the results from this SAP meeting will provide significant input to enable it publish an amendment to this IRED in October 2003 which will address the issue of the potential effects of atrazine on amphibian endocrinology and development.

IV. Interim Risk Management and Reregistration Decision

A. Determination of Interim Reregistration Eligibility

Section 4(g)(2)(A) of FIFRA calls for the Agency to determine whether products containing a specific active ingredient are eligible for reregistration after submission of the relevant data. The Agency has previously identified and required the submission of the generic data (*i.e.*, data specific to an active ingredient) to support reregistration of products containing atrazine.

The Agency has completed its assessment of the ecological and occupational risks associated with the use of currently registered pesticides containing the active ingredient atrazine, as well as an atrazine-specific dietary risk assessment and residential risk assessment that have not considered the cumulative effects of the triazines, as a class. The ecological assessment does not address the potential for effects on amphibian endocrinology and reproductive and developmental responses. As mentioned above, the Agency will publish an amendment to this IRED in October 2003 which will address the issue. Based on a review of the generic data, other special studies, and public comments on the Agency's assessments, EPA has sufficient information on the human health and ecological effects of atrazine to make interim decisions as part of the tolerance reassessment process under FFDCA and reregistration under FIFRA, as amended by FQPA. The Agency has determined that atrazine products, based on currently approved labeling, pose unreasonable dietary, residential, occupational, and ecological risks. However, the Agency believes that these risks can be mitigated through routine changes to pesticide labeling and through actions designed to further prevent risks from occurring that are described in a Memorandum of Agreement with the registrants. Accordingly, the Agency has determined that the active ingredient atrazine is eligible for reregistration provided that: (i) the additional data needs that the Agency has identified are addressed; (ii) the risk mitigation measures outlined in this document are adopted, and label amendments are made to reflect these measures; (iii) the consideration of cumulative risk for the triazines supports a final reregistration eligibility decision; and (iv) the Memorandum of Agreement is implemented. Further mitigation measures and additional data requirements may be warranted following the completion of the stakeholder process outlined in this document.

Although the Agency has not yet considered the cumulative risk for the triazines, the Agency is issuing this interim assessment now in order to identify risk reduction measures that are necessary to support the continued use of atrazine. Based on its current evaluation of atrazine alone, the Agency has determined that atrazine products, unless labeled and used as specified in this document, would present risks inconsistent with FIFRA. Accordingly, should a registrant fail to implement any of the risk mitigation measures identified in this document, the Agency may take regulatory action to address the risk concerns from use of atrazine.

At the time that a cumulative assessment is conducted, the Agency will address any outstanding risk concerns. For atrazine, if all changes outlined in this document are incorporated into the labels and the Memorandum of Agreement is implemented, then all currently identified risks will be mitigated. However, because this is an interim RED, the Agency may take any

necessary further actions to finalize the reregistration eligibility decision for atrazine after assessing the cumulative risk of the triazine class. Such an incremental approach to the reregistration process is consistent with the Agency's goal of improving the transparency of the reregistration and tolerance reassessment processes. By evaluating each triazine in turn and identifying appropriate risk reduction measures, the Agency is addressing the risks from use of all of the triazines in as timely a manner as possible.

Because the Agency has not yet considered cumulative risk for all of the triazines, this reregistration eligibility decision does not fully satisfy the reassessment of the existing atrazine food residue tolerances as called for by the Food Quality Protection Act (FQPA). When the Agency has completed the cumulative assessment, atrazine tolerances will be reassessed. At that time, the Agency will reassess atrazine along with the other triazine pesticides to complete the FQPA requirements and make a final reregistration eligibility determination for atrazine. By publishing this interim decision on reregistration eligibility and requesting mitigation measures now for the individual chemical atrazine, the Agency is not deferring or postponing FQPA requirements; rather, EPA is taking steps to assure that uses that exceed FIFRA's unreasonable risk standard do not remain on the label longer than is necessary, pending completion of the cumulative assessment required under FQPA. This decision does not preclude the Agency from making further FQPA determinations or tolerance-related rulemakings that may be required on this pesticide or any other in the future.

If the Agency determines, before finalization of the interim RED, that any of the determinations described in this interim RED are no longer appropriate, the Agency will pursue appropriate action, including, but not limited to, reconsideration of any portion of this interim RED.

Label changes that are necessary to adequately mitigate the risks of atrazine use are described in Section V of this document. Appendix A summarizes the uses of atrazine that are eligible for reregistration. Appendix B identifies the generic data requirements that the Agency reviewed as part of its determination of reregistration eligibility, and lists the submitted studies that the Agency found acceptable.

B. Summary of Phase 5 Comments and Responses

When making its interim reregistration decision, the Agency took into account all comments received during Phases 3, 4, and 5 of the Public Participation Process for atrazine. These comments are available in the docket in their entirety. Numerous letters were received commenting on the atrazine risk assessments during Phase 5 of the public process. Comments that addressed human health and ecological concerns were received from the technical registrants (Syngenta Crop Protection, Inc., and Sipcam Agro USA); state and other regulatory agencies (California Department of Pesticide Regulation, California Regional Water Quality Control Board, State of New York Office of the Attorney General, Connecticut Office of the Attorney General,U.S. Department of the Interior, Fish and Wildlife Service); environmental and advocacy groups (Natural Resources Defense Council [NRDC], People for the Ethical Treatment of Animals, Beyond Pesticides/NCAMP, Center for Regulatory Effectiveness; universities (Yale

University; Texas Tech University; U.C. Berkeley); grower and agricultural advocacy groups (National Agricultural Aviation Association, Sugar Cane Growers Cooperative of Florida, Weed Science Society of America, Triazine Network, Marion County Farm Bureau, American Farm Bureau Federation, Illinois Farm Bureau, Louisiana Farm Bureau Federation, Ohio Farm Bureau Federation, Minnesota Farm Bureau); water advocacy groups (American Water Works Association); and many private citizens and growers. Comments were received on the following topics:

- Toxicology and Mode of Action of Atrazine and Endpoints Chosen;
- Carcinogenicity of Atrazine;
- Ecological Risks of Atrazine;
- Exposure to Atrazine and its Degradates;
- Other Atrazine Regulations;
- Occupational and Residential Exposure to and Risk from Atrazine;
- Atrazine Treatment Costs; and
- Benefits of the Use of Atrazine.

These comments have been addressed and the assessments refined as appropriate by the Agency. Response to Comments documents addressing most of these comments are available in the public docket and on the Agency's web page at http://www.epa.gov/pesticides/reregistration.

Three comments that were received are being addressed in the IRED, as follows: comments from the The New York State Office of the Attorney General (NYOAG) on the Endangered Species Act (ESA) and consultations with the U.S. Fish and Wildlife Service (FWS); comments from the Natural Resources Defense Council (NRDC) on the consideration of farm worker children in the assessment; and comments from the Center for Regulatory Effectiveness on the new Data Quality Act (DQA)

Comment: The NYOAG commented to the Agency that EPA must initiate consultations with the FWS because EPA's issuance of a reregistration decision for atrazine triggers the ESA consultation requirement and stated that the ESA requires that the Agency consider any existing FWS biological opinion.

Response: Atrazine has been reviewed on several occasions by the FWS as described in Section III above under the discussion on endangered species. Currently, the Agency is developing a proposal to implement its Endangered Species Protection Program (ESPP). The Agency is soliciting public opinion on this proposal through issuance of a Federal Register Notice, Endangered Species Protection Program Field Implementation, December 2, 2002. The Agency obtained input on several key aspects of the program in a workshop held in September 2002 that included the pesticide industry, pesticide user groups, and environmental advocacy organizations. An Advance Notice of Proposal Rulemaking (ANPR), Endangered Species and Pesticide Regulation, was issued jointly by the Agency, the Department of Interior and the Department of Commerce on January 24, 2003. The ANPR is soliciting comments regarding methods to make the consultation

process more efficient.

Comment: The Center for Regulatory Effectiveness commented on November 25, 2002, requesting correction under the Environmental Protection Agency's (EPA) Information Quality Guidelines. This Request for Correction was filed on behalf of the Kansas Corn Growers Association, the Triazine Network, and the Center for Regulatory Effectiveness. The complaint alleges that the April 22, 2002, Environmental Risk Assessment for Atrazine does not comply with the "Data Quality Act" because the document "states that atrazine causes endocrine effects in various organisms including frogs." The comment requests that the environmental risk assessment be corrected to state that there is no reliable evidence that atrazine causes "endocrine effects" in the environment and that there can be no reliable, accurate or useful information regarding atrazine's endocrine effects until and unless there are test methods for those effects that have been properly validated.

Response: After reviewing the questions raised in the request, the Agency has decided that some minor clarifications of the April 2002 Environmental Risk Assessment for Atrazine may help to avoid any future misunderstanding of the Agency's position on the environmental effects of atrazine. Any such clarifications will be included in a revised *Environmental Risk Assessment for Atrazine*. This Request for Correction is further addressed in the Agency's Response to Comments document available in the public docket and on the Agency's web page at http://www.epa.gov/pesticides/reregistration.

The Agency is providing a 60-day public comment period on this IRED. While all comments are welcome, those with specific data or information bearing on the risk and benefit assessments are most useful.

C. Regulatory Position

1. FQPA Assessment

a. "Risk Cup" Determination

As part of the FQPA tolerance reassessment process, EPA assessed the risks associated with this triazine. The assessment was for this individual triazine, and does not attempt to fully reassess these tolerances as required under FQPA. FQPA requires the Agency to evaluate food tolerances on the basis of cumulative risk from substances sharing a common mechanism of toxicity, such as the toxicity expressed by the triazine pesticides through a common biochemical interaction. The Agency will evaluate the cumulative risk posed by the entire class of triazines once the policy concerning cumulative assessments is fully resolved.

EPA has determined that risk from exposure to atrazine exceeds its own "risk cup" for the currently registered uses of atrazine. In reaching this determination, EPA has considered the

available information on the special sensitivity of infants and children, as well as dietary (food and drinking water) and residential exposure to atrazine. However, if the use of atrazine is modified, the Memorandum of Agreement is implemented, and any other mitigation measures outlined in this document are implemented, the Agency believes that risks from the use of atrazine will not exceed the Agency's level of concern (i.e., atrazine uses will "fit" within its risk cup). Therefore, the atrazine tolerances can remain in effect until a full reassessment of the cumulative risk from all triazines is completed.

b. Tolerance Summary

Tolerances for residues of atrazine *per se* are established under 40 CFR §180.220(a)(1). Tolerances for atrazine and its chlorinated metabolites are established under 40 CFR §180.220(a)(2).

The Agency has determined that the tolerance expression in 40 CFR §180.220(a)(1) must be changed to reflect the combined residues of atrazine and its chlorinated metabolites, and that all tolerances based on atrazine and its chlorinated metabolites should be placed together under 40 CFR § 180.220 (a)(1). A summary of atrazine tolerance reassessments is presented in Table 28. Reassessments are based on tolerances redefined as atrazine and its chlorinated metabolites.

The Agency has also determined that tolerance expressions for the combined residues of each of the four hydroxy compounds are not needed.

The Agency will commence proceedings to revoke and modify existing tolerances, and to correct commodity definitions. The establishment of a new tolerance or raising tolerances will be deferred, pending consideration of cumulative risk for the triazines. "Reassessed" does not imply that all of the tolerances have been fully reassessed as required by FQPA, since these tolerances may only be fully reassessed once the cumulative risk assessment of all triazine pesticides is considered, as required by the statute. Rather, this IRED provides reassessed tolerances for atrazine in/on various commodities, supported by all the submitted residue data, only for atrazine. EPA will finalize these tolerances after considering the cumulative risks for all triazine pesticides. The Agency's tolerance summary is provided in Table 28.

<u>Tolerances Listed Under 40 CFR §180.220(a)(1)</u>

Tolerances for residues in/on sweet corn forage and fodder can be lowered to 4.0 ppm and 2.0 ppm, respectively, to 1.5 ppm for field/pop corn forages, and to 0.5 ppm for field/pop corn fodder and the designation "fodder" should be revised to "stover." The tolerances for residues in/on corn, fresh, K+CWHR and corn grain can be decreased to 0.20 ppm, each based on combined nondetectable residues at 0.05 ppm for atrazine and each chloro-metabolite. The tolerance for residues in/on macadamia nuts can be lowered to 0.20 ppm based on combined nondetectable residues at 0.05 ppm for atrazine and each chloro-metabolite. Tolerances for residues in/on sorghum forage and fodder can be lowered to 0.50 ppm, each; the designation "fodder" should be revised to "stover." The tolerance for residues in/on sorghum grain can be

lowered to 0.20 ppm based on combined nondetectable residues at 0.05 ppm for atrazine and each chloro-metabolite. The tolerances for residues in/on wheat fodder, grain, and straw can be lowered to 1.5, 0.10, and 0.50 ppm, respectively; the designation "fodder" should be revised to "forage." The tolerance for sugar cane can be lowered to 0.20 ppm based on combined nondetectable residues at 0.05 ppm for atrazine and each chlorinated metabolite. The tolerances for residues in/on sugarcane, forage and fodder, should be revoked, as these are no longer regulated as livestock feed items. The tolerance for residues in/on guavas is adequate.

Existing tolerances for residues in commodities from cattle, goats, horses, and sheep (0.02 ppm) must be increased to 0.10 ppm include combined residues of atrazine and chlorinated metabolites. Tolerances have been reassessed based on animal feeding study data.

The tolerances for commodities from hogs, poultry, and eggs can be revoked as there is no reasonable expectation of finite residues.

Syngenta proposes lowering the tolerances for sweet and field corn forages to 1.5 ppm, and the tolerance for sorghum forage to 0.25 ppm. For postemergent treatments, the registrant proposes a change from a 30-day PHI to a 45-day PHI for sweet corn and sorghum forages, and from a 30-day PHI to a 60-day PHI for field corn forage. For preemergent treatments on sorghum, they propose a change from a 45-day PHI to a 60-day PHI. Preemergent treatments on sweet and field corn will retain the existing 45-day and 60-day PHI, respectively. Existing labels contain 21 and 30-day PHIs for corn and sorghum forages.

The Agency has reassessed the tolerance for sweet corn forages at 4.0 ppm based on field trial data showing the highest chlorotriazine residues detected at 3.2 ppm after one treatment, and a 30-day PHI. Syngenta states that a sweet corn forage tolerance of 1.5 ppm is supported by data representing a 45-day PHI. Maximum chlorotriazine residues on sweet corn forage harvested 45 days after postemergent treatments at the 1X rate expected to result in the highest residues (0.5 + 2.0 lbs ai/A) were approximately 1.15 ppm. The Agency concludes that if labels for postemergent sweet corn use are amended to allow a minimum PHI of 45 days, the tolerance for sweet corn forage be lowered to 1.5 ppm.

The Agency has already reassessed the tolerance for field corn forage at 1.5 ppm based on the highest chlorotriazine residues detected at 1.1 ppm after a 1X treatment, at either a 30-day or a 60-day PHI. Maximum chlorotriazine residues on field corn forage harvested 60 days after postemergent treatments at the 1X rate expected to result in the highest residues (0.5 + 2.0 lbs ai/A) were approximately 1.11 ppm. The Agency concludes that all atrazine labels for postemergent field corn should be amended to allow a minimum PHI of 60 days.

The tolerance for sorghum forage has already been reassessed at 0.5 ppm based on field trial data showing the highest chlorotriazine residues detected at 0.22 ppm after a 1X treatment, and a 23-day PHI. Maximum chlorotriazine residues on sorghum forage harvested 30 and 45 days after postemergent treatments at the 1X rate were approximately 0.35 ppm and 0.09 ppm, respectively. Maximum chlorotriazine residues on sorghum forage harvested 45 and 60 days after preemergent treatments at the 1X rate were approximately 0.12 and 0.16 ppm, respectively.

The Agency concludes that if all atrazine labels for postemergent sorghum use are amended to allow a minimum PHI of 45 days, and for preemergent sorghum use to allow a minimum PHI of 60 days, the tolerance for sorghum forage be lowered to 0.25 ppm.

The Agency has recalculated the maximum theoretical dietary burden (MTDB) for dairy cattle based on a reassessed sweet corn forage tolerance of 1.5 ppm. The resulting MTDB for dairy cattle is approximately 2.0 ppm chlorotriazines. Extrapolating the results from cattle feeding studies to this MTDB results in a reassessed milk tolerance of 0.03 ppm. If all atrazine labels are amended to the proposed PHIs discussed above for sweet and field corn forage and sorghum forage, the milk tolerance can be lowered to 0.03 ppm, based on available feeding studies and residue data.

Tolerances Needed Under 40 CFR §180.220(a)(1)

The Agency proposes establishing a tolerance for residues of atrazine and the chlorinated metabolites in wheat hay based on existing wheat forage residue data, and taking into account any concentration of residues during drying processes for hay. Alternatively, the registrant may submit field trials to determine an appropriate tolerance level for residues in/on wheat hay.

An additional processing study is required for sugarcane, in order to determine the need for a separate tolerance for residues in molasses.

Tolerances Currently Listed Under 40 CFR §180.220(a)(2) To Be Placed Under 40 CFR §180.220(a)(1)

The Agency recommends that the established tolerances for residues of atrazine in or on orchard grass and orchard grass, hay be revoked, as these uses are not being supported.
The Agency also recommends the revocation of the 15 ppm tolerance for Perennial rye grass and that the use be cancelled. In addition, the tolerance for Grass, range should be revoked and a crop group tolerance for Crop Group 17 (Grass, Forage, Fodder, and Hay) should be established under 180.220(a)(1), that will cover range grasses. Residue data on representative grasses to support the crop group tolerance are recommended. This will include residue data on bermuda grass, bluegrass, and bromegrass or fescue from 12 trials (four for each cultivar) conducted in concordance with the current label rates. If the registrant(s) do not wish to support a crop group tolerance with new residue data, the existing tolerances should be revoked and the uses cancelled.

Table 28. Tolerance Reassessment Summary for Atrazine

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Tolerances Listed Under 40 CFR §180.220(a)(1)[1]			

Table 28. Tolerance Reassessment Summary for Atrazine

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Cattle, fat	0.02	0.10	Reassessed tolerances based on reassessed sweet corn forage tolerance of 4.0 ppm. Registrant recommended lowering tolerances for sweet corn forage to 1.5 ppm pending amendment of all atrazine labels for postemergent sweet corn use to allow a minimum PHI of 45 days.
Cattle, mbyp	0.02	0.10	
Cattle, meat	0.02	0.10	
Corn, fodder, field	15	0.5	*corn, field, stover*
Corn, fodder, pop	15	0.5	*corn, pop, stover*
Corn, fodder, sweet	15	2.0	*corn, fresh, stover*
Corn, forage, field	15	1.5	Amend all atrazine labels for postemergent and preemergent field corn use to require a minimum PHI of 60-days.
Corn, forage, pop	15	1.5	
Corn, forage, sweet	15	1.5	Amend all atrazine labels for postemergent and preemergent sweet corn use to require a minimum PHI of 45 days.
Corn, fresh, K+CWHR	0.25	0.20	
Corn, grain	0.25	0.20	
Eggs	0.02	Revoke	The Agency concludes that there is no reasonable expectation of finding quantifiable atrazine residues in eggs or the meat, fat, or meat byproducts of poultry
Goats, fat	0.02	0.10	Reassessed tolerances based on reassessed sweet corn forage tolerance of 4.0 ppm. Registrant recommended lowering tolerances for sweet corn forage to 1.5 ppm pending amendment of all atrazine labels for postemergent sweet corn use to allow a minimum PHI of 45 days.
Goats, mbyp	0.02	0.10	
Goats, meat	0.02	0.10	
Guava	0.05	0.05	
Hogs, fat	0.02	Revoke	No reasonable expectation of finding quantifiable atrazine residues in the meat, fat, or meat byproducts of hogs.
Hogs, mbyp	0.02	Revoke	
Hogs, meat	0.02	Revoke	
Horses, fat	0.02	0.10	Reassessed tolerances based on reassessed sweet corn forage tolerance of 4.0 ppm. Registrant recommended lowering tolerances for sweet corn forage to 1.5 ppm pending amendment of all atrazine labels for postemergent sweet corn use to allow a minimum PHI of 45 days.
Horses, mbyp	0.02	0.10	
Horses, meat	0.02	0.10	
Macadamia nuts	0.25	0.20	
Milk	0.02	0.03	All atrazine labels must be amended to the proposed PHIs for sweet and field corn forage and sorghum forage.

Table 28. Tolerance Reassessment Summary for Atrazine

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Poultry, fat	0.02	Revoke	The Agency concludes that there is no reasonable expectation of finding quantifiable atrazine residues in eggs or the meat, fat, or meat byproducts of poultry.
Poultry, mbyp	0.02	Revoke	
Poultry, meat	0.02	Revoke	
Rye, grasses, perennial	15	Revoke	Uses are restricted to the Conservation Reserve Program (CRP) lands in OK, OR, NE, and TX. Restrictions on grazing and cutting for hay apply.
Sheep, fat	0.02	0.10	Reassessed tolerances based on reassessed sweet corn forage tolerance of 4.0 ppm. Registrant recommended lowering tolerances for sweet corn forage to 1.5 ppm pending amendment of all atrazine labels for postemergent sweet corn use to allow a minimum PHI of 45 days.
Sheep, mbyp	0.02	0.10	
Sheep, meat	0.02	0.10	
Sorghum, fodder	15	0.50	*Sorghum, stover*
Sorghum, forage	15	0.25	Amend all atrazine labels for postemergent sorghum use to require a minimum PHI of 45 days, and for preemergent sorghum use to require a minimum PHI of 60 days.
Sorghum, grain	0.25	0.20	
Sugarcane	0.25	0.20	
Sugarcane, fodder	0.25	Revoke	Not a significant livestock feed item
Sugarcane, forage	0.25	Revoke	Not a significant livestock feed item
Wheat, fodder	5	1.5	*Wheat, forage*
Wheat, grain	0.25	0.10	
Wheat, straw	5	0.50	
Tolerances Listed Under 40 CFR §180.220(a)(2) To be Places Under 40 CFR §180.220(a)(1)[1]			
Grasses, orchardgrass	15	Revoke	Uses on orchard grass are not supported by the basic produce
Grasses, orchardgrass, hay	15	Revoke	Uses on orchard grass are not supported by the basic producer

Table 28. Tolerance Reassessment Summary for Atrazine

Commodity	Established Tolerance, ppm	Reassessed Tolerance, ppm	Comments [*Correct Commodity Definition*]
Grasses, range	4	TBD	Uses are restricted to the Conservation Reserve Program (CRP) lands in OK, OR, NE, and TX. Restrictions on grazing and cutting for hay apply. However, these grasses may be fed during drought and emergencies. Registrant may establish a crop group tolerance under Crop Group 17. Residue data on representative crops are recommended. Once data are submitted a crop group tolerance should be established under 180.220(a)(1). Table 2 of OPPTS 860.1500 Crop Field Trials calls for 12 trials (four for each cultivar). Existing tolerances are believed to be unsupportable based on today's data requirements. If the registrant(s) do not wish to support a crop group tolerance with new residue data, the existing tolerances will be revoked and the uses cancelled.
Tolerances Needed Under 40 CFR §180.220(a)(1)[1]			
Sugarcane molasses	none	TBD[2]	Additional data are required to determine the need for a separate tolerance.
Wheat, hay	none	5	This tolerance is based on residue data for wheat forage, taking into account concentration of residues as forage is dried to hay. Alternatively, the registrants may provide residue data on wheat hay from field trials.
Tolerances to be Proposed Under 40 CFR §180.220(d)			
[Indirect residues in foliage of legume vegetables]	none	TBD	Additional data are required to determine the need for indirect residue tolerance(s).

[1]Tolerances reassessed based on combined residues of atrazine, G30033, G-28279, and G-28273.
[2]TBD = To be determined. Reassessment of tolerance(s) cannot be made at this time because additional data are required.
[3]Tolerances based on combined residues of 2-hydroxy-4-ethylamino-6-isopropylamino-s-triazine (G-34048), 2-amino-4-hydroxy-6-isopropylamino-s-triazine (GS-17794), 2-amino-4-hydroxy-6-ethylamino-s-triazine (GS-17792), and 2,4-diamino-6-hydroxy-s-triazine (GS-17791).

3. Codex Harmonization

The Codex Alimentarius Commission has not proposed or established maximum residue limits (MRLs) for residues of atrazine in/on agricultural commodities. Therefore, there are no issues regarding harmonization or compatibility of U.S. tolerances with Codex MRLs.

4. Endocrine Disruptor Effects

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate."

Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there were scientific bases for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP).

When the appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, atrazine may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

5. Labels

A number of label amendments, in addition to the existing label requirements, are necessary in order for atrazine products to be eligible for reregistration. The Agency has determined that these measures, in addition to the existing label requirements, will adequately reduce risks.

Provided the following risk management measures are incorporated in their entirety into labels for atrazine-containing products, the Agency finds that all currently registered uses of atrazine are eligible for interim reregistration, pending consideration of cumulative risks of the triazines. While all uses are eligible at this time, the cotton use will be phased out over five years. The regulatory rationale for each of the risk management measures outlined below is discussed immediately after this list of required risk management measures.

a. Agricultural Use Exposure Reduction Measures

For agricultural use, the following measures are required, in addition to the existing label requirements to address risks of concern.

<u>Dietary (Drinking Water)</u>

- Require the following statement:
  "ANY USE OF THIS PRODUCT IN AN AREA WHERE USE IS PROHIBITED IS A VIOLATION OF FEDERAL LAW. Before using this product, you must consult the Atrazine Watershed Information Center (AWIC) to determine whether the use of this product is prohibited in your watershed. AWIC can be accessed through [website], [mailing address] or [1-800-toll-free number]. If use of this product is prohibited in your watershed, you may return this product to your point of purchase or contact [insert name of registrant] for a refund."

<u>Occupational - Agricultural Uses</u>

1) Mixing/Loading Scenarios:

a) Liquids:
- require closed systems for mixing/loading to support aerial applications at greater than 3 lb ai/A
- all mixers/loaders (including using engineering controls) must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

b) Wettable Powders:
- require water-soluble packaging for all WP formulations
- all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

c) Dry Flowables:
- water-soluble packaging optional
- if in water-soluble packaging, all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron
- if not in water-soluble packaging, mixers/loaders must wear coveralls over long-sleeve shirt and long pants, chemical-resistant gloves, chemical-resistant footwear, and chemical-resistant apron plus a NIOSH-approved dust/mist filtering respirator with any N, R, P, or HE filter.
- if not in water-soluble packaging, aerial application is prohibited.

d) Granular Products:
- Loaders must wear long-sleeve shirt, long pants, shoes, and socks.

2) Applicator and Flagger Scenarios:

a) Pilots must use enclosed cockpits (40 CFR 170.240(d)(6)) for aerial applications.

b) Human flaggers supporting aerial applications must used enclosed cabs (40 CFR 170.240(d)(5)).

c) Applicators applying sprays with motorized ground equipment (i.e., groundboom or rights-of-way sprayers) must wear long-sleeve shirt, long pants, shoes, socks, and chemical-resistant gloves.

d) Applicators applying granular products or impregnated fertilizer must wear long-sleeve shirt, long pants, shoes, and socks.
- Restrict the impregnation of bulk fertilizer to commercial facilities (prohibit on-farm impregnation)
- Restrict the impregnation of dry bulk fertilizer to 500 tons per day for no more than 30 days per calendar year per facility

e) Reduce the maximum application rate for handlers applying liquids with rights-of-way sprayers to 1.0 lb ai/A

f) Reduce the maximum application rate for liquids for chemical follow to 2.25 lb ai/A

g) Require a 60-day PHI for field corn forage uses

h) Require a 45-day PHI for sweet corn forage uses

i) Require a 60-day PHI for pre-emergent uses and a 45-day PHI for postemergent

sorghum forage uses

b. Non-Agricultural Use Exposure Reduction Measures

1) Non-Agricultural Products including Lawns and Turf (not Sod Farms)

a) Require that all wettable powder products be packaged in water soluble bags.
b) Granular formulations: loaders, applicators, and other handlers must wear long-sleeve shirt, long pants, shoes, and socks.
c) Liquid, wettable powder, dry flowable (water-dispersible granule) formulations:
   - applicators using spray equipment mounted on their backs must wear coveralls worn over long sleeved shirt and long pants, chemical-resistant gloves and chemical-resistant footwear plus socks.
   - all other mixers, loaders, applicators, and other handlers must wear long-sleeved shirt and long pants, shoes and socks, and chemical resistant gloves.
   - Reduce the maximum single application rate for liquid formulations on residential lawns and turf to 1 lb ai/A from 2 lb ai/A (liquid products containing >4% ai are restricted use)
d) Require that granular lawn products be watered in

2) Residential

z) Restrict the application of granular lawn products when using hand-held devices (e.g. belly grinder) to spot applications only.
aa) Prohibit applications of granular lawn products by hand
bb) Reduce the maximum single application rate for liquid formulations on residential lawns and turf to 1 lb ai/A from 2 lb ai/A (liquid products containing >4% ai are restricted use)
cc) Require that granular lawn products be watered in

c. Label Harmonization

As described in Section II under the discussion of the regulatory history of atrazine, a number of risk mitigation measures have been instituted over the years to address exposure to atrazine. While most product labels have adopted these measures there are some that continue to reflect use patterns prior to the implementation of these risk mitigation measures. The listing below identifies measures that are not fully implemented on all current product labels. All of these measures, in addition to new label requirements as defined by this IRED, are needed on atrazine labels in order for products to be eligible for reregistration.

- Atrazine products containing >4% active ingredient must be classified as restricted use
- Maximum broadcast application rates for corn and sorghum must be as follows:
  a) Where both a preemergence and a postemergence are used, the total atrazine

applied in the preemergence PLUS postemergence treatment cannot exceed 2.5 lb ai/A/calendar year.

b) 2.0 lb ai/A as a single preemergence application on soils that are not highly erodible or on highly erodible soils if at least 30% of the soil is covered with plant residues; or

c) 1.6 lb ai/A as a single preemergence application on highly erodible soils if <30% of the surface is covered with plant residues; or

d) 2.0 lb ai/A if only applied postemergence.

e) For all tank mixtures and sequential treatment of products containing atrazine, the total lbs. a.i. of atrazine applied cannot exceed the application limits described above.

- Maximum application rates per crop must be as follows (single application and annual maximum):
  a) Conifers 4 lb ai/A; 4 lb ai/A per year maximum
  b) Sugarcane 4 lb ai/A (single application);10 lb ai/A per year maximum
  c) Rights-of-Way/Roadsides Treatment 1 lb ai/A; 1 application per year
  d) Guava 4 lb ai/A (single application); 8 lb ai/A per year maximum
  e) Macadamia Nuts 4 lb ai/A (single application); 8 lb ai/A per year maximum
  f) Conservation Reserve Program (CRP) 2 lb ai/A
  g) Chemical Fallow 2.25 lbs ai/Aa
- Delete all uses for total vegetation control on non-cropland areas. This does not include rights-of-way/roadsides or CRP
- Prohibit use in chemigation systems
- Prohibit use, and mixing and loading within 50 feet of all wells, including abandoned wells, drainage wells, and sink holes
- Prohibit mixing and loading within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs.
- Prohibit application within 66 feet of the points where field surface water runoff enters perennial or intermittent streams and rivers. If land is highly erodible, the buffer must be planted to the crop or seeded with grass or other suitable crop.
- Prohibit application within 200 feet of natural or impounded lakes and reservoirs.
- Require that one of the following restrictions be used in applying Atrazine to tiled-outletted fields containing standpipes
  a) Do not apply within 66 feet of standpipes in tile-outletted fields
  b) Apply this product to the entire tile-outletted field and immediately incorporate it to a depth of 2-3 inches in the entire field
  c) Apply this product to the entire tile-outletted field under a no-till practice only when a high crop residue management practice is practiced. High crop residue management is described as a crop management practice where little or no crop residue is removed from the field during and after crop harvest.

D. Regulatory Rationale

The following is a summary of the rationale for managing risks associated with the current uses of atrazine. The Agency has discussed these measures with the technical registrants

and in all cases the registrants have agreed to the measures presented here. Where labeling revisions are warranted, specific language is set forth in the summary tables of Section V of this document.

1. Human Health Risk Mitigation

a. Dietary (Food)

The acute and chronic dietary risks from atrazine residues on food are well below the Agency's level of concern at the 99.9th percentile of exposure. Therefore, no mitigation measures are necessary at this time.

b. Dietary (Drinking Water)

1) Community Water Systems (CWS)

The Agency has identified 34 surface water CWS with levels of atrazine that have exceeded the Agency's current DWLOC (12.5 ppb as a 90-day average) at least once since frequent monitoring for atrazine began in 1993. The 12.5 DWLOC was used as a screening tool to identify specific CWS that were of concern to the Agency. The registrant has since added 3 CWS to the list of CWS of concern. These 37 CWS have been targeted for intensive monitoring, risk mitigation, and probabilistic risk assessments.

The 12.5 ppb DWLOC was also used as a tool to establish a trigger value based on SDWA compliance monitoring data by which CWS with potential high-end seasonal exposures could be identified in the future. The Agency considered available data from SDWA compliance monitoring and determined that a trigger value of 2.6 TCT provides an appropriate early warning. If annual average concentrations of atrazine and its chlorinated metabolites (total chlorotriazines - TCT) in a surface water CWS reach 2.6 ppb, this triggers weekly (during the use season) and biweekly (during the remainder of the year) monitoring of that CWS for TCT concentrations.

The 12.5 ppb DWLOC is based on an endpoint of 1.8 mg/kg/day and a 1000 fold uncertainty factor. The uncertainty factor includes a 10x factor for interspecies variation; a 10x factor for intraspecies variability, and a 10x FQPA Safety Factor. The 10x FQPA safety factor was applied to account for the uncertainties associated with atrazine's toxic effects on the developing child and the extent and magnitude of exposure to atrazine in drinking water.

Community water systems found to be potentially impaired by atrazine, as predicted by exceedences of an annual average of 2.6 ppb based on SDWA compliance monitoring data, and the 37 CWS identified above will be subject to an intensive monitoring program that includes weekly sampling for atrazine during the use season and biweekly sampling for atrazine during the remainder of the year. This monitoring program will determine the maximum 90-day average TCT concentration with sufficient accuracy to allow removal of that portion of the 10x FQPA safety factor associated with residual uncertainties regarding the extent and magnitude of

drinking water exposure, thereby reducing the 10x FQPA safety factor to 3x for the risk assessments conducted in those community water systems for which there is available, reliable drinking water exposure data.

For those specific CWS undergoing or preparing to undergo intensive monitoring, uncertainties regarding the extent and magnitude of exposure to chlorotriazines no longer exist; this supports a reduction in the FQPA safety factor to 3x for those CWS. Based on this, the Agency has recalculated the DWLOC using a total risk assessment 300x uncertainty factor for those CWS currently undergoing or targeted for future intensive monitoring. For these CWS, the DWLOC becomes 37.5 ppb for total chlorotriazines based on an endpoint of 1.8 mg/kg/day, and a 300x uncertainty factor reflecting a 10x factor for interspecies variation, a 10x factor for intraspecies variability, and a 3x FQPA safety factor. The 3x FQPA safety factor reflects residual uncertainties associated with atrazine's toxic effects on the developing child only. For CWS without intensive monitoring as described above, the screening level DWLOC remains 12.5 ppb for total chlorotriazines.

As such, the Agency is establishing 37.5 ppb TCT (as a 90-day average) as a performance standard that must be met in CWS that are being intensively monitored. The Agency believes that its usual mitigation measures for pesticide chemicals (e.g., reduction in label rates, labeled use restrictions, etc.) are not appropriate in the case of atrazine because of the nature of the chemical. Exceedences do not appear to be linked to nation-wide use practices that can be amended on the label. Based on atrazine monitoring data, the Agency's risk assessment for atrazine has determined that drinking water risks from atrazine use are localized problems and, as such, lend themselves to a localized mitigation plan. In addition, this localized approach is consistent with the conclusions from a February 2000 FIFRA Scientific Advisory Panel meeting (Partial Report May 25, 2000. Report Number 2000-01). OPP's approach is also consistent with the intent of the Agency's recent January 2003 Water Quality Trading Policy that encourages solutions within watersheds, provides incentives and encourages actions, and provides flexibility to meet local challenges and accountability to ensure improvements.

The Agency's approach to these CWS is as follows:

- For 2 CWS that were identified in the screening-level assessment and are of concern to the Agency, Shipman, IL, and Hettick, IL, the Agency understands that these CWS will no longer be using the reservoir that has shown unacceptable atrazine levels as a water source for the community in the future.

- For 8 CWS that were identified in the screening-level assessment (see Appendix H for a site-specific listing), the Agency is requiring frequent monitoring data. If an exceedence of 37.5 is detected in raw drinking water (pre-treatment) in any of these watersheds, further use of atrazine will be prohibited in that watershed.

- For all remaining CWS, the Agency is requiring frequent monitoring data if an annual average of 2.6 total chlorotriazines is triggered through SDWA compliance monitoring data. If an exceedence is detected in raw drinking water (pre-treatment) twice in any

watershed, further atrazine use will be prohibited in that watershed.

- Frequent monitoring will continue annually for five years (minimum) and may only cease if no 90-day rolling average exceeds the performance standard of 37.5 ppb total chlorotriazines during the five year period.

Based on the monitoring programs, the registrants are being required to submit annual reports to the Agency that include the results of that year's analysis. Atrazine registrants must notify EPA in writing of any raw water exceedance within 30 days of date of the last water sample included in that result.

As part of the Agency's mitigation program for atrazine, registrants are also being required to submit to the Agency written mitigation plans for the 8 CWS of concern (or any other CWS that has an exceedence in the future) describing mitigation measures to be implemented and a strategy for communication with growers within the watershed and quarterly progress reports describing the measures taken during that quarter in each CWS.

An important element of the mitigation program is the ability of the Agency to quickly prohibit use of atrazine in watersheds that have exceeded the applicable performance standard. This is possible because the mitigation program includes a mechanism that does not require lengthy administrative proceeding before the use prohibition goes into effect. The principle registrants of atrazine have agreed to this measure. Without this voluntary measure, it may have been necessary for the Agency to seek immediate cancellation of atrazine.

In order to implement this agreement, if the product contains directions for use other than for reformulation and contains greater than 4% atrazine active ingredient, the label must include all of the following statements:

> "ANY USE OF THIS PRODUCT IN AN AREA WHERE USE IS PROHIBITED IS A VIOLATION OF FEDERAL LAW. Before using this product, you must consult the Atrazine Watershed Information Center (AWIC) to determine whether the use of this product is prohibited in your watershed. AWIC can be accessed through [website], [mailing address] or [1-800-toll-free number]. If use of this product is prohibited in your watershed, you may return this product to your point of purchase or contact [insert name of registrant] for a refund."

The atrazine registrants will establish an Atrazine Watershed Information Center (AWIC) that:

- will provide detailed information on what Watershed Areas have become subject to a prohibition on Atrazine use. Only information approved by EPA may be included in the AWIC.
- shall be accessible to the public daily, including weekends and holidays, through a toll-free telephone number available 24 hours a day and seven days a week, a World Wide Web site, and a regular mailing address. Contact information for the AWIC will be included on all Atrazine product labels.
- shall be updated to include any Watershed Areas for which use is prohibited
- will prominently display information regarding use prohibitions in a manner that is simple and convenient for users to access and understand.

This localized drinking water mitigation program will ensure that mitigation actions taken in watersheds of concern are providing results in raw drinking water and will prevent any exceedences from occurring or going undetected in the future. The Memorandum of Agreement with the atrazine technical registrants provides further details on this mitigation plan, including the specifics of the monitoring programs being established and the mechanism by which use prohibitions will be implemented.

This program allows the Agency to make a safety finding because future exceedences in raw water trigger use prohibitions in the watershed of concern. Since this exceedence is in raw, not finished water, treatment of water by CWS operators to meet the MCL may prevent actual exposures above the Agency's level of concern. In addition, the Agency does not expect future exceedences to occur because of the responsible use programs being implemented and coordinated by the registrants as product stewardship. The Agency feels that the risk of use prohibitions is a strong incentive for atrazine users and the registrants to make every effort to prevent exceedences. The performance standard approach makes the prevention of atrazine water contamination the responsibility of the user, but will not result in unacceptable risks.

2) Rural Drinking Water Wells

To confirm that rural drinking water wells will not have atrazine levels that exceed the Agency's level of concern, the Agency will be requiring that the registrant(s) develop and conduct a program for the monitoring of rural wells. The Agency is requiring that the registrants define a protocol for monitoring total chlorotriazine levels in rural wells by **April 30, 2003.** The protocol must identify the number of wells to be sampled, the frequency of monitoring, the duration and timing of monitoring, and the timing of submission of data. The Agency may take appropriate regulatory action if EPA determines that additional label restrictions for the protection of rural drinking water wells are necessary.

b. Residential Risk Mitigation

1) Residential Handler Risk

Residential handler risks were considered for homeowners who mix, load, and apply atrazine products to home lawns.

One residential handler risk scenario was above the Agency's level of concern, the broadcast application of granular formulations with a bellygrinder. To address these concerns, the following risk mitigation measures are needed in order for EPA to conclude that atrazine products are eligible for reregistration:

- Restrict the application of granular lawn products when using hand-held devices to spot applications only.
- Prohibit applications of granular lawn products by hand.

2) Residential Post-Application Risk

Residential post-application risks were considered for individuals that reenter lawns and golf courses treated with atrazine.

The Agency has risk concerns for incidental oral exposures in children to atrazine residues. For lawns treated with liquid formulations of atrazine, the Agency has concerns for hand-to-mouth exposures alone (MOE = 210) and for combined oral routes of exposure (hand-to-mouth, turfgrass & object mouthing, and ingestion of soil; MOE = 200). For lawns treated with granular formulations, the Agency has concerns for incidental ingestion of granules.

To address those concerns, the risk mitigation measures listed below are necessary. These mitigation measures make it possible for EPA to conclude that atrazine products are eligible for reregistration. The mitigation measures are as follows:

- Reduce the maximum 1 time application rate for liquid formulations on lawns and turf to 1 lb ai/A from 2 lb ai/A.
- Require that granular lawn products be watered in.

At the 1 lb ai/A rate for liquid formulations of atrazine, the short term MOE for hand-to-mouth and combined incidental oral exposures becomes acceptable individually (420 and 370, respectively). If granular lawn products are watered in, the short-term MOE for ingestion of granules is no longer appropriate since the individual granules will no longer be present in the turf.

c. Aggregate Risk Mitigation

The Agency's aggregate risk assessment for atrazine is based on exposure estimates for drinking water based on monitoring data and residential exposure estimates based on chemical-specific exposure data.

1) Acute Exposure

Acute aggregate exposure estimates for atrazine are the same as those presented for acute drinking water risks because the Agency does not believe that high-end exposures through food, drinking water, and residential uses will all occur on the same day. Since acute drinking water risks do not exceed the Agency's level of concern, acute aggregate risk is also acceptable, and no mitigation measures are necessary.

2) Intermediate-Term and Chronic Exposure

The aggregate risk assessment for intermediate-term and chronic exposures to atrazine and the chlorinated metabolites combines estimates of high-end seasonal or long-term average exposures to atrazine in drinking water with long-term average exposures in food. Neither intermediate-term nor long-term exposures are expected to occur in or around the home from residential uses of atrazine. Therefore, the intermediate-term and chronic aggregate risk for atrazine is the same as the intermediate-term and chronic drinking water risk. As such, mitigation measures presented above to address intermediate-term and chronic drinking water risk also mitigates the intermediate-term and chronic aggregate risk. No additional mitigation measures are needed to specifically address aggregate risk.

3) Short-Term Aggregate Exposure

The short-term (1-30 days) aggregate risk assessment combines short-term residential exposures with short-term drinking water exposures. If the short-term DWLOC is less than the measured average concentrations in surface water and groundwater, there is a risk of concern. Short-term aggregate risk estimates that include residential exposures to atrazine are only applicable for those regions of the United States where atrazine is used on turf, the Southeast (including Florida).

For adult handlers applying granular formulations of atrazine via bellygrinder, both residential exposures alone and aggregate exposures are of concern. To address the residential concern, the Agency has concluded that the application of granular lawn products using hand-held devices should be limited to spot applications only.

For adults exposed to atrazine after it has been applied to turf or home lawns, neither residential exposure alone nor aggregate exposures are of concern. Therefore, no mitigation is needed.

For children exposure to atrazine after it has been applied in liquid formulations to home lawns, aggregate exposure is of concern. Combined dermal and incidental oral exposures for toddlers result in a MOE of 180 for toddlers' aggregate dermal and oral exposures, based on the 1 lb ai/A rate necessary to address residential concerns alone. Since this is above the Agency's level of concern, the short-term DWLOC is zero for aggregated exposures from liquid formulations across multiple exposure routes for toddlers. However, since the lawn use of atrazine is limited to the Southwest and Florida and the CWS of concern, with the exception of

Iberville, LA, are in the Midwest, it is highly unlikely that home lawn exposure will occur at the same time as high-end drinking water exposures.

For children exposed to atrazine after it has been applied as a granular formulation to home lawns, and watered-in, aggregate exposure is not of concern. Toddlers' risk estimates from combined pathways for incidental oral exposures based on granular formulations result in an MOE of 730 and thus do not exceed the Agency's level of concern. Toddlers' risk estimates from dermal exposures based on granular formulations also do not exceed HED's levels of concern (MOE = 690 if not watered-in and 2000 if granules are watered-in immediately after application). For most CWS, short-term DWLOCs for toddlers' post application aggregate exposures do not exceed the Agency's level of concern for granular formulations watered-in after application to turf. Thus, mitigation measures required for residential concerns alone (i.e, requiring that granular formulations be watered-in) mitigate any aggregate post-application concerns. In addition, the few CWS that have 30-day average concentrations above the DWLOC are primarily located in the Midwest (outside of atrazine turf use areas), with the exception of Iberville, Louisiana.

Further, all of the CWS with 30-day average concentrations above the DWLOC have also been identified under the intermediate-term drinking water risk assessment as of concern, including Iberville, Lousiana. As such, levels of atrazine in all of these CWS are being mitigated through the Agency's localized atrazine drinking water mitigation plan described above.

d. Occupational Risk Mitigation

It is the Agency's policy to mitigation occupational risks to the greatest extent necessary and feasible with personal protective equipment and engineering controls. In managing these risks, EPA must take into account the economic, social, and environmental costs and benefits of the pesticide's use. A wide range of factors is considered in making risk management decisions for worker risks. These factors include, in addition to the calculated MOEs, incident data, the nature and severity of adverse effect, uncertainties in the risk assessment, the cost, availability and relative risk of alternatives, importance of the chemical in integrated pest management (IPM) programs, and other similar factors.

Agricultural Handlers

Several occupational handler scenarios are not of concern at baseline levels of PPE (long-sleeved shirt and long pants, shoes and socks); therefore, no risk mitigation is necessary at this time in order for these uses to remain eligible for reregistration. These scenarios are described in Section III.A.4. of this document.

For the remaining agricultural handlers scenarios, occupational risks are of concern when considering the use of PPE or engineering controls (the maximum feasible mitigation). To reduce mixer/loader and applicator risk so that atrazine products are eligible for reregistration, risk mitigation measures are necessary. These mitigation measures are explained in more detail below.

1) Mixing/Loading Scenarios

Liquids:

- require closed systems for mixing/loading to support aerial applications at greater than 3 lb ai/A
- all mixers/loaders (including using engineering controls) must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

Wettable Powders:

- require water-soluble packaging for all WP formulations
- all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron

Dry Flowables:

- water-soluble packaging optional
- if in water-soluble packaging, all mixers/loaders must wear long-sleeve shirt, long pants, shoes, socks, chemical-resistant gloves and chemical resistant apron
- if not in water-soluble packaging, mixers/loaders must wear coveralls over long-sleeve shirt and long pants, chemical-resistant gloves, chemical-resistant footwear, and chemical-resistant apron plus a NIOSH-approved dust/mist filtering respirator with any N, R, P, or HE filter.
- if not in water-soluble packaging, aerial application is prohibited.

Granular Products:

- Loaders must wear long-sleeve shirt, long pants, shoes, and socks.

2) Applicator and Flagger Scenarios

- Pilots must use enclosed cockpits (40 CFR 170.240(d)(6)) for aerial applications.
- Human flaggers supporting aerial applications must used enclosed cabs (40 CFR 170.240(d)(5)).
- Applicators applying sprays with motorized ground equipment (i.e., groundboom or rights-of-way sprayers) must wear long-sleeve shirt, long pants, shoes, socks, and chemical-resistant gloves.
- Applicators applying granular products or impregnated fertilizer must wear long-sleeve shirt, long pants, shoes, and socks.

In Addition:

- Restrict the impregnation of bulk fertilizer to commercial facilities (prohibit on-farm impregnation)
- Restrict the impregnation of dry bulk fertilizer to 500 tons per day for no

more than 30 days per calendar year per facility

- Reduce the maximum application rate for handlers applying liquids with rights-of-way sprayers to 1.0 lb ai/A
- Reduce the maximum application rate for liquids for chemical follow to 2.25 lb ai/A
- Require a 60-day PHI for field corn forage uses
- Require a 45-day PHI for sweet corn forage uses
- Require a 60-day PHI for preemergent uses and a 45-day PHI for postemergent sorghum forage uses

3. Non-Agricultural Products including Lawns and Turf (not Sod Farms)

For turf and LCO uses of atrazine, handler risks are of concern, but can be mitigated through the use of PPE. To reduce this risk so that atrazine turf products are eligible for reregistration, risk mitigation measures are necessary. These mitigation measures are explained in more detail below.

- Require that all wettable powder products be packaged in water soluble bags.
- Granular formulations: loaders, applicators, and other handlers must wear long-sleeve shirt, long pants, shoes, and socks.
- Liquid, wettable powder, dry flowable (water-dispersible granule) formulations:
  - applicators using spray equipment mounted on their backs must wear coveralls worn over long sleeved shirt and long pants, chemical-resistant gloves and chemical-resistant footwear plus socks.
  - all other mixers, loaders, applicators, and other handlers must wear long-sleeved shirt and long pants, shoes and socks, and chemical resistant gloves.
- Reduce the maximum single application rate for liquid formulations on residential lawns and turf to 1 lb ai/A from 2 lb ai/A (liquid products containing >4% ai are restricted use)
- Require that granular lawn products be watered in

<u>Post-Application Occupational Risk</u>

The Agency has not identified any post-application occupational risks from atrazine. Therefore, no mitigation measures are needed at this time.

2. Environmental Risk Mitigation

The Agency has ecological risk concerns from the use of atrazine. The Agency has

identified the potential for community-level and population-level risk to aquatic ecosystems at concentrations of atrazine from 10 to 20 ppb.

To mitigate these ecological risks to aquatic communities, the Agency is requiring that atrazine registrants, in consultation with EPA, develop a program under which the registrants monitor for atrazine concentrations and mitigate environmental exposures if EPA determines that mitigation is necessary. The program will focus on watershed impacts of atrazine use.

The program will include an appropriate ecological level of concern (LOC), including for endangered species, identified by EPA; development of a protocol for a monitoring program that specifies the frequency, location, and timing of sampling, as well as an appropriate coordination with TMDL programs; triggers for mitigation measures; and description of mitigation measures that will be taken if triggers are exceeded. This monitoring and mitigation program would be designed, conducted and implemented on a tiered watershed level and must be consistent with existing state and federal water quality programs.

The requirement that this process be established is presented in the Memorandum of Agreement between the Agency and the atrazine technical registrants. Per the Memorandum of Agreement, the Agency and the registrants must reach an agreement on the ecological monitoring program by April 30, 2003. If an agreement has not been reached, the Agency will identify any requirements the Agency deems necessary in the October 31, 2003, revision to the Atrazine IRED. The establishment of a process to address ecological risks on a watershed basis allows the Agency to conclude that atrazine products are eligible for reregistration.

3. Other Labeling

Other use and safety information need to be placed on the labeling of all end-use products containing atrazine, in addition to the mitigation measures listed above and other existing label requirements. For the specific labeling statements, refer to Section V of this document.

The Agency reserves the right to require additional label amendment to mitigate risks from triazine residues. Any further amendments will be discussed in the triazine cumulative decision.

a. Endangered Species Statement

The Agency has developed the Endangered Species Protection Program to identify pesticides whose use may cause adverse impacts on endangered and threatened species, and to implement mitigation measures that address these impacts. The Endangered Species Act requires federal agencies to ensure that their actions are not likely to jeopardize listed species or adversely modify designated critical habitat. To analyze the potential of registered pesticide uses to affect any particular species, EPA puts basic toxicity and exposure data developed for

IREDs into context for individual listed species and their locations by evaluating important ecological parameters, pesticide use information, the geographic relationship between specific pesticide uses and species locations, and biological requirements and behavioral aspects of the particular species. This analysis will take into consideration any regulatory changes recommended in this IRED that are being implemented at this time. A determination that there is a likelihood of potential impact to a listed species may result in limitations on use of the pesticide, other measures to mitigate any potential impact, or consultations with the Fish and Wildlife Service and/or the National Marine Fisheries Service as necessary.

The Endangered Species Protection Program as described in a *Federal Register* notice (54 *FR* 27984) is currently being implemented on an interim basis. As part of the interim program, the Agency has developed County Specific Pamphlets that articulate many of the specific measures outlined in the Biological Opinions issued to date. The Pamphlets are available for voluntary use by pesticide applicators on EPA's website at www.epa.gov/espp. A final Endangered Species Protection Program, which may be altered from the interim program, is scheduled to be proposed for public comment in the *Federal Register* before the end of 2001.

b. Spray Drift Management

The Agency is currently working with stakeholders to develop appropriate generic label statements to address spray drift risk. Once this process has been completed, atrazine product labels will need to be revised to include this additional language.

V. What Registrants Need to Do

In order to be eligible for reregistration, registrants need to implement the risk mitigation measures outlined in Section IV and V, which include, among other things, submission of the following:

For products containing atrazine, registrants need to submit the following items for each product within eight months of the date of the PDCI:

(1) an application for reregistration (EPA Form 8570-1, filled in, with a description on the application, such as, "Responding to Interim Reregistration Eligibility Decision" document);
(2) five copies of the draft label incorporating all label amendments outlined in Table 17 of this document;
(3) responses to the generic and/or product specific Data Call-Ins (DCIs) as instructed in the enclosed DCIs;
(4) two copies of the Confidential Statement of Formula (CSF); and
(5) a certification with respect to data compensation requirements.

Note that the first set of required responses for the product-specific DCI is due 90 days from the receipt of the DCI. The second set of required responses is due eight months from the date of the DCI. For questions about product reregistration and/or the product-specific DCI, please contact Bonnie Adler at (703) 308-8523.

For the generic DCI, the following items are due:

(1) DCI response form, due 90 days from the receipt of the DCI;
(2) Registrant response form, due 90 days from the receipt of the DCI; and
(3) the actual generic data in response to the DCI.

A. Manufacturing Use Products

1. Additional Generic Data Requirements

The generic data base supporting the reregistration of atrazine for the above eligible uses has been reviewed and determined to be substantially complete. The following data gaps remain:

Product Chemistry Data

Product-Specific Product Chemistry data requirements have not been fulfilled (Series 830). Please see Product-Specific Data Call-Ins.

Toxicology Data

Non-Guideline Study	28-day inhalation toxicity study measuring LH surge and estrus cycle parameters
Non-Guideline Study	Assessment of CNS alterations after atrazine exposure (recommended)

Occupational Data

None

Environmental Fate and Ecological Effects Data

OPPTS 850.2100 (71-1(a))	Acute Avian Oral - Northern Quail (3 major degradates)
OPPTS 850.1075 (72-1(a))	Acute Fish Toxicity Bluegill (major degradate)
OPPTS 850.1075 (72-1(c))	Acute Fish Toxicity Rainbow Trout (major degradate)
OPPTS 850.1010 (72-2(a))	Acute Aquatic Invertebrate Toxicity (major degradate)
OPPTS 850.1025 (72-3(a))	Acute Estuarine/Marine Fish Toxicity (major degradate)
OPPTS 850.1025 (72-3(b))	Acute Estuarine/Marine Mollusk Toxicity (TGAI and major degradate)
OPPTS 850.1025 (72-3(c))	Acute Estuarine/Marine Shrimp Toxicity (major degradate)
OPPTS 850.1400 (72-4(a))	Early Life-Stage Fish (Marine) (TGAI)
OPPTS 850.1350 (72-4(b))	Life-Cycle Marine Invertebrate (TGAI)
OPPTS 835.4300 (162-4)	Aerobic Aquatic Metabolism - Lab
OPPTS 835.1410 (163-2)	Volatility (Lab)
OPPTS 850.1950 (165-5)	Accumulation in Aquatic Non-Target Organisms
OPPTS 840.1100 (201-1)	Spray Drift - Droplet Size Spectrum
OPPTS 840.1200 (202-1)	Spray Drift - Drift Field Evaluation
OPPTS 830.7050 (NA)	UV/Visible Absorption

Residue Chemistry Data

OPPTS 860.1380 (171-4e)	Storage Stability
OPPTS 860.1900 (165-2)	Field Rotational Crop Study (in review)
OPPTS 860.1500 (171-4k)	Crop Field Trials - Crop Group 17
OPPTS 860.1360 (171-4)	Multi-Residue Method

Other Data Requirements

Non-Guideline Study	Rural Well Monitoring Program (see MOA & DCI for details)
Non-Guideline Study	Surface Water CWS Monitoring Program (see MOA & DCI for details)
Non-Guideline Study	Ecological Monitoring and Mitigation Program (see MOA & DCI for details - specifics to be negotiated)

2. Labeling for Manufacturing Use Products

To remain in compliance with FIFRA, manufacturing use product (MUP) labeling should be revised to comply with all current EPA regulations, PR Notices and applicable policies. The MP labeling should bear the labeling contained in Table 17 at the end of this section.

B. End-Use Products

1. Additional Product-Specific Data Requirements

Section 4(g)(2)(B) of FIFRA calls for the Agency to obtain any needed product-specific data regarding the pesticide after a determination of eligibility has been made. Registrants must review previous data submissions to ensure that they meet current EPA acceptance criteria and if not, commit to conduct new studies. If a registrant believes that previously submitted data meet current testing standards, then the study MRID numbers should be cited according to the instructions in the Requirement Status and Registrants Response Form provided for each product.

A product-specific data call-in, outlining specific data requirements, accompanies this interim RED.

2. Labeling for End-Use Products

Labeling changes are necessary to implement the mitigation measures outlined in Section IV above. Specific language to incorporate these changes is specified in the Table 28 at the end of this section.

C. Existing Stocks

Registrants may generally distribute and sell products bearing old labels/labeling for 26 months from the date of the issuance of this Interim Reregistration Eligibility Decision document. Persons other than the registrant may generally distribute or sell such products for 50 months from the date of the issuance of this interim RED. However, existing stocks time frames will be established case-by-case, depending on the number of products involved, the number of label changes, and other factors. Refer to "Existing Stocks of Pesticide Products; Statement of Policy"; Federal Register, Volume 56, No. 123, June 26, 1991.

The Agency has determined that registrants may not distribute or sell atrazine products bearing old labels/labeling after the date of cancellation or amendment unless it is for the purpose of relabeling in accordance with the terms of this interim RED. Persons other than the registrants may distribute or sell such products until October 1, 2003. Registrants and persons other than the registrants remain obligated to meet pre-existing label requirements and existing stocks requirements applicable to products they sell or distribute. In addition, EPA has agreed to allow the atrazine technical registrants to re-label cancelled products with new provisions or to create supplemental labeling that will allow distributors to provide new label language to

purchasers of atrazine products with labels that do not comply with this interim RED.

D. Labeling Changes Summary Table

In order to be eligible for reregistration, amend all product labels to incorporate the risk mitigation measures outlined in Section IV. Table 29 below describes how language on the labels should be amended.

Labeling Changes Summary Table

In order to be eligible for reregistration, amend all product labels to incorporate the risk mitigation measures outlined in Section IV. The following table describes how language on the labels should be amended.

Table 29: Summary of Labeling Changes for Atrazine		
Description	**Amended Labeling Language**	**Placement on Label**
Manufacturing Use Products		
One of these statements may be added to a label to allow reformulation of the product for a specific use or all additional uses supported by a formulator or user group	"Only for formulation into an ***herbicide*** for the following use(s) [fill blank only with those uses that are being supported by MP registrant]." Note: In addition to the uses previously classified as restricted use, all uses of products containing >4% active ingredient must be classified as restricted use. Uses for total vegetation control on non-cropland areas (not including rights-of-ways, roadsides, or CRP programs) are cancelled. Uses on pineapple, rangeland, and proso millet are also cancelled. Technical and end-use product labels must be revised to delete all references to and use-directions for these cancelled use patterns.	Directions for Use
	"This product may be used to formulate products for specific use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)." "This product may be used to formulate products for any additional use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)."	Directions for Use
Text required from Memorandum of Agreement	"This product may not be reformulated or repackaged into another product unless the registration of the reformulated or repackaged product was either granted or amended after March 15, 2004, so as to be consistent with the terms and conditions set forth in the Atrazine January 31, 2003 Interim Reregistration Eligibility Document (IRED)."	Directions for Use

Description	Amended Labeling Language	Placement on Label
Text required from Memorandum of Agreement	No product (other than products containing 4% or less atrazine active ingredient) may be formulated or repackaged from this product unless the formulated repackaged product bears a label including all of the following statements: The following language must be prominently displayed in the DIRECTIONS FOR USE on the label: "ANY USE OF THIS PRODUCT IN AN AREA WHERE USE IS PROHIBITED IS A VIOLATION OF FEDERAL LAW. Before using this product, you must consult the Atrazine Watershed Information Center (AWIC) to determine whether the use of this product is prohibited in your watershed. AWIC can be accessed through www.atrazine-watershed.info, or 1-866-365-3014. If use of this product is prohibited in your watershed, you may return this product to your point of purchase or contact [insert name of registrant] for a refund." "No product containing 4% or less atrazine active ingredient may be formulated or repackaged from this product unless the registration of the resulting product includes the following terms and conditions: The registrant of this product shall immediately: i) cease all distribution and sale to any retailer or entity distributing or selling such product to any retailer located within all counties containing any portion of the Watershed Area listed in the AWIC; ii) ensure the removal of such Atrazine product from the shelves of any retailer located within all counties containing any portion of any Watershed Area listed in the AWIC; and iii) repurchase any such Atrazine product from any of the purchasers described above. In addition, such Registrant shall consult with the State(s) in which such counties are located to determine whether additional territory shall be included in the area to which these requirements will apply. If the State(s) determine that a larger area is warranted, the Registrant shall within 10 days of such determination notify the Director of EPA's Special Review and Reregistration Division (SRRD) (7508C), Office of Pesticide Programs, of the specific boundaries within which the stop sale, removal, and repurchase shall take place."	Directions for Use
Environmental Hazards	"Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA."	Precautionary Statements immediately following the User Safety Recommendations
End Use Products Intended for Occupational Use (WPS and NonWPS)		

Description	Amended Labeling Language	Placement on Label
Restricted Use Pesticide (In addition to the uses previously restricted, all uses of products containing >4% active ingredient must be classified restricted use)	"RESTRICTED USE PESTICIDE" "Due to ground and surface water concerns. For retail sale to and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the certified applicator's certification."	Top of front panel
Text required from Memorandum of Agreement	"ANY USE OF THIS PRODUCT IN AN AREA WHERE USE IS PROHIBITED IS A VIOLATION OF FEDERAL LAW. Before using this product, you must consult the Atrazine Watershed Information Center (AWIC) to determine whether the use of this product is prohibited in your watershed. AWIC can be accessed through [www.atrazine-watershed.info], or [1-866-365-3014]. If use of this product is prohibited in your watershed, you may return this product to your point of purchase or contact [registrant] for a refund."	Directions for Use
PPE Requirements Established by the IRED[1] for liquid products that do NOT contain directions for use on lawns or other turfgrass	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are (*registrant inserts correct chemical-resistant material*). If you want more options, follow the instructions for category *[registrant inserts A,B,C,D,E,F,G,or H*] "on an EPA chemical-resistance category selection chart." "Mixers, loaders, applicators, flaggers, and other handlers must wear: > Long sleeved shirt and long pants, > Chemical resistant gloves, such as (*registrant insert correct chemical-resistant materials),* > Shoes plus socks, and > Chemical-resistant apron, when mixing/loading, cleaning up spills, or cleaning equipment, or otherwise exposed to the concentrate." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
PPE Requirements Established by the IRED[1] for liquid products that DO contain directions for use on lawns or other turfgrass	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are (*registrant inserts correct chemical-resistant material*). If you want more options, follow the instructions for category *[registrant inserts A,B,C,D,E,F,G,or H*] "on an EPA chemical-resistance category selection chart." "Applicators using spray equipment mounted on their backs must wear: > Coveralls over long-sleeved shirt and long pants, > Chemical-resistant footwear plus socks, and > Chemical-resistant gloves, such as (*registrant insert correct chemical-resistant materials)*." "Mixers, loaders, all other applicators, flaggers, and other handlers must wear: > Long sleeved shirt and long pants, > Chemical resistant gloves, such as (*registrant insert correct chemical-resistant materials)*, > Shoes plus socks, and > Chemical-resistant apron, when mixing/loading, cleaning up spills, cleaning equipment, or otherwise exposed to the concentrate." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
PPE Requirements Established by the IRED[1] for wettable powder and dry flowable (water dispersible granular) formulations in water-soluble packets that do NOT contain directions for use on lawns or other turfgrass. *Note: all wettable powder products with WPS uses on the label must be in water soluble packets to be eligible for reregistration. Dry flowable (water dispersible granular) formulations are not required to be in water-soluble packets. However aerial application is prohibited unless a dry flowable (water dispersible granular) formulation is packaged in water-soluble packets.*	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are (*registrant inserts correct chemical-resistant material*). If you want more options, follow the instructions for category *[registrant inserts A,B,C,D,E,F,G,or H*] "on an EPA chemical-resistance category selection chart." "Mixers, loaders, applicators, flaggers, and other handlers must wear: > Long sleeved shirt and long pants, > Chemical resistant gloves, such as (*registrant insert correct chemical-resistant materials)*, > Shoes plus socks, and > Chemical-resistant apron, when mixing/loading, cleaning up spills, cleaning equipment, or otherwise exposed to the concentrate." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
PPE Requirements Established by the IRED[1] for wettable powder and dry flowable (water dispersible granular) formulations packaged in water-soluble packets that DO contain directions for use on lawns or other turfgrass. *Note: all wettable powder products with WPS uses on the label must be in water soluble packets to be eligible for reregistration. Dry flowable* (water dispersible granular) *formulations are not required to be in water-soluble packets. However aerial application is prohibited unless a dry flowable (water dispersible granular) formulation is packaged in water-soluble packets.*	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are (registrant inserts correct chemical-resistant material). If you want more options, follow the instructions for category [registrant inserts A,B,C,D,E,F,G,or H] "on an EPA chemical-resistance category selection chart." "Applicators using spray equipment mounted on their backs must wear: > Coveralls over long-sleeved shirt and long pants, > Chemical-resistant footwear plus socks, and > Chemical-resistant gloves, such as (registrant insert correct chemical-resistant materials)." "Mixers, loaders, applicators, flaggers, and other handlers must wear: > Long sleeved shirt and long pants, > Chemical resistant gloves, such as (registrant insert correct chemical-resistant materials), > Shoes plus socks, and > Chemical-resistant apron, when mixing/loading, cleaning up spills, cleaning equipment, or otherwise exposed to the concentrate." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
PPE Requirements Established by the IRED[1] for dry flowable (water dispersible granule) products NOT packaged in water soluble packets that do NOT contain directions for use on lawns or other turfgrass.. *Note: if not packaged in water-soluble packets, aerial application is prohibited.*	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are (*registrant inserts correct chemical-resistant material*). If you want more options, follow the instructions for category *[registrant inserts A,B,C,D,E,F,G,or H*] on an EPA chemical-resistance category selection chart." "Mixers, loaders, cleaners of equipment or spills, and other handlers exposed to the concentrate must wear: > Coveralls over long sleeved shirt and long pants, > Chemical-resistant gloves, such as (*registrant insert correct chemical-resistant materials)* > Chemical resistant footwear plus socks, > Chemical-resistant apron, and > A NIOSH-approved dust/mist filtering respirator with any N, R, P or HE filter or a NIOSH-approved dust/mist filtering respirator with approval number prefix TC-21C)." Applicators and all other handlers exposed to the dilute must wear: > Long sleeved shirt and long pants, > Shoes plus socks, and > Chemical resistant gloves, such as (*registrant insert correct chemical-resistant materials)*." "Aerial application is prohibited." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
PPE Requirements Established by the IRED[1] for dry flowable (water dispersable granule) products NOT packaged in water soluble packets that DO contain directions for use on lawns or other turfgrass.. *Note: if not packaged in water-soluble packets, aerial application is prohibited.*	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are" (*registrant inserts correct chemical-resistant material*). "If you want more options, follow the instructions for category" *[registrant inserts A,B,C,D,E,F,G,or H]* "on an EPA chemical-resistance category selection chart." "Mixers, loaders, cleaners of equipment or spills, and other handlers exposed to the concentrate must wear: > Coveralls over long sleeved shirt and long pants, > Chemical-resistant gloves, such as (*registrant insert correct chemical-resistant materials)*, > Chemical resistant footwear plus socks, > Chemical-resistant apron, and > A NIOSH-approved dust/mist filtering respirator with any N, R, P or HE filter or a NIOSH-approved dust/mist filtering respirator with approval number prefix TC-21C)." "Applicators using spray equipment mounted on their backs must wear: > Coveralls over long sleeved shirt and long pants, > Chemical-resistant gloves, such as (*registrant insert correct chemical-resistant materials)*, and > Chemical resistant footwear plus socks." "All other applicators and all other handlers exposed to the dilute must wear: > Long sleeved shirt and long pants, > Shoes plus socks, and > Chemical resistant gloves, such as (*registrant insert correct chemical-resistant materials)*." "Aerial application is prohibited." "See engineering controls for additional requirements."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals
PPE Requirements Established by the IRED[1] for granular products	"Personal Protective Equipment (PPE)" "Loaders, applicators and other handlers must wear: > Long-sleeved shirt and long pants, and > Shoes plus socks."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

Description	Amended Labeling Language	Placement on Label
User Safety Requirements	"Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry." *If coveralls are specified in the handler PPE section of the label, use the following in addition to the above statement:* "Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them."	Precautionary Statements: Hazards to Humans and Domestic Animals immediately following the PPE requirements
Engineering Controls for liquid formulations that contain directions for use permitting aerial application.	"Engineering Controls" "Mixers and loaders supporting aerial applications **at a rate greater than 3 lbs ai/A** must use a closed system that meets the requirements for dermal protection listed in the Worker Protection Standard (WPS) for Agricultural Pesticides [40 CFR 170.240(d)(4) and must: -wear the personal protective equipment required for mixers and loaders, -wear protective eyewear if the system operates under pressure, and -be provided and have immediately available for use in an emergency, such as a spill or equipment breakdown: chemical resistant footwear." "Pilots must use an enclosed cockpit in a manner that is consistent with the WPS for Agricultural Pesticides [40 CFR170.240(d)(6)]. Pilots must wear the PPE required on this labeling for applicators, however, they need not wear chemical-resistant gloves when using an enclosed cockpit." "Flaggers supporting aerial applications must use an enclosed cab that meets the definition on the Worker Protection Standard for Agricultural Pesticides [40 CFR 170.240 (d)(5)] for dermal protection."	Precautionary Statements: Hazards to Humans and Domestic Animals (Immediately following PPE and User Safety Requirements.)
Engineering Controls for wettable powders and dry flowables (water dispersible granules) packaged in water-soluble packets. *All wettable powders with WPS uses must be in water soluble packets to be eligible for reregistration.*	"Engineering Controls" "Water soluble packets when used correctly qualify as a closed mixing/loading system under the Worker Protection Standard for Agricultural Pesticides [40 CFR 170.240(d)(4). Mixers and loaders using water soluble packets must: -wear the personal protective equipment required on this labeling for mixers and loaders, and -be provided and have immediately available for use in an emergency, such as a broken package, spill, or equipment breakdown, chemical resistant footwear."	Precautionary Statements: Hazards to Humans and Domestic Animals (Immediately following PPE and User Safety Requirements.)

Description	Amended Labeling Language	Placement on Label
Engineering Controls for wettable powders and dry flowables (water dispersible granules) packaged in water-soluble packets that contain directions for use permitting aerial application. *All wettable powders with WPS uses must be in water soluble packets to be eligible for reregistration.*	"Pilots must use an enclosed cockpit in a manner that is consistent with the WPS for Agricultural Pesticides [40 CFR170.240(d)(6)]. Pilots must wear the PPE required on this labeling for applicators, however, they need not wear chemical-resistant gloves when using an enclosed cockpit." "Flaggers supporting aerial applications must use an enclosed cab that meets the definition on the Worker Protection Standard for Agricultural Pesticides [40 CFR 170.240 (d)(5)] for dermal protection.	Precautionary Statements: Hazards to Humans and Domestic Animals (Immediately following the water-soluble packaging engineering control requirements.)
Additional Engineering Controls Statement for all liquid, wettable powder, and dry flowable formulations.	"When applicators use enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(5), the handler PPE requirements may be reduced or modified as specified in the WPS."	Precautionary Statements: Hazards to Humans and Domestic Animals (Immediately following any other engineering control requirements.)
Engineering Controls for Granular Formulations	Note to registrants: no engineering controls statement is needed on labels of granular formulations.	not applicable
User Safety Recommendations	"User Safety Recommendations" "Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet." "Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing." "Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing."	Precautionary Statements under: Hazards to Humans and Domestic Animals immediately following Engineering Controls (Must be placed in a box.)

Description	Amended Labeling Language	Placement on Label
Environmental Hazards	"Atrazine can travel (seep or leach) through soil and can enter ground water which may be used as drinking water. Atrazine has been found in ground water. Users are advised not to apply atrazine to sand and loamy sand soils where the water table (ground water) is close to the surface and where these soils are very permeable; i.e., well-drained. Your local agricultural agencies can provide further information on the type of soil in your area and the location of ground water." "Product must not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs. Product must not be applied within 66 feet of points where field surface water runoff enters perennial or intermittent streams and rivers or within 200 feet of natural or impounded lakes and reservoirs. If this product is applied to highly erodible land, the 66 foot buffer or setback from runoff entry points must be planted to crop, or seeded with grass or other suitable crop." "Product must not be mixed or loaded, or used within 50 feet of all wells, including abandoned wells, drainage wells, and sink holes. Operations that involve mixing, loading, rinsing, or washing of this product into or from pesticide handling or application equipment or containers within 50 ft. of any well are prohibited, unless conducted on an impervious pad constructed to withstand the weight of the heaviest load that may be positioned on or moved across the pad. Such a pad shall be designed and maintained to contain any product spills or equipment leaks, container or equipment rinse or wash water, and rain water that may fall on the pad. Surface water shall not be allowed to either flow over or form the pad which means the pad must be self-contained. The pad shall be sloped to facilitate material removal. An unroofed pad shall be of sufficient capacity to contain at a minimum 110% of the capacity of the largest pesticide container or application equipment on the pad. A pad that is covered by a roof of sufficient size to completely exclude precipitation from contact with the pad shall have a minimum containment of 100% of the capacity of the largest pesticide container or application equipment on the pad. Containment capacities as described above shall be maintained at all times. The above-specified minimum containment capacities do not apply to vehicles when delivering pesticide to the mixing/loading sites." "Additional State imposed requirements regarding well-head setbacks and operational area containment must be observed."	Environmental Hazards

Description	Amended Labeling Language	Placement on Label
Environmental Hazards Continued	"One of the following restrictions must be used in applying atrazine to tile-outletted fields containing standpipes: - Do not apply within 66 feet of standpipes in tile-outletted fields. - Apply this product to the entire tile-outletted field and immediately incorporate it to a depth of 2-3 inches in the entire field. - Apply this product to the entire tile-outletted field under a no-till practice only when a high crop residue management practice is practiced. High crop residue management is described as a crop management practice where little or no crop residue is removed from the field during and after crop harvest." "This pesticide is toxic to aquatic invertebrates. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Runoff and drift from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment wash water."	Environmental Hazards
Restricted-Entry Interval (for labels with WPS uses)	"Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours."	Directions for Use, Agricultural Use Requirements Box
Early Reentry Personal Protective Equipment established by the IRED (for labels with WPS uses.	"PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is: > coveralls, > shoes plus socks, and > chemical resistant gloves, such as any waterproof material."	

Description	Amended Labeling Language	Placement on Label
Entry Restriction for NonWPS uses	***Entry Restriction for non-WPS uses applied as a spray:*** "Do not enter or allow others to enter until sprays have dried." ***Entry Restriction for non-WPS uses applied dry:*** "Do not enter or allow others to enter until dusts have settled." ***Entry Restriction for non-WPS uses applied as a solid (i.e. granular) and watered-in (for occupational use to home lawns):*** "Do not enter or allow others to enter the treated area until dusts have settled. If soil incorporation is required after the application, do not enter or allow others to enter the treated area (except those persons involved in the incorporation) until the incorporation is complete. If the incorporation is accomplished by watering-in, do not enter or allow others to enter the treated area until the surface is dry after the watering-in."	If no WPS uses on the label, place the statements in the Directions for Use Under General Precautions and Restrictions. If WPS uses are also on the labeling, place these statements in a NonAgricultural Use Requirements box as specified in PR Notice 93-7 and 93-11.

Description	Amended Labeling Language	Placement on Label
Other Application Restrictions (Risk Mitigation)	**All Products/Formulations Containing Atrazine** "Do not apply this product through any type of irrigation system" "When tank-mixing or sequentially applying atrazine or products containing atrazine to corn or sorghum, the total pounds of atrazine applied (lbs ai/A) must not exceed 2.5 pounds active ingredient per year." "When tank-mixing or sequentially applying atrazine or products containing atrazine to crops other than corn or sorghum, the total pounds of atrazine applied (lbs ai/A) must not exceed the specific seasonal rate limits as noted in the use directions." Delete all directions for use for the following use-patterns: >rangeland >total vegetation control on non-cropland areas (except Conservation Reserve Program(CRP), rights-of-ways, and roadsides) >proso millet, and >pineapple uses. **Products with Guava Uses:** – "Do not apply more than 4 pounds active ingredient per acre for any application." – "Do not apply more than 8 pounds active ingredient per year." **Macadamia Nut Uses:** – "Do not apply more than 4 pounds active ingredient per acre for any application." – "Do not apply more than 8 pounds active ingredient per year." **Conifers Uses:** – "Do not apply more than 4 pounds active ingredient per acre for any application." – "Do not apply more than 4 pounds active ingredient per year."	Directions for Use

Description	Amended Labeling Language	Placement on Label
Other Application Restrictions (Risk Mitigation)	**Sod Farm Uses** -For muck or peat soils: > "Do not apply more than 4 pounds active ingredient per acre for any application." > "Do not apply more than 6 pounds active ingredient per year." *-For sandy soils:* > "Do not apply more than 4 pounds active ingredient per acre for any application." > "Do not apply more than 3 pounds active ingredient per year." **Conservation Reserve Program Uses:** – "Do not apply more than 2 pounds active ingredient per acre for any application." **Chemical Fallow Uses:** *For soils in North and South Dakota with a pH of 7.5 or greater*: – "Do not apply more than 1.5 pounds active ingredient per acre for any application." – "Do not apply more than one application per year." *For soils in North and South Dakota with a pH of less than 7.5*: – "Do not apply more than 2.0 pounds active ingredient per acre for any application." – "Do not apply more than one application per year." *For all other locations:* – "Do not apply more than 2.25 pounds active ingredient per acre for any application." – "Do not apply more than one application per year."	Directions for Use

Description	Amended Labeling Language	Placement on Label
Other Application Restrictions (Risk Mitigation) continued	**Rights-of-Way Uses (applied as a spray):** – "Do not apply more than 1.0 pounds active ingredient per acre for any application." – "Do not apply more than one application per year." **Sugarcane Uses**: – "Do not apply more than 4.0 pounds active ingredient per acre for any application." – "Do not apply more than 10.0 pounds active ingredient per acre per year." **Corn and Sorghum Uses:** -Field corn forage uses: 60-day PHI -Sweet corn forage uses: 45-day PHI - Preemergent sorghum forage uses: 60-day PHI - Postemergent sorghum forage uses: 45-day PHI -"Postemergence applications to corn and sorghum must be made before crop reaches 12 inches in height" "Maximum broadcast application rates for corn and sorghum must be as follows: > If no atrazine was applied prior to corn/sorghum emergence, apply a maximum of 2 lb ai/A broadcast. If a postemergence treatment is required following an earlier herbicide application, the total atrazine applied may not exceed 2.5 lb ai/A per calendar year. > Apply a maximum of 2.0 lb ai/A as a single preemergence application on soils that are not highly erodible or on highly erodible soils if at least 30% of the soil is covered with plant residues; or > Apply a maximum of 1.6 lb ai/A as a single preemergence application on highly erodible soils if <30% of the surface is covered with plant residues; or 2.0 lb ai/A if only applied postemergence."	Directions for Use

Description	Amended Labeling Language	Placement on Label
Other Application Restrictions (Risk Mitigation) continued	**Roadsides Uses:** – "Do not apply more than 1.0 pounds active ingredient per acre for any application." – "Do not apply more than one application per year." **Dry Bulk Fertilizer Impregnation Uses:** - "Impregnation of bulk fertilizer is restricted to commercial facilities. On-farm fertilizer impregnation is prohibited." - "No more than 500 tons of dry bulk fertilizer can be impregnated per day." - "No single facility may impregnate fertilizer with this product for more than to 30 days per calendar year." - "The commercial facility impregnating the dry bulk fertilizer must inform, in writing, the user (applicator) of the dry bulk fertilizer that: > "Applicators must wear long-sleeved shirt, long pants, shoes, and socks." > "The restricted-entry interval is 12 hours."	Directions for Use
Application Restrictions for Granular formulations that contain directions for use on turfgrass at residential sites, including homes, daycare facilities, schools, playgrounds, parks, recreational areas, and sports fields	"**Turfgrass at Residential Sites** (including homes daycare facilities, schools, playgrounds, parks, recreational areas, and sports fields:" "This product must be watered in immediately after application. Watering-in must be performed by the commercial applicator or the commercial applicator must provide the following instructions to the resident or owner in writing: > "This product must be watered in immediately. > "Do not enter or allow others (including children or pets) to enter the treated areas (except those involved in the watering) until the watering-in is complete and the surface is dry."	Directions for Use

Description	Amended Labeling Language	Placement on Label
Application Restrictions for Liquid, Wettable Powder, or Dry Flowable (Water-Dispersible Granule) formulations that contain directions for use on turfgrass at residential sites, including homes, daycare facilities, schools, playgrounds, parks, recreational areas, and sports fields	**"Turfgrass at Residential Sites** (including homes daycare facilities, schools, playgrounds, parks, recreational areas, and sports fields):" – "Do not apply more than 1.0 pounds active ingredient per acre for any application." – "Do not apply more than 2.0 pounds active ingredient per acre per year."	
Application Restrictions for Dry Flowable Formulations NOT packaged in water-soluble packets	"Aerial application is prohibited."	Near the beginning of the Directions for Use in bold type and red lettering.
End Use Products Intended Primarily for Use by Homeowners		
Environmental Hazards	"Atrazine can travel (seep or leach) through soil and can enter ground water which may be used as drinking water. Atrazine has been found in ground water. Users are advised not to apply Atrazine on sand and loamy soils where the water table (ground water) is close to the surface and where these soils are very permeable; i.e., well drained. Your local agricultural agencies can provide further information on the type of soil in your area and the location of ground water. This product is toxic to aquatic invertebrates. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Runoff and drift from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters."	Precautionary Statements

Description	Amended Labeling Language	Placement on Label
Application Restrictions	**All products:** "Do not apply this product in a way that will contact any person or pet, either directly or through drift. Keep people and pets out of the area during application." **Granular Products Applied Dry:** "This product must be watered in immediately after application."	Directions for Use under General Precautions and Restrictions Statements must be in the color red and in all caps.
Entry Restriction	**Products Applied as a Liquid**: "Do not allow people or pets to enter the treated area until sprays have dried." **Products Applied Dry:** "Do not enter or allow others (including children or pets) to enter the treated areas (except those involved in the watering) until the watering-in is complete and the surface is dry."	Directions for Use under General Precautions and Restrictions Statements must be in the color red and in all caps.

Description	Amended Labeling Language	Placement on Label
Precautionary Statements	**For Granular Lawn Products:** "Do not apply granular lawn products by hand. Avoid contact with hands or skin." "Broadcast applications must NOT be made using hand-held devices, such as a belly grinder or handheld rotary applicator. Such equipment may only be used for spot treatments." **For Liquid products:** - "Maximum rate per application turfgrass (including lawns) is [registrant insert the maximum rate of the *formulated product* per unit area – such as 2 pints per 1,000 square feet – that reflects an maximum application rate of 1 pound active ingredient per acre]." – "Maximum of two applications per year."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals

APPENDICES

Appendix A: ATRAZINE USE PATTERNS ELIGIBLE FOR REREGISTRATION

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
FOOD/FEED USE PATTERNS							
Corn							
Broadcast or banded Early Preplant; preplant surface or incorporated, preemergence, or postemergence to corn ≤12" tall Ground or aerial applications	90% DF 4 lb/gal FlC Others [d]	1.6 preemergence on highly erodible soil if < 30% surface covered with plant residues 2 preemergence on not highly erodible soil or if > 30% surface covered with plant residues 2 postemergence	NS (Not specified)	2.5	60 for forage 60 for field corn 45 for sweet corn	NS	For preplant surface treatments, use on medium or fine-textured soils with reduced tillage systems only in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, WI and WY, up to 45 days preplanting; on coarse textured soils, do not apply >2 weeks prior to planting.
Broadcast Fallow weed control (and continued control in following minimum tillage corn). Applied to stubble ground after wheat harvest in a wheat-corn-fallow crop rotation. Ground or aerial applications	90% DF 4 lb/gal FlC	3 1.5 (ND & SD soils with pH>7.5) 2.0 (ND & SD soils with pH<7.5)	1	NS	NS	NS	Use limited to CO, KS, ND, NE, SD, and WY. Wheat-corn-fallow cropping sequence must be followed. Do not apply following corn harvest. An 18-month plant-back restriction is specified for all crops other than those on the label. Grazing or feeding of forage from treated areas are prohibited.

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Broadcast Winter weed control in TX Ground or aerial applications	90% DF 4 lb/gal FlC	0.8-1.0	NS	NS	NS	N/A	For postemergence control of winter weeds only on fall bedded land in the Gulf Coast and Blacklands of TX. Normal weed control programs may be used in the following corn, grain sorghum, or sorghum forage crops the following spring. The label prohibits planting any crops except corn, grain sorghum, or forage sorghum in the spring following this treatment.
Guava							
Broadcast Ground application	90% DF 4 lb/gal FlC	4.0	3	8.0	NS	120	Use only on established guava at least 18 months old. Label states, "do not apply more frequntly than at 4-month intervals". “Do not apply more than 4 pounds active ingredient per acre for any application.” “Do not apply more than 8 pounds active ingredient per year.”
Grain Sorghum or Sorghum-sudan hybrids (grain and forage types)							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Broadcast or banded Early Preplant; preplant surface or incorporated, preemergence, or postemergence to sorghum ≤12" tall Ground or aerial applications	90% DF 4 lb/gal FlC Others [d]	1.6 preemergence on highly erodible soil if < 30% surface covered with plant residues 2 preemergence on not highly erodible soil or if > 30% surface covered with plant residues 2 postemergence	NS	2.5	60 for forage 60 for preemerg. use 45 for postemer. use	NS	A 60-day PGI or PHI for forage is in effect. For preplant surface treatments, use on medium or fine-textured soils with reduced tillage systems only in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, WI and WY, up to 45 days preplanting; on coarse textured soils, do not apply >2 weeks prior to planting. Do not apply preplant surface or incorporated in AL, AR, FL, GA, LA, MS, NC, NM, OK, SC, TN, or TX. Do not apply preemergence in NM, OK, or TX, except in northeast OK, the TX Gulf Coast and Blacklands areas.
Broadcast Winter weed control in TX Ground or aerial applications	90% DF 4 lb/gal FlC	0.8-1.0	NS	NS	NS	NA	For postemergence control of winter weeds only on fall bedded land in the Gulf Coast and Blacklands of TX. Normal weed control programs may be used in the following corn, grain sorghum, or sorghum forage crops the following spring. The label prohibits planting any crops except corn, grain sorghum, or forage sorghum in the spring following this treatment.
Broadcast Fallow weed control (and continued control in minimum tillage sorghum) applied to stubble ground following wheat harvest in a wheat-sorghum-fallow crop rotation. Ground or aerial applications	90% DF 4 lb/gal FlC	3	1	NS	NS	NA	Wheat-sorghum-fallow cropping sequence must be followed. Do not apply following sorghum harvest. An 18-month plant-back restriction is specified for all crops other than those on the label. Grazing or feeding of forage from treated areas are prohibited.
Macadamia nuts							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Broadcast Ground application	90% DF 4 lb/gal FlC	4.0	NS	8.0	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any applications." "Do not apply more than 8 pounds active ingredient per year."
Soybeans (Unspecified)							
	43% EC	2.5	NS	NS	NS	NS	
Sugarcane							
Broadcast or banded Preemergence (at-planting or ratooning) followed by one application at emergence, and up to two interline post-emergence directed applications prior to close-in (lay-by). Ground or aerial application	90% DF 4 lb/gal FlC	2-4	4	10	NS	NS	Treatments may be made applied in a minimum of 20 gal/A of water by ground and 5 gal/A of water by air. A reasonable interval between lay-by and harvest would be 120-150 days, providing a built-in PHI. In FL and TX, 0.5-1 gal of surfactant/100 gal of spray may be used. In LA, an application of 2 lb ai/A may be used to control annual weeds during summer fallow period; after-planting applications may not exceed 8 lb ai/A.
Fallow Wheat Stubble (Wheat is not a target crop)							
Broadcast Fallow weed control applied to stubble ground following wheat harvest in a wheat-fallow-wheat crop rotation. Ground or aerial applications	90% DF 4 lb/gal FlC	0.5-1	1	NS	NS	NA	Use limited to CO, KS, ND, NE, SD, and WY. Grazing of treated areas is prohibited for 6 months, and a 12-month plant-back interval for wheat is specified.
NON FOOD/NON FEED USE PATTERNS							
Agricultural Fallow/Idleland							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
At Planting	43% EC 43% SC/L 90% DF	2.25	1	2.25	NS	NS	"Do not apply more than 2.25 pounds active ingredient per acre for any application." "Do not apply more than one application per year."
Established Plantings	90% DF	1	1	NS	NS	NS	
Fall	43% EC 90% DF	1	NS	NS	NS	NS	
Fallow	20.9% EC 21.92% FlC 43% EC 43% FlC 43% SC/L 80% WP 85.5% DF 90% DF 90% WP	2.25	1	2.25	NS	NS	"Do not apply more than 2.25 pounds active ingredient per acre for any application." "Do not apply more than one application per year."
February March	90% DF	1	NS	NS	NS	NS	
Late Fall	43% FlC 85.5% DF 90% DF	0.4	1	0.4	NS	NS	
Postharvest	22% FlC 43% EC 90% WP	1	1	1	NS	NS	
Preemergence Preplant	43% EC 43% SC/L 85.5% DF 90% DF	2	NS	NS	NS	NS	

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Renovation Spring	43% EC 85.5% DF 90% DF	2	NS	2	NS	NS	
Stubble	22% EC 22% FlC 43% EC 43% SC/L 53.5% EC 80% WP 90% DF 90% WP	2.25	1	2.25	NS	NS	"Do not apply more than 2.25 pounds active ingredient per acre for any application." "Do not apply more than one application per year."
Bermudagrass							
Dormant, spring	43% EC 90% DF	2	NS	NS	NS	NS	
Christmas Tree Plantations							
Fall, Early Spring							
	21.42 EC 80% WP	4	NS	NS	NS	NS	
Commercial/industrial Lawns							
Early Spring							
	.58% G .92% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Fall							
	.45% G .92% G 1.05% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Post-plant							
	25% FIC	.75	NS	NS	NS	NS	
Spring							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.45% G .92% G 1.05% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Conifers (Seed Orchard)							
Dormant							
	43% EC 90% WP	4	NS	4	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any applications." "Do not apply more than 4 pounds active ingredient per year."
Forest Plantings (Reforestation Programs)(Tree Farms, Tree Plantations, Etc.)							
Early Spring							
	80% WP	4	1	NS	NS	NS	
Fall							
	80% WP 90% WP	4	1	NS	NS	NS	
Forest Trees (Softwoods, Conifers)							
Dormant							
	43% EC 43% FIC 85.5% DF 90% DF	4	1	4	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Early Spring							
	25% FIC 90%DF 90% WP	3.96	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Established Planting							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% EC 43.6% EC 53.48% EC 80% WP 85.5% DF 90% DF	4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Fall							
	25% FIC 43% EC 90% DF 90% WP	4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Post-Plant							
	43% DF 43% EC	4.4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Post-transplant							
	43% EC 43% SC/L 43.5% EC 43.6% EC 53.48% EC 80% WP 85.5% DF 90% DF 90% WP	4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Pre-plant (Spring)							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% DF 43% EC	4.4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Pre-transplant							
	43% RC 43% SC/L 43.5% EC 43.6% EC 53.48% EC 80% WP 85.5% DF 90% DF 90% WP	4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Spring							
	43% DF 43% EC	4.4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Transplant							
	43% EC 43% SC/L 43.5% EC 85.5% DF 90% DF	4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Winter							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% DF 43% EC	4.4	1	NS	NS	NS	"Do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 4 pounds active ingredient per year."
Golf Course Turf							
At Planting							
	90% DF	099	NS	NS	NS	NS	
Dormant							
	53.48% EC 90% DF	2.5	NS	NS	NS	NS	
Early Spring							
	90% DF	1.98	NS	NS	NS	NS	
Fall							
	.45% G .6% G .92% G 43% EC 43% FIC 53.48% EC 89% WP 90% DF 90% WP	2	NS	NS	NS	NS	
Foliar							
	53.48% EC 90% DF	2.5	NS	NS	NS	NS	
Late Winter							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.6% G 43% EC 43% FIC 53.48% EC 80% WP 90% DF 90.1% DF	2	NS	NS	NS	NS	
Post-plant							
	25% FIC	.75	NS	NS	NS	NS	
Spring							
	.45%G .6% G .92% G	.046 lb/1Kft^2	NS	NS	NS	NS	
Winter							
	90% DF	1.98	2	NS	NS	NS	
Grasses Grown for Seed							
Dormant							
	43% FIC 90% DF	1	NS	NS	NS	NS	
Nonagricultural Rights of way/fencerows/hedgerows							
Delayed Dormant							
	43% EC	1	1	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Dormant							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% EC 53.48 EC	2.5	NS	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Early Spring							
	90% DF 90.1% FIC	3.96	1	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Fall							
	43% EC 43% FIC 43% SC/L 43.5% EC 43.6% EC 53.48% EC 80% WP 85.5% DF 90% DF 90% WP 90.1% DF 90.1% FIC	2.4	1	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Foliar							
	43% EC 53.48% EC	2.5	NS	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Spring							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% EC 43% FIC 43% SC/L 43.5% EC 43.6% EC 53.48% EC 80% WP 85.5% DF 90% DF 90% WP 90.1% DF 90.1% FIC	4	1	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
When Needed							
	43% EC	2	NS	NS	NS	NS	"Do not apply more than 1 pound active ingredient per acre for any application." "Do not apply more than one application per year."
Ornamental And/or Shade Trees							
Dormant							
	43% EC 90% DF	4	1	NS	NS	NS	
Early Spring							
	53.48% EC 90.1% DF	4	1	NS	NS	NS	
Established Planting							
	90% DF	3.96	1	NS	NS	NS	
Fall							
	53.48% EC 90.1% DF	4	1	NS	NS	NS	

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Post-transplant							
	43% EC 53.48% EC 90% DF 90.1% DF	4	1	NS	NS	NS	
Pre-transplant							
	43% EC 53.48% EC 90% DF 90.1% DF	4	1	NS	NS	NS	
Transplant							
	43% EC 90.1% DF	4	1	NS	NS	NS	
Ornamental Lawns and Turf							
Dormant							
	23.6% FIC 43% EC 43% FIC 43% SC/L 53.48% EC 90% DF	4	1	NS	NS	NS	"This product must be watered in immediately after application."
Early Spring							
	.58% G .92% G 43% FIC 90% DF	1.98	NS	NS	NS	NS	"This product must be watered in immediately after application."
Early Winter							
	.92% G	.046 lb/1Kft^2	NS	NS	NS	NS	"This product must be watered in immediately after application."
Fall							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	042% G .57% G .6% G .63% G .79% G .83% G .91% G .92% G 1.05% G 1.11% G 1.15% G 1.16% G 1.28% G 1.41% G 1.5% G 43%EC 43% FIC 80% WP 85.5% DF 90% DF 90% WP	2	NS	NS	NS	NS	"This product must be watered in immediately after application."
Foliar							
	1.1% G 23.6% FIC 43% EC 43% FI43% SC/L 53.48% EC 80% WP 90% DF	2.5	NS	NS	NS	NS	"This product must be watered in immediately after application."
Late Winter							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.6% G .8% G 1.11% G 43% EC 43% FIC 43% SC/L 43.5% EC 43.6% EC 80% WP 90% DF 90.1% DF	4	NS	NS	NS	NS	"This product must be watered in immediately after application."
Postplant							
	.42% G .44% G .91% G	.75	NS	NS	NS	NS	"This product must be watered in immediately after application."
Preemergence							
	90% DF	1.98	2	NS	NS	NS	"This product must be watered in immediately after application."
Spring							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.42% G .57% G .6% G .63% G .79% G .83% G .91% G .92% G 1.05% G 1.11% G 1.15% G 1.16% G 1.28% G 1.5% G	.048 lb/1Kft^2	NS	NS	NS	NS	"This product must be watered in immediately after application."
Summer							
	.6% G 1.05% G	.046 lb/1Kft^2	NS	NS	NS	NS	"This product must be watered in immediately after application."
When Needed							
	08% G .83% G .92% G 1.22% G 1.41% G 43% EC	2	NS	NS	NS	NS	"This product must be watered in immediately after application."
Winter							
	.42% G .63% G .91% G 1.05% G 90% DF	1.98	NS	NS	NS	NS	"This product must be watered in immediately after application."
Ornamental Sod Farm (Turf)							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
At Planting							
	90% DF	3.96	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Dormant							
	53.48% EC 90% DF	2	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Early Spring							
	90% DF	2	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Fall							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.45% G .92% G 43% EC 43% FIC 53.48% EC 85.5% DF 90% DF 90% WP	2	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Foliar							
	43% EC 43% FIC 53.48% EC 85.5% DF 90% DF 90% WP 43% EC	4	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Late Winter							
	43% EC 43% FIC 53.48% EC 85.5% DF 90% DF 90% WP 90.1% DF 43% EC	2	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Post Harvest							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% EC 43% FIC 53.48% EC 85.5% DF 90% DF 90% WP 90.1% DF	4	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Post Plant							
	43% EC 43% FIC 53.48% EC 85.5% DF 90% DF 90% WP 90.1% DF	4	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Post-transplant							
	80% WP	4	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Preemergence, Pretransplant and Preplant							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% DC/L	4	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Spring							
	.455G .92% G	.046 lb 1Kft^2	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
When Needed							
	43% EC 90% DF	3.96	NS	NS	NS	NS	"*For muck or peat soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 6 pounds active ingredient per year." "*For sandy soils*: do not apply more than 4 pounds active ingredient per acre for any application." "Do not apply more than 3 pounds active ingredient per year."
Rangeland							
Established Planting							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	43% EC 90% DF	1	1	NS	NS	NS	
March							
	90% DF	1	1	NS	NS	NS	
Preemergence							
	43% EC	1	1	NS	NS	NS	
Recreation Area Lawns							
Dormant							
	43% EC 43% FIC 43% SC/L 53.48% EC 90% DF	2.5	NS	NS	NS	NS	
Early Spring							
	43% FIC 90% DF	1.98	NS	NS	NS	NS	
Fall							
	1.05% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Foliar							
	43% Ec 43% FIC 43% SC/L 53.48% EC 90% Df	2.5	NS	NS	NS	NS	
Late Winter							
	80% Wp 90% DF	2	2	NS	NS	NS	
Post-plant							
	25% FIC	.75	NS	NS	NS	NS	

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
Spring							
	1.05% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Recreational Areas							
Fall							
	.45% G .92% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Spring							
	.45% G .92% G	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	
Residential Lawns							
Dormant							
	14% EC 23.6% FIC 43% EC 43% FIC 53.48% EC 90% DF	2.5	NS	NS	NS	NS	"This product must be watered in immediately after application."
Early Spring							
	14% EC 43% FIC 90% DF	1.98	NS	NS	NS	NS	"This product must be watered in immediately after application."
Early Summer							
	14% Ec	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	"This product must be watered in immediately after application."
Fall							

Site Application Type Application Timing Application Equipment	Formulation	Max. Single Application Rate (lb ai/A)	Max. # Apps/ season	Max Annual Application Rate (lb ai/A)	Pre-harvest Interval (days)	Minimum Retreatment Interval (days)	Use Limitations
	.45% G .6% G .92% G 1.05% G 14% EC	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	"This product must be watered in immediately after application."
Foliar							
	23.6% FIC 43% EC 43% FIC 53.48% EC 90% DF	2.5	NS	NS	NS	NS	"This product must be watered in immediately after application."
Late Winter							
	.6% G 14% EC 80% WP 90% DF	2	NS	NS	NS	NS	"This product must be watered in immediately after application."
Mid-Winter							
	14% EC	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	"This product must be watered in immediately after application."
Post-Plant							
	25% FIC	.75	NS	NS	NS	NS	"This product must be watered in immediately after application."
Spring							
	.45% G 0.6% G .92% G 1.05% G 14% EC	0.046 lb 1Kft ^{2}	NS	NS	NS	NS	"This product must be watered in immediately after application."

Appendix B: STUDIES USED TO SUPPORT THE REREGISTRATION OF ATRAZINE

GUIDE TO APPENDIX B

Appendix B contains listing of data requirements which support the reregistration for active ingredients within the case atrazine covered by this IRED. It contains generic data requirements that apply to atrazine in all products, including data requirements for which a "typical formulation" is the test substance.

The data table is organized in the following formats:

1. Data Requirement (Column 1). The data requirements are listed by Guideline Number. The Guideline Numbers accompanying each test refer to the test protocols set in the Pesticide Assessment Guidance available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (703) 487-4650.

2. Use Pattern (Column 2). This column indicates the use patterns for which the data requirements apply. The following letter designations are used for the given use patterns.

A .	Terrestrial Food	H.	Greenhouse Food
B.	Terrestrial Feed	I.	Greenhouse Non-Food
C.	Terrestrial Non-Food	J.	Forestry
D.	Aquatic Food	K.	Residential
E.	Aquatic Non-Food Outdoor	L.	Indoor Food
F.	Aquatic Non-Food Industrial	M.	Indoor Non-Food
G.	Aquatic Non-Food Residential	N.	Indoor Medical
		O.	Indoor Residential

3. Bibliographic Citation (Column 3). If the Agency has acceptable data in its files, this column list the identify number of each study. This normally is the Master Record Identification (MRID) number, but may be a "GS" number if no MRID number has been assigned. Refer to the Bibliography appendix for a complete citation of the study.

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
PRODUCT CHEMISTRY				
830.1550	61-1	Product Identity and Composition	All	40566501, 43188901, 43505801
830.1600 830.1620 830.1650	61-2A	Starting Materials and Manufacturing Process	All	40566501
830.1670	61-2B	Formation of Impurities	All	00142160, 42043501, 43188901
830.1700	62-1	Preliminary Analysis	All	00142160, 00164821, 42043501, 42211401, 42873701, 42925201, 44488801
830.1750	62-2	Certification of Limits	All	40566501, 42925201, 43188901
830.1800	62-3	Analytical Method	All	00142160, 00164821, 42873701
830.6302	63-2	Color	All	00142160
830.6303	63-3	Physical State	All	00142160
830.6304	63-4	Odor	All	00142160
830.7050	None	UV/Visible Absorption	All	**data gap**
830.7200	63-5	Melting Point	All	00142160, 00164822
830.7220	63-6	Boiling Point	All	not applicable
830.7300	63-7	Density	All	00023548, 43016501, 43188902

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
830.7840 830.7860	63-8	Solubility	All	00023497, 43337901
830.7950	63-9	Vapor Pressure	All	00142160, 00164822
830.7370	63-10	Dissociation Constant in Water	All	00022855
830.7550 830.7560 830.7570	63-11	Partition Coefficient (Octanol/Water)	All	00142160, 00164822, 43337901
830.7000	63-12	pH	All	00142160, 43337901
830.6313	63-13	Stability	All	00023497, 00023548, 00023963, 43337901, 43796001
830.6314	63-14	Oxidizing/Reducing Action	All	43016501, 43188902
830.6315	63-15	Flammability	All	not applicable
830.6316	63-16	Explodability	All	43016501, 43188902
830.6317	63-17	Storage Stability	All	0023548, 43395501
830.7100	63-18	Viscosity	All	not applicable
830.6319	63-19	Miscibility	All	not applicable
830.6320	63-20	Corrosion Characteristics	All	00142160, 43016501, 43188902
ECOLOGICAL EFFECTS				
850.2100	71-1	Avian Acute Oral Toxicity Test	ABCJK	00024721 (parent) **data gap (3 major degradates)**

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
850.2200	71-2	Avian Dietary Toxicity	ABCJK	00022923
850.2300	71-4	Avian Reproduction	ABCJK	42547102, 42547101
850.1075	72-1 (a & b)	Fish Acute Toxicity - Freshwater	ABCJK	00024717, 00024716 (parent) **data gap (major degradate)**
850.1010	72-2	Acute Aquatic Invertebrate Toxicity	ABCJK	00024377 (parent) **data gap (major degradate)**
850.1075	72-3a	Acute Estuarine/Marine Toxicity - Fish	ABCJK	43344901 (parent), **data gap (major degradate)**
850.1025	72-3b	Acute Estuarine/Marine Toxicity - Invertebrate (Mollusk)	ABCJK	**data gap (parent and major degradate)**
	72-3c	Estuarine/Marine Toxicity - Invertebrate (Shrimp)	ABCJK	43344902 (parent) **data gap (major degradate)**
850.1400	72-4a	Early Life-Stage Fish (Freshwater)	ABCJK	45208304
	72-4a	Early Life-Stage Fish (Marine)	ABCJK	**data gap** 45202920 (upgradable)
850.1300	72-4b	Life-Cycle Aquatic Invertebrate	ABCJK	00024377
850.1350	72-4b	Life-Cycle Marine Invertebrate	ABCJK	45202920**, data gap**
850.1500	72-5	Life-Cycle Fish	ABCJK	00024377
850.4225 850.4230	123-1a	Seedling Germination/Seedling Emergence	ABCJK	42041403

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
850.4250	1231b	Vegetative Vigor	ABCJK	42041402
850.4400	123-2	Aquatic Plant Growth	ABCJK	41065203a & b 43074801, 43074802, 43074803
850.3020	141-1	Nontarget Insect Acute Contact Toxicity (Honey Bee)	ABCJK	00036935
TOXICOLOGY - Parent Atrazine				
870.1100	81-1	Acute Oral - Rat	All	00024706, 00027097 Accession No. 230303
870.1200	81-2	Acute Dermal - Rabbit	All	00024708, 00027097 Accession Nos. 230303; 231466
870.1300	81-3	Acute Inhalation - Rat	All	42089901, 43016502
870.2400	81-4	Primary Eye Irritation - Rabbit	All	Accession No. 230303 00024709
870.2500	81-5	Primary Dermal Irritation - Rabbit	All	Accession No. 230303 00024709, 00024710
870.2600	81-6	Dermal Sensitization	All	00105131
870.3100	82-1	90-Day Feeding	All	44723701
870.3200	82-2	21-Day Dermal Toxicity - Rat	All	42089902
870.3700	83-3	Developmental Toxicity	All	41065201, 00143008, 40566302 Accession No. 254979 00143006, 40566301
870.3800	83-4	Reproduction and Fertility Effects - 2 Generation Repro	All	40431303, 42743903

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	Old Guideline Number	Study Title	Use Pattern	MRID Number
870.4100 870.4300	83-1A 83-5	Chronic Feeding Toxicity - Rodent Combined Chronic Toxicity/Carcinogenicity	All	40629302, 42227001, 43934402, 00158930, 43532001
870.4100	83-1B	Chronic Feeding Toxicity - Non-Rodent (dog)	All	40431301
870.4200	83-2A	Oncogenicity - Rat	All	40629302, 42227001, 42204401, 43934402, 00158930
870.4200	83-2B	Oncogenicity - Mouse	All	40431302
non-guideline	non-guideline	Special Studies - Neurotoxicity	All	44152102, 43934406, 45166902, 45166901
870.5100	84-2	Bacterial Reverse Mutation Assay	All	00060642, 40246601
870.5385	84-2	Micronucleus Assay	All	40722301
870.5450	84-2	Rodent Dominant Lethal Assay	All	42637003
870.5550	84-2	UDS Assay	All	00161790, 40722301, 42547105
870.7485	85-1	General Metabolism	All	40431304, 40431305, 40431306, 42165503, 44713802, 40437501
870.7600	85-2	Dermal Absorption	All	43314302 (rat) 44152114 (human)
non-guideline	non-guideline	Special Studies - Assays of Direct Estrogenic Activity of Triazines	All	43598617, 43598618, 43598619, 43934403
non-guideline	non-guideline	Special Study - Estrous Cycle Alterations and LH Surge Attenuation - Method Validation	All	43934405
non-guideline	non-guideline	Special Study - Estrous Cycle Alterations and LH Surge Attenuation - Pilot	All	43934404

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	Old Guideline Number	Study Title	Use Pattern	MRID Number
non-guideline	non-guideline	Special Study - Estrous Cycle Alterations and LH Surge Attenuation - 28-day	All	43934406
non-guideline	non-guideline	Special Study - Estrous Cycle Alterations and LH Surge Attenuation - 6-month	All	44152102
non-guideline	non-guideline	Special Study - Hormone and Estrous Cycle Measurements in SD Rats	All	42085001, 42743902, 43598622
non-guideline	non-guideline	Special Study - Mammary Gland and Ovarian Histomorphology in SD Rats	All	43598622, 42085001, 42743902
non-guideline	non-guideline	Special Study - Two-Year Bioassay in F-344 Rats	All	42146101, 42743902, 43598622
non-guideline	non-guideline	Special Study - Hormone and Estrous Cycle Measurements in F-344 Rats	All	42743902, 42146101, 43598622
non-guideline	non-guideline	Special Study - Mammary Gland and Ovarian Histomorphology in F-344 Rats	All	43598622, 42146101, 42743902, 44917701
non-guideline	non-guideline	Special Study - Two-year Bioassay with the SD Strain of Rate	All	42204401
non-guideline	non-guideline	Special Study - Tumor Incidence in Ovariectomized (OVX) vs Intact Animals	All	44544701
non-guideline	non-guideline	Special Study - Sexual Maturation	All	45058702, 45722401
non-guideline	non-guideline	Long-Term Estrous Cycle Measurements	All	Unaudited draft report of the interim estrous cycle data from 44544701
non-guideline	non-guideline	Direct Comparison of LH Surge Attenuation of Atrazine, Simazine, and Dact	All	45471002, 45058701

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
non-guideline	non-guideline	Other published literature	All	Cooper et al. 1996 Shafer et al. 1999 Das et al. 2000 Cummings et al. 2000 Narotsky et al. 2000 Laws et al. 2000 Stoker et al. 2000
TOXICOLOGY - Degradate DACT				
870.1100	81-1	Acute Oral - Rat	All	43013201
870.3100	82-1A	Subchronic Oral Toxicity in Rats	All	43013207
870.3150 870.4100	82-1B 83-1B	Subchronic & Chronic Oral Toxicity in Dogs	All	41392401
870.3700	83-3	Developmental Toxicity in Rats	All	41392402
870.5100	84-2	Mutagenicity Study - Bacterial Reverse Mutation	All	40722302
870.5550	84-2	Mutagenicity Study - UDS Assay	All	40722303
TOXICOLOGY - Degradate Desisopropyl Atrazine				
870.1100	81-1	Acute Oral - Rat	All	43013201
870.3100	82-1A	Subchronic Oral Toxicity in Rats	All	43013205
870.3150	82-1B	Subchronic Oral Toxicity in Dogs	All	43013203
870.3700	83-3	Developmental Toxicity in Rats	All	43013208
870.5100	84-2	Mutagenicity Study - Bacterial Reverse Mutation Assay	All	43093101

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
870.5385	84-2	Mutagenicity Study - Mammalian Bone Marrow Chromosome Aberration Test	All	43093103
870.5550	84-2	Mutagenicity Study - UDS Assay	All	43093105
TOXICOLOGY - Degradate Deethyl Atrazine				
870.1100	81-1	Acute Tox - Rat	All	43013202
870.3100	82-1A	Subchronic Oral Toxicity in Rats	All	43013206
870.3150	82-1B	Subchronic Oral Toxicity in Dogs	All	43013203
870.3700	83-3	Developmental Toxicity in Rats	All	43013209
870.5100	84-2	Mutagenicity Study - Bacterial Reverse Mutation Assay	All	43093102
870.5385	84-2	Mutagenicity Study - Mammalian Bone Marrow Chromosome Aberration Test	All	43093104
870.5550	84-2	Mutagenicity Study - UDS Assay	All	43093106
TOXICOLOGY - Degradate Hydroxyatrazine				
870.3100	82-1A	Subchronic Oral Toxicity in Rats	All	41293501
870.3700	83-3	Developmental Toxicity in Rats	All	41065202
870.4100 870.4300	83-1A 83-5	Chronic Toxicity - Rat	All	43532001
870.5100	84-2	Mutagenicity Study - Bacterial Reverse Mutation Assay	All	40722304
870.5385	84-2	Mutagenicity Study - Mammalian Bone Marrow Chromosome Aberration Test	All	41479401

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
870.5550	84-2	Other Genetic Effects	All	40722305, 40888101
EPIDEMIOLOGY				
non-guideline	non-guideline	Cancer Epidemiologic Studies - Submitted to EPA	All	45152101, 45518401, 44008601
non-guideline	non-guideline	Cancer Epidemiologic Studies - Other Published Literature	All	Alvanja et al. 2003 Breckenridge 2002 Breckenridge 2003 MacLennan et al. 2002 MacLennan et al. 2003 Mills 1998
OCCUPATIONAL/RESIDENTIAL EXPOSURE				
875.1100 875.1300 875.1500	231 232 235	Applicator Exposure Monitoring (Dermal outdoor exposure, Inhalation outdoor exposure, Biological monitoring)	ABCJK	43934416, 43934417, 43934418, 44152109, 44152110, 44152111, 44315403, 44315404, 43598604
875.1500	235	Biological Monitoring	ABCJK	44597605 44597606
875.1100	231	Dermal Exposure	ABCJK	43016506
875.1100 875.1300	231 232	Exposure Monitoring (ORETF)	ABCJK	44972201
875.2100	132-1	Foliar Dislodgeable Residue Dissipation	ABCJ	44883601
875.2100	132-1	Transferable Residue Dissipation: Lawn and Turf	CK	44958001, 44958801, 45517301
840.1100	201-1 202-1	Droplet Size Spectrum Drift Field Evaluation	ABCJK	**data gap**

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
non-guideline	non-guideline	Dermal Transfer Efficiency of Granular Atrazine Residues From Turf to Dry and Wetted Palms	CK	45622310, 45622311
non-guideline	non-guideline	Exposure Assessments	ABCJK	44152106, 44152108, 45399905, 44597604
ENVIRONMENTAL FATE				
835.2120	161-1	Hydrolysis of Parent and Degradates	ABCJK	40431319
835.2240	161-2	Photodegradation - Water	ABCJK	42089904, 45545301
835.2410	161-3	Photodegradation - Soil	ABCJK	40431320 42089905
835.2370	161-4	Photodegradation - Air	ABCJK	not applicable
835.4100	162-1	Aerobic Soil Metabolism	ABCJK	42089906
835.4200	162-2	Anaerobic Soil Metabolism	ABCJK	42089906
835.4400	162-3	Anaerobic Aquatic Metabolism	ABCJK	40431323
835.4300	162-4	Aerobic Aquatic Metabolism	ABCJK	**data gap**
835.1240	163-1	Leaching/Adsorption/Desorption	ABCJK	40431324, 40431325, 40431326, 40431327, 40431328
835-1410	163-2	Volatility-Lab	ABCJK	**data gap**
835.6100	164-1	Terrestrial Field Dissipation	ABCJK	42165504, 42165505, 40431336, 42165506, 40431337, 42165507
835.1200	164-2	Aquatic (sediment) Dissipation	ABCJK	not applicable
835.1300	164-3	Forestry Dissipation	ABCJK	40431340, 42041405

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
835.1500	164-5	Soil, Long Term Dissipation	ABCJK	40431339, 42089911, 40431337, 42089912, 40431338, 42089909, 40431336, 42089910
850.1730	165-4	Bioaccumulation in Fish	ABCJK	40431344
850.1950	165-5	Bioaccumulation in Non-Target Organisms	ABCJK	**data gap**
ENVIRONMENTAL FATE - DRINKING WATER MONITORING DATA				
non-guideline	non-guideline	Atrazine Drinking Water Monitoring Data (PLEX & VMP)	All	43598634, 43934413, 43934414, 44152122, 44152123, 44152124, 44315414, 44597601, 44711001, 44856901, 44997001, 44997003, 45058703, 45058704, 45145601, 45209601, 45253401, 45475101, 45475102, 45545305, 45622305
non-guideline	non-guideline	Atrazine Drinking Water Monitoring Data (ARP)	All	45728401, 45730200, 45722700 Acetochlor Registration Partnership (ARP) Final Report for the State Monitoring Program
non-guideline	non-guideline	Atrazine Rural Well Monitoring Data	ALL	**data gap**
non-guideline	non-guideline	Atrazine Ground-Water Monitoring Data	All	43934414, 44222601, 44222602, 45399906, 45545304, **data gap**
RESIDUE CHEMISTRY				

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
860.1300	171-4A	Nature of Residue - Plants	AB	00023324 00023529 00022474 00024786 00055672 00149428 00161854 00016306 41209801 42547116 42547115 43016503 43048501 43598628 43598629 44152119 44152120 44152121 44315408 44315409
860.1300	171-4B	Nature of Residue - Livestock	AB	00022857 00038297 00161854 00016306 00038294 40431352 40431353 40431354 40431355 40431356 40431357 40437502 41209802 41209803 41209804 41209806 41209807 41209808 42925601 43508501 43934412
860.1340	171-4C	Residue Analytical Method - Plants	AB	00016401 00016402 00016403 00023499 00023502 00024480 00024482 00055644 00093520 40431365 41397102 42547118 42547119 43016504 44315412 43395502
860.1340	171-4D	Residue Analytical Method - Animals	AB	00023280 00023502 00161854 40431364 40431369 40431370 40431422 40431424 41397103 42547120 42547121 42547122 42547123
860.1360		Multiresidue Methods	AB	41423401, **data gap**

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
860.1380	171-4E	Storage Stability	AB	00024482 40431421 40431426 41258601 41258602 41258603 41397101 43395503, **data gap**
860.1480	171-4J	Magnitude of Residues - Meat, Milk, Poultry, Eggs Milk and the Fat, Meat, and Meat Byproducts of Cattle, Goats, Hogs, Horses, and Sheep Eggs and the Fat, Meat, and Meat Byproducts of Poultry	AB	 00026977, 00080629, 00093524, 40431424 40431422, 40431423
860.1500	171-4K	Crop Field Trials - Macadamia Nuts	AB	00024799, 40431418
860.1500	171-4K	Crop Field Trials - Corn, field and sweet, K+CWHR	AB	00094135, 00093523, 40431401, 42547117, 43598630, 44152117, 44315410, 44597602, 45399901
860.1500	171-4K	Crop Field Trials - Sorghum grain	AB	00093523, 40431383, 43598631, 43598632, 44152118, 44315411, 44597603, 45399902
860.1500	171-4K	Crop Field Trials - Wheat grain	AB	00024475, 40431420, 43160502
860.1500	171-4K	Crop Field Trials - Corn forage and stover	AB	00093520 00093523 00094135 40431401 43598630 44152117 44315410 44597602
860.1500	171-4K	Crop Field Trials - Sorghum forage and stover	AB	00093523 40431383 43598631 43598632 44315411 44597603
860.1500	171-4K	Crop Field Trials - Wheat forage, fodder, straw, grasses, and forage	AB	00024475 00067425 40431420 43160502 **data gap**

APPENDIX B. Data Supporting Guideline Requirements for the Reregistration of Atrazine

DATA REQUIREMENT				CITATION(S)
New Guideline Number	**Old Guideline Number**	**Study Title**	**Use Pattern**	**MRID Number**
860.1500	171-4K	Crop Field Trials - Orchardgrass, orchardgrass hay, rye, perennial	AB	00024487
860.1500	171-4K	Crop Field Trials - RangeGrasses	AB	00126712 **data gap**
860.1500	171-4K	Crop Field Trials - Guava	AB	00055643
860.1500	171-4K	Crop Field Trials -Sugarcane	AB	00115588, 43160504
860.1520	171-4L	Processed Foods (Corn)	AB	43160505
860.1520	171-4L	Processed Foods (Sorghum)	AB	43160503
860.1520	171-4L	Processed Foods (Sugarcane)	AB	43160504, 43395504
860.1520	171-4L	Processed Foods (Wheat)	AB	43160502
860.1850	165-1	Confined Rotational Crop	AB	43016505
860.1900	165-2	Field Rotational Crop	AB	43160501
PROBABILISTIC ASSESSMENTS				
non-guideline	non-guideline	Probabilistic Drinking Water Exposure Assessment	All	45503101, 45503102, 45622306, 45629401, 45711308
non-guideline	non-guideline	Probabilistic Ecological Risk Assessment	All	45299501, 45299505, 45622302, 45622303

Appendix C: TECHNICAL SUPPORT DOCUMENTS

Additional documentation in support of this IRED is maintained in the OPP docket, located in Room 119, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA. It is open Monday through Friday, excluding legal holidays, from 8:30 am to 4 pm.

The docket initially contained the February 14, 2001 preliminary human health risk assessment, and the September 26, 2001 preliminary ecological fate and effects risk assessment and related documents. EPA then considered comments on these risk assessments, revised the risk assessments, and added the formal "Response to Comments" documents and the revised risk assessments to the docket in May 2002. Additional response to comments documents and documents supporting the IRED were published in January 2003.

All documents, in hard copy form, may be viewed in the OPP docket room or downloaded or viewed via the Internet at the following sites:

www.epa.gov/pesticides/op
http://cascade.epa.gov/RightSite/dk_public_home.htm

These documents include:

SRRD Documents:

- Atrazine Memorandum of Understanding. January 31, 2003
- Atrazine Summary. May 2, 2002
- Atrazine Overview. May 2, 2002

HED Documents:

<u>IRED Supporting Documents</u>

- Atrazine: Addendum to Revised Human Health Risk Assessment for the Reregistration Eligibility Decision (RED) dated April 16, 2002. January 31, 2003
- Atrazine: Reassessment of DWLOC value for use in human health risk assessment. January 31, 2003
- Atrazine: Addendum to Revised Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document. January 31, 2003
- Atrazine: Response to Public Comments on the EPA's April 16, 2002, Revised Human Health Risk Assessment and Associated Documents for the Reregistration Eligibility Decision (RED). January 31, 2003
- Review of Additional Data on Potential Atrazine Exposure and Review Comments Submitted by Syngenta and NRDC on Atrazine Cancer Epidemiology Study: "Follow-up Study of Cancer Incidence Among Workers in Triazine-related Operations at the Novartis St. Gabriel Plant" by Elizabeth Delzell et al. January 15, 2003.

- Atrazine: Response to Syngenta's Comments on the EPA's April 16, 2002, Revised Human Health Risk Assessment and Associated Documents for the Reregistration Eligibility Decision (RED). November 22, 2002

Revised Risk Assessments and Supporting Documents

- Atrazine: HED's Revised Human Health Risk Assessment for the Reregistration Eligibility Decision (RED). April 16, 2002
- Atrazine: Response to Public Comments on the EPA's January 19, 2001, Revised Preliminary Human Health Risk Assessment and Associated Documents for the Reregistration Eligibility Decision (RED). April 16, 2002
- Atrazine: Response to Syngenta's Comments on the EPA's January 19, 2001, Revised Preliminary Human Health Risk Assessment and Associated Documents for the Reregistration Eligibility Decision (RED). April 16, 2002
- Atrazine/DACT - Reassessment Report of the FQPA Safety Factor Committee. April 8, 2002
- Atrazine/DACT - Fourth Report of the Hazard Identification Assessment Review Committee. April 5, 2002
- Atrazine: Metabolism Assessment Review Committee. Residues to be Regulated and Residues of Concern for Dietary Assessment. November 15, 2000
- Atrazine: Toxicology Chapter of the Reregistration Eligibility Decision. Second Revision. April 11, 2002
- Atrazine: HED Product and Residue Chemistry Chapters. April 16, 2002
- Atrazine: Revised Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document. April 25, 2002
- Response to Comments from Sipcam Agro. April 18, 2002
- Atrazine: Review of Probabilistic Exposure Assessment for Drinking Water from 28 Community Water Systems. April 23, 2002.
- Addendum and Corrections to Occupational and Residential Exposure Chapter for Atrazine. May 23, 2002.
- Review of Atrazine Cancer Epidemiology Studies: "A Follow-up Study of Mortality Among Workers at the Novartis St. Gabriel Plant" "Follow-up Study of Cancer Incidence Among Workers in Triazine-related Operations at the Novartis St. Gabriel Plant" both by Elizabeth Delzell et al. March 25, 2002.
- Review of Atrazine Cancer Epidemiology Study "Follow-up Study of Cancer Incidence Among Workers in Triazine-related Operations at the Novartis St. Gabriel Plant" by Elizabeth Delzell et al. December 13, 2001.

Preliminary Risk Assessments and Supporting Documents

- EPA's Response to Syngenta's Comments on the Preliminary Human Health Risk Assessment for Atrazine in Support of the Reregistration, Tolerance Reassessment, and Special Review. January 23, 2001
- Atrazine - Drinking Water Exposure Assessment for Atrazine and Various Chloro-Triazine and Hydroxy-Triazine Degradates. January 23, 2001

- Atrazine - Toxicology Chapter of the Reregistration Eligibility Decision - Revised. January 19, 2001
- Atrazine - HED's Revised Preliminary Human Health Risk Assessment for the Reregistration Eligibility Decision (RED). January 19, 2001
- Atrazine - Anticipated Residues and Acute and Chronic Dietary Exposure Assessments for Atrazine, Revised January 2001. January 18, 2001
- Atrazine - HED Product and Residue Chemistry Chapters. January 18, 2001
- Atrazine - Occupational and Residential Exposure Assessment and Recommendations for the Reregistration Eligibility Decision Document. January 18, 2001
- Atrazine - 3rd Report of the Hazard Identification Assessment Review Committee. December 21, 2000
- Atrazine - Evaluation of Carcinogenic Potential. December 13, 2000
- Atrazine - Reevaluation by the FQPA Safety Factor Committee. November 14, 2000
- Atrazine - Cancer Peer Review Committee Meetings - Provisional Conclusions. November 1, 2000
- Review of Atrazine Incident Reports. October 31, 2000
- Diaminochlorotriazine (DACT) - Report of the Hazard Identification Assessment Review Committee. August 28, 2000
- Hydroxyatrazine - Report of the Hazard Identification Assessment Review Committee. August 28, 2000

EFED Documents:

<u>IRED Supporting Documents</u>

- EPA Response to Comments from Syngenta and its Contractors, the Triazine Network, the Center for Regulatory Effectiveness, the American Water Works Association, the State of New York Office of Attorney General, the U.S. Department of Interior Fish and Wildlife Service, the California Regional Water Control Board, the American Farm Bureau Federation, and the Louisiana Farm Bureau Federation, about the EPA Reregistration Eligibility Science Chapter for Atrazine, Environmental Fate and Effects Chapter, dated April 22, 2002. March 2003 *(Replaces January 2003 Response to Comments document)*
- Reregistration Eligibility Science Chapter for Atrazine: Environmental Fate and Effects Chapter (and Appendices). January 31, 2003
- EPA Response to Comments. January 28, 2003

<u>Revised Risk Assessments and Supporting Documents</u>

- Reregistration Eligibility Science Chapter for Atrazine. Environmental Fate and Effects Chapter (and appendices). April 22, 2002.
- EFED Review of Comments from Syngenta and Its Contractors About the EPA Revised Environmental Risk Assessment for Atrazine. April 22, 2002
- EFED Review of Public Comments in Reponse to the EPA Revised Environmental Risk

Assessment for Atrazine. April 10, 2002

- Response to Comments Contained in Attachment 6 of Syngenta's Comments on "Atrazine. HED's Revised Human Health Risk Assessment for the Reregistration Eligibility Document." April 9, 2002

Preliminary Risk Assessments and Supporting Documents

- Response to Syngenta's Error Corrections of EPA's Atrazine RED and Environmental Fate and Effects Chapter (including Appendices). March 16, 2001

Appendix D: CITATIONS CONSIDERED TO BE PART OF THE DATA BASE SUPPORTING THE INTERIM REREGISTRATION DECISION (BIBLIOGRAPHY)

GUIDE TO APPENDIX D

1. CONTENTS OF BIBLIOGRAPHY. This bibliography contains citations of all studies considered relevant by EPA in arriving at the positions and conclusions stated elsewhere in the Reregistration Eligibility Document. Primary sources for studies in this bibliography have been the body of data submitted to EPA and its predecessor agencies in support of past regulatory decisions. Selections from other sources including the published literature, in those instances where they have been considered, are included.

2. UNITS OF ENTRY. The unit of entry in this bibliography is called a "study." In the case of published materials, this corresponds closely to an article. In the case of unpublished materials submitted to the Agency, the Agency has sought to identify documents at a level parallel to the published article from within the typically larger volumes in which they were submitted. The resulting "studies" generally have a distinct title (or at least a single subject), can stand alone for purposes of review and can be described with a conventional bibliographic citation. The Agency has also attempted to unite basic documents and commentaries upon them, treating them as a single study.

3. IDENTIFICATION OF ENTRIES. The entries in this bibliography are sorted numerically by Master Record Identifier, or "MRID" number. This number is unique to the citation, and should be used whenever a specific reference is required. It is not related to the six-digit "Accession Number" which has been used to identify volumes of submitted studies (see paragraph 4(d)(4) below for further explanation). In a few cases, entries added to the bibliography late in the review may be preceded by a nine character temporary identifier. These entries are listed after all MRID entries. This temporary identifying number is also to be used whenever specific reference is needed.

4. FORM OF ENTRY. In addition to the Master Record Identifier (MRID), each entry consists of a citation containing standard elements followed, in the case of material submitted to EPA, by a description of the earliest known submission. Bibliographic conventions used reflect the standard of the American National Standards Institute (ANSI), expanded to provide for certain special needs.

   a Author. Whenever the author could confidently be identified, the Agency has chosen to show a personal author. When no individual was identified, the Agency has shown an identifiable laboratory or testing facility as the author. When no author or laboratory could be identified, the Agency has shown the first submitter as the author.

b. Document date. The date of the study is taken directly from the document. When the date is followed by a question mark, the bibliographer has deduced the date from the evidence contained in the document. When the date appears as (1999), the Agency was unable to determine or estimate the date of the document.

c. Title. In some cases, it has been necessary for the Agency bibliographers to create or enhance a document title. Any such editorial insertions are contained between square brackets.

d. Trailing parentheses. For studies submitted to the Agency in the past, the trailing parentheses include (in addition to any self-explanatory text) the following elements describing the earliest known submission:

(1) Submission date. The date of the earliest known submission appears immediately following the word "received."

(2) Administrative number. The next element immediately following the word "under" is the registration number, experimental use permit number, petition number, or other administrative number associated with the earliest known submission.

(3) Submitter. The third element is the submitter. When authorship is defaulted to the submitter, this element is omitted.

(4) Volume Identification (Accession Numbers). The final element in the trailing parentheses identifies the EPA accession number of the volume in which the original submission of the study appears. The six-digit accession number follows the symbol "CDL," which stands for "Company Data Library." This accession number is in turn followed by an alphabetic suffix which shows the relative position of the study within the volume.

BIBLIOGRAPHY

MRID	Citation
00002875	Frear, D. E. H. and J. E. Boyd. 1967. Use of *Daphnia magna* for the microbioassay of pesticides. I. Development of standardized techniques for rearing *Daphnia* and preparation of dosage-mortality curves for pesticides. J. Econ. Entomol. 60(5):1228-1236.
00016306	Hermes, P. (1972) Biphasic Extraction of Radioactive Metabolites from Treated Biological Material. Method no. AG-214 dated Aug 15, 1972. (Unpublished study received Sep 26, 1974 under 5F1606; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL: 094385-Q)
00016401	Cannizzaro, R.D.; Li, C. (1972) Determination of Atrazine Residues in Dry Crops by Gas Chromatography. Method no. AG-145 dated Nov 29, 1972. (Unpublished study received Feb 18, 1977 under 100-583; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL: 228126-L)
00016402	Cullen, T.; Balu, K. (1972) Determination of 2-Chloro-4,6-diamino s-triazine (G-28273) Residues in Sorghum by Gas Chromatography. Method no. AG-232 A dated Dec 20, 1972. (Unpublished study received Feb 18, 1977 under 100-583; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:228126-M)
00016403	Cheung, M.W.; Hsieh, K. (1974) Determination of Atrazine, G-30033, and G-28279 Residues in Rangeland Forage by Gas Chromatography. Method no. AG-269 dated Seted by Ciba-Geigy Corp., Greensboro, Method no. AG-269 dated Sep 12, 1974. (Unpublished study received Feb 18, 1977 under 100-583; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:228126-O)
00022474	Malina, M. (1964) Dissipation of Banvel D from Bermuda Grass (Ap- plied 6/28/63 in Texas): Report No. 3. (Unpublished study re- ceived Aug 30, 1965 under 6F0466; submitted by Velsicol Chemical Corp., Chicago, Ill.; CDL:090517-G)
00022855	Esser, H.O.; DuPuis, G.; Ebert, E.; et al. (1974) s-Triazines. Pages 129-208,~In~Without Title|. By N.P. (Also~In~unpub- lished submission received Oct 7, 1977 under 100-566; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:231969-C)
00022857	Bakke, J.E.; Larson, J.D.; Price, C.E. (1972) Metabolism of Atrazine and 2-Hydroxyatrazine by the rat. Journal of Agricultural and Food Chemistry 20(3):602-607. (Also~In~unpublished submission received Oct 7, 1977 under 100-566; submitted by Ciba-Geigy Corp., Greensboro, N.C.,; CDL:231969-F)

00022923 Hill, E.F.; Heath, R.G.; Spann, J.W.; et al. (1975) Lethal Dietary Toxicities of Environmental Pollutants to Birds: Special Scien- tific Report--Wildlife No. 191. (U.S. Dept. of the Interior, Fish and Wildlife Service, Patuxent Wildlife Research Center; unpublished report)

00023280 Mattson, A.M.; Solga, J. (1966) The Determination of Atrazine, Simazine and Prometryne in Cow's Milk by Gas Chromatography. Method dated Nov 11, 1966. (Unpublished study received Jul 15, 1968 under 7F5034; submitted by Geigy Chemical Co., Ardsley, N.Y.; CDL:092912-A)

00023324 Ciba-Geigy Corporation (19??) The Uptake of Atrazine by Corn Plants from a Post-emergence Application. (Unpublished study received May 17, 1960 under 100-439; CDL:120785-E)

00023497 Ciba-Geigy Corporation (19??) Name, Chemical Identity and Composition of Atrazine. (Unpublished study received Aug 10, 1973 un- der 4F1425; submitted by BASF Wyandotte Corp., Parsippany, N.J.; CDL:093800-A)

00023499 Kahrs, R.A.; Gemma, A.A. (1970) Determination of Atrazine Residues in Bermuda Grass by Microcoulometric Gas Chromatography. Method AG-126 dated Jan 29, 1970. (Unpublished study received Aug 10, 1973 under 4F1425; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:0938-C)

00023502 Geigy Chemical Corporation (19??) The Determination of Chlorotriazine Residues in Plant Material, Animal Tissues and Water Using the Ultraviolet Method: Anng, Including a Description of the the Ultraviolet Method: Analytical Bulletin No. 7. (Unpublished study received Aug 10, 1973 under 4F1425; CDL:093800-F)

00023529 Humphreys, T.E. (1961) The Metabolism of Atrazine by Sugarcane Plants following Soil Application of the Herbicide. (Unpublished study received Apr Project Number: HWI 6117-178: 51-91. lished study received Apr 5, 1961 under 100-439; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:101149-A)

00023543 Foy, C. L. and H. Hiranpradit. 1977. Herbicide movement with water and effects of contaminant levels on non-target organisms. Virginia Polytech. Instit. State Univ., VA Water Resources Res. Center, OWRT Proj. A-046-VA. 89 p.

00023544 Torres, A. M. R. and L. M. O'Flaherty. 1976. Influence of pesticides on *Chlorella*, *Chlorococcum*, *Stigeoclonium* (Chlorophyceae), *Tribonema*, *Vaucheria* (Xanthophyceae) and *Oscillatoria* (Cyanophyceae). Phycologia 15(1):25-36.

00023548 Ciba-Geigy Corporation (1977) Atrazine: Chemical Data Section. (Unpublished study received Jun 2, 1977 under 100-529; CDL: 230302-A)

00023963 Burkhard, N. (1976) Project Report 17/76: Hydrolysis of 2-Chloro- and 2-Methylthio-4,6-bis-(alkylamino)-s-triazines under Laboratory Conditions. (Unpublished study received Apr 27, 1977 under 100-588; prepared by Ciba-Geigy, Ltd., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:229641-A)

00024328 Burkhard, N. and J. A. Guth. 1976. Photodegradation of atrazine, atraton and ametryne in aqueous solution with acetone as a photosensitizer. Pesticide Science 7(1):65-71. (Also In: Unpublished submission received July 19, 1978 under 201-403; submitted by Shell Chemical Co., Washington, D.C.; CDL:234469-C).

00024377 Macek, K. J., K. S. Buxton, S. Sauter, S. Gnilka and J. W. Dean. 1976. Chronic toxicity of atrazine to selected aquatic invertebrates and fishes. Prepared by EG & G Bionomics, Inc., Duluth, MN; submitted by Shell Chemical Co., Washington, D.C.

00024377 Macek, K. J., K. S. Buxton, S. Sauter, S. Gnilka and J. W. Dean. 1976. Chronic toxicity of atrazine to selected aquatic invertebrates and fishes. US. EPA, Off. Res. Dev., Environ. Res. Lab. Duluth, MN. EPA-600/3-76-047. 49 p.

00024395 Union Carbide Corp. 1975. Acute toxicity of SD 12011, Code 4-1-2-1 and Code 4-1-3-1 to fiddler crabs, *Uca pugilator*. Prepared by Union Carbide Corp.; submitted by Shell Chemical Co., Washington, D. C.

00024475 Forsythe, J.R.; King, E. (1967) Residue Report: Winter Wheat: AG-A No. 1608. (Unpublished study received Dec 29, 1967 under 7F0620; submitted by Geigy Chemical Co., Ardsley, N.Y.; CDL:090810-B)

00024480 Solga, J.; Mattson, A. (1967) The Determination of 2-Chloro-4-amino-6-isopropylamino-s-triazine (I) and 2-Chloro-4-amino-6-ethylamino-s-triazine (II). (Unpublished study received Dec 29, 1967 under 7F0620; submitted by Geigy Chemical Co., Ardsley, N.Y.; CDL:090810-G)

00024482 Mattson, A.M.; Kahrs, R.A. (1967) Efficiency of Various Extraction Procedures in Removing Residual Atrazine from Field-Treated Sorghum. (Unpublished study received Dec 29, 1967 under 7F0620; submitted by Ciba-Geigy Chemical Co., Ardsley, N.Y.; CDL:090810-I)

00024487 Lee, W.O.; Torrell, P.J.; Freeman, E.; et al. (1967) [Residues of Atrazine in Grasses]: AG-A No. 244. (Unpublished study including AG-A nos. 280, 463, 1038..., received Dec 29, 1967 under 7F0620; prepared in cooperation with Oregon State Univ., Farm Crops Dept. and others, submitted by Geigy Chemical Co., Ardsley, N.Y.; CDL:090810-Q)

00024706 Sachsse, K.; Bathe, R. (1975) Acute Oral LD450^ of Technical Atrazine (G 30027) in the Rat: Project No. Siss 4569. (Unpublished study received Jun 2,

1977 under 100-529; prepared by Ciba-Geigy, Ltd., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:230303-E)

00024708 Sachsse, K.; Bathe, R. (1976) Acute Dermal LDI50^ in the Rat of Technical G 30027: Project No. Siss 5663. (Unpublished study received Jun 2, 1977 under 100-529; prepared by Ciba-Geigy, Ltd., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL: 230303-G)

00024709 Sachsse, K.; Ullmann, L. (1976) Eye Irritation in the Rabbit of G 30027: Project No. Siss 5663. (Unpublished study received Jun 2, 1977 under 100-529; prepared by Ciba-Geigy, Ltd., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:230303-H)

00024710 Sachsse, K.; Ullmann, L. (1976) Skin Irritation in the Rabbit after Single Application of G 30027: Project No. Siss 5663. (Unpublished study received Jun 2, 1977 under 100-529; prepared by Ciba-Geigy, Ltd., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:230303-I)

00024716 Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in rainbow trout. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024717 Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in sunfish. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024718 Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in goldfish. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024719 Bentley, R. E. and K. J. Macek. 1973. Acute toxicity of atrazine to mud crab (*Neopanope texana*). Prepared by Bionomics, Inc.; Submitted by Ciba-Geigy Corp., Greensboro, NC.

00024721 Fink, R. 1976. Final report: Acute oral LD_{50} – Bobwhite quail. Project No. 108-123. Prepared by Wildlife International, Ltd., Easton, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024722 Sachsse, K. and L. Ullmann. 1974. Acute oral LD_{50} of technical atrazin (G 30027) in the Japanese quail. Project No. Siss 4407. Prepared by Ciba-Geigy, Ltd., Basle, Switzerland; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024723 Sachsse, K. and L. Ullmann. 1975. 8-Day feeding toxicity of technical G30027 (Atrazine) in the Japanese quail. Prepared by Ciba-Geigy, Ltd., Basle, Switzerland; submitted by Ciba-Geigy Corp., Greensboro, NC.

00024786 Humphreys, T.E. (1960) Post-emergence Application of Simazine and Atrazine to Young Sugarcane Plants. (Unpublished study received Apr 6, 1961 under 100-439; prepared by Univ. of Florida, Agricultural Experiment Station, Dept. of Botany, submitted by CibaGeigy Corp., Greensboro, N.C.; CDL:027029-A)

00024799 Ooka, H. (1961) Atrazine Residues--Macadamia Nuts. (Unpublished study including AG-A 96, received Aug 14, 1962 under 100-439; prepared in cooperation with Royal Hawaiian Macadamia Nut Co., submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:000246-B)

00026977 Mattson, A.M.; Solga, J. (1963) Residues in Body Tissues of Sheep and Cattle Receiving Simazine in Their Diet as Compared with Residues of Propazine and Atrazine in Animals Similarly Treated. (Unpublished study received Nov 19, 1963 under unknown admin. no.; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL: 119489-A)

00027097 Consultox Laboratories, Limited (1974) Atrazine: Acute Oral and Dermal Toxicity Evaluation. (Unpublished study received April 22, 1976 under 33660-1; submitted by Industria Prodotti Chemici, S.p.a., Novate Milanese, Italy; CDL:225976-A)

00027134 Talbert, R. E. and O. H. Fletchall. 1965. The adsorption of some s-triazines in soils. Weeds 13:46-52. (Also In: Unpublished submission received July 19, 1978 under 201-403; submitted by Shell Chemical Co., Washington, D.C.; CDL:234472-J).

00027204 Drake, C. H. 1976. Acute toxicity of technical NC 1659 (atrazine) to *Daphnia magna*. Lab. Rep. No. BIOSC/76/E/12. Prepared by Fisons, Ltd., submitted by Fisons Corp., Agricultural Chemicals Div., Bedford, MA.

00036935 Atkins, E. L., E. A. Greywood and R. L. MacDonald. 1975. Toxicity of pesticides and other agricultural chemicals to honey bees: Laboratory studies. Prepared by Univ. of Calif., Div. Agric. Ser., Leaflet 2287. 38 p.

00038294 Burnside, O.C.; Furrer, J.D.; McCarty, M.K.; et al. (1964) Chemi- cals That Control Weeds--A Guide for 1964. :Univ. of Nebras- ka, Extension Service. (EC 64-130; Incomplete; also~In~unpub- lished submission received Nov 17, 1965 under 876-44; submitted by Velsicol Chemical Corp., Chicago, Ill.; CDL:021022-A)

00038297 Bohme, C.; Bar, F. (1975) Breakdown of Triazine Herbicides in the Animal

Organism. A translation of: Uher den Abbau von Triazin- Herbiciden im Tierischen Organismus. (Unpublished study re- ceived on unknown date under 0F0996; prepared by Bundesgesund- heitsamt, Max von Pettenkofer-Institute, Laboratorium fur Ernahrungshygiene, submitted by Geigy Chemical Co., Ardsley, N.Y.; CDL:093306-A)

00040663 Obien, S. R. and Green, R. E. 1969. Degradation of atrazine in four Hawaiian soils. Weed Science 17(4):509-514. (Also~In: Unpublished submission received July 19, 1978 under 201-403; submitted by Shell Chemical Co., Washington, D.C.; CDL:234476-C)

00041408 Jessup, D. 1980. Two year oral chronic toxicity study in rats. International Research and Development Corp, Mattewan, MI. Report number 382-007.

00041409 Jessup, D. C. 1979. Three generation reproduction study in rats. International Research and Development Corp, Mattewan, MI. Report number 382-010.

00044017 Helling, C. S. 1971. Pesticide mobility in soils. II. Applications of soil thin-layer chromatography. Soil Science Society of America Proceedings 35:737-748. Also In: Unpublished submission received May 5, 1975 under 464-323; submitted by Dow Chemical U.S.A., Midland, Mich.; CDL:221997-S.

00055643 Interregional Research Project Number 4 (1979) (Efficacy of Atrazine on Guavas in Hawaii). (Compilation; unpublished study received Aug 18, 1980 under 0E2398; CDL:099550-A)

00055644 University of Hawaii (1965) Analytical Procedure for Atrazine in Guava. (Unpublished study received Aug 18, 1980 under 0E2398; prepared by Agricultural Biochemistry Dept., Pesticide Laboratory, submitted by Interregional Research Project No. 4, New Brunswick, N.J.; CDL:099550-B)

00055672 Ciba-Geigy Chemical Corporation (1971) Metabolism of s-Triazine Herbicides. (Unpublished study including letter dated Dec 29, 1971 from J.R. Forsythe to Harold G. Alford, received Dec 29, 1971 under 100-437; CDL:231915-A)

00058746 Heath, R. G., J. W. Spann, E. F. Hill and J. F. Kreitzer. 1972. Comparative dietary toxicities of pesticides to birds. Prepared by U.S. Dept. Interior, Bureau Sport Fish. Wildlife, Spec. Rep. - Wildlife. No., 152. 57 p.; submitted by Fisons Corp.

00059214 Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish). Prepared by Woodard Res. Corp.; submitted by Geigy Chemical Co., Ardsley, NY.

00060642 Simmon, V.F.; Poole, D. (1977) Final Report:~In vitro~and~in vivo~ Microbiological Assays of Six Ciba-Geigy Chemicals: SRI Project LSC-5686. (Unpublished study received Dec 29, 1977 under 100- 542; prepared by Stanford Research Institute, submitted by Ciba- Geigy Corp., Greensboro, N.C.; CDL:232550-B)

00067425 Monsanto Company (1980) Residues of Glyphosate and Other Herbicides in Wheat following Chemical Fallow Applications of Roundup Tank Mix Combinations. Includes method dated Jul 1, 1979 and undated methods entitled: 2,4-D in wheat forage, straw and grain; Dicamba in wheat forage, straw and grain; Residues of alachlor in wheat grain, forage and straw; Atrazine in wheatforage, straw and grain; Cyanazine in wheat forage, straw.

00080629 Woodard, M.W.; Cockrell, K.O.; Woodard, G. (1963) Simazine, Atrazine, and Propazine: Tissue Residues and Safety Evaluation in Sheep and Beef Cattle Fed for Four Weeks. (Unpublished study received Mar 15, 1965 under 5F0447; prepared by Woodard ResearchCorp., submitted by Geigy Chemical Corp., New York, N.Y.; CDL:090488-D)

00093520 Mattson, A.; Solga, J.; Insler, M. (1966) The Determination of Hydroxy-simazine in Bermuda Grass and Hydroxy-atrazine in Corn Forage. (Unpublished study received Aug 1, 1966 under 7F0525; submitted by Geigy Agricultural Chemicals, Yonkers, N.Y.; CDL: 090628-A)

00093523 Geigy Agricultural Chemicals (1966) (Atrazine Residues on Corn and Sorghum). (Compilation; unpublished study, including AG-A 235, AG-A 830, AG-A 875 ..., re5, 1961 under 100-439; submitted by AG-A 830, AG-A 875 ..., received Aug 1, 1966 under 7F0525; CDL: 090628-F)

00093524 Geigy Agricultural Chemicals (1966) (Determination of Atrazine in Milk of Cows). (Compilation; unpublished study received Aug 1, 1966 under 7F0525; CDL:090628-G)

00094135 Gigger, R.P. (1959) Letter sent to R.E. Hamman dated Oct 14, 1959: Atrazine residues on corn. (Unpublished study received Nov 9, 1959 under 100-439; submitted by Ciba-Geigy Corp., Greensboro, N.C.; CDL:120788-A)

00098254 Hardies, D. E. and D. Y. Studer. 1982. Soil thin-layer chromatography of PPG-1292: BRC 22593. Unpublished study received April 5, 1982 under 2F2666; submitted by PPG Industries, Inc., Barberton, Ohio; CDL:070755-J.

00103153 Cassidy, J. (1972) A Rotational Metabolism Study of [delta]14C-Atrazine in Soil and Soybeans 52 to 72 Weeks after Herbicide Application to Soil: M2-01-3P, M2-01-45: Report No. GAAC-72137. (Unpublished study received Jun 10, 1982 under 100-631; submitted by Ciba-Geigy Corp., Greensboro, NC;

CDL:070914-L)

00105131 Burlingham, M.; Young, S.; Adamik, E. (1979) Comparative Skin Sensitization of Technical Atrazine: Project No. WIL-1214-78. (Unpublished study received May 12, 1982 under 201-411; prepared by WIL Research Laboratories, Inc., submitted by Shell Chemical Co., Washington, DC; CDL:247726-A)

00105942 Leake, C., D. Lines and K. Tiffen. 1981. The leaching of NC 21 314 in four soil types using soil TLC: METAB/81/40. Unpublished study received July1, 1982 under 45639-EX-7; prepared by FBC Ltd., England; submitted by FBC Chemicals, Inc., Wilmington, DE; CDL:070966-E.

00111690 Ciba-Geigy Corp. (1971) Igran 80W: Rotational Crop Residue Review. (Compilation; unpublished study received Nov 6, 1974 under 100-496; CDL:101175-A)

00115588 Ciba-Geigy Corp. (1982) Atrazine--Sugarcane: Report No. ABR-82065. (Compilation; unpublished study received Oct 12, 1982 under 100-439; CDL:071172-A)

00116620 Froelich, L., T. Bixler, C. Peake et al. 1982. Soil adsorption/desorption characteristics of FMC 57020: M-4861. Unpublished study received Oct 1, 1982 under 279-EX-93; submitted by FMC Corp., Philadelphia, PA; CDL:248476-D.

00126712 Ciba-Geigy Corp. (1983) Residues of Atrazine and Its Three Chlorometabolites in Forage and Hay Resulting from Spring Application of Atrazine to Pasture Grasses. (Compilation; unpublished study received Apr 8, 1983 under 100-439; CDL:071516-A)

00142160 Ciba-Geigy Corp. (1984) [Product Chemistry of Technical Atrazine]. Unpublished compilation. 108 p.

00143006 Arthur, A. (1984) Segment II Teratology Study in Rabbits: Toxicology/Pathology Report No. 68-84. Unpublished study prepared by Ciba-Geigy Corp. 220 p.

00143008 Infurna, R. (1984) A Teratology Study of Atrazine Technical in Charles River Rats: Toxicology/Pathology Report No. 60-84. Unpublished study prepared by Ciba-Geigy Corp. 269 p.

00143265 Tai, C. N., Breckenridge, C., and Green, J. D. 1985a. Simazine technical: Subacute oral 13 week toxicity study in rats. Ciba-Geigy Corporation, Division of Toxicology/Pathology, Summit, NJ. Study number 85018.

00147125 Buccafusco, R. 1976. Acute toxicity of Atrazina technical to bluegill (*Lepomis macrochirus*). Prepared by EG & G Bionomics, Wareham, MA; submitted by unknown.

00149428 Wright, A. (19??) The Breakdown of Carbon-14 -DW 3418 Herbicide Part II: Residues in Maize and Soils following Soil Application of Carbon-14 -DW 3418, Atrazine or Simazine: Group Research Report No. WKGR.0104.68. Unpublished study prepared by Wood stock Agricultural Research Centre, Shell Research Limited.14 p.

00150623 Puri, E. 1984. Autoradiographic DNA repair test on rat hepatocytes. Ciba-Geigy. Basle, Switzerland. Study No. 831371. May 16, 1984.

00158646 Orr, G.R., and Simoneaux, B.J. 1986. Disposition of simazine in the rat. Biochemistry Department. Agricultural Division. Ciba-Geigy Corporation, Greensboro NC. Report No: ABR-86032. April 30, 1986. FIFRA CBI.

00158745 Hollister, T. A. 1973. Differential responses of marine phytoplankton to herbicides: Oxygen Evolution, Bull. Environ. Contam. Toxicol. 9(5):291-295.

00158930 Mayhew, D.A., Taylor, G.D., Smith, S.H. and Banas, D.A. 1986. Twenty-four month combined chronic oral toxicity and oncogencity study in rats utilizing atrazine technical. American Biogenics Corp., Decatur, IL. Lab Study No.: 410-1102. Accession no. 262714-262727.

00161790 Puri, E. (1984) Autoradiographic DNA Repair Test on Rat Hepatocytes: Test No. 831171. Unpublished study prepared by Ciba- Geigy Ltd. 12 p.

00161854 Ciba-Geigy Corp. (1986) Atrazine--Corn: Reports of Investigations Made with Respect to the Residue Chemistry of Atrazine Containing Products: Plant Metabot charcoal. Journal of Economic Products: Plant Metabolism, Animal Metabolism and Residue Data . Unpublished compilation. 1813 p.

00164821 Parshley, T. (1986) Letter sent to R. Taylor dated Oct 23, 1986: Additional product chemistry data requested in agency letter of Oct. 9, 1986 - Atrazine registration standard; Atrazine tech- nical. Prepared by Ciba-Geigy Corp. 86 p.

00164822 Ciba-Geigy Corp. (1986) [Atrazine Product Chemistry Including Octanol/Water Partition Coefficient Study]. Unpublished compilation. 149 p.

00257694 Simoneaux, B., and Sy, A. 1971. Metabolism of simazine and its metabolites in female rats. Geigy Agricultural Chemicals Division. Ciba-Geigy Corporation. Ardsley NY. Report No: GAAC-71030. May 31, 1971. FIFRA-CBI.

40098001 Mayer, F. L., Jr. 1987. Acute toxicity handbook of chemicals to estuarine orgnisms. US. EPA, Off. Res. Dev., Environ. Res. Lab., Gulf Breeze, FL. EPA 600/8-87/017. 274 p.

40098001 Mayer, F. L., Jr. and M. R. Ellersieck. 1986. Manual of acute toxicity:

Interpretation and data base for 410 chemicals and 66 species of freshwater animals. USDI, Fish & Wildl, Serv., Resource publ. 160. 506 p.

40228401 Mayer, F. L., Jr. 1986. Acute toxicity handbook of chemicals to estuarine organisms. U.S. Environmental Protection Agency, EPA/600/X-86/231. 274 pages.

40245511 Tobia, A. 1987. Combined Chronic Toxicity/Oncogenicity Study with INL-5300: Long-term Feeding Study in Rats. Haskel Laboratory, Report No. 61-87: [includes supplementary Report, prepared by F. O'Neal].

40245516 Hardesty, P.T. 1987. Fate of radiolabeled DPX-L5300 in rats. Agricultural Products Dept. E.I. du Pont de Nemours and Co., Inc. Wilmingrton DE 19898. Haskell Laboratorty report No. 31-87. April 15, 1987.

40246601 Deparade, E. (1986) Atrazine: Salmonella/Mammalian--Microsome Mutagenicity Test: Laboratory Study No. 861172. Unpublished study prepared by Ciba-Geigy Ltd. 23 p.

40389109 McKay, J. (1987) Sutan + (Butylate) 6.7-E Field Accumulation on Rotational Crops, Mississippi: Laboratory Project ID: RRC 87-86. Unpublished study prepared by Stauffer Chemical Co., Richmond Research Center. 124 p.

40389110 McKay, J. (1987) Sutan + (Butylate) 6.7-E Field Accumulation on Rotational Crops, Iowa: Laboratory Project ID: RRC 87-102. Unpublished study prepared by Stauffer Chemical Co., Richmond Research Center. 61 p.

40431301 O'Connor, D.; McCormick, G.; Green, J. (1987) Chronic Toxicity Study in Dogs: Atrazine Technical: Laboratory Study No. 852008. Unpublished study prepared by Ciba-Geigy Corp. 1405 p.

40431302 Hazelette, J.; Green, J. (1987) Oncogenicity Study in Mice: Atrazine Technical: Laboratory Study No. 842120. Unpublished study prepared by Ciba-Geigy Corp. 3160 p.

40431303 Mainiero, J.; Youreneff, M.; Giknis, M.; *et al.* (1987) Two-generation Reproduction Study in Rats: Atrazine Technical: Laboratory Study No. 852063. Unpublished study prepared by Ciba-Geigy Corp. 1395 p.

40431304 Orr, G. (1987) Disposition of Atrazine in Rat: (General Metabolism): Atrazine: Laboratory Study No.: ABR-87048. Unpublished study prepared by Ciba-Geigy Corp. 62 p

40431305 Thede, B. (1987) Study of Carbon 14σ-Atrazine Dose/Response Relationship in the Rat: (General Metabolism): Laboratory Study No. ABR-87087. Unpublished

study prepared by Ciba-Geigy Corp. 53p.

40431306 Miles, B. (1987) Characterization and Identification of Atrazine Metabolites from Rat Urine: (General Metabolism): Laboratory Study No.: ABR-87115. Unpublished study prepared by Ciba-Geigy Corp. 35 p.

40431319 Spare, W. 1986. Determination of the hydrolysis rate constants of atrazine: Laboratory Study. No. 1236. 33 p. Unpublished study prepared by Agrisearch Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431320 Spare, W. 1987. Photodegradation of atrazine on soil surfaces exposed to artificial and natural sunlight: Laboratory Study No.1237. 68 p. Unpublished study prepared by Agrisearch Inc., Frederick, MD; Submitted by Ciba-Geigy Corp., Greensboro, NC.

40431321 Rustum, A. 1987. Aerobic, aerobic/anaerobic, and sterile soil metabolism of carbon 14-atrazine: Laboratory Study No. 6015-185. 133 p. Unpublished study prepared by Hazleton Laboratories America, Inc., Madison, WI; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431322 Klaine, S. 1987. Biotic and abiotic degradation of atrazine and three of its metabolites in a west Tennessee soil: Laboratory Study No. TX-431. 63 p. Unpublished study prepared by Memphis State University, Memphis, TN; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431323 Spare, W. 1987. Anaerobic aquatic metabolism of atrazine: Laboratory Study No. 1231. 69 p. Unpublished study prepared by Agrisearch, Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431324 Yu, W. C. 1986. Determination of adsorption/desorption constants of atrazine: Laboratory Study No. 59-1A. 33 p. Unpublished study prepared by Cambridge Analytical Associates, Inc., Boston, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431325 Yu, W. C. 1986. Determination of adsorption/desorption constants of G-28279: Laboratory Study No. 59-6A. Unpublished study prepared by Cambridge Analytical Associates, Inc., Boston, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431326 Yu, W. C. 1986. Determination of adsorption/desorption constants of G-34048: Laboratory Study No. 59-7A. Unpublished study prepared by Cambridge Analytical Associates, Inc., Boston, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431327 Yu, W. C. 1986. Determination of adsorption/desorption constants of G-28273:

Laboratory Study No. 59-5A. Unpublished study prepared by Cambridge Analytical Associates, Inc., Boston, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431328 Yu, W. C. 1986. Determination of adsorption/desorption constants of G-30033: Laboratory Study No. 59-6A. Unpublished study prepared by Cambridge Analytical Associates, Inc., Boston, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431330 Saxena, A. M. 1987. Determination of the mobility of soil-aged ^{14}C-atrazine residues by thin-layer chromatography: Laboratory Study No. HLA 6015-186. Unpublished study prepared by Hazleton, Laboratories America, Inc., Madison, WI; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431336 White, S. 1987. Field dissipation study on Aatrex Nine-O for terrestrial uses on bareground, Ripon, California: Laboratory Study No. 1641-86-71-01-21E-23. 300 p. Unpublished study prepared by Minnesota Valley Testing Labs, Inc., New Elm, MN; Submitted by Ciba-Geigy Corp., Greensboro, NC.

40431337 White, S. 1987. Field dissipation study on Aatrex Nine-O for terrestrial uses on bareground, Hollandale, Minnesota: Laboratory Study No. 1641-86-71-01-21E-25. 356 p. Unpublished study prepared by Minnesota Valley Testing Labs, Inc., New Elm, MN; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431338 White, S. 1987. Field dissipation study on Aatrex Nine-O for terrestrial uses on corn, Ripon, California: Laboratory Study No.1641-86-71-01-06B-22. 311 p. Unpublished study prepared by Minnesota Valley Testing Labs, Inc., New Elm, MN; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431339 White, S. 1987. Field dissipation study on Aatrex Nine-O for terrestrial uses on corn, Hollandale, Minnesota: Laboratory Study No. 1641-86-71-01-06B-24. 372 p. Unpublished study prepared by Minnesota Valley Testing Labs, Inc., New Elm, MN; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431340 Schofield, M. 1986. Combined field dissipation and aquatic non-target organism accumulation Studies on Aatrex Nine-O for forestry use at Oregon City, Oregon: Laboratory Study No. 32989. 135 p. Unpublished study prepared by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO; submitted by Ciba-Geigy Corp., Greensboro, NC.

40431344 Forbis, A. 1986. Uptake, depuration, and bioconcentration and metabolite characterization of carbon 14-atrazine by bluegill sunfish (*Lepomis macrochirus*): Laboratory Study No. 34737. 107 p. Unpublished study prepared by Analytical Bio-Chemistry Laboratories, Inc.; submitted by Ciba-Geigy Corp.,

Greensboro, NC .

40431352 Caballa, S. (1973) The in vitro Metabolism of Carbon 14 -Atrazine and Derivatives by Rat and Sheep Liver under Tissue Culture Conditions: (Nature of Residue--Metabolism): Laboratory Study No.: GAAC-73035. Unpublished study prepared by Ciba-Geigy Corp. 30p.

40431353 Simoneaux, B. (1987) Distribution and Characterization of Carbon 14 -Atrazine in a Goat: (Nature of Residue--Metabolism): Laboratory Study No.: ABR-86056. Unpublished study prepared by Ciba-Geigy Corp. 42 p.

40431354 Thede, B. (1987) Study of Solubilized Residues from Protease Treated Tissues of Carbon 14 -Atrazine Dosed Chickens and Goat: (Nature of Residue--Metabolism): Laboratory Study No.: ABR- 87105. Unpublished study prepared by Ciba-Geigy Corp. 44 p.

40431355 Farrier, D. (1987) Study of Protease Released Metabolites in Selected Tissues of Lactating Goats Dosed with Carbon 14 -Atrazine: (Nature of Residue--Metabolism): Laboratory Study No.: ABR-87109. Unpublished study prepared by Ciba-Geigy Corp. 130

40431356 Simoneaux, B. (1986) Distribution and Characterization of Carbon 14 -Atrazine in a Chicken: (Nature of Residue--Metabolism): Laboratory Study No.: ABR-86045. Unpublished study prepared by Ciba-Geigy Corp. 29 p.

40431357 Madrid, S. (1987) Metabolism of Carbon 14 -Atrazine in Laying Hens Dosed for Eight Consecutive Days at 50 ppm: (Nature of Residue-Metabolism): Laboratory Stlism): Laboratory Study No.: ABR- Metabolism): Laboratory Study No.: ABR-87099. Unpublished study prepared by Ciba-Geigy Corp. 84 p.

40431364 Bade, T. (1986) Determination of Atrazine, G-28279, G-30033 and G-28273 Residues in Milk (including Sour Milk) using a Strong Cation Exchange Column Isolation and Cleanup: (Residue Analytical Method): Laboratory Study No.: AG-496. Unpublished studyprepared by Ciba-Geigy Corp. 19 p.

40431365 Bade, T. (1987) Determination of Atrazine, G-30033, G-28279 and G-28273 Residues in Forage, Fodder, Grain and Grain Fractions from Grain Crops Using Capillary Gas Chromatography: (Residue Analytical Method): Laboratory Study No.: AG-484. Unpublished study prepared by Ciba-Geigy Corp. 50 p.

40431369 Bade, T. (1985) Determination of Atrazine, G-28279, G-30033 and G-28273 Residues in Milk: (Residue Analytical Method): Laboratory Study No.: AG-463. Unpublished study prepared by Ciba-Geigy Corp. 19 p.

40431370 Bade, T. (1985) Determination of Atrazine, G-28279, G-30033 and G-28273 Residues in Beef Tissues (Blood, Muscle, Liver, Kidney, Fat): (Residue

Analytical Method): Laboratory Study No.: AG-476. Unpublished study prepared by Ciba-Geigy Corp. 60 p.

40431383 Bade, T. (1987) Residues of Atrazine and Its Chlorometabolites in Grain Sorghum (Forage, Fodder, Grain and Grain Fractions) following Application of Aatritions (Storage Stability): Study No. lowing Application of Aatrex 4L, 80W or Nine-O Herbicide: (Magnitude of Residues): Laboratory Study No.: ABR-87056. Unpublished study prepared by Ciba-Geigy Corp. 368 p.

40431401 Bade, T. (1987) Residues of Atrazine and Its Chlorometabolites in Corn (Forage, Fodder, Grain and Grain Fractions) following Application of Aatrex 4L, 80W or Nine-O Herbicide (Magnitude of Residues): Study No. ABR-87057. Unpublished compilation prepared by Ciba-Geigy Corp. 947 p.

40431418 Bade, T. (1987) Residues of Atrazine and Its Chlorometabolites in Macadamia Nutmeat following Application of Aatrex Herbicide (Magnitude of Residues): Study No. ABR-87096. Unpublished compilation prepared by Ciba-Geigy Corp. 54 p.

40431420 Bade, T. (1987) Residue of Atrazine and its Chlorometabolites in Wheat and Wheat Fractions Following Application of Aatrex Herbicide (Magnitude of Residues): Study No. ABR-87107. Unpublished study prepared in cooperation with Ciba-Geigy Corp and En-Cas A Analytical Laboratories. 130 p.

40431421 Cheung, M. (1987) Residue Stability Study of Atrazine and Chlorometabolites in Sweet Corn, Field Corn and Field Corn Fractions under Freezer Storage Cond No.: AG-175. Unpublished study pre- under Freezer Storage Conditions (Storage Stability): Study No. ABR-87095. Unpublished compilation prepared by Ciba-Geigy Corp. 76 p.

40431422 Bade, T. (1987) Residues of Atrazine and its Chlorometabolites in Poultry Tissues and Eggs from Laying Hens Following Administration of Atrazine (Magnitude of Residues): Study No. ABR-87059. Unpublished compilation prepared in cooperation with Ciba-Geigy Corp. and En-Cas Analytical Laboratories. 109 p.

40431423 Bade, T. (1987) Magnitude of Residues of Atrazine and its Chlorometabolites in Poultry Tissues and Eggs from Laying Hens Fed Atrazine in their Diet (Ma4L, 80W or Nine-O Herbicide (Magnitude Atrazine in their Diet (Magnitude of Residues): Study No. ABR- 87102. Unpublished compilation prepared by Ciba-Geigy Corp. 34 p.

40431424 Bade, T. (1987) Residues of Atrazine and its Chlorometabolites in Dairy Tissues and Milk Following Administration of Atrazine (Magnitude Of Residues): Study No. ABR-87060. Unpublished compilation prepared by Ciba-Geigy Corp. 169 p.

40431425 Bade, T. (1987) Magnitude of Residues of Atrazine and its Chlorometabolites in Meat and Milk of Beef and Dairy Cattle Fed Atrazine in Their Diet [ABR-87101, ABR-82065] (Magnitude of Residues): Study No. ABR-87101. Unpublished compilation prepared by Ciba-Geigy Corp. 43 p.

40431426 Cheung, M. (1987) Residue Stability Study of Atrazine, Simazine and Chlorometabolites in Dairy and Poultry Tissues, Milk and Eggs under Freezer Storage Conditions (Storage Stability): Study No. ABR-87094. Unpublished compilation prepared by Ciba-Geigy Corp. 105 p.

40437501 Orr, G. (1987) A Summary of the Disposition, Kinetics and Metabolism of Atrazine in the Rat (General Metabolism): Laboratory/Study No. ABR-87116. Unpublished study prepared by Ciba-Geigy Corp. 44 p.

40437502 Sumner, D. (1972) Characterization of the Atrazine Residues Present in the Liver of Cows--A Progress Report (Nature of Residue-Metabolism): Laboratory/Study No. ABR-72030R. Unpublished study prepared by Ciba-Geigy Corp. 20 p.

40566301 Arthur, A. (1984) A Supplement to a Teratology Study of Atrazine Technical in New Zealand White Rabbits. Unpublished study prepared by Ciba-Geigy Corporation. 4 p.

40566302 Infurna, R. (1984) A Supplement to a Teratology Study of Atrazine Technical in Charles River Rats. Unpublished study prepared by Ciba-Geigy Corporation. 6 p.

40566501 Brown, R.; Lail, L. (1988) Technical Atrazine: Product Chemistry: Laboratory Project ID PC-87-023. Unpublished study prepared by Ciba-Geigy Corporation. 267 p.

40614405 McCormick, C.C., Arthur, A.T., and Green, J.D. 1988. Simazine-technical: 104 week oral chronic toxicity and carcinogenicity study in rats. Pharmaceutical Div., Ciba-Geigy. Laboratory report number: 2-011-09.

40629302 Hardisty, J. (1987) Supplement to Two-year Chronic Feeding/Oncogenicity Study in Rats Administered Atrazine: 410-1102. Unpublished study prepared by Experimental Pathology Laboratories, Inc. 316 p.

40629303 Rustum, A. 1988. Aerobic, aerobic/anaerobic, and sterile soil metabolism of ^{14}C-atrazine: Study No. HLA 6015-185. 165 p. Unpublished study prepared by Hazleton Laboratories America, Inc., Madison, WI; submitted by Ciba-Geigy Corp., Greensboro, NC.

40722301 Ceresa, C. (1988) Atrazine: Structural Chromosomal Aberration Test

Micronucleus Test, Mouse: Study No. 871546. Unpublished study prepared by Ciba-Geigy Corp. 29 p.

40722302 Deparade, E. (1987) Diaminochlorotriazine: Gene Mutations Test: Salmonella/ Mammalian Mutagenicity Test: Study No. 871372. Unpublished study prepared by Ciba-Geigy Corp. 26 p.

40722303 Meyer, A. (1987) Diaminochlorotriazine: Tests for Other Genetoxic Effects: Autoradiographic DNA Repair Test on Human Fibroblasts: Study No. 871371. Unpublished study prepared by Ciba-Geigy Corp. 81 p.

40722304 Deparade, E. (1988) Hydroxyatrazine: Gene Mutations Test: Salmonella/ Mammalian-Microsome Mutagenicity Test: Study No. 871376. Unpublished study prepared by Ciba-Geigy Corp. 27 p.

40722305 Hertner, T. (1988). Tests for other genotoxic effects - auto-radiographic DNA repair test on rat hepatocytes. Ciba-Geigy, Basle, Switzerland. Laboratory report number: 871374. January 22, 1988. Unpublished.

40888101 Meyer, A. (1988) Hydroxyatrazine: Tests for other genotoxic effects, autoradiographic DNA repair tests on human fibroblasts. Ciba-Geigy, Basle, Switzerland . Study No. 871375. January 11, 1988. Unpublished.

41065201 Giknis, M. (1989) A Teratology (Segment II) Study in Rats: Atrazine Technical: Laboratory Study No. 882049. Unpublished study prepared by Ciba-Geigy Corp. 357 p

41065202 Giknis, M. (1989) A Teratology (Segment II) Study in Rats: Hydroxyatrazine Technical: Laboratory Study No. 872202. Unpublished study prepared by Ciba-Geigy Corp. 362 p.

41065203 Hughes, J. R. 1986. The toxicity of atrazine, Lot No. FL-850612 to four species of aquatic plants. Lab. Study No. 267-28-1100. Prepared by Malcolm Pirnie, Inc., White Plains, NY.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

41065204 Parrish, R. 1978. Effects of atrazine on two freshwater and five marine algae. Lab. Study No. H82-500. Prepared by E G & G Bionomics, Marine Research Laboratory, Pensacola, FL.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

41065205 Balu, K. 1989. Atrazine: Summary of surface water monitoring data for atrazine. Laboratory Study No. EIR-89001. 484 p. Unpublished study prepared and submitted by Ciba-Geigy Corp., Greensboro, NC.

41209801 Simoneaux, B. (1989) Nature of Atrazine Residues in Plants: Project ID

ABR-89060. Unpublished study prepared by Ciba-Geigy Corp. 170 p.

41209802 Thede, B. (1989) Nature of Atrazine Residues in Animals: An Overview: Project ID ABR-89053. Unpublished study prepared by Ciba-Geigy Corp. 46 p.

41209803 Simoneaux, B. (1989) Atrazine - Nature of the Residue: Characterization of Metabolites Present in Feces of an Atrazine Dosed Goat: Project ID ABR-89026. Unpublished study prepared by Ciba-Geigy Corp. 70 p.

41209804 Simoneaux, B. (1989) Atrazine - Nature of the Residue: Further Characterization of Metabolites Present in Urine and Tissues of an Atrazine Dosed Goat: Project ID ABR-89027. Unpublished study prepared by Ciba-Geigy Corp. 121 p.

41209805 Ballantine, L. (1989) Estimated Dietary Exposure of Hydroxyatrazine Metabolites to Man: Atrazine: Project ID ABE-89067. Unpublished study prepared by Ciba-Gei study prepared by Ciba-Geigy Corp. 18 p.

41209806 Capps, T. (1989) Atrazine: Nature of Plant Metabolites in Animals (Animal Metabolism): Project ID ABR-89065. Unpublished study prepared by Ciba-Geigy Corp. 96 p.

41209807 Emrani, J. (1989) Fate of Corn Biosynthesized Metabolites of [Delta-Carbon 14]-Atrazine in Chickens: Project ID ABr-89006. Unpublished study prepared by Ciba-Geigy Corp. 42 p.

41209808 Simoneaux, B. (1989) Fate of Biosynthesized [Carbon 14]-Atrazine Metabolites in Lactating Goats: Project ID ABR-89054. Unpublished study prepared by Cibagy Corp. 18 p. hed study prepared by Ciba-Geigy Corp. 53 p.

41223001 Chetram, R. S. 1989. Atrazine: Tier 2 seed germination nontarget phytotoxicity test. Lab, Study No. LR 89-07B. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

41223003 Chetram, R. S. 1989. Atrazine: Tier 2 vegetative vigor nontarget phytotoxicity test, Lab, Study No. LR 89-07A. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

41257901 Spare, W. 1989. Adsorption/desorption of ^{14}C-atrazine: Agrisearch Project No. 12174. 59 p. Unpublished study prepared by Agrisearch, Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

41257902 Spare, W. 1989. Adsorption/desorption of ^{14}C-G-34048: Agrisearch Project No. 12171. 57 p. Unpublished study prepared by Agrisearch, Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

41257904 Spare, W. 1989. Adsorption/desorption of ^{14}C-G-28273: Agrisearch Project No. 12173. 55 p. Unpublished study prepared by Agrisearch Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

41257905 Spare, W. 1989. Adsorption/desorption of ^{14}C-G-28279: Agrisearch Project No. 12170. 57 p. Unpublished study prepared by Agrisearch, Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

41257906 Spare, W. 1989. Adsorption/desorption of ^{14}C-G-30033: Agrisearch Project No. 12169. 57 p. Unpublished study prepared by Agrisearch Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

41258601 Cheung, M. (1989) Simazine, Atrazine, and Chlorometabolites: Residue Stability Study of Simazine, Atrazine, and Chlorometabolites in Sweet Corn, Field Corn, and Field Corn Fractions under Freezer Storage Conditions: Final Report: Laboratory Project IDABR-89032. Unpublished study prepared by Ciba-Geigy Corp.83 p.

41258602 Cheung, M. (1989) Simazine, Atrazine, and Chlorometabolites: Residue Stability Study of Simazine, Atrazine, and Chlorometabolites in Apples and Apple Fraigy Corp. 53 p. lites in Apples and Apple Fractions under Freezer Storage Conditions: Final Report: Laboratory Project ID ABR-89033. Unpublished study prepared by Ciba-Geigy Corp. 73 p.

41258603 Cheung, M. (1989) Simazine, Atrazine, and Chlorometabolites: Residue Stability Study of Simazine, Atrazine, and Chlorometabolites in Dairy and Poultry Tissues, Milk, and Eggs under Freezer Storage Conditions: Final Report: Laboratory Project ID ABR- 89031. Unpublished study prepared by Ciba-Geigy Corp. 107 p.

41293501 Rudzki, M.; McCormick, G.; Arthur, A. (1989) 90-Day Oral Toxicity Study in Rats: Hydroxyatrazine: Lab Study Number 882146; MIN 882146; 89015. Unpublished study prepared by Ciba-Geigy Corp., Research Dept., Pharmaceuticals Div. 408 p.

41392401 Thompson, S.; Batastini, G.; Arthur, A. (1990) 13/52-Week Oral Toxicity Study in Dogs: Lab Project Number: 872151. Unpublished study prepared by Ciba-Geigy Corp. 784 p.

41392402 Hummel, H.; Youreneff, M.; Giknis; et al. (1989) Diaminochlorotriazine: A Teratology (Segment II) Study in Rats: Lab Project Number: 872177. Unpublished study prepared by Ciba-Geigy Corp. 428 p.

41397101 Ross, J. (1990) Atrazine - Sample Storage Stability Interval Sum- mary: Lab Project Number: ABR-89116. Unpublished study prepared by Ciba-Geigy Corp.

46 p.

41397102 Szorik, M. (1990) Ruggedness Testing of Atrazine Analytical Method AG-484 for the Determination of Atrazine and its Metabolites G-30033, G-28279, and G-2827ex 4L, 80W or Nine-O Herbicide: (Mag- 30033, G-28279, and G-28273 in Field Corn Forage, Field Corn Grain, and Sweet Corn (K + CWHR): Final Report: Lab Project Number: HLA 6012-298. Unpublished study prepared by Hazleton Laboratories America, Inc. 95 p.

41397103 Szorik, M. (1990) Ruggedness Testing of Atrazine Analytical Method AG-476 for the Determination of Atrazine and its Metabolites G-30033, G-28279, and G-28273 in Beef Muscle, Beef Fat, and Beef Blood: Final Report: Lab Project Number: HLA 6012-297. Unpublished study prepared by Hazleton Laboratories Americas, Inc. 76 p.

41423401 Williams, R. (1990) Multiresidue Method Testing of Atrazine, Simazine, and their Chloro-and Hydroxy-triazine Metabolites in Crops and Animal Tissues: Lab Project ID: ABR-89010. Unpublished prepared by Ciba Geigy Corp. 130 p.

41479401 Ceresa, C. (1988) Hydroxyatrazine: Structural Chromosomal Aberration Test: Lab Project Number: 871373. Unpublished study prepared by Ciba-Geigy, Ltd. 32 p.

42041401 Putt, Arthur E. 1991. Atrazine 80% WP: Acute toxicity to daphnids (*Daphnia magna*) underflow-through conditions. Lab. Study No. 91-5-3761. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation.

42041402 Chetram, R. S. 1989. Atrazine: Tier 2 vegetative vigor nontarget phytotoxicity test, Lab, Study No. LR 89-07A. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

42041403 Chetram, R. S. 1989. Atrazine: Tier 2 seed emergence nontarget phytotoxicity test. Lab, Study No. LR 89-07C. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

42041404 Hoberg, J. R. 1991. Atrazine technical: Toxicity to the duckweed *Lemna gibba* G3. SLI Rep. No. 91-1-3613. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

42041405 Speth, Robert M. 1991. Responses to the EPA review of the atrazine forestry field dissipation study at Oregon City, Oregon. Supplement to MRID 40431340). Laboratory Project ID: ABR-91067. 45 p. Unpublished study prepared by Ciba-Geigy Corp., Greensboro, NC.; submitted by Ciba-Geigy Corp., Greensboro, NC.

42043501 Slaven, R. (1991) Atrazine Technical: Response to Agency's Letter of September 6, 1991:Atrazine Contamination with 2,3,7,8,-TCDF. Unpublished study prepared by Ciba-Geigy Corp. 41 p.

42060701 Hoberg, J. R. 1991. Atrazine technical: Toxicity to the freshwater green alga *Selenastrum capricornutum*. SLI Rep. No. 91-1-3600. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

42085001 Thakur, A. (1991) Determination of Hormone Levels in Sprague-Dawley Rats Treated with Atrazine Technical: Final Report: Lab Project Number: 483-278. Unpublished study prepared by Hazleton Washington, Inc. 1132 p.

42089901 Holbert, M. (1991) Acute Inhalation Toxicity Study in Rats: Atrazine Technical: Lab Project Number: 8079-91. Unpublished study prepared by Stillmeadow Inc. 23 p.

42089902 Huber, K. (1989) Atrazine Technical: 21-Day Dermal Toxicity Study in Rabbits: Lab Project Number: 882035. Unpublished study pre- pared by Ciba-Geigy. 330 p.

42089904 Schabacker, D. 1991. Summary report: Aqueous photolysis of carbon 14-atrazine under natural and artificial light. Lab. Project Number: 12112 A: 12112 B. 185 p. Unpublished study prepared by Agrisearch Inc., Frederick, MD; submitted by Ciba-Geigy Corp., Greensboro, NC.

42089905 Das, Y. 1989. Photodegradation of triazine(U)-carbon 14-atrazine on soil under artificial sunlight. Lab. Project Number: 89070. 109 p. Unpublished study prepared by Innovative Science Services, Inc.; submitted by Ciba-Geigy Corp., Greensboro, NC.

42089906 Nelson, D. and D. Schabacker. 1991. Summary report: Soil metabolism of carbon 14-atrazine and metabolite characterization/identification: Lab. Project Number: 6015-185: ABR-91073. 321 p. Unpublished study prepared by Hazleton Labs America, Inc.

42089909 Landis International, Inc. (1991) Supplement to Field Dissipation Study on Aatrex Nine-O for Terrestrial Uses on Corn in Ripon, California: Lab Project Number: 1641-86-71-01-06B-22. Unpubli- shed study. 124 p.

42089910 Landis International, Inc. (1991) Supplement to Field Dissipation Study on Aatrex Nine-O for Terrestrial Uses on Bareground in Ripon, California: Lab Project Number: 1641-86-71-01-21E-23. Unpublished study. 122 p.

42089911 Landis International, Inc. (1991) Supplement to Field Dissipation Study on

Aatrex Nine-O for Terrestrial Uses on Corn in Hollan- dale, Minnesota: Lab Project Number: 1641-86-71-01-06B-24. Unpublished study. 134 p.

42089912 Landis International, Inc. (1991) Supplement to Field Dissipation Study on Aatrex Nine-O for Terrestrial Uses on Bareground in Hollandale, Minnesota: Lab Project Number: 1641-86-71-01-21E-25. Unpublished study. 134 p.

42146101 Thakur, A. (1991) Determination of Hormone Levels in Fischer-344 Rats Treated with Atrazine Technical: Final Report: Lab Project Number: 483-279. Unpublished study prepared by Hazleton Washington, Inc. 1534 p.

42165308 Balu, K. 1991. Responses to the EPA review of the field dissipation study on Aatrex Nine-0 for terrestrial uses on corn, Hollandale, Minnesota: Supplement to EPA MRID Number 40431339. Lab. Project Number: ABR-91066. 49 p. Unpublished study prepared and submitted by Ciba-Geigy Corp., Greensboro, NC

42165503 Thede, B. (1991) Response to Data Request in EPA Review of Atrazine Registration Standard--Toxicity Studies: Lab Project Number: ABR-91076. Unpublished study prepared by Ciba-Geigy Corp. 301 p.

42165504 Guy, S. 1987. Field dissipation on Aatrex Nine-0 for terrestrial uses on corn in Donalsonville, GA: Lab. Project Number: 1641-86-71-01-06B-26. 325 p. Unpublished study prepared by Landis International and Others; submitted by Ciba-Geigy Corp., Greensboro, NC.

42165505 Guy, S. 1987. Field dissipation on Aatrex Nine-0 for terrestrial uses on bareground in Donalsonville, GA: Lab. Project Number: 1641-86-71-01-21E-27. 317 p. Unpublished study prepared by Landis International and Others; submitted by Ciba-Geigy Corp., Greensboro, NC.

42165506 Balu, K. 1991. Responses to the EPA review of the field dissipation study on Aatrex Nine-0 for terrestrial uses on bareground, Ripon, California: Supplement to EPA MRID Number 40431336. Lab. Project Number: ABR-91063. 110 p. Unpublished study prepared and submitted by Ciba-Geigy Corp., Greensboro, NC.

42165507 Balu, K. 1991. Responses to the EPA review of the field dissipation study on Aatrex Nine-0 for terrestrial uses on bareground, Hollandale, Minnesota: Supplement to EPA MRID Number 40431337. Lab. Project Number: ABR-91064. 50 p. Unpublished study prepared and submitted by Ciba-Geigy Corp., Greensboro, NC.

42165509 Balu, K. 1991. Responses to the EPA review of the field dissipation study on Aatrex Nine-0 for terrestrial uses on corn, Ripon, California: Lab. Project Number: ABR-91065. 111 p. Unpublished study prepared and submitted by

Ciba-Geigy Corp., Greensboro, NC.

42204401 Thakur, A. (1992) Oncogenicity Study in Sprague-Dawley Rats with Atrazine Technical: Lab Project Number: 483-275. Unpublished study prepared by Hazleton Washington, Inc. 1092 p.

42211401 Stumpf, K. (1992) Letter Sent to R. Taylor dated Feb 7, 1992: Modification of the Enseco analytical method for determination of 2,3,7,8-TCDF in Technical Atrazine|. Prepared by Ciba-Geigy Corp. 1287 p.

42227001 Thakur, A. (1992) Oncogenicity Study in Fischer 344 Rats with Atrazine Technical: Lab Project Number: 483-277. Unpublished study prepared by Hazleton Washington, Inc. 2999 p.

42547101 Pedersen, C. A. and D. R. DuCharme. 1992. Atrazine technical: Toxicity and reproduction study in mallard ducks. Lab. Proj. ID. No. BLAL No. 102-013-08. Prepared by Bio-Life Associates, Ltd., Neillsville, WI; submitted by Ciba-Geigy Corp., Greensboro, NC.

42547102 Pedersen, C. A. and D. R. DuCharme. 1992. Atrazine technical: Toxicity and reproduction study in bobwhite quail. Lab. Proj. ID. No. BLAL No. 102-012-07. Prepared by Bio-Life Associates, Ltd., Neillsville, WI; submitted by Ciba-Geigy Corp., Greensboro, NC.

42547103 Dionne, E. 1992. Atrazine technical – Chronic toxicity to the fathead minnow (*Pimephales promelas*) during a full life-cycle exposure. SLI Report No. 92-7-4324. Prepared by Springborn Laboratories, Inc., Wareham, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

42547105 Hertner, T. (1992) Autoradiographic DNA Repair Test on Rat Hepatocytes Tests for Other Genotoxic Effects: Lab Project Number: 911246. Unpublished study prepared by Ciba-Geigy Limited. 98 p.

42547115 Simoneaux, B.; Wurz, R. (1992) Atrazine--Overview of the Nature and Magnitude of Potential Market Metabolites in Corn and Sorghum: Analysis of Field Samples Treated with (Carbon 14)-Atrazine or Aatrex Nine-O: Lab Project Number: ABR-92068. Unpublished study prepared by Ciba Geigy Corp. 31 p.

42547116 Larson, J. (1992) Carbon 14-Atrazine: Nature of the Residues in Corn and Sorghum: Lab Project Number: HWI 6117-178: 51-91. Unpublished study prepared by Hazleton Wisconsin, Inc. 249 p.

42547117 McLaughlin, R. (1992) Magnitude of the Residues in Corn Samples following Applications of Aatrex Nine-O [Atrazine]: Lab Project Number: ABR-92028. Unpublished study prepared by Ciba-Geigy Corp. 433 p.

42547118 Wurz, R. (1992) Validation of Analytical Method AG-596 by the Analysis of [carbon 14]-Atrazine Treated Corn and Sorghum Raw Agricultrual Commodities: Deasso or Lasso + Atrazine Agricultrual Commodities: Determination of the Radioactive Accountability of Hydroxy-and Chloro-metabolites of Atrazine in [carbon 14]-Atrazine Treated Crops by Analytical Methods AG-596 and AG-484 including Residue Data: Lab Project Number: ABR-92025. Unpublished study prepared by Ciba-Geigy Corp.

42547119 Wurz, R. (1992) Atrazine: Analytical Method for the Determination of G-34048 and GS-17794 in Crops by High Performance Liquid Chromatography with Column Switching: Lab Project Number: AG-596: ABR-91032. Unpublished study preparedby Ciba-Geigy Corp. 136 p.

42547120 Yokley, R. (1990) Determination of Atrazine, G-28279, G-30033, and G-28273 Residues in Fresh and Sour Milk using a Strong Cation Exchange Column Isolation and Cleanup: Lab Project Number: AG-496A. Unpublished study prepared by Ciba-Geigy Corp. 31 p.

42547121 Yarko, J. (1990) Independent Laboratory Confirmation of the Tolerance Enforcement Method (...) for the Determination of Atrazine, G-28279, G-30033, anrmination of the Radioactive Atrazine, G-28279, G-30033, and G-28273 Residues in Fresh and Sour Milk using a Strong Cation Exchange Column Isolation and Cleanup: Analytical Method AG-496A: Lab Project Number: 900204. Unpublished study prepared by Ciba-Geigy Corp. 246 p.

42547122 Yokley, R. (1992) Analytical Method for the Determination of Residues of Atrazine, G-28273, G-28279, and G-30033 in Poultry Tissues and Eggs by Gas Chromatography including Validation Data: Lab Project Number: AG-593. Unpublished study prepared by Ciba-Geigy Corp. 105 p.

42547123 Yarko, J. (1992) Independent Laboratory Confirmation of the Tolerance Enforcement Method (...) for the Determination of Residues of Atrazine, G-28273, G-28279, and G-30033 in Poultry Tissues and Eggs by Gas Chromatography Analytical Method AG-593: Lab Project Number: 920201. Unpublished study prepared by CYAL, Inc. 169 p.

42637003 Hertner, T. (1993) Atrazine Technical: Structural Chromosomal Aberration Test--Dominant Lethal Test, Mouse, 8 Weeks: Lab Project Number: 911247. Unpublished study prepared by Ciba-Geigy Ltd. 141 p.

42743902 Eldridge, J., Wetzel, L., Tisdel, M., and Luempert, L.G. 1993a. Determination of Hormone Levels in Sprague-Dawley Rats Treated with Atrazine Technical: Revised Supplement to Final Report. Hazleton Washington, Inc. Lab Project Number: 483-278.

42743903 Eldridge, J.; Wetzel, L.; Tisdel, M. *et al.* (1993) Determination of Hormone Levels in Fischer-344 Rats Treated with Atrazine Technical: Revised Supplement to Final Report: Lab Project Number: 483-279. Unpublished study prepared by Bowman Gray School of Medicine. 166 p.

42873701 Stubbs, D. (1993) Technical Atrazine: Product Chemistry: Lab Project Number: PC-93-009. Unpublished study prepared by Ciba Plant Protection. 214 p.

42925201 Jackson, W. (1993) Atrazine Technical: Product Chemistry. Final Report: Lab Project Number: PC-93-010: ASGSR-93-141: 232-93. Unpublished study prepared by Ciba-Geigy Corp. 289 p.

42925601 Tortora, N. (1993) Metabolism of (Triazine-(Carbon 14))-Hydroxy-Atrazine in Lactating Goats: Lab Project Number: G-34048: F-00123: ANPHI-91004. Unpublir 201-279; CDL:252506-A; G-34048: F-00123: ANPHI-91004. Unpublished study prepared by Ciba-Geigy Corp. 145 p.

43013201 Kuhn, J. (1991) G-28279 Technical: Acute Oral Toxicity Study in Rats: Lab Project Number: 7803/91. Unpublished study prepared by Stillmeadow, Inc. 27 p.

43013202 Kuhn, J. (1991) G-30033 Technical: Acute Oral Toxicity Study in Rats: Lab Project Number: 7802/91. Unpublished study prepared by Stillmeadow, Inc. 28 p.

43013203 Thompson, S.; Batastini, G.; Arthur, A. (1992) G-28279 Technical: 90-Day Oral Toxicity Study in Dogs: 13-Week Feeding Study in Dogs: Lab Project Number: 912021. Unpublished study prepared by Research Dept. Ciba-Geigy Corp. 429 p

43013205 Schneider, M. (1992) G-28279 Technical: 90-Day Oral Toxicity Study in Rats: 3-Month Oral Toxicity Study in Rats (Administration in Food): Lab Project Number: 901261. Unpublished study prepared by Ciba-Geigy Ltd. 263 p.

43013206 Gerspach, R. (1991) G-30033 Technical: 90-Day Oral Toxicity Study in Rats: 3-Month Oral Toxicity Study in Rats (Administration in Food): Lab Project Number: 901264. Unpublished study prepared by Ciba-Geigy Ltd. 254 p.

43013207 Pettersen, J.; Richter, A.; Gilles, P. (1991) Diaminochlorotriazine (G-28273): 90-Day Oral Toxicity Study in Rats: Lab Project Number: F-00006. Unpublished study prepared by Ciba-Geigy Corp. 450 p.

43013208 Marty, J. (1992) G-28273 Technical: Teratology Study in Rats: Developmental Toxicity (Teratogenicity) Study in Rats with G-28279 Technical (Oral Administration): Lab Project Number: 901262. Unpublished study prepared by Ciba-Geigy Ltd. 298 p.

43013209 Marty, J. (1992) G-30033 Technical: Teratology Study in Rats: Developmental Toxicity (Teratogenicity) Study in Rats with G-30033 Technical (Oral Administration): Lab Project Number: 901265. Unpublished study prepared by Ciba-Geigy Ltd. 296 p.

43016501 Stubbs, D. (1993) Technical Atrazine: Product Chemistry: Lab Project Number: PC/93/014. Unpublished study prepared by Ciba Plant Protection. 5 p.

43016502 Sova, J. (1993) Atrazine Technical: Response to the EPA Review of the Acute Inhalation Toxicity Study. Unpublished study prepared by Ciba Plant Protection. 5 p.

43016503 Larson, J. (1993) Carbon 14--Atrazine: Nature of Residue in Sugarcane: Final Report Amendment No. 1: Lab Project Number: HWI/6117/181: 95/91. Unpublished study prepared by Hazleton Wisconsin, Inc. 307 p.

43016504 Wurz, R. (1993) Validation of Analytical Method AG-596 for the Determination of G-34048 and GS-17794 in Sugarcane and Wheat: Determination of the Radio-use activated carbon filters. Determination of the Radioactive Accountability of Hydroxy-and Chloro-metabolites of Atrazine in (carbon 14)-Atrazine Treated Crops by Analytical Methods AG-596 and AG-484, IncludingResidue Data: Lab Project Number: ABR/93053. Unpublished studyprepared by Ciba Plant Protection. 87 p.

43016505 Larson, J. (1993) Uptake and Metabolism of Atrazine in Field Rotational Crops Following Corn and Sorghum Treated at a Rate of 3.0 lb. AI/Acre: (carbon 14)-Atrazine: Lab Project Number: HWI/6117/183. Unpublished study prepared by Hazleton Wisconsin, Inc. 273 p.

43016506 Rosenheck, L.; Phillips, J.; Selman, F. (1993) Worker Mixer/Loader and Applicator Exposure to Atrazine: Lab Project Number: AE/91/511: 126/91. Unpublished study prepared by Pan-Agricultural Labs, Inc. 309 p.

43048501 Ciba-Geigy Corp. (1993) Atrazine: Supplement to Nature of Residue in Corn and Sorghum: Lab Project Number: HWI 6117-178: 51-91: PM-013. Unpublished study. 50 p.

43074801 Hoberg, J. R. 1993. Atrazine technical: Toxicity to the marine diatom, (*Skeletonema costatum*). SLI Rep. No. 93-4-4753. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

43074802 Hoberg, J. R. 1993. Atrazine technical: Toxicity to the freshwater green alga, (*Selenastrum capricornutum*). SLI Rep. No. 93-4-4751. Prepared by Springborn Laboratories, Inc.,Wareham, MA.; submitted by Ciba-Geigy Corporation,

Greensboro, NC.

43074803 Hoberg, J. R. 1993. Atrazine technical: Toxicity to duckweed, (*Lemna gibba*). SLI Rep. No. 93-11-5053. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

43074804 Hoberg, J. R. 1993. Atrazine technical: Toxicity to duckweed, (*Lemna gibba*). SLI Rep. No. 93-4-4755. Prepared by Springborn Laboratories, Inc., Wareham, MA.; submitted by Ciba-Geigy Corporation, Greensboro, NC.

43093101 Deparade, E. (1990) Salmonella and Escherichia/Liver-Microsome Test: G-28279 Technical: Gene Mutations Test: Lab Project Number: 891243. Unpublished study prepared by Ciba-Geigy Limited. 39 p.

43093102 Deparade, E. (1989) Salmonella and Escherichia/Liver-Microsome Test: G-30033 Technical: Gene Mutations Test: Lab Project Number: 891236. Unpublished study prepared by Ciba-Geigy Limited. 37 p.

43093103 Ogorek, B. (1991) Structural Chromosomal Aberration Test: Micronucleus Test, Mouse: G-28279 Technical: Lab Project Number: 901307. Unpublished study prepared by Ciba-Geigy Limited. 37 p.

43093104 Ogorek, B. (1991) Structural Chromosomal Aberration Test: Micronucleus Test, Mouse: G-30033 Technical: Lab Project Number: 901309. Unpublished study prepared by Ciba-Geigy Limited. 40 p.

43093105 Geleick, D. (1991) Tests for Other Genotoxic Effects: Autoradiographic DNA Repair Test on Rat Hepatocytes: G-28279 Technical: Lab Project Number: 901308. Unpublished study prepared by Ciba-Geigy Limited. 94 p.

43093106 Geleick, D. (1991) Tests for Other Genotoxic Effects: Autoradiographic DNA Repair Test on Rat Hepatocytes: G-30033 Technical: Lab Project Number: 901310. Unpublished study prepared by Ciba-Geigy Limited. 94 p.

43160501 Selman, F. (1993) Magnitude of Residues in Field Corn and Rotational Indicator Crops Following an Application of AATREX 4L Plus Crop Oil Concentrate (COC): Lab Project Number: ABR-93046: 101175: 25-91-B2. Unpublished study prepared by Biochemistry Department, Ciba-Geigy Corp. 1062 p.

43160502 Ross, J. (1994) Atrazine--Magnitude of Residues in or on Wheat Following an Application of AATREX Nine-O to Wheat Stubble (Wheat-Fallow-Wheat): Lab Project Number: ABR-93045: 119-89-B1: 101171. Unpublished study prepared by Biochemistry Department, Ciba-Geigy Corp. 716 p.

43160503 Ross, J. (1994) Atrazine--Magnitude of the Residues in or on Grain Sorghum,

Used for Processing, Following Post Application of AATREX Nine-O: Lab Project 1979 under 100-583; prepared in of AATREX Nine-O: Lab Project Number: ABR-93079: 58-89-A: 101170. Unpublished study prepared by Biochemistry Department, Ciba-Geigy Corp. 252 p.

43160504 Ross, J. (1994) Atrazine--Magnitude of the Residues in or on Sugarcane and Processed Fractions Following Applications of AATREX Nine-O or AATREX 4L: Lab Project Number: ABR-93044: 101173: 25-89. Unpublished study prepared by Biochemistry Department, Ciba-Geigy Corp. 658 p.

43160505 Selman, F. (1994) Atrazine--Magnitude of the Residues in Corn Samples Following Applications of AATREX Nine-O: Amendment No. 1 to Add Results of Processing of Corn Grain: Lab Project Number: ABR-92028: 101168: 57-89. Unpublished study prepared by Biochemistry Department, Ciba-Geigy Corp. 507 p.

43188901 Jackson, W. (1994) Atrazine Technical: Product Chemistry: Lab Project Number: PC-94-003. Unpublished study prepared by Ciba-Geigy Corp. 12 p.

43188902 Stubbs, D. (1994) Atrazine Technical: Product Chemistry: Lab Project Number: PC-94-003: MP94-001. Unpublished study prepared by Ciba-Geigy Corp. 15 p.

43314302 Chengelis, C. (1994) A Dermal Radiotracer Absorption Study in Rats with (carbon 14) Atrazine: Final Report: Lab Project Number: 82048: 89/90/B. Unpublished study prepared by WIL Research Laboratories, Inc. 510 p.

43337901 Stubbs, D. (1994) Technical Atrazine: Product Chemistry: Lab Project Number: PC/94/008. Unpublished study prepared by Ciba Plant Protection. 174 p.

43344901 Machado, M. W. 1994. Atrazine technical -- Acute toxicity to sheepshead minnow (*Cyprinodon variegatus*) under flow-through conditions. Prepared by Springborn Laboratories, Inc., Wareham, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

43344902 Machado, M. W. 1994. Atrazine technical -- Acute toxicity to mysid shrimp (*Mysidopsis bahia*) under flow-through conditions. Prepared by Springborn Laboratories, Inc., Wareham, MA; submitted by Ciba-Geigy Corp., Greensboro, NC.

43395501 Stubbs, D. (1994) Product Chemistry: Technical Atrazine: Lab Project Number: PC/94/015: PPD/228/93/F. Unpublished study prepared by Ciba-Geigy Corp. 23 p.

43395502 Wurz, R. (1992) Validation of Analytical Methods AG-571 and AG-572 for the

Analysis of G-34048 and GS-17794 in Crops by High Performance Liquid Chromatography with Column Switching: Lab Project Number: ABR/91032: 101982. Unpublished study prepared by Ciba-Geigy Corp. 37 p.

43395503 Wurz, R. (1994) Stability of the Atrazine and Ametryn Metabolites G-34048 and GS-17794 in Crop Substrates Under Freezer Storage Conditions: Lab Project Number: ABR/94053. Unpublished study prepared by Ciba-Geigy Corp. 68 p.

43395504 Ross, J. (1994) Atrazine: Magnitude of Residues in or on Sugarcane and Processed Fractions Following Applications of AATREX NINE-0 or AATREX 4L-Amendment 1 (Supplement to EPA MRID No. 43160504): Lab Project Number: ABR/93044. Unpublished study prepared by Ciba-Geigy Corp. 41 p.

43934407 Hui, X.; Wester, R.; Maibach, H. (1995) Disposition of Atrazine in Rhesus Monkey Following Intravenous Administration: Interim Report: Lab Project Number: UCSF 95SU04: 333-95. Unpublished study prepared by University of California. 63 p.

43505801 Stubbs, D. (1994) Atrazine Technical: Supplement to Product Chemistry: Lab Project Number: PC-94-018: AK-53/2. Unpublished study prepared by Ciba Crop Protection. 71 p.

43508501 Tortora, N. (1993) Metabolism of (Triazine-(carbon 14)-Hydroxy-Atrazine in Lactating Goats: Addendum 1 to F-00123: Lab Project Number: G-34048: F-00123. Unpublished study prepared by Ciba-Geigy Corp. 12 p.

43532001 Chow, E.; Hart, S. (1995) 2-Year Dietary Toxicity/Oncogenicity Study with G-34048 (Hydroxyatrazine) in Rats: Final Report: Lab Project Number: F-00125. Unpublished study prepared by Ciba-Geigy Corp. 2599 p.

43598602 Simoneaux, B. (1995) Nature of Atrazine and Simazine Metabolism in Animals and Plants: Lab Project Number: ABR-95039. Unpublished study prepared by Ciba-Geigy Corp. 67 p.

43598604 Cheung, M. Analysis of Human Urine to Determine Residues of Atrazine, G-28273, G-28279, and G-30033 Resulting From Oral Ingestion of Atrazine Including Storage Stability Results. Ciba-Geigy Corp.[now Syngenta] March 7, 1990. 44 p.

43598608 Johnson, E. (1993) An Evaluation and Critique of Atrazine Developmental Toxicology Safety Evaluations and Human Epidemiological Data: A Review of Published and Unpublished Studies for Hazard Potential and Risk Estimation: Lab Project Numbers: 832020: 832039. Unpublished study prepared by Ciba-Geigy Corp. 43 p.

43598609 Austin, H. (1995). A Critique of a Document Entitled “Summary: Low Birth

Weight in Relation to Source and Characteristic of Drinking Water Supplies in Rural Areas of Iowa" by Peter Isacson, Dated October, 1989. No Laboratory Number. Unpublished study prepared by Ciba-Geigy Corp.[now Syngenta] 7 p.

43598610 Johnson, E. (1993) The Effects of Representative Groundwater Pesticides on Reproduction and in utero Development of Experimental Animals: Lab Project Number: 311U-4349-16: 356/311U--3698. Unpublished study prepared by Ciba-Geigy Corp. 19 p.

43598614 Eldridge, J.; Fleenor-Heyser, D.; Extrom, P.; et al. (1994) Short-term effects of chlorotriazines on estrus in female Sprague-Dawley and Fischer 344 rats. Journal of Toxicology and Environmental Health 43:155-167.

43598616 Tennant, M.; Jerome, W.; Eldridge, J. (1993) Ultrastructural changes in rat hypothalamic arcuate nucleus following long-Term diaminochlorotriazine feeding. Steroid Biochemistry (Life Sci. Adv.) 12:21-26.

43598617 Tennant, M.; Hill, D.; Eldridge, J.; et al. (1994) Possible antiestrogenic properties of chloro-s-triazines in rat uterus. Journal of Toxicology and Environmental Health 43:183-196.

43598618 Tennant, M.; Hill, D.; Eldridge, J.; et al. (1994) Chloro-s-triazine antagonism of estrogen action: Limited interaction with estrogen receptor binding. Journal of Toxicology and Environmental Health 43:197-211

43598619 Safe, S.; Chen, I.; Liu, H.; et al. (1995) Failure of Atrazine and Simazine to Induce Estrogenic Responses in MCF-7 Human Breast Cancer Cells. Unpublished study prepared by Texas A&M Univ.; and Univ. of Western Ontario. 25 p.

43598620 Simpkins, J. (1995) Evaluation of a Hormonal Mechanism for Mammary Carcinogenesis of the Chlorotriazine Herbicides; Consensus Panel Report. Unpublished study prepared by Univ. of Florida. 44 p.

43598621 Wetzel, L.; Tisdel, M. (1995) Ciba Response to May 3, 1994, EPA Letter by Penelope Fenner-Crisp, Director, Health Effects Division, Office of Prevention, Pesticides and Toxic Substances, U.S. EPA. Unpublished study prepared by Ciba-Geigy Corp. 43 p.

43598622 McConnell, R. (1995) A Histomorphologic Reevaluation of the Ovaries, Uterus, Vagina, Mammary Gland, and Pituitary Gland From Sprague-Dawley and Fischer-344 Female Rats Treated With Atrazine: Lab Project Numbers: 483-278: 483-279. Unpublished study prepared by Ciba-Geigy Corp. 107 p.

43598624 Lamb, J. (1995) Weight of the Evidence on the Oncogenic Potential of Atrazine: Consensus Panel Report. Unpublished study prepared by Jellinek, Schwartz & Connolly, Inc. 38 p.

43598625 Delzell, E.; Sathiakumar, N. (1995) An Evaluation of Epidemiologic Studies of Exposure to Triazines and Cancer in Humans: Triazine. Unpublished study prepared by Ciba-Geigy Corp. 51 p.

43598626 Sathiakumar, N.; Delzell, E.; Cole, P. (1995) Mortality Among Workers at Two Triazine Herbicide Manufacturing Plants. Unpublished study prepared by University of Alabama (at Birmingham). 31 p.

43598627 Breckenridge, C. (1995) Response to EPA Review of Retrospective Triazine Mortality Studies. Unpublished study prepared by Ciba-Geigy Corp. 25 p.

43598628 Larson, J.; Ash, S. (1993) (Carbon 14)-Atrazine: Nature of the Residue in Sugarcane: Supplement No. 1 to the Final Report: Lab Project Numbers: HWI 6117-181: 95-91. Unpublished study prepared by Hazleton Wisconsin, Inc. 231 p.

43598629 Larson, J.; Ash, S. (1992) (Carbon 14)-Atrazine: Nature of the Residue in Corn and Sorghum: Amendment No. 2 to the Final Report: Lab Project Numbers: HWI 6117-178: 51-91. Unpublished study prepared by Hazleton Wisconsin, Inc. 146 p.

43598630 Gold, B. (1995) Magnitude of Residues in Field Corn Forage, Silage-Stage Forage, Fodder, and Grain and Sweet Corn Ears and Forage Following Applications of AATREX 4L to Field Corn: Atrazine: Lab Project Numbers: ABR-91070: 35-A-88. Unpublished study prepared by Ciba-Geigy Corp. 563 p.

43598631 Gold, B. (1995) Magnitude of Residues in Grain Sorghum Forage, Hay, Silage-Stage Forage, Fodder, Grain, and Processed Grain Fractions Following Applications of AATREX 4L to Grain Sorghum: Atrazine: Lab Project Number: ABR-91071: 34-88. Unpublished study prepared by Ciba-Geigy Corp. 503 p.

43598632 Selman, F. (1995) Atrazine and Metolachlor--Magnitude of Residues in Soil and Grain Sorghum Following Applications of AATREX 4L and DUAL 8E With and Wi6117-178: 51-91. Unpublished AATREX 4L and DUAL 8E With and Without the Addition of Acrysol G-110: Lab Project Numbers: 02-HR-002-91 CA: 03-HR-004-91 MS: 04-HR-002-91 IL. Unpublished study prepared by Ciba-Geigy Corp. 326 p.

43598633 Wurz, R. (1995) Dietary Risk Exposure Assessment for Atrazine: Lab Project Number: ABR-94021. Unpublished study prepared by Ciba-Geigy Corp. 65 p.

43598634 Clarkson, J.; Golden, K. (1995) Human Exposure to Atrazine and Simazine Via Ground and Surface Drinking Water: Lab Project Number: 2852.0410. Unpublished study prepared by Ciba-Geigy Corp. 1350 p.

43598637 Selman, F. (1995) Summary of Assessment of Worker Exposure for Atrazine in Response to the U.S. Environmental Protection Agency Issuance of "The Triazine Herbicides Position Document 1 Initiation of Special Review.": Lab Project Number: ABR-95041. Unpublished study prepared by Ciba-Geigy Corp. 17 p.

43598638 Selman, F. (1995) Assessment of Worker Exposure for Atrazine in Response to the U.S. Environmental Protection Agency Issuance of "The Triazine Herbicides Position Document 1 Initiation of Special Review.": Lab Project Number: ABR-95038. Unpublished study prepared by Ciba-Geigy Corp. 115 p.

43598639 Kendall, R.; Soloman, K.; Baker, D.; et al. (1995) Ecological Risk Assessment of Atrazine in North American Surface Waters: Lab Project Number: WEI 242.12-A. Unpublished study prepared by Atrazine Ecological Risk Assessment Panel. 926 p.

43689801 Krautter, G. 1995. ^{14}C-Propazine: disposition and metabolism in the rat. PTRL East, Inc. . Richmond, KY. PTRL Project No. 821, June 16, 1995.

43796001 Stubbs, D. (1995) Product Chemistry: Technical Atrazine: (Stability): (Final Report): Lab Project Number: PC-95-032: 458-95F. Unpublished study prepared by Ciba-Geigy Corp. 35 p.

43934402 Pettersen, J.C. and Turnier, J.C. 1995. One-year chronic toxicity study with atrazine technical in rats. Ciba-Geigy Environmental Health Center, Farmington, CT. Lab Study no. F-00171.

43934403 Safe, S. (1995) Failure of chloro-s-triazine derived compounds to induce estrogenic responses *in vivo* and *in vitro*. in Fundamental Applied Toxicology (in Press).

43934404 Morseth, S. (1996) Evaluation of the Luteinizing Hormone (LH) in Female Sprague-Dawley Rats--Pilot Study: Final Report: Lab Project Number: CHV 2386-109: 6791. Unpublished study prepared by Corning Hazleton Inc. (CHV). 33 p.

43934405 Morseth, S. (1996) Evaluation of the Luteinizing Hormone (LH) in Female Sprague-Dawley Rats--Method Validation: Final Report: Lab Project Number: CHV 2386-110: 6791F: 2386-110. Unpublished study prepared by Corning Hazleton Inc. (CHV). 32 p.

43934406 Morseth, S. (1996) Evaluation of the Luteinizing Hormone (LH) Surge in

Atrazine-Exposed Female Sprague-Dawley Rats: Interim Report: Lab Project Number: CHV 2386-111: 6791E: 2386-111. Unpublished study prepared by Corning Hazleton Inc. (CHV). 624 p.

43934407 Hui, X.; Wester, R.; Maibach, H. (1995) Disposition of Atrazine in Rhesus Monkey Following Intravenous Administration: Interim Report: Lab Project Number: UCSF 95SU04: 333-95. Unpublished study prepared by University of California. 63 p.

43934408 Maibach, H. (1996) Disposition of Atrazine in Rhesus Monkey Following Intravenous Administration: Interim Report: Lab Project Number: ABR-95131: 333-95. Unpublished study prepared by Ciba-Geigy Corp. and University of California. 59 p.

43934411 Hackett, D.; Bray, L. (1996) Updated Dietary Exposure Assessment for Atrazine: Lab Project Number: ABR-96009. Unpublished study prepared by Ciba-Geigy Corp. 48 p.

43934412 Thalacker, F. (1996) Determination of Transfer Rate and Nature of the Residue(s) in Milk from (carbon 14)-Atrazine Treated Cows: Lab Project Number: CHW 6117-325: 287-95: AM044. Unpublished study prepared by Corning Hazleton, Inc. 105 p.

43934413 Clarkson, J.; Golden, K.; Tierney, D.; et al. (1996) Human Exposure to atrazine and Simazine via Ground and Surface Drinking Water: Update-I: Lab Project Number: 2852.0480: 696-95. Unpublished study prepared by Montgomery Watson. 1840 p.

43934414 Balu, K. and P. W. Holden. 1996. Ciba/State ground-water monitoring study for atrazine and its major degradation products in the United States. Final Report. Ciba Study No. 174-91. 24 p. Unpublished study prepared by Waterborne Environmental, Inc. Leesburg, VA.; submitted by Ciba-Geigy Corp., Greensboro, NC.

43934415 Sielken, R.; Bretzlaff, R.; Valez-Flores, C. (1996). Preliminary Risk Characterization for Atrazine and Simazine: Lab Project Number: 56. Unpublished study prepared by Sielken, Inc. 1254 p.

43934416 Brady, J.F. (1995). Analytical Method for the Semi-Quantitative Determination of Atrazine Mercapturate in Urine by Enzyme Immunoassay including Validation Study. Laboratory Project Identification Analytical Method Number AG-638. Unpublished study prepared by Ciba-Geigy Corp. [now Syngenta] 34 p.

43934417 Evaluation of the Potential Exposure of Workers to Atrazine During Commercial Mixing, Loading, and Spray Applications to Corn. Biological Field

Phase. Honeycutt, R., Bennet, R., and DeGeare, M. (1996). HERAC, Inc. No. 95-501HE. Ciba Study No. 178-95. Unpublished study prepared by Ciba Crop Protection.[now Syngenta] 839 pages.

43934418 Selman, F. (1996). Assessment of Potential Worker Exposure to Atrazine During Commercial Mixing, Loading, and Application to Corn: Interim Report: Lab Project Number: ABR-95133: 101930: 178-95. Unpublished study prepared by Ciba-Geigy Corp. [now Syngenta] 64 p.

43934419 Solomon, K. R., D. B. Baker, R. P. Richards, K. R. Dixon, S. J. Kline, T. W. La Point, R. J. Kendall, C. P. Weisskopf, J. M. Giddings, J. P. Giesy, L. W. Hall, Jr., and M. Williams. Ecological risk assessment of atrazine in North American surface waters. Environ. Toxicol. Chem. 15(1):31-76.

43934420 Ecorisk, Inc. (1995) Ecological Risk Assessment of Atrazine in North American Surface Waters: Additional Considerations of Exposure and Ecological Effects. Unpublished study. 35 p.

43934421 Benjamin, R. (1996) Characterization of Selenastrum Capricornutum Response to Episodic Atrazine Exposure: Lab Project Number: 09524: TIWET 09542: TIWET-09524. Unpublished study prepared by The Institute of Wildlife and Environmental Toxicology, Clemson University. 92 p.

43934422 Drewing, L. (1996) Supplement to Ciba's Benefits Analysis of Atrazine and Simazine: Lab Project Number: EV-1991-3: OPP-30000-60: SS-AGR-9. Unpublished study prepared by Ciba-Geigy Corp. 532 p.

44008601 Delzell, E, I. Brill, and C. Beall. (1996). A follow-up Study of Workers at the Ciba-Geigy St. Gabriel Plant. Laboratory Study No. Supplemental Document No. 11181. Unpublished study prepared by Ciba-Geigy Corp.[now Syngenta] 42 p.

44008602 Gass, R. and G.A. Stalder. (1993). Atrazine: An Epidemiology Study at the Schweizerhalle Plant. Laboratory Study No. Supplemental Document No. 11182. Unpublished study prepared by Ciba-Geigy Corp.[now Syngenta] 36 p.

44152102 Morseth, S. (1996) Evaluation of the Luteinizing Hormone (LH) Surge in Atrazine-Exposed Female Sprague-Dawley Rats--(Final) 6-Month Interim Report: Lab Project Number: CHV 2386-111: 2386-111: 6791E. Unpublished study prepared by Corning Hazleton Inc. 727 p.

44152104 Simpkins, J. (1996) Evaluation of a Hormonal Mode of Action for Mammary Carcinogenesis of the Chlorotriazine Herbicides: Second Concensus Panel Report. Unpublished study prepared by Ciba-Geigy Corp. 37 p.

44152105 Consensus Panel (1995) Weight of the Evidence on the Oncogenic Potential of

Atrazine: Consensus Panel Report. Unpublished study. 38 p.

44152106 An Updated Assessment of Worker Exposure for Atrazine in Response to the U.S. Environmental Protection Agency Issuance of the "Triazine Herbicides Position Document 1 Initiation of Special Review". Supplement to ABR-95038: Assessment of Worker Exposure for Atrazine in Response to the U.S. Environmental Protection Agency Issuance of the "Triazine Herbicides Position Document – Initiation of Special Review" (MRID 435986-38). Laboratory Project Number: ABR-96071. Unpublished study by Ciba Crop Protection.[now Syngenta] 124 pages.

44152108 Selman, F.B. (1996). Supplemental Data and Evaluation of Exposure to Lawn Care Operators Using Atrazine in the Southern United States. Supplement to ABR-95038: Assessment of Worker Exposure from Atrazine in Response to the U.S. Environmental Protection Agency Issuance of the "Triazine Herbicides Position Document – Initiation of Special Review" (MRID 435986-38). Laboratory Project Number: ABR-96069. Unpublished study by Ciba Crop Protection.[now Syngenta] 13 pages.

44152109 Selman, F.B. and L. Rosenheck. (1996). Evaluation of the Potential Exposure of Workers to Atrazine During Commercial Mixing, Loading, and Spray Applications to Corn: (Final Report): Lab Project Number: ABR-95133. Unpublished study prepared by Ciba Crop Protection.[now Syngenta] 199 p.

44152110 Bodalbhai, L. (1996) Analytical Method for the Determination of Residues of Atrazine, G-30033, G-28279, and G-28273 in Urine by Gas Chromatography/Mass Selective Detection Including Validation Data: Lab Project Number: 264-95: AG-637: 101930. Unpublished study prepared by Ciba Crop Protection. 91 p.

44152111 Honeycutt, R.C., Bennett, R.M. and DeGeare, M.A. (1996). Evaluation of the Potential Exposure of Workers to Atrazine during Commercial Mixing, Loading, and Spray Application to Corn (EPA-Subpart U) -- Biological Field Phase: Final Report: Lab Project Number: 178-95: 95-501HE: 95-517. Unpublished study prepared by Ciba Crop Protection [now Syngenta]. 687 pages, 2 volumes.

44152113 Hui, X.; Wester, R.; Simoneaux, B.; et al. (1996) Disposition of Atrazine in Rhesus Monkey Following Oral Administration: Lab Project Number: ABR-96094: UCSF 96SU01: 306-96. Unpublished study prepared by University of California, San Francisco and Ciba Crop Protection. 171 p.

44152114 Hui, X.; Gilman, S.; Simoneaux, B.; et al. (1996) *In vivo* Percutaneous Absorption of Atrazine in Man: Lab Project Number: ABR-96067: BDH-081-2: H832-11835-01. Unpublished study prepared by UCSF; UC Davis; and Ciba Crop Protection. 297 p.

44152115 Bray, L. (1996) Revised Dietary Exposure Assessment for Atrazine: Lab Project Number: ABR-96105. Unpublished study prepared by Ciba-Geigy Corp. 97 p.

44152117 Boyette, S. (1996) Atrazine--Magnitude of the Residues In or On Corn: (Final Report): Lab Project Number: ABR-96087: 25-96: 101930. Unpublished study prepared by Ciba-Geigy Corp. 211 p.

44152118 Boyette, S. (1996) Atrazine--Magnitude of the Residues In or On Grain Sorghum: Lab Project Number: ABR-96088: 26-96: 101930. Unpublished study prepared by Ciba-Geigy Corp. 286 p.

44152119 Thalacker, F.; Ash, S. (1996) (Carbon 14)-Atrazine: Nature of the Residues in Corn and Sorghum: Amendment No. 3 to the Final Report: MRID 42547116: Lab PW 6117-325: 287-95: AM044. Report: MRID 42547116: Lab Project Number: HWI 6117-178: 51-91. Unpublished study prepared by Hazleton Wisconsin, Inc. 31 p.

44152120 Thalacker, F.; Ash, S. (1996) (Carbon 14)-Atrazine: Nature and Magnitude of the Hydroxy-triazine and Chlorotriazine Residues in Sorghum Following a Pre-emergence Application at 2 lb. ai/A: Lab Project Number: CHW 6117-337: 229-96. Unpublished study prepared by Corning Hazleton, Inc. 65 p.

44152121 Thalacker, F.; Ash, S. (1996) (Carbon 14)-Atrazine: Nature and Magnitude of the Hydroxy-triazine and Chlorotriazine Residues in Corn Following a Pre-emergence Application at 2 lb. ai/A: Lab Project Number: CHW 6117-335: 228-96. Unpublished study prepared by Corning Hazleton, Inc. 65 p.

44152122 Clarkson, J.; Hines, N.; Tierney, D.; et al. (1996) Human Exposure to Atrazine and Simazine via Ground and Surface Drinking Water: Update--II: Supplement to MRID No. 43934413 (and No. 43598634): Lab Project Number: 2852.0540: 696-95. Unpublished study prepared by Montgomery Watson. 2267 p.

44152123 Tierney D and Balu K. 1996. Summary of Voluntary Atrazine Monitoring Program at Selected Community Water Systems. October 29, 1996. Submitted by Novartis.

44152124 Tierney, D.; Balu, K. (1996) Summary of Sampling Methods for Estimating Annual Mean Concentrations of Atrazine in Community Water Systems: Lab Project Number: ABR-96103. Unpublished study prepared by Ciba Crop Protection. 162 p.

44152125 Sielken, R.; Bretzlaff, R.; Valdez-Flores, C. (1996) Risk Characterization for Atrazine and Simazine: Report Supplement: Lab Project Number: 56. Unpublished study prepared by Sielken, Inc. 1245 p.

44152126 Giddings, J.; Hall, L.; Kendall, R.; et al. (1996) Beyond the Probabilistic Approach: Risk Assessment of Atrazine in North American Surface Waters: Supplement to MRID 43934419. Unpublished study prepared by Ecorisk, Inc. 54 p.

44152127 Hill, E.; Crouse, K. (1996) The Role of Atrazine in Managing Weed Biotypes Resistant to ALS-Inhibitor Herbicides. Unpublished study prepared by Ciba Crop Protection. 87 p.

44222601 Balu, K.; Holden, P. (1996) Ciba/State Ground-Water Monitoring Study for Atrazine and Its Major Degradation Products in the United States: Amendment to the Final Report--MRID 43934414: Lab Project Number: 174-91: 242.01: CIGNC01E-5. Unpublished study prepared by Waterborne Environmental, Inc.; Ciba Crop Protection; and Alta Analytical Lab, Inc. 13 p.

44222602 Balu, K.; Holden, P. (1997) Ciba/State Ground-Water Monitoring Study for Atrazine and Its Major Degradation Products in the United States: Second Amendment to the Final Report--MRID 43934414: Lab Project Number: 174-91: 242.01: CIGNC01E-5. Unpublished study prepared by Waterborne Environmental, Inc.; Ciba Crop Protection; and Alta Analytical Lab, Inc. 14 p.

44256501 Delzell, E.; Sathiakumar, N. (1996) An Updated Follow-up Study of Workers at the Ciba-Geigy McIntosh Plant: Final Report. Unpublished study prepared by University of Alabama at Birmingham. 76 p.

44256502 Delzell, E.; Sathiakumar, N. (1996) A Combined Analysis of Mortality Among Workers at the Ciba-Geigy Corporation's McIntosh and St. Gabriel Plants--An Update. Unpublished study prepared by University of Alabama at Birmingham. 113 p.

44315401 Simpkins, J. (1997) Evaluation of a Hormonal Mode of Action for Mammary Carcinogenesis of the Chloro-s-triazine Herbicides: Third Consensus Panel Report. Unpublished study prepared by Novartis Crop Protection, Inc. 27 p.

44315402 Safe, S.; McDougal, A.; Wilson, C. (1997) Induction of estradiol 2-hydroxylase activity in MCF-7 human breast cancer cells by pesticides and carcinogens. Environmental Toxicology and Pharmacology p. 1-5.

44315403 Selman, F.B. and Rosenheck, L. (1996). Assessment of Potential Worker Exposure to Atrazine During Commercial Mixing, Loading, and Application to Corn (MRID 441521-09). Amendment 1. Laboratory Project Number ABR-95133. Unpublished study prepared by Novartis Crop Protection, Inc.[now Syngenta] 29 pages.

44315404 Selman, F.B. and Rosenheck, L. (1996). Presentation of Data from ABR-95133

"Assessment of Potential Worker Exposure to Atrazine During Commercial Mixing, Loading, and Application to Corn" from Use in the Pesticide Handler's Exposure Database (PHED 1.1). Laboratory Project Number ABR-97068. Unpublished study prepared by Novartis Crop Protection, Inc.[now Syngenta] 97 pages.

44315405 Simoneaux, B. (1996) Disposition of Atrazine in Rhesus Monkey Following Oral Administration: Final Report Amendment 1: Lab Project Number: ABR-96094: 306-96. Unpublished study prepared by Novartis Crop Protection, Inc. 54 p.

44315406 Bray, L.; Boyette, S.; Breckenridge, C. et al. (1997) Summary of the Nature and Magnitude of Atrazine Residues on Corn and Sorghum Grain, Forage and Fodder and the Basis for the Dietary Risk Assessment. Unpublished study prepared by Novartis Crop Protection, Inc. 17 p.

44315407 Bray, L. (1997) Revised Dietary Assessment for Atrazine Including Two Exposure Scenarios: Lab Project Number: ABR-97064: 396-97. Unpublished study prepared by Novartis Crop Protection, Inc. 193 p.

44315408 Thalacker, F. (1996) (Carbon-14)-Atrazine: Nature and Magnitude of the Hydroxy-triazine and Chlorotriazine Residues in Corn Following a Pre-Emergence Application at 2 lb. ai/A: Amendment No. 2 to the Final Report: Lab Project Number: 6117-335: 228-96: BIOL-97003. Unpublished study prepared by Covance Labs., Inc. 78 p.

44315409 Thalacker, F.; Ash, S. (1996) ^{14}C-Atrazine: Nature and Magnitude of the Hydroxy-triazine and Chlorotriazine Residues in Sorghum Following a Pre-Emergence Application at 2 lb. ai/A: Amendment No. 2 to the Final Report: Lab Project Number: 6117-337: 229-96: BIOL-97004. Unpublished study prepared by Covance Labs., Inc. 88 p.

44315410 Boyette, S. (1996) Atrazine--Magnitude of the Residues in or on Corn: Amendment 1: Lab Project Number: ABR-96087: 25-96: 101930. Unpublished study prepared by Novartis Crop Protection, Inc. 533 p. {OPPTS 860.1500}.

44315411 Boyette, S. (1996) Atrazine-Magnitude of the Residues in or on Grain Sorghum: Amendment 1: Lab Project Number: ABR-96088: 26-96: 26-96-A. Unpublished study prepared by Novartis Crop Protection, Inc. 366 p. {OPPTS 860.1500}.

44315412 Lin, K. (1997) Validation of Analytical Method AG-484A for the Determination of Residues of Atrazine, G-30033, G-28279 and G-28273 in or on Corn and Sorghum: Lab Project Number: ABR-97056: 300-97: AG-484A. Unpublished study prepared by Novartis Crop Protection, Inc. 141 p. {OPPTS 860.1340}.

44315413 Bray, L. (1997) Rationale for the Dairy Cattle Diet Utilized in the Revised

Dietary Exposure Assessment for Atrazine and Simazine: Lab Project Number: ABR-97067: 400-97. Unpublished study prepared by Novartis Crop Protection, Inc. 15 p.

44315414 Clarkson, J.; Hines, N.; Tierney, D. et al. (1997) Human Exposure to Atrazine and Simazine via Ground and Surface Drinking Water: Update--III: Supplement: Lab Project Number: 1176029. 010301: 696-95. Unpublished study prepared by Montgomery Watson. 1958 p.

44315417 Brooks, R.; Crouse, K.; Hill, E. et al. (1997) Supplement to Novartis' Benefits Analysis of Atrazine and Simazine: Additional Information on Weed Control, Yield and Impact to Growers and Livestock Producers June 1997. Unpublished study prepared by Novartis Crop Protection. 187 p.

44488801 Lail, L. (1998) Technical Atrazine: Product Chemistry (Preliminary Analysis): Lab Project Number: 206-98: ASR-073: 145-94. Unpublished study prepared by Novartis Crop Protection, Inc. 17 p. {OPPTS 830.1700}

44518401 Van Kampen, W.; Thus, J. (1996) The Determination of Diflubenzuron and Related Substances in Technical Diflubenzuron Validation and Typical Batch Analysis: Lab Project Number: C. 303.10.013: 56834/78/95. Unpublished study prepared by Solvay Duphar B.V. 45 p.

44544701 Morseth, S. (1998) Chronic (12-24 Month) Study in Rats with Atrazine Technical. Study No. 2386-108. Unpublished study prepared by Covance Laboratories Inc. 2251 p.

44590401 Hackett, A. (1998) 1997 Annualized Mean Concentrations (AMCs) and 1997 and Early 1998 Analytical Results: Surface Water Monitoring Program: Monstanto Study No. 94-27-R-3. Unpublished study prepared by Monsanto Co. and the Acetochlor Registration Partnership. 92 p.

44597601 Clarkson J, Hines N, Tierney D, Christensen B, and Mattan C. 1998. Human exposure to atrazine and simazine via ground and surface drinking water: Update - IV. June 26, 1998. Submitted by Novartis.

Supplement to MRID 445976-01: Tierney D, Christensen B, Mattan C, and Dando C. 1999. Atrazine annual maximum and mean concentrations at CWS in 21 major use states, PLEX Database, 1993-1998. December 13, 1999. Submitted by Novartis.

44597602 Boyette, S. (1998) Atrazine--Magnitude of the Residues in or on Corn Amendment 2: MRID No. 44152117: Lab Project Number: ABR-96087: 25-96: 0S-HR-601-6. Unpublished study prepared by Novartis Crop Protection, Inc. 608 p. {OPPTS 860.1500}

44597603 Boyette, S. (1998) Atrazine--Magnitude of the Residues in or on Grain Sorghum Amendment 2: MRID No. 44152118: Lab Project Number: ABR-96088: 26-96: 0S-HR-110-96. Unpublished study prepared by Novartis Crop Protection, Inc. 374 p. {OPPTS 860.1500}

44597604 Selman, F.B. (1998). Comparison of Exposure Assessments to Atrazine and Simazine for Commercial Operators and Farmers who Mix, Load, and/or Apply Atrazine. Novartis Laboratory Number 542-98. ABR-98068. Unpublished study prepared by Novartis.[now Syngenta] 16 pages.

44597605 Selman, F.B. (1998). Evaluation of the Potential Internal Dose of Atrazine to Workers During Mixing-Loading and Application of Atrazine Products – Biological Monitoring. Novartis Laboratory Number 179-95. ABR-97094. Unpublished study prepared by Novartis [now Syngenta]. 182 pages.

44597606 Honeycutt, R.C. and M.A. DeGeare. (1998). Evaluation of the Potential Internal Dose of Atrazine to Workers During Mixing-Loading and Application of Atrazine Products – Biological Field Phase. Novartis Laboratory Number 179-95. Unpublished study prepared by Novartis [now Syngenta]. 912 pages.

44711001 Tierney, D.; Christensen, B.; Mattan, C. (1998) Human Exposure to Atrazine and Simazine via Ground and Surface Drinking Water: Update IV: Supplement to EPA MRID No. 44597601: Cumulative Community Water Systems (CWS) Population and Exposure Distributions: Lab Project Number: 00300: 696-95. Unpublished study prepared by En. Fate, LLC. 969 p.

44713802 Paul, H. J.; Dunsire, J.P.; Hedley, D. (1993). The Absorption, Distribution, Degradation and Excretion of [U-^{14}C]-Triazine G 30027 in the Rat. Inveresk Research International, Tranent, EH33 2NE, Scotland. IRI Report No. 9523. December 10, 1993

44723701 Bachmann, M. (1994) 3 Month Oral Toxicity Study in Rats (Administration in Food) (Atrazine): Lab Project Number: 931063: 351270. Unpublished study prepared by Novartis Crop Protection, AG. 392 p.

44856901 Brady, J. (1999) Validation Study of an Atrazine Immunoassay for Drinking Water Monitoring in Compliance with the Safe Drinking Water Act: Lab Project Number: RS-WM-009-98: 101178: 634-97. Unpublished study prepared by Novartis Crop Protection, Inc. and Ohio Dept. of Health. 267 p.

44883601 Prochaska, L.M. (1999). Dissipation of Dislodgeable Foliar Residues of Atrazine on Field Corn. Stewart Project Number: SARS-97-54; Wildlife International Project Number: 468C-105. Unpublished study prepared by Stewart Agricultural Research Services. 131 pages.

44917701 Lui, C.; Thakur, A. (1999) Statistical Report for Survival and Mammary Tumor Analysis from the Fischer 344/Lati Rat Study (Pinter et al., 1990): Lab Project Number: 6117-998: 1109-99. Unpublished study prepared by Covance Laboratories, Inc. 28 p

44958001 Hofen, J. (1999) Determination of Transferable Residues on Turf Treated with Atrazine. Stewart Project Number: SARS-98-81. Ricerca Project Number: 7617-98-0197-CR Unpublished study prepared by Stewart Agricultural Research Services, Inc. and Ricerca, Inc. 358 pages.

44958801 Rosenheck, L. (1999). Determination of Transferable Turf Residues on Turf Treated with Atrazine Applied in a Granular Fertilizer Formulation. Novartis Laboratory Number 805-98. ABC Laboratory Number 45035. Unpublished Study prepared by Novartis [now Syngenta]. 183 pages.

44972201 ORETF Studies:

ORETF Study Number OMA001. D. Larry Merricks (Director), Dennis R. Klonne, Susan C. Artz, March 4, 1999. Exposure of Professional Lawn Care Workers During the Mixing, Loading, and Application of Granular Turf Pesticides Utilizing a Surrogate Compound. Agrisearch Inc. (Frederick, MD) and Ricerca, Inc. (Painesville, OH). Laboratory report numbers 3701 (Agrisearch) and 69331-96-0182-CR-001 (Ricerca). Unpublished.

ORETF Study Number OMA002. Merricks, L., Klonne, D.R., and Smith, L.D. January 22, 1999. Exposure of professional Lawn Care Workers during the Mixing and Loading of Dry and Liquid Formulations and the Liquid Application of Turf Pesticides Utilizing a Surrogate Compound. Agrisearch, Inc. Unpublished.

ORETF Study Number OMA003. Klonne, D.R., Honeycutt, R. February 3, 1999. A Generic Evaluation of Homeowner Exposure Associated with Granular Turf Pesticide Handling and Application to Residential Lawns. H.E.R.A.C. Inc., and Outdoor Residential Exposure Task Force. Unpublished.

ORETF Study Number OMA004. Klonne, D.R., Artz, S.C., and Merricks, L.D. February 22, 1999, A Generic Evaluation of Homeowner Exposure Associated with Liquid Pesticide Handling and Hose-End Application (Ready-to-Use and Ortho DIAL'n SPRAY) to Residential Lawns.

44997001 Mattan, C.; Dando, C.; Tierney, D. et al. (1999) Atrazine Voluntary Monitoring Program Analytical Results 1993-1998: Final Report: Lab Project Number: 00900: 11940-98. Unpublished study prepared by En-Fate LLC. 232 p.

44997003 Mattan, C.; Dando, C.; Tierney, D. et al. (1999) Atrazine Annual Maximum and

Mean Concentrations at CWS in 21 Major Use States, PLEX Database, 1993-1998: Supplemental to EPA MRID Number 44597601: Final Report: Lab Project Number: 00900: 696-95. Unpublished study prepared by En-Fate LLC. 2346 p.

45020001 Cohn, S. L. Unpublished. An evaluation of the toxicity and sublethal effects of atrazine on the physiology and growth phases of the aquatic macrophyte *Vallisneria americana* L. American Univ., Ph. D Thesis. (1985).

45020002 Carder, J. P. and K. D. Hoagland. 1998. Combined effects of alachlor and atrazine on benthic algal communities in artificial streams. Environ. Toxicol. Chem. 17(7):1415-1420.

45020003 Davies, P. E., L. S. J. Cook and J. L. Barton. 1994. Triazine herbicide contamination of Tasmanian streams: Sources, concentrations and effects on biota. Aust. J. Mar. Freshwater Res. 45:209-226.

45020004 Jurgensen, T. A. and K. D. Hoagland. 1990. Effects of short-term pulses of atrazine on attached algal communities in a small stream. Arch. Environ. Contam. Toxicol. 19:617-623.

45020005 Kosinski, R. J. 1984. The effect of terrestrial herbicides on the community structure of stream periphyton. Environ. Poll. (Ser. A) 36:165-189.

45020006 Kosinski, R. J. and M. G. Merkle. 1984. The effect of four terrestrial herbicides on the productivity of artificial stream algal communities. J. Environ. Qual. 13(1):75-82.

45020007 Krieger, K. A., D. B. Baker and J. W. Kramer. 1988. Effects of herbicides on stream *Aufwuchs* productivity and nutrient uptake. Arch. Environ. Contam. Toxicol. 17:299-306.

45020008 Lakshminarayana, J. S. S., H. J. O'Neill, S. D. Jonnavithula, D. A. Leger and P. H. Milburn. 1992. Impact of atrazine-bearing agricultural tile drainage discharge on planktonic drift of a natural stream. Environ. Poll. 76:201-210.

45020009 Lynch, T. R., H. E. Johnson and W. J. Adams. 1985. Impact of atrazine and hexachlorobiphenyl on the structure and function of model stream ecosystems. Environ. Toxicol. Chem. 4:399-413.

45020010 Moorhead, D. L. and R. J. Kosinski. 1986. Effect of atrazine on the productivity of artifical stream algal communities. Bull. Environ. Contam. Toxicol. 37:330-336.

45020011 DeNoyelles, F., W. D. Kettle and D. E. Sinn. 1982. The responses of plankton communities in experimental ponds to atrazine, the most heavily used pesticide in

the United States. .

45020012 Herman, D., N. K. Kaushik and K. R. Solomon. 1986. Impact of atrazine on periphyton in freshwater enclosures and some ecological consequences. J. Fish. Aquat. Sci. 43:1917-1925.

45020013 Baturo, W., L. Lagadic and T. Caquet. 1995. Growth, fecundity and glycogen utilization in *Lymnaea palustris* exposed to atrazine and hexachlorobenzene in freshwater mesocosms. Environ. Toxicol. Chem. 14(3):503-511.

45020014 Hoagland, K. L., R. W. Drenner, J. D. Smith and D. R. Cross. 1993. Freshwater community responses to mixtures of agricultural pesticides: Effects of atrazine and Bifenthrin. Environ. Toxicol. Chem. 12:627-637.

45020015 Larsen, D. P., F. DeNoyelles, Jr., F. Stay and T. Shiroyama. 1986. Comparisons of single-species, microcosm and experimental pond responses to atrazine exposure. Environ. Toxicol. Chem. 5:179-190.

45020016 Lay, J. P., A Muller, L. Peichl, W. Klein and F. Korte. 1984. Longterm effects of the herbicides atrazine and dichlobenil upon the phytoplankton density and physio-chemical conditions in compartments of a freshwater pond. Chemosphere 13(7):821-832.

45020017 Neugebaur, K., F.-J. Zieris and W. Huber. 1990. Ecological effects of atrazine on two outdoor artifical freshwater ecosystems. Z. Wasser-Abwasser-Forsch. 23:11-17.

45020018 Johnson, J. R. and K. T. Bird. 1995. The effects of the herbicide atrazine on *Ruppia maritima* L. growing in autotrophic versus heterotrophic cultures. Botanica Marina 38:307-312.

45020020 Hamilton, P. B. 1987. The impact of atrazine on lake periphyton communities, including carbon uptake dynamics using track autoradiography. Environ. Poll. 46:83-103.

45020021 Bester, K., H. Huhnerfuss, U. Brockmann and H. J. Rick. 1995. Biological effects of triazine herbicide contamination on marine phytoplankton. Arch. Environ. Contam. Toxicol. 29:277-283.

45020022 Juttner, I., A. Peither, J. P. Lay, A. Kettrup and S. J. Ormerod. 1995. An outdoor mesocosm study to assess ecotoxicological effects of atrazine on a natural plankton community. Arch. Environ. Contam. Toxicol. 29:435-441.).

45058701 Minnema, D.J. (2000) Comparison of the LH surge in female rats administered atrazine, simazine or DACT via oral gavage for one month. Covance # 6117-398 Novartis # 1198-98. Covance Labs, Vienna, VA. Feb. 29, 2000. Unpublished

study.

45058702 Zirkin, B. (2000) Atrazine Effects on Testosterone and Androgen-Dependent Reproductive Organs in Peripubertal Male Rats. Unpublished study prepared by Novartis Crop Protection, Inc. 26 p.

45058703 Cheung M, Yokley R, Tierney D, and Ross R. 2000. Novartis/Community Water System surface water monitoring study for atrazine and its major degradation products in seven states in the United States. February 17, 2000.

45058704 Tierney D, Christensen B, Mattan C, and Dando C. 2000. Human exposure to atrazine and simazine via ground and surface drinking water: Update - V. February 18, 2000. Submitted by Novartis.

45087401 Stratton, G. W. 1984. Effects of the herbicide atrazine and its degradation products, alone and in combination, on phototrophic microorganisms. Bull. Environ. Contam. Toxicol. 29:35-42.

45087401 Stratton, G. W. 1984. Effects of the herbicide atrazine and its degradation products, alone and in combination, on phototrophic microorganisms. Bull. Environ. Contam. Toxicol. 29:35-42.

45087403 Cunningham, J. J., W. M. Kemp, M. R. Lewis and J. C. Stevenson. 1984. Temporal responses of the macrophyte, *Potamogeton perfoliatus* L., and its associated autotrophic community to atrazine exposure in estuarine microcosms. Estuaries 7(4B):519-530.

45087404 Jones, T. W. and P. S. Estes. 1984. Uptake and phytotoxicity of soil-sorbed atrazine for the submerged aquatic plant, *Potamogeton perfoliatus* L. Arch. Environ. Contam. Toxicol. 13:237-241.

45087405 Lytle, J. S. and T. F. Lytle. 1998. Atrazine effects on estuarine macrophytes *Spartina alterniflora* and *Juncus roemerianus*. Environ. Toxicol. Chem. 17(10):1972-1978. (MRID #).

45087406 Plumley, F. G. and D. E. Davis. 1980. The effects of a photosynthesis inhibitor atrazine, on salt marsh edaphic algae, in culture, microecosystems, and in the field. Estuaries 3(4):271-277.

45087407 Brockway, D. L., P. D. Smith and F. E. Stancil. 1984. Fate and effects of atrazine in small aquatic microcosms. Bull. Environ. Contam. Toxicol. 32:345-353.

45087408 Correll, D. L. and T. L. Wu. 1982b. Atrazine toxicity to submersed vascular plants in simulated estuarine microcosms. Aquatic Botany 14:151-158.

45087409 Fleming, W. J., M. S. Ailstock, J. J. Momot and C. M. Norman. 1991. Response of sago pondweed, a submerged aquatic macrophyte, to herbicides in three laboratory culture systems, p. 267-275. *In*: Gorsuch, J. W., W. R. Lower, W. Wang and M. A. Lewis (eds.). Plants for toxicity assessment: Second volume. ASTM STP 1115.

45087410 Forney, D. R. and D. E. Davis. 1981. Effects of low concentrations of herbicides on submersed aquatic plants. Weed Sci. 29:677-685.

45087411 Gruessner, B. and M. C. Watzin. 1996. Response of aquatic communities from a Vermont stream to environmentally realistic atrazine exposure in laboratory microcosms. Environ. Toxicol. Chem. 15(4):410-419.

45087412 Hamala, J. A. and H. P. Kollig. 1985. The effects of atrazine on periphyton communities in controlled laboratory ecosystems. Chemosphere 14(9):1391-1408.

45087413 Johnson, B. T. 1985. Potential impact of selected agricultural chemical contaminants on a northern prairie wetland: A microcosm evaluation. Environ. Toxicol. Chem. 5:473-485.

45087414 Lampert, W., W. Fleckner, E. Pott, U. Schober and K-U. Storkel. 1989. Herbicide effects on planktonic systems of different complexity. Hydrobiologia 188/189:415-424.

45087415 Langan, M. M. and K. D. Hoagland. 1996. Growth responses of *Typhya latifolia* and *Scirpus acutus* to atrazine contamination. Bull. Environ. Contam. Toxicol. 57:307-314.

45087416 Pratt, J. R., N. J. Bowers, B. R. Niederlehner and J. Cairns, Jr. 1988. Effects of atrazine on freshwater microbial communities. Arch. Environ. Contam. Toxicol. 17:449-457.

45087417 van den Brink, P. J., E. van Donk, R. Gylstra, S. J. H. Crum and T. C. M. Brock. 1995. Effects of chronic low concentrations of the pesticides chlorpyrifos and atrazine in indoor freshwater microcosms. Chemosphere 31(5):3181-3200.

45087418 Stay, F. S., A. Katko, C. M. Rohm, M. A. Fix and D. P. Larsen. 1989. The effect of atrazine on microcosms developed from four natural plankton communities. Arch. Environ. Contam. Toxicol. 18:866-875.

45087419 Stay, F. S., D. P. Larsen, A. Katko and C. M. Rohm. 1985. Effects of atrazine on community level responses in Taub microcosms, p. 75-90. *In:* Boyle, T. P. (ed.). Validation and predictability of laboratory methods for assessing the fate and effects of contaminants in aquatic ecosystem. ASTM STP 865. (MRID #

45087419).

45088212 Fairchild, J. F., D. S. Ruessler, P. S. Haverland and A. R. Carlson. 1997. Comparative sensitivity of *Selenastruum capricorntum* and *Lemna minor* to sixteen herbicides. or. Arch. Environ. Contam. Toxicol. 32:353-357.

45088215 Walsh, G. E. 1972. Effects of herbicides on photosynthesis and growth of marine unicellular algae. Hyacinth Control J. 10:45-48.

45088231 Univ. Maryland. 1998. The influence of salinity on the chronic toxicity of atrazine to sago pondweed: Filling a data need for development of an estuarine chronic condition. Univ. Maryland, Agr. Exper. Sta., Wye Res. Educ. Center, Printed by US EPA for Chesapeake Bay Program. EPA 903-R-98-020.

45145601 Cheung, M.; Yorkley, R.; Tierney, D. et al. (2000) Novartis/Community Water System Surface Water Monitoring Study for Atrazine and its Major Degradation Products in Seven States in the United States: Supplementary Report--Regression Analyses: Supplemental to EPA MRID 45058703: Lab Project Number: 419-97. Unpublished study prepared by Developmental Resources/Chemical Support Department, Novartis Crop Protection. 100 p.

45152101 Delzell, E.; Sathiakumar, N.; MacLennan, P. (2000) Atrazine: A Follow-up Study of Mortality Among Workers at the Novartis St. Gabriel Plant: Final Report. Unpublished study prepared by University of Alabama, School of Public Health, Department of Epidemiology. 58 p.

45166901 Cooper, R.L., Stoker, T.E., Tyrey, L., Goldman, J.M., and McElroy, W.K. 2000. Atrazine disrupts the hypothalamic control of pituitary-ovarian function. *Tox. Sci*. 53: 297-307.

45166902 Stoker, T.E., Robinette, C.L., and Cooper, R.L. (1999) Maternal exposure to atrazine during lactation suppresses suckling-induced prolactin release and results in prostatitis in the adult male offspring. *Tox. Sci*. 52;68-79.

45202901 Benson, B. and G. M. Boush. 1983. Effect of pesticides and PCBs on budding rates of green hydra. Bull. Environ. Contam. Toxicol. 30:344-350.

45202902 Birge, W. J., J. A. Black and D. M. Bruser. 1979. Toxicity of organic chemicals to embryo-larval stages of fish. US. EPA, Office of Toxic Substances, EPA-560/11-79-007. 60 p.

45202903 Cossarini-Dunier, M. A. Demael, J. L. Riviere and D. Lepot. 1988. Effects of oral doses of the herbicide atrazine on carp (*Cyprinus carpio*). Ambio 17(6):401-405.

45202904 Davies, P. E., L. S. J. Cook and D. Goenarso. 1994. Sublethal responses to

pesticides of several species of Australian freshwater fish and crustaceans and rainbow trout. Environ. Toxicol. Chem. 13(8):1341-1354.

45202905 Alazemi, B. M., J. W. Lewis and E. B. Andrews. 1996. Gill damage in the freshwater fish *Gnathonemus petersii* (Family: Mormyridae) exposed to selected pollutants: An ultrastructural study. Environ. Technol. 17:225-238.

45202905 Douglas, W. S., A. McIntosh and J. C. Clausen. 1993. Toxicity of sediments containing atrazine and carbofuran to larvae of the midge *Chironomus tentans*. Environ. Toxicol. Chem. 12:847-853.

45202906 Eisler, R. 1989. Atrazine hazards to fish, wildlife, and invertebrates: A synoptic review. USDI, Fish & Wildl. Serv., Biol. Rep. 85(1.18), Contaminant Hazard Rev. Rep. No. 18. 53 p.

45202907 Fischer-Scherl, T. A. Veeser, R. W. Hoffmann, C. Kühnhauser, R.-D. Negele and T. Ewringmann. 1991. Morphological effects of acute and chronic atrazine exposure in rainbow trout (*Oncorhynchus mykiss*). Arch. Environ. Contam. Toxicol. 20:454-461.

45202908 Görge, G. and R. Nagel. 1990. Toxicity of Lindane, Atrazine, and Deltamethrin to early life stages of zebrafish (*Brachydanio rerio*). Ecotoxicol. Environ. Safety 20:246-255.

45202909 Grande, M., S. Andersen & D. Berge. 1994. Effects of pesticides on fish: Experimental and field studies. Norwegian J. Agr. Sci., Suppl. 13:195-209.

45202910 Howe, G. E., R. Gillis and R. C. Mowbray. 1998. Effect of chemical synergy and larval stage on the toxicity of atrazine and alachlor to amphibian larvae. Environ. Toxicol. Chem. 17(3):519-525.

45202911 Hussein, S. Y., M. A. El-Nasser and S. M. Ahmed. 1996. Comparative studies on the effects of herbicide atrazine on freshwater fish *Oreochromis niloticus* and *Chrysichthyes auratus* at Assiut, Egypt. Bull. Environ. Contam. Toxicol. 57:503-510.

45202912 Kettle, W. D., F. DeNoyelles, Jr., B. D. Heacock and A. M. Kadoum. 1987. Diet and reproductive success of bluegill recovered from experimental ponds treated with atrazine. Bull. Environ. Contam. Toxicol. 38:47-52.

45202913 Neskovic, N. K., I. Elezovic, V. Karan, V. Poleksic and M. Budimir. 1993. Acute and subacute toxicity of atrazine to carp (*Cyprinus carpio* L.). Ecotoxicol. Environ. Safety 25:173-182.

45202914 Saglio, P. and S. Trijasse. 1998. Behavioral responses to atrazine and diuron in

goldfish. Arch. Environ. Contam. Toxicol. 35:484-491.

45202915 Schober, U. and W. Lampert. 1977. Effects of sublethal concentrations of the herbicide Atrazin[R] on growth and reproduction of *Daphnia pulex*. Bull. Environ. Contam. & Toxicol. 17(3):269-277.

45202916 Streit, B., and H. M. Peter. 1978. Long-term effects of atrazine to selected freshwater invertebrates. Arch. Hydrobiol. Suppl. 55:62-77.

45202917 Taylor, E. J., S. J. Maund and D. Pascoe. 1991. Toxicity of four common pollutants to the freshwater macroinvertebrates *Chironomus riparius* Meigen (Insecta: Diptera) and *Gammarus pulex* (L.) (Crustacea: Amphipoda). Arch. Environ. Contam. Toxicol. 21:371-376.

45202918 Thursby, G. B., D. Champlin and W. Berry. 1990. Acute toxicity of atrazine to copepods. (Memorandum to D. J. Hansen, US. EPA, Narragansett Lab., RI., September 16.).

45202919 Walker, C. R. 1964. Simazine and other *s*-triazine compounds as aquatic herbicides in fish habitats. Weeds 12(2):134-139.

45202920 Ward, G. S. and L. Ballantine. 1985. Acute and chronic toxicity of atrazine to estuarine fauna. Estuaries 8:22-27. (Estuaries 8(1):22-27.

45204902 Biagianti-Risbourg, S. and J. Bastide. 1995. Hepatic perturbations induced by a herbicide (atrazine) in gray mullet *Liza ramada* (Mugilidae, Teleostei): An ultrastructural study. Aquat. Toxicol. 31:217-229.

45204903 Freemark, K. E. and C. Boutin. 1994. Impacts of agricultural herbicide use on terrestrial wildlife: A review with special reference to Canada. Canadian Wildl. Serv., Tech. Rep. Ser. 196.

45204904 Gluth, G. and W. Hanke. 1985. A comparison of physiological changes in carp, *Cyprinus carpio*, induced by several pollutants at sublethal concentrations: The dependency on exposure time. Ecotoxicol. Environ. Safety 9:179-188.

45204905 Grobler, E., J. H. J. van Vurin and H. H. du Preez. 1989. Routine oxygen consumption of *Talapia sparrmanii* (Cichlidae) following acute exposure to atrazine. Comp. Biochem. Physiol. 93C(1):37-42.

45204906 Moore, A. and C. P. Waring. 1998. Mechanistic effects of a triazine pesticide on reproductive endocrine function in mature male Atlantic salmon (*Salmo salar* L.) parr. Pest. Biochem. Physiol. 62:41-50.

45204907 Prasad, T. A. V. and D. C. Reddy. 1994. Atrazine toxicity on hydromineral balance of fish, *Tilapia mossambicus*. Ecotoxicol. Environ. Safety 28:313-316. (

45204908 Prasad, T. A. V., T. Srinivas, G. Md. Rafi and C. D. Reddy. 1991. Effect *in vivo* of atrazine on haematology and O_2 consumption in fish, *Talapia mossambica*. Biochem. Internat. 23(1):157-161.

45204909 Srinivas, T., T. A. V. Prasad, G. Md. Raffi and D. C. Reddy. 1991. Effect of atrazine on some aspects of lipid metabolism in fresh water fish. Biochem. Internat. 23(3):603-609.

45204910 Steinberg, C. E. W., R. Lorenz and O. H. Spieser. 1995. Effects of atrazine on swimming behavior of zebrafish, *Bachydanio rerio*. Water Research 29(3):981-985.

45205101 Mitchell, C. A. 1987. Growth of *Halodule wrightii* in culture and the effects of cropping, light, salinity and atrazine. Aquatic Botany 28:25-37.

45205102 Huckins, J. N. J. D. Petty and D. C. England. 1986. Distribution and impact of trifluralin, atrazine, and fonofos residues in microcosms simulating a northern prairie wetland. Chemosphere 15(5):563-588.

45205103 Best, L. B., K. E. Freemark, J. J. Dinsmore and M. Camp. 1995. A review and synthesis of habitat use by breeding birds in Agricultural Landscapes of Iowa. Amer. Midl. Nat. 124:1-29.

45205104 Stallman, Heidi R. and Louis B. Best. 1996. Bird use of an experimental strip intercropping system in northeast Iowa. J. Wildl. Manage. 60(2):354-362.

45205105 Morrison, Michael L. and E. Charles Meslow. 1984. Response of avian communities to herbicide-induced vegetation changes. J. Wildl. Manage. 48(1):14-22.

45205106 Marrs, R. H., C. T. Williams, A. J. Frost & R. A. Plant. 1989. Assessment of the effects of herbicide spray drift on a range of plant species of conservation interest. Environ. Poll. 59:71-86.

45205107 Lorz, H. W., S. W. Glenn, R. H. Williams, C. M. Kunkel, L. A. Norris and B. R. Loper. 1979. Effects of selected herbicides on smolting of coho salmon. US. EPA, Office of Res. Devel., Environ. Res. Lab., Corvallis, OR. EPA-600/3-79-071. 102 p.

45208302 Birge, W. J., J. A. Black and R. A. Kuehne. 1980. Effects of organic compounds on amphibian reproduction. University of Kentucky, Water Resour. Res. Inst., Res. Rep. 121. 39 p. (USDI, Agreement Numbers: 14-34-0001-7038 (FY 1977), 14-34-0001-8019 (FY 1978), and 14-34-0001-9091 (FY 1979).

45208303 Hall, L. W., Jr., M. C. Ziegenfuss, R. D. Anderson, T. D. Spittler and H. C. Leichtweis. 1994. Influence of salinity on atrazine toxicity to a Chesapeake Bay copepod (*Eurytemora affinis*) and fish (*Cyprinodon variegatus*). Estuaries

17:181-186.

45208304 Whale, G. F., D. A. Sheahan and M. F. Kirby. 1994. Assessment of the value of including recovery periods in chronic toxicity test guidelines for rainbow trout (*Onchorhynchus mykiss*), p. 175-187. *In*: R. Muller and R. Lloyd (ed.). Sublethal and chronic effects of pollutants on freshwater fish. Fishing News Books, London, U.K.

45208305 Oris, J. T., R. W. Winner and M. V. Moore. 1991. A four-day survival and reproduction toxicity test for *Ceriodphnia dubia*. Environ. Toxicol. Chem. 10:217-224.

45208308 McNamara, P. C. 1991. Atrazine technical - Acute toxicity to the marine copepod (*Acartia tonsa*) under flow-through conditions. SLI Rep. No. 91-2-3662. Springborn Laboratories, Inc. Wareham, MA.

45208309 Jop, K. M. 1991. (Atrazine technical) - Acute toxicity to (*Ceriodaphnia dubia*) under static conditions. SLI Report No. 91-1-3629. Springborn Laboratories, Inc., Wareham, MA.

45209601 Hertl, P.; Cheung, M.; Ross, R. (2000) Response to EPA Questions Concerning the Regression Analysis of Atrazine and its Major Degradation Products (EPA MRID 45145601): Lab Project Number: 1171-00. Unpublished study prepared by Novartis Crop Protection. 34 p.

45227701 Baird, Donald J., Ian Barber, Amadeu M. V. M. Soares and Peter Calow. 1991. An early life-stage test with *Daphnia magna* Straus: An alternative to the 21-day chronic test Ecotox. and Environ. Safety 22:1-7.

45227702 Belden, J. B. and M. J. Lydy. 2000. Impact of atrazine on organophosphate insecticide toxicity. Environ. Toxicol. Chem. 19(9):2266-2274.

45227704 Davis, D. E. 1980. Effects of herbicides on submerged seed plants. Auburn Univ., Dept. Botany, Plant Pathol. Microbio., USDI, Project A-067-ALA (Oct. 1, 1978 to Sept. 30, 1980. 19 p.

45227705 Delistraty, D. and C. Hershner. 1984. Effects of the herbicide atrazine on adenine nucleotide levels in *Zostera marina* L. (eelgrass). Aquatic Botany 18:353-369.

45227706 Dewey, S. L. 1986. Effects of the herbicide atrazine on aquatic insect community structure and emergence. Ecology 67(1):148-162. (MRID #).

45227707 El-Sheekh, M. M., H. M. Kotkat and O. H. E. Hammouda. 1994. Effect of Atrazine herbicide on growth, photosynthesis, protein synthesis, and fatty acid composition in the unicellular green alga *Clorella kessleri*. Ecotox. Environ.

Safety 29:3490358.

45227708 Fairchild, J. F., D. S. Ruessler and A. R. Carlson. 1998. Comparative sensitivity of five species of macrophytes and six species of algae to atrazine, metribuzin, alachlor, and metolachlor. Environ. Toxicol. Chem. 17(9):1830-1834. (MRID #).

45227709 Gonzalez-Murua, C., A. Munoz-Rueda, F. Hernando and M. Sanchez-Diaz. 1985. Effect of atrazine and methabenzthiazuron on oxygen evolution and cell growth of *Chlorella pyrenoidosa*. Weed Research 25:61-66.

45227710 Grenier, G., L. Proteau, J.-P. Marier and G. Beaumont. 1987. Effects of a sublethal concentration of atrazine on the chlorophyll and lipid composition of chlorophyll-protein complexes of *Lemna minor*. Plant Physiol. Biochem. 25(4):409-413.

45227711 Hall, L. W., Jr., M. C. Ziegenfuss and R. D. Anderson. 1993. An assessment of salinity effects on the toxicity of atrazine to Chesapeake Bay species: Data needs for development of estuarine aquatic life criteria. Final report. Univ. of Maryland, Maryland Agr. Exper. Sta., Wye Res. Educ. Center. 28 p.

45227712 Hartman, W. and D. B. Martin. 1985. Effects of four agricultural pesticides on *Daphnia pulex*, *Lemna minor*, and *Potamogeton pectinatus*. Bull. Environ. Contam. Toxicol. 35:646-651.

45227713 Hersh, C. M. and W. G. Crumpton. 1987. Determination of growth rate depression of some green algae by atrazine. Bull. Environ. Contam. Toxicol. 39:1041-1048.

45227714 Hofmann, A. and S. Winkler. 1990. Effects of atrazine in environmentally relevant concentrations on submersed macrophytes. Arch. Hydrobiol. 118(1):69-79.

45227715 Hopkin, R. and J. M. Kain. 1978. The effects of some pollutants on the survival, growth and respiration of *Laminaria hyperborea*. Estuarine Coast. Mar. Sci. 7:531-553.

45227716 Hurlbert, S. H. 1975. Secondary effects of pesticides on aquatic ecosystems. Residue Rev. 57:81-148

45227718 Jones, T. W., W. M. Kemp, P. S. Estes and J. C. Stevenson. 1986. Atrazine uptake, photosynthetic inhibition, and short-term recovery for the submersed vascular plant, *Potamogeton perfoliatus* L. Arch. Environ. Contam. Toxicol. 15:277-283.

45227719 Jones, T. W. and L. Winchell. 1984. Uptake and photosynthetic inhibition by

atrazine and its degradation products on four species of submerged vascular plants. J. Environ. Qual. 13(2):243-247.

45227720 Kemp, W. M., W. R. Boynton, J. J. Cunningham, J. C. Stevenson, T. W. Jones and J. C. Means. 1985. Effects of atrazine and linuron on photosynthesis and growth of the macrophytes, *Potamogeton perfoliatus* L. and *Myriophyllum spicatum* L. in an estuarine environment. Mar. Environ. Res. 16:255-280.

45227721 Mayer, P., J. Frickmann, E. R. Christensen and N. Nyholm. 1998. Influence of growth conditions of the results obtained in algal toxicity tests. Environ. Toxicol. Chem. 17(6):1091-1098.

45227722 Moragua, D. and A. Tauguy. 2000. Genetic indicators of herbicide stress in the Pacific oyster *Crassostrea gigas* under experimental conditions. Environ. Toxicol. Chem. 19(3):706-711.

45227723 Neckles, H. A. 1992. Indicator development: Seagrass monitoring and research in the Gulf of Mexico. Report of Workshop at Mote Marine Laboratory, Sarasota, FL., January 28-29, 1992. US EPA, Off. Res. Devel., Environ. Res. Lab., Gulf Breeze, FL. EPA/620/R-94/029. 64 p.

45227724 Nelson, K. J., K. D. Hoagland and B. D. Siegfried. 1999. Chronic effects of atrazine on tolerance of a benthic diatom. Environ. Toxicol. Chem. 18(5):1038-1045.

45227725 Pereira, W. E., J. L. Domagalski, F. D. Hostettler, L. R. Brown and J. B. Rapp. 1996. Occurrence and accumulation of pesticides and organic contaminants in river sediment, water and clam tissues from the San Joaquin River and tributaries, California. Environ. Toxicol. Chem. 15(2):172-180.

45227726 Peterson, H. G., C. Boutin, P. A. Martin, K. E. Freemark, N. J. Ruecker and M. J. Moody. 1994. Aquatic phyto-toxicity of 23 pesticides applied at expected environmental concentrations. Aquatic Toxicol. 28:275-292.

45227727 Plumley, F. G., D. E. Davis, J. T. McEnerney and J. W. Everest. 1980. Effects of a photosynthesis inhibitor, atrazine, on the salt-marsh fiddler crab, *Uca pugnax* (Smith). Estuaries 3(3):217-223.

45227728 Portmann, J. E. 1972. Results of acute toxicity tests with marine organisms, using a standard method, 212-217. Mar. Poll. Sea Life.

45227729 Schwarzschild, A. C., W. G. MacIntyre, K. A. Moore and E. L. Libelo. 1994. *Zostera marina* L. growth response to atrazine in root-rhizome and whole plant exposure exposure experiments. J. Exper. Mar. Biol. Ecol. 183:77-89.

45227731 Walsh, G. E. 1983. Cell death and inhibition of population growth of marine unicellular algae by pesticides. Aquatic Toxicol. 3:209-214.

45253401 Tierney, D.; Christensen, B.; Dando, C. et al. (2000) Human Exposure to Atrazine and Simazine via Ground and Surface Drinking Water: Update VI: Final Report: Lab Project Number: 00800:696-95. Unpublished study prepared by En-Fate, LLC. 3422 p.

45277002 US Geological Survey (1998) Herbicides in rainfall across the midwestern and northeastern United States, 1990-91. USGS Fact Sheet FS-181-97:1-4.

45277003 Capel, P.; Lin, M.; Wotzka, J. (1994) Pesticides in Rain in Minnesota, 1991-1993: An Interim Report (includes addendum dated Sept, 1994). Unpublished study prepared by University of Minnesota. 33 p.

45299501 Giddings, J.; Anderson, T.; Hall, L. et al. (2000) Aquatic Ecological Risk Assessment of Atrazine -A Tiered, Probabilistic Approach. A Report of an Expert Panel: Lab Project Number 709-00. Unpublished study prepared by Novartis Crop Protection. 449 p.

45299504 Madsen, T. J. 2000. Effects of atrazine on the sex ratio of *Daphnia pulicaria*. Prepared by ABC Laboratories, Inc., Columbia, MO, ABC Study No. 45810; submitted by Novartis Crop Protection, Inc., Greensboro, NC.

45299505 Burnett, G.; Balu, K.; Barton, H. et al. (2000) Summary of Environmental Fate of Atrazine: Lab Project Number: 1213-99. Unpublished study prepared by Novartis Crop Protection, Inc. 68 p.

45399901 Kahrs, R. (2001) Atrazine--Corn Supporting Data for Amending Tolerances: Lab Project Number: 827-99. Unpublished study prepared by Syngenta Crop Protection, Inc. 41 p. {OPPTS 860.1500}

45399902 Kahrs, R. (2001) Atrazine--Sorghum Supporting Data for Amending Tolerances: Lab Project Number: 826-99. Unpublished study prepared by Syngenta Crop Protection, Inc. 29 p.

45399904 Bray, L.; Beidler, W.; Szarka, A. (2001) Atrazine: Chronic Dietary Exposure Assessment for Atrazine and the Simazine Metabolites Common to Atrazine: Lab Project Number: 1256-00. Unpublished study prepared by Syngenta Crop Protection, Inc. 160 p.

45399905 Rosenheck, L. (2001) Atrazine Impregnation of Bulk Dry Fertilizer and Mixing Atrazine with Liquid Bulk Fertilizer: A Description of the Processes and Occupational Risk Assessment: Lab Project Number: 1273-01. Unpublished study

prepared by Syngenta Crop Protection, Inc. 71 p.

45399906 Cheung, M.; Yokley, R.; Ross, R. et al. (2001) Syngenta/Community Water System Ground Water Monitoring Study for Atrazine and its Major Degradation Products in Multiple States in the United States: Lab Project Number: 758-00. Unpublished study prepared by Syngenta Crop Protection, Inc. 806 p.

45471001 Holden, L.; Sielken, R. (2001) Comparison of the LH Surge in Female Rats Administered Atrazine, Simazine, or DACT for Six Months: Statistical Analysis of the LH Surge: Final Report: Lab Project Number: 6117-399: 2214-01. Unpublished study prepared by Sielken and Associates Consulting, Inc. 49 p.

45471002 Minnema, D. 2001a. Comparison of the LH Surge in Female Rats Administered Atrazine, Simazine, and Diaminochlorotriazine (DACT) via Oral Gavage for One Month. Covance Laboratories, Vienna, VA. Laboratory report number: 6117-398, March 21, 2001.

45475101 Tierney, D.; Christensen, B. (2001) Atrazine and Total Chloro-triazine (TCT) Concentrations from Community Water Systems (CWS) on Surface Water in 31 Atrazine Major Use States from 1993 through 1999: Final Report: Lab Project Number: 1264-99: 00104. Unpublished study prepared by Syngenta Crop Protection and En-fate, LLC. 12 p.

45475102 Tierney, D.; Christensen, B. (2001) Atrazine and Total Chloro-triazine (TCT) Concentrations for Raw and Finished Water from Community Water Systems (CWS) on Surface Water that Participated in the Syngenta Voluntary Monitoring Programs, 1993-2000: Final Report: Lab Project Number: 1265-99: 00103. Unpublished study prepared by Syngenta Crop Protection and En-fate, LLC. 18 p.

45503101 Sielken, R.; Valdez-Flores, C. (2001) Probabilistic Assessment of Drinking Water and Dietary Exposure Combined: Atrazine: Final Report: Lab Project Number: 2214-01. Unpublished study prepared by Sielken & Associates Consulting, Inc. 379 p.

45503102 Barraj, L.; Walls, C. (2001) Total Chlorotriazine Probabilistic Water Assessment Using Calendex: Lab Project Number: 01-01: 2314-01. Unpublished study prepared by Novigen Sciences, Inc. 84 p.

45517301 Rosenheck, L. (2001) Atrazine Use in Southern Turf: Additional Information For Residential Turf Risk Assessments: Lab Project Number: 1143-01. Unpublished study prepared by Syngenta Crop Protection, Inc. 46 p.

45518401 Delzell, E.; Grizzle, W.; Cheng, H. et al. 2001. A Follow-Up Study of Cancer

Incidence Among Workers in Triazine-Related Operations at the Novartis St. Gabriel Plant: Final Report: Lab Project Number: 2207-01. Unpublished study prepared by University of Alabama at Birmingham. 170 p.

45520101 Minnema, D. 2001b. Pilot Study for the Evaluation of the LH Surge in Female Rats Exposed to Propazine, Atrazine, Cyanazine, and Diaminochlorotriazine (DACT). Covance Laboratories, Vienna, VA. Laboratory report number: 6641-107. August 23, 2001.

45545301 Burnett, D. (1992) Response to the EPA Request for Additional Information for the Aqueous Photolysis of (Carbon 14)-Atrazine Under Natural and Artificial Light: Lab Project Number: 534-92. Unpublished study prepared by Syngenta Crop Protection, Inc. 17 p.

45545302 Gross, T. S. 2001. Determination of potential effects of 10 day neonatal exposure of atrazine on histological and hormonal sex determination in incubated American alligator (*Alligator mississippiensis*) eggs. Prepared by University of Florida, Wildlife Reproductive Toxicology Laboratory, Gainesville, FL, NOVA98,02a; submitted by Syngenta Crop Protection, Inc., Greensboro, NC.

45545303 Gross, T. S. 2001. Determination of potential effects of 10 day neonatal exposure of atrazine on histological and hormonal sex determination in incubated red-eared slider (Pseudemys elegans) eggs. Prepared by University of Florida, Wildlife Reproductive Toxicology Laboratory, Gainesville, FL, NOVA98,02b; submitted by Syngenta Crop Protection, Inc., Greensboro, NC.

45545304 Yokley, R. (2001) Re-Sampling of Domestic Rural Drinking Water Wells: Atrazine: Final Report: Lab Project Number: 1697-01. Unpublished study prepared by Syngenta Crop Protection, Inc. 61 p.

45545305 Cheung, M. (1995) Storage Stability of Atrazine, G-30033, G-28279 and G-28273 In Water Under Refrigerator Storage Conditions: Atrazine: Final Report: Lab Project Number: ABR-94094: 105-91. Unpublished study prepared by Ciba Crop Protection, Inc. 86 p. {OPPTS 860.1380}

45545306 Chen, W.; Wong, A. (2001) Trend of Atrazine Concentrations Monitored in Ohio Lake Erie Tributary Drainage Basins and Community Water Systems (CWS) on Surface Water of Six States: Final Report: Lab Project Number: 1662-01. Unpublished study prepared by Syngenta Crop Protection, Inc. 39 p.

45599702 Brooks, R.; Crouse, K.; Drewing, L. et al. (1995) Benefits/Alternatives Summary for Atrazine and Simazine. Unpublished study prepared by Ciba Crop Protection. 28 p.

45599703 Parshley, T. (1995) Farming Trends and Practices: Atrazine and Simazine. Unpublished study prepared by Ciba Crop Protection. 188 p.

45599704 Parshley, T. (1995) Sustainable Agriculture: The Potential of Non-Chemical Weed Control Methods as Substitutes for Herbicides in U.S. Corn Production. Unpublished study prepared by Ciba Crop Protection. 68 p.

45599705 Parshley, T. (1995) Environmental Benefits of Atrazine and Simazine. Unpublished study prepared by Ciba Crop Protection. 185 p.

45599706 Parshley, T. (1995) The Role of Atrazine and Simazine in Weed Resistance Management. Unpublished study prepared by Ciba Crop Protection. 143 p.

45599707 Parshley, T. (1995) Economic Evaluations: Lost Benefits from Atrazine or Triazine Herbicide Cancellations (U.S.Impact). Unpublished study prepared by Ciba Crop Protection. 60 p.

45599708 Parshley, T. (1995) Economic Review of Past Atrazine and Triazine Herbicide Assessments. Unpublished study prepared by Ciba Crop Protection. 564 p.

45599709 Parshley, T. (1995) Comparative Analysis of Alternatives in Corn. Unpublished study prepared by Ciba Crop Protection. 1056 p.

45599710 Parshley, T. (1996) Comparative Analysis of Alternatives in Sorghum. Unpublished study prepared by Ciba Crop Protection. 459 p.

45599711 Parshley, T. (1995) Benefits of Atrazine in Ecofallow. Unpublished study prepared by Ciba Crop Protection. 613 p.

45599712 Parshley, T. (1995) Benefits of Atrazine and Simazine in Turf and Ornamental Nurseries. Unpublished study prepared by Ciba Crop Protection. 165 p.

45599713 Parshley, T. (1995) Benefits of Atrazine and Simazine in Conifers. Unpublished

study prepared by Ciba Crop Protection. 286 p.

45622302 Giddings, J.; Anderson, T.; Hall, L. et al. (2002) Supplement to "Aquatic Ecological Risk Assessment of Atrazine -A Tiered, Probabilistic Approach." Including Responses to EPA Comments: Final Report: Lab Project Number: 709-00 Unpublished study prepared by Syngenta Crop Protection. 293 p.

45622303 Burnett, G.; Chen, W.; Francis, P. (2002) Response to the EPA Document Entitled "Review of Atrazine PRA": Lab Project Number: 1274-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 67 p.

45622304 Wieser, C. M. and T. Gross. 2002. Determination of potential effects of 20 day exposure of atrazine on endocrine function in adult largemouth bass (*Micropterus salmoides*). Prepared by University of Florida, Wildlife Reproductive Toxicology Laboratory, Gainesville, FL, Wildlife No. NOVA98.02e; submitted by Syngenta Crop Protection, Inc., Greensboro, NC.

45622305 Tierney, D.; Marut, K.; Dando, C.; et al. (2001) Exposure Analysis of Atrazine and Simazine in Community Water Systems in 32 Use States, 1993-2000: Update VII: Final Report: Lab Project Number: 1629-00: 00023. Unpublished Study prepared by En Fate, LLC. 3881 p.

45622306 Sielken, R.; Valdez-Flores, C. (2002) Probabilistic Assessment of Drinking Water and Exposure Combined Using Water Concentration Data Between 1993 and 2001: Final Report: Lab Project Number: 1305-02. Unpublished study prepared by Sielken & Associates Consulting, Inc. 259 p.

45622307 Sielken, R.; Valdez-Flores, C. (2002) Analysis of Time Trends in Total Chlorotriazine Residue Concentrations in Finished Water in Twenty Eight Community Water Supply Systems Between 1993 and 2001: Final Report: Lab Project Number: 1292-02. Unpublished study prepared by Sielken & Associates Consulting, Inc. 163 p.

45622308 Riggs, M.; McMichael, B.; Clayton, A.; et al. (2002) Long-Term (1994-2000) Trend Analysis of Atrazine Concentrations from 127 Midwestern Water Bodies: Lab Project Number: 07779.002: 2694-01. Unpublished study prepared by Research Triangle Institute. 41 p.

45622309 Minnema, D. (2002) 52-Week Toxicity Study of Simazine, Atrazine, and DACT Administered in the Diet to Female Rats: Lab Project Number: 6117-399: 2214-01. Unpublished study prepared by Covance Laboratories Inc. 1199 p.

45622310 Rosenheck, L. (2002) Determination of Dermal Transfer Efficiency of Granular Atrazine Residues From Turf to Dry and Wetted Palms: Final Report: Lab Project Number: 1841-01. Unpublished study prepared by Central California Research Laboratories, Inc. 217 p.

45622311 Rosenheck, L. (2002) Children's Residential Exposure and Risk Assessment to Atrazine Treated Turf Using Hand Press Transfer Efficiency: Lab Project Number: 1255-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 23 p.

45629401 Walls, C.; Scrafford, C.; Barraj, L. (2002) Probabilistic Assessment of Drinking Water and Dietary Exposure Combined Using Calendex Based on Water Concentration Data Between 1993 and 2001: (Chlorotriazine): Lab Project Number: 02-01: 1365-02. Unpublished study prepared by Novigen Sciences, Inc. 298 p

45629402 Sielken, R.; Holden, L. (2002) Comparison of the LH Surge in Female Rats Administered Atrazine, Simazine, or DACT for Six Months: Statistical Analysis of the LH Surge: Supplemental Analysis: Final Report: Lab Project Number: 6117-399: 2214-01. Unpublished study prepared by Sielken & Associates Consulting, Inc. 42 p.

45711302 Breckenridge, C.; Stevens, J.; Pastoor, T. (2002) The Selection of Endpoints, Application of FQPA Uncertainty Factors and Risk Extrapolation at the 99.9th Percentile: Atrazine: Lab Project Number: 1776-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 21 p.

45711304 Hertl, P. (2002) Occurrence of Atrazine in Community Water Systems on Groundwater and Rural Wells in High Atrazine Use Areas: Final Report: Lab Project Number: 1778-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 58 p.

45711305 Breckenridge, C.; Hertl, P. (2002) An Analysis of the Trends in Atrazine Concentration in Raw and Finished Drinking Water in High Atrazine Use Areas: Lab Project Number: 1777-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 43 p.

45711306 Sielken, R.; Valdez-Flores, C. (2002) Analysis of Time Trends in Total Chlorotriazine Residue Concentration in Finished Water in Twenty Eight Community Water Supply Systems Between 1993 and 2001: Final Report

Amendment: Lab Project Number: 1292-02. Unpublished study prepared by Sielken and Associates Consulting, Inc. 41 p.

45711307 Sielken, R.; Valdez-Flores, C. (2002) Effect of Time Trends in Total Chlorotriazine Residue Concentrations on the Probabilistic Assessment of Drinking Water and Dietary Exposure Combined Using Water Concentration Data Between 1993 and 2001: Amendment 2: Final Report: Lab Project Number: 1292-02. Unpublished study prepared by Sielken and Associates Consulting, Inc. 68 p.

45711308 Scrafford, C.; Barraj, D. (2002) Probabilistic Assessment of Exposure to Total Chlorotriazines in Drinking Water Using Calendex: 11 Additional Sites: Lab Project Number: 02-02: 1757-02. Unpublished study prepared by Exponent, Inc. 127 p.

45722401 Ashby, J.; Tinwell, H. (2002) The Effects of Atrazine on the Sexual Maturation of Female Alderley Park-Wistar and Sprague-Dawley Rats: Final Report: Lab Project Number: 1775-02. Unpublished study prepared by Central Toxicology Laboratory. 32 p.

45722700 Acetochlor Registration Partnership (2002) Submission of Environmental Fate Data in Support of the Registration of Acetochlor. Transmittal of 1 Study.

45728401 van Wesenbeeck, I.; Guzman, N.; Fuhrman, J.; et al. (2002) State Ground Water Monitoring Program for Acetochlor and Other Corn Herbicides--Part 9: Final Study Report: Lab Project Number: ARP-GWM-02: 852-577: ACET-95-GW-02. Unpublished study prepared by LFR Levine-Fricke and Monsanto. 121 p.

45730200 Acetochlor Registration Partnership (2002) Submission of Environmental Fate Data in Support of Acetochlor. Transmittal of 1 Study.

45824501 Breckenridge, C.; Hertl, P.; Chen, W.; et al. (2002) A Statistical-Based Rationale for Identifying Vulnerable Community Water Systems (CWSs) Delivering Drinking Water Derived from Surface Water: Atrazine: Draft Report: Lab Project Number: 2204-02. Unpublished study prepared by Syngenta Crop Protection, Inc and Sielken & Associates Consulting, Inc. 195 p.

45904001 Putt, A. (2002) Atrazine Technical SF--Toxicity to Midge (Chironomus tentans) Under Flow-Through Conditions: Final Report: Lab Project Number: 1781-6635: 1500-02. Unpublished study prepared by Springborn Smithers Laboratories. 58 p. {OPPTS 850.1735}

45904002 Putt, A. (2003) Atrazine Technical SF--Toxicity to Midge (Chironomus tentans) During a 10-Day Sediment Exposure: Final Report: Lab Project Number: 1781-6636: 1501-02. Unpublished study prepared by Springborn Smithers

Laboratories. 79 p. {OPPTS 850.1735}

45904003 Chen, W. (2002) Comparison of 90-Day Rolling Averages to Annual Means of Quarterly Sampled Data--A Monte Carlo Simulation: Atrazine: Lab Project Number: 2203-02. Unpublished study prepared by Syngenta Crop Protection, Inc. 42 p.

45904004 Wiliams, W.; Briscoe, V.; Pugsley, R.; et al. (2003) Magnitude, Duration, and Temporal Occurrence Frequency of Atrazine Residues in North American Waters: Atrazine: Final Report: Lab Project Number: WEI 936.30: 1745-02: 936-30. Unpublished study prepared by Waterborne Environmental, Inc. 275 p.

Citations Not Identified by a MRID Number

Anna, K., L. Themistoklis and B. Georgia. 1997. Toxicity of the herbicide atrazine, two of its degradation products and the herbicide metolachor on photosynthetic microorganisms. Fresenius Environ. Bull. 6(9-10):502-508.

Abou-Waly, Hoda, M. M. Abou-Setta, H. N. Nigg and L. L. Mallory. 1991. Growth response of freshwater algae, *Anabaena flos-aquae* and *Selenastrum capricornutum* to Atrazine and hexazinone herbicides. Bull. Environ. Contam. Toxicol. 46:223-229.

Adami H, Colditz G, Mandel J, Trichopoulos D. 2002. An evaluation of the report by Dr. Delzell et al., 2001 on "A follow-up study of cancer incidence among workers in triazine operations at the Novartis St. Gabriel plant". July 2002.

Adgate, J., et al. Measurement of Children's Exposure to Pesticides: Analysis of Urinary Metabolite Levels in a Probability-Based Sample. Environmental Health Perspectives, June 2001. pp 583-590.

Aldercreutz H, Gorbach SL, Goldin BR, Woods MN, Dwyer JT, and Harnalaninen E Estrogen metabolism and excretion in oriental and Caucasian women. J. Nat. Cancer Inst. 86:1076-1082. 1994

Allen, R. Review of five atrazine epidemiology published articles for SAP. DP Barcode D262405. January 14, 2000. US EPA.

Alavanja MCR, Samanic C, Dosemeci M, et al. 2003. Use of agricultural pesticides and prostate cancer risk in the Agricultural Health Study cohort. *Am J Epidemiol* 157:800-814.

Armstrong, D. E., C. Chester and R. F. Harris 1967. Atrazine hydrolysis in soil. Soil Sci. Soc. Amer. Proc. 31:61-66.

Baier, C. H., K. Hurle and J. Kirchhoff. 1985. Datensammlung zur Abschätzung des Gefährdungspotentials von Pflanzenschutzmitteln-Wirkstoffen für Gewässer. Deutscher Verband für Wasserwirtschaft und Kulturbau e. V., Verlag Paul Parey, Hamburg and Berlin, pp. 74-294.

Baker, D. B. 1987. Lake Eire Agro-Ecosystem Program: Sediment, nutrient, and pesticide export studies. US EPA, Great Lakes National Program Office, Chicago, IL.

Baker, D. B., K. A. Kieger, R. P. Richards and J. W. Kramer. 1985. Effects of intensive agricultural land use on regional water quality in northwestern Ohio, p. 201-207. *In*: US EPA. Perspectives on nonpoint source pollution, proceedings of a national conference, Kansas City,

MO. EPA-440/5-85-001.

Baker, D. B., K. A. Krieger and J. V. Setzler. 1981. The concentrations and transport of pesticides in northwestern Ohio rivers – 1981. US Army Corps of Engineers, Tech. Rep. Series, No. 19, Buffalo District, Buffalo, NY.

Bakke, J., Robbins, J., and Feil, V. 1967. Metabolism of 2-chloro-4, 6-bis(isopropylamino)-s-triazine (propazine) and 2-methoxy-4, 4-bis(isopropylamino)-2-triazine (prometone) in the rat. Balance study and urinary metabolite separation. J. Agric. Food Chem. 15: 628-631.

Bakke, J. Larson, J.D., and Price, C.E. 1972. Metabolism of atrazine and 2-hydroxyatrazine by the rat. J. Agric. Food Chem. 20: 602-607.

Barriuso, E., R. Calvet and S. Houot. 1995. Field study of the effect of sewage sludge application on atrazine behaviour in soil. Internat. J. Environ. Anal. Chem. 59(2-4):107-123.

Basta, N. T., R. L Huhnke and J. H. Stiegler. 1997. Atrazine runoff from conservation tillage systems: A simulated rainfall study. J. Soil Water Conserv. 52(1):44-49.

Beynon, K. I., G. Stoydin and A. N. Wright. 1972. A comparison of the breakdown of the triazine herbicides cyanazine, atrazine and simazine in soils and in maize. Pestic. Biochem. Physiol. 2:153-161.

Blondell, J., and Spann, M. Review of Atrazine Incident Reports. DP Barcode D270014. October 31, 2000. US EPA.

Bogdanffy, M.S., O'Connor, J., Hansen, J.F., Gaddamidi, V., Van Pelt, S., Green, J., and Cook, J.C. 2000. Chronic toxicity and oncogenicity bioassay in rats with the chloro-s-triazine herbicide cyanazine. J Toxicol Environ Health. 60: 567-586.

Bond, C. E. 1966. Progress report on aquatic weed research. Projects 773 and 294. Dept. Fish. Wildlife, Oreg. Agr. Exp. Sta., Oreg. State Univ.

Borisover, M. D. and E. R. Graber. 1997. Competitive sorption between atrazine and other organic compounds in soils and model sorbents. Comment. Environ. Sci. Technol. 31(5):1577-1578. [Xing, B. S., J. J. Pignatello and B. Gigliotti. 1997. Response. Environ. Sci. Technol. 31(5):1578-1580.

Boundy-Mills, K. L., M. L. deSouza, R. T. Mandelbaum, L. P. Wackett, and M. J. Sadowsky. 1997. The ATZB gene of *Pseudomonas* sp. strain ADP encodes the second enzyme of a novel atrazine degradation pathway. Appl. Environ. Microbiol. 63(3):916- .

Bouquard, C., J. Quazzani, J. C. Prome, Y. Michel-Briand and P. Plesiat. 1997. Dechlorination

of atrazine by a *Rhizobium* sp. isolate. Appl. Environ. Microbiol. 63(3):862-916.

Bradlow, H.l., Davis, D.L., Lin, g., Sepkovic, D. and Tiwari, R. 1995. Effects of pesticides on the ratio of 16"/2-hydroxy estrone: a biologic marker of breast cancer risk. *Environ.. Health Persp*.: Vol 103, Supplement 7: 147-150.

Bradway, D. E., and Moseman R. F. 1982. Determination of urinary residue levels of the N-dealkyl metabolites of triazine herbicides. J. Agric. Food Chem. 30: 244-247.

Braun, F., W. Schűssler and R. Wehrle. 1987. Organische Schadstoffe, Polychlorbiphenyle (PCB) und Pestizide im Kreislauf des Wassers. Bilanzierung und Bewertung. Report of the Bavarian Water Research Institute, Munich, pp. 18-27.

Breckenridge CB. 2002. Summary of information on potential atrazine exposure for 12 out of 17 prostate cancer cases reported by Delzell et al. 2001. Nov. 1, 2002. [Confidential report not available to public]

Breckenridge C. Jan. 16th and 17th, 2003. St. Gabriel Workforce: male Syngenta Employees excluding contract manufacturers. Two Emails to Jerry Blondell with Attached Table.

Brooke, L. 1990. University of Wisconsin-Superior, Superior, WI. (Memorandum to R. L. Spehar, US. EPA, Duluth, MN. January 30).

Brown LM, Blair A, Gibson R, et al. 1990. Pesticide exposures and other agricultural risk factors for leukemia among men in Iowa and Minnesota. *Cancer Research* 50:6585-6591.

Brown LM, Burmeister LF Everett GD, et al. 1993. Pesticide exposures and multiple myeloma in Iowa men. *Cancer Causes Control* 4:153-156.

Buchholz, B. A., Fultz, E., Haack, K. W., Vogel, J. S., Gilman, S. D., Gee, S. J., Hammock, B. D., Hui, X., Wester, R. C., and Maibach, H. I. 1999. HPLC-accelerator MS measurement of atrazine metabolites in human urine after dermal exposure. Anal. Chem. 71: 3519-3525.

Burken, J. G. and J. L. Schnoor. 1997. Uptake and metabolism of atrazine by popular trees. Environ. Sci. Technol. 31(5):1399-1407.

Burrell, R. E., W. E. Inniss and C. I. Mayfield. 1985. Detection and analysis of interactions between atrazine and sodium pentachlorophenate with single and multiple algal-bacterial populations. Arch. Environ. Contam. Toxicol. 14:167-176.

Butler, G. L., T. R. Deason and J. C. O'Kelley. 1975. The effect of atrazine, 2, 4-D, methoxychlor, carbaryl and diazinon on the growth of planktonic algae. Br. Phycol. J. 10:371-376.

Cantor KP, Blair A, Everett G, et al. 1992. Pesticides and other agricultural risk factors for non-Hodgkin's lymphoma among men in Iowa and Minnesota. *Cancer Research* 52:2447-2455.

Capel, P. D., M. Lin and P. J. Wotzka. 1994. Pesticides in rains in Minnesota 1991-1993: An interim report. Minnesota Dept. Agr., Agronomy Serv. Div., p. 26. (Additional pages on 1994 data).

Carney, E. C. 1983. The effects of atrazine and grass carp on freshwater communities. Thesis Univ. of Kansas, Lawrence, Kansas, USA.

Caux, Pierre-Yves, Lucie Menard, and Robert A. Kent. 1996. Comparative study of the effects of MCPA, butylate, atrazine, and cyanazine on *Selenastrum capricornutum*. Environ. Poll. 92(2):219-225.

Celis, R., J. Cornejo, M. C. Hermosin and W. C. Koskinen. 1997. Sorption-desorption of atrazine and simazine by model soil colloidal components. Soil Sci. Soc. Amer. J. 61(2):436-444.

Chen, W. and R. J. Wagenet. 1997. Description of atrazine transport in soil with heterogeneous nonequilibrium sorption. Soil Sci. Soc. Amer. J. 61(2):360-372.

Clothier, J.M. 1999. Dermal Transfer Efficiency of Pesticides from Turf Grass to Dry and Wetted Palms. Prepared for U.S. EPA, National Exposure Research Laboratory, Research Triangle Park, N.C.

Close, M. E., L. Pang, J. P. C. Watt and K. W. Vincent. 1998. Leaching of picloram, atrazine and simazine through two New Zealand soils. Geoderma 84(1-3):45-65.

Cohen B, Wiles R, and Bondoc, E. 1995. Weed Killers by the Glass. August, 1995. Submitted by Environmental Working Group.

Cohen, S. 1997. Atrazine in Wisconsin ground water: An evaluation of management control. Ground water Monit. Remed. 17(3):60-63.

Conner, K., Howell, J., Chen, I., Liu, H., Berhane, K., Sciarretta, C., Safe, S., and Zacharewski, T. 1996. Failure of chloro-S-triazine-derived compounds to induce estrogen receptor-mediated responses in vivo and in vitro MRID 43934403. Fundam. Appl. Toxicol. 30, 93-101.

Cook, J. 1989. Ninety-Day Feeding Study with INL5300-20: Effect on Estrous Cycle. Haskell Laboratory, Report No. 112-89: Medical Research Project No. 8435-001. MRID 41181901.

Cooper, R. L., Parrish, M. B., McElroy, W. K., Rehnberg, G. L., Hein, J. F., Goldman, J. M., Stoker, T. E. and Tyrey, T. E. 1995. Effect of atrazine on the hormonal control of the ovary.

The Toxicologist 15(1): 294.

Cooper, R. L., Stoker, T. E., Goldman, J. M., Hein, J. F., and Tyrey, L. 1996. Atrazine disrupts hypothalamic control of pituitary-ovarian function. The Toxicologist 30: 66.

Cooper, R.L., Stoker, T.E., Goldman, J.M., Parrish, M.B., Tyrey, L. (1996) Effect of atrazine on ovarian function in the rat. Reprod Toxicol 1996 Jul-Aug;10(4):257-64.

Cooper, R.L., Stoker, T.E., McElroy, W.K., and Hein, J. 1998. Atrazine (ATR) disrupts hypothalamic catecholamines and pituitary function. *The Toxicologist*. 42:160.

Cooper, R.L., Stoker, T.E., Tyrey, L., Goldman, J.M., and McElroy, W.K. 2000. Atrazine disrupts the hypothalamic control of pituitary-ovarian function. *Tox. Sci*. 53: 297-307

Cooper, R.L. Unpublished data. The Effects of Propazine on LH surge in Female Rats. US EPA/NHEERL/RTD

Correll, D. L., J. W. Pierce and T. L. Wu. 1978. Herbicides and submerged plants in Chesapeake Bay, p. 858-877. *In*: Proc. Symp. Tech., Environ. Socioecon. And Regul. Aspects Coastal Zone Manag., ASCE, San Francisco, Calif.

Crain, D. A., L. J., Guillette, Jr., A. A. Rooney and D. B. Pickford. 1997. Alterations in steroidogenesis in alligators (*Alligator mississippiensis*) exposed to naturally and experimentally to environmental contaminants. Environ. Health Perspectives 105(5):528-533.

Crosignani P, Berrino F. 1994. Re: "Role of the herbicide atrazine in the development of non_Hodgkin's lymphoma" by S Hoar Zahm, DD Weisburger, KP Kantor, FF Holmes, A Blair. *Scand J Work Environ Health*. 1993;19:108-14. *Scand J Work Environ Health* 20:223-226.

Crosignani P, Donna A, Berrino F. 1990. Authors reply. *Scand J Work Environ Health*.16:446-447.

Cummings, A. M., Rhodes, B.E., and Cooper, R.L. 2000. Effect of Atrazine on Implantation and Early Pregnancy in Four Strains of Rats. *Tox. Sci.* Nov. 58: 135-143.

Das, P.C., McElroy, W.K., Cooper, R.L. 2000. Differential modulation of catecholamines by chlorotriazine herbicides in pheochromocytoma (PC12) cells in vitro. Tox. Sci. Aug; 56(2): 324-31.

Dao, T. H., T. L. Lavy and R. C. Sorenson. 1979. Atrazine degradation and residue distribution in soil. Soil Sci. Soc. Amer. J. 43:1129-1134.

Davis, D. E., J. D. Weete, C. G. P. Pillai, F. G. Plumley, J. T. McEnerney, J. W. Everest, B. Truelove and A. M. Diner. 1979. Atrazine fate and effects in a salt marsh. U.S. Environmental Protection Agency EPA-600/3-79-111. 84 p.

Davis DL, Bradlow LH, Wolff M, Woodruff T, Hoel DG, and Anton-Culver H. 1993. Medical Hypothesis: Xenoestrogens as preventable causes of breast cancer. Environ. Health Perspect. 101:372-277.

Day, G. M., B. T. Hart, I. D. McKelvie and R. Beckett. 1997. Influence of natural organic matter on the sorption of biocides onto goethite. 1. gamma-BHC and atrazine. Environ. Tech. 18(8):769-781.

DiCorcia, A., C. Crescenzi, E. Guerriero and R. Samperi. 1997. Ultratrace determination of atrazine and its six major degradation products in water by solid-phase extraction and liquid chromatography electrospray mass spectrometry. Environ. Sci. Technol. 31(6):1658-1664.

Dodson, S. I., C. M. Merritt, J. Shannahan, and C. M. Shults. 1999. Low exposure concentrations of atrazine increase male production in *Daphnia pulicaria*. Environ. Toxicol. Chem. 18(7):1568-1573.

Donna A, Crosignani P, Robutti F, et al. 1989. Triazine herbicides and ovarian epithelial neoplasms. *Scan J Work Environ Health* 15:47-53.

Donna A, Crosignani P, Robutti F, et al. 1989. Triazine herbicides and ovarian epithelial neoplasms. *Scan J Work Environ Health* 15:47-53.

Doulia, D., A. Hourdakis, F. Rigas and E. Anagnostopoulos. 1997. Removal of atrazine from water by use of nonionic polymeric resins. J. Environ. Sci. Health A-Environ. 32(9-10):2635-2657.

Douset, S., C. Mouvet and M. Schiavon. 1997. Degradation of [C-14] terbuthylazine and [C-14] atrazine in laboratory soil microcosms. Pest. Sci. 49(1):9-17.

Dowdy, D. L. and T. E. McKone. 1997. Predicting plant uptake of organic chemicals from soil or air using octanol/water and octanol/air partition ratios and a molecular connectivity index. Environ. Toxicol. Chem. 16(12):2448-2456.

El Jay, A. 1996. Effects of organic solvents and solvent-atrazine interactions on two algae, *Chorella vulgaris* and *Selenastrum capricornutum*. Arch. Environ. Contam. Toxicol. 31(1):84-91.

Eldridge, J.C., Wetzel, L.T., Stevens, J.T., Simpins, J.W. 1999. The mammary tumor response in triazine-treated female rats: A threshold-mediated interaction with strain and species-specific

reproductive senescence. *Steroids* 64:672-678.

Farooqui, M. A., A. V. Rao, T. Jayasree and A. Sadanandam. 1997. Induction of atrazine resistance and somatic embryogensis in *Solanum melongena*. Theor. Appl. Genet. 95(4):702-706.

Fawley, M. W. 1984. Effects of light intensity and temperature interactions on growth characteristics of *Phaeodactylum tricornutum* (Bacillariophyceae). J. Phycol. 20:67-72.

Fischer-Scherl, T., A. Veeser, R. W. Hoffmann, C. Kűhnhauser, R.-D. Negele and T. Ewringmann. 1991. Morphological effects of acute and chronic atrazine exposure in rain bow trout (*Oncorhynchus mykiss*). Arch. Environ. Contam. Toxicol. 20:454-461.

Forget, J., J. F. Pavillon, M. R. Menasria, and G. Bocquene. Ecotox. Environ. Safety 40(3):239-

Frank, R., H. E. Braun, M. V. Holdrinet, G. J. Sirons and B. D. Ripley. 1982. Agriculture and water quality in the Canadian Great Lakes Basin. V. Pesticide use in 11 agricultural watersheds and presence in stream water 1975-1977. J. Environ. Qual. 11:497-505.

Frank, R. and G. J. Sirons. 1979. Atrazine: Its use in corn production and its loss to stream waters in southern Ontario, 1975-1977. Sci. Total Environ. 12:223-239.

Frank, R., G. J. Sirons, R. L. Thomas and K. McMillan. 1979. Triazine residues in suspended solids (1974-1976) and water (1977) from the mouths of Canadian streams flowing into the Great Lakes. J. Great Lakes Res. 5:131-138.

Frear, D. E. H. and J. E. Boyd. 1967. Use of *Daphnia magna* for the microbioassay of pesticides. I. Development of standardized techniques for rearing *Daphnia* and preparation of dosage-mortality curves for pesticides. J. Econ. Entomol. 60(5):1228-1236. (MRID # 00002875).

Fremanich, K. J., W. L. Bland, B. Lowery and K McSweeney. 1996. Irrigation and tillage effects on atrazine and metabolite leaching from a sandy soil. J. Environ. Qual. 25(6):1291-1300.

Gaggi, C., G. Sbrilli, A. M. H. El Naby, M. Bucci, M. Duccini and E. Bacci. 1995. Toxicity and hazard ranking of s-triazine herbicides using Microtox, two green algal species and a marine crustacean. Environ. Toxicol. Chem. 14(6):1065-1071.

Gascon, J., G. Durand and D. Barcelo. 1995. Pilot survey for atrazine and total chlorotriazines in estuarine waters using magnetic particle based immunoassay and gas chromatography nitrogen/phosphorus detection. Environ. Sci. Technol. 29(6):1151-1557.

Gaynor, J. D., D. C. MacTavish and W. I. Findlay. 1995. Organic chemicals in the environment: Atrazine and metolachlor loss in surface and subsurface runoff from three tillage treatments in corn. J. Environ. Qual. 24:246-256.

Gaynor, J. D., D. C. MacTavish and A. B. Labaj. 1998. Atrazine and metolachlor residues in Brookston CL following conventional and conservation tillage culture. Chemosphere 36(15):3199-3211.

Gianturco, F., C. M. Chiodaroli, I. R. Bellobono, M. L. Raimondi, A. Moroni and B. Gawlik. 1997. Pilot-plant photomineralization of atrazine in aqueous solution, by photocatalytic membranes immobilising titanium dioxide and promoting photocatalysts. Fresenius Environ. Bull. 6(7-8):461-469.

Giddings, J. M. and L. W. Hall, Jr. 1998. The aquatic ecotoxicology of triazine herbicides. Amer. Chem. Soc. Symp. Ser. 683:347-356.

Gilliom, R. J., J. E. Barbash, D. W. Kolpin and S. J. Larson. 1999. Testing water quality for pesticide pollution. Environ. Sci. Technol. 33:164-169.

Gimenez-Espinosa, R., E. Romera, M. Tena and R. DePrado. 1996. Fate of atrazine in treated and pristine accessions of three *Setaria* species. Pest. Biochem. Physiol. 56(3):196-208.

Glotfelty, D. E., A. W. Taylor, A. R. Isensee, J. Jersey and S. Glenn. 1984. Atrazine and simazine movement to Wye River estuary. J. Environ. Qual. 13:115-121.

Gruessner, B. 1994. Patterns of herbicide contamination in Vermont streams and the effect of atrazine on communities of stream organisms. M. S. Thesis, Univ. Vermont, Burlington, VT, USA.

Guasch, H., N. Ivorra, V. Lehmann, M. Paulsson, M. Real and S. Sabater. 1998. Community composition and sensitivity of periphyton to atrazine in flowing waters: The role of environmental factors. J. Appl. Phycology 10(2):203-215.

Guasch, H., I. Munoz, N. Roses and S. Sabater. 1997. Changes in atrazine toxicity throughout sucession of stream periphyton communities. J. Appl. Phycology 9(2):137-147.

Hall, J. K., M. Pawlus and E. R. Higgins. 1972. Losses of atrazine in runoff water and soil sediment. J. Environ. Qual. 1:172-176.

Hall, J. K. 1974. Erosional losses of s-triazine herbicides. J. Environ. Qual. 3:174-180.

Hall, L. W., Jr. and R. D. Anderson. 1991. A review of estuarine aquatic toxicity data for the development of aquatic life criteria for atrazine in Chesapeake Bay. Maryland Dept. of Environ.,

Baltimore, Maryland. 60 p.

Hall, L. W., Jr., M. C. Ziegenfuss, and R. D. Anderson. 1994. The influence of salinity on the chronic toxicity of atrazine to an estuarine copepod: Filling a data need for development of an estuarine chronic criterion. Report. Wye Research and Education Center, University of Maryland, Queenstown, MD.

Hall, L. W., Jr., M. C. Ziegenfuss, R. D. Anderson and D. P. Tierney. 1995. The influence of salinity on the chronic toxicity of atrazine to an estuarine copepod: Implications for development of an estuarine chronic criterion. Arch. Environ. Contam. Toxicol. 28:344-348.

Hannan, Patrick J. 1995. A novel detection scheme for herbicidal residues. Environ. Toxicol. Chem. 14(5):775-780.

Hanioka, N., Jinno, H., Tanaka-Kagawa, T., Nishimura, T., and Ando, M. 1999. In vitro metabolism of chlorotriazines: characterization of simazine, atrazine, and propazine metabolism using liver microsomes from rats treated with various cytochrome P450 inducers. Toxicol. Appl. Pharmacol. 156: 195-205.

Hapeman, C. J., J. S. Karns and D. R. Shelton. 1995. Total mineralization of aqueous atrazine in the presence of ammonium nitrate using ozone and *Klebsiella terragena* (strain DRS-1): Mechanistic considerations for pilot scale disposal. J. Agr. Food Chem. 43(5):1383-1392.

Harris, C. I. 1967. Fate of 2-chloro-s-triazine herbicides in soil. J. Agric. Food Chem. 15(1):157-162. Also In: Unpublished submission received July 17, 1978 under 100-541; submitted by Ciba-Geigy Corp., Greensboro, NC.

Hayar, S., C. Munier-Lamy, T. Chone and M. Schiavon. 1997. Physico-chemical versus microbial release of C-14-atrazine bound residues from a loamy clay soil incubated in laboratory microcosms. Chemosphere 34(12):2683-2699.

Hequet, V., C. Gonzalez and P. LeCloirec. 1997. Methodological approach for the hydrolysis degradation of atrazine. Intern. J. Environ. Anal. Chem. 66(4):253-269.

Hoar SK, Blair A, Holmes FF, et al. 1986. Agricultural herbicide use and risk of lymphoma and soft-tissue sarcoma. *JAMA*. 256:1141-7.

Hoar SK, Blair A, Holmes FF, et al. 1985. Herbicides and colon cancer. *Lancet*. 1(8440):1277-8.

Hopenhayn-Rich C, Stump ML, Browning SR. 2002. Regional assessment of atrazine exposure and incidence of breast and ovarian cancers in Kentucky. *Arch Environ Contam Toxicol* 42:127-136.

Hörmann, W. D., J. C. Tournayre and H. Egli. 1979. Triazine herbicides residues in central European streams. Pest. Monit. J. 13:128-131.

Horswell, J., A. Hodge and K. Killham. 1997. Influence of plant carbon on the mineralisation of atrazine residues in soils. Chemophere 34(8):1739-1753.

Hottenstein, C. S., F. M. Rubio, D. P. Herzog, J. R. Fleeker and T. S. Lawruk. 1996. Determination of trace atrazine levels in water by a sensitive magnetic particle-based enzyme immunoassay. J. Agr. Food Chem. 44(11):3576.

Isensee, A. R. 1976. Variability of aquatic model ecosystem-derived data. Internat. J. Environ. Stud. 10:35-41.

Isensee, A. R. and A. M. Sadeghi. 1997. Interactions of tillage and rainfall on atrazine leaching under field and laboratory conditions. Chemosphere 34(12):2715-2725.

Issa, S., M. Wood, L. Pussemier, V. Vanderheyden, C. Douka, S. Vizantinopoulos, Z. Gyori, M. Borbely and J. Katai. 1997. Potentail dissipation of atrazine in the soil unsaturated zone: A comparative study in four European counties. 50(2):99-104.

Jenks, B. M., F. W. Roeth and A. R. Martin. 1997. Comparison of an enzyme immunoassay with gas chromatography for atrazine determination in water and soil. Bull. Environ. Contam. Toxicol. 58(5):696-704.

Johnson, R. M. and A. B. Pepperman. 1998. Release of atrazine and alachor from clay-oxamide controlled-release formulations. Pesticide Sci. 53(3):233-241.

Johnson, R. M., A. B. Pepperman and H. M. Selim. 1998. Field mobility and persistence of alginate controlled release formulations of atrazine. Soil Sci. 163(1):46-53.

Jones, R. O. 1962. Tolerance of the fry of common warm-water fishes to some chemicals employed in fish culture, 436-445. Proc. 16th Ann. Conf. Southeast. Assoc. Game Fish Comm.

Jones, T. W., W. M. Kemp, P. S. Estes and J. C. Stevenson. 1982a. Atrazine uptake, phytotoxicity, release, and short-term recovery for the submersed aquatic plant, *Potamogeton perfoliatus*. Report to U.S. Environmental Protection Agency, Annapolis. NTIS, Springfield, VA.

Jones, T. W., W. M. Kemp, J. C. Stevenson and J. C. Means. 1982b. Degradation of atrazine in estuarine water/sediment systems and soils. J. Environ. Qual. 11:632-638.

Jop, K. M. 1991. (Atrazine technical) - Acute toxicity to (*Ceriodaphnia dubia*) under static conditions. SLI Report No. 91-2-3665. Springborn Laboratories, Inc., Wareham, MA.

Jop, K. M. 1991. (Atrazine technical) - Acute toxicity to fathead minnow (*Pimephales promelas*) under static conditions. SLI Report No. 91-1-3630. Springborn Laboratories, Inc., Wareham, MA.

Jop, K. M. 1991. (Atrazine technical) - Acute toxicity to fathead minnow (*Pimephales promelas*) under static conditions. SLI Report No. 91-2-3666. Springborn Laboratories, Inc., Wareham, MA.

Juracek, K. E. and E. M. Thurman. 1997. Assessing aquifer contamination risk using immunoassay: Trace analysis of atrazine in unsaturated zone sediments. J. Environ. Qual. 26(4):1080-1090.

Kadoum, A. M. and D. E. Mock. 1978. Herbicide and insecticide residues in tailwater pits: Water and pit bottom soil from irrigated corn and sorghum fields. J. Agric. Food Chem. 26:45-50.

Kanwar, R. S., J. L. Baker and P. Singh. 1997. Use of chloride and fluorescent dye as tracers in measuring nitrate and atrazine transport through soil profile under laboratory conditions. J. Environ. Sci. Health Part A. 32(7):1907-1921.

Kaushik, N. K., K. R. Solomon, G. Stephenson and K. Day. 1985. Assessment of sublethal effects of atrazine on zooplankton. Canada Tech. Rep. Fish. Aquat. Sci. 1368:377-379.

Keck, G., C. Bostvironnois and E. Braquet. 1991. Veterinary toxicology of a model-herbicide: Atrazine. Rev. Med. Vet. 142(6):481-489.

Kelleher T and Pinto K. Ohio EPA Pesticide Special Study: First Year Summary. May 10, 1996.

Kemp, W. M., J. C. Means, T. W. Jones and J. C. Stevenson. 1982. Herbicides in the Chesapeake Bay and their effect on submerged aquatic vegetation, p. 503-567. *In*: Chesapeake Bay Program, Tech. studies, a synthesis. Part IV. US EPA, Washington, DC.

Kettles MA, Browning SR, Prince TS, Horstman SW. 1997. Triazine herbicide exposure and breast cancer incidence: an ecologic study of Kentucky counties. *Environmental Health Perspectives* 105:1222-1227.

Khan, S. U. and P. B. Marriage. 1977. Residues of atrazine and its metabolites in an orchard soil and their uptake by oat plants. J. Agric. Food Chem. 25:1408-1413.

Khan, S. U. and W. J. Saidak. 1981. Residues of atrazine and its metabolites after prolonged usage. Weed Res. 21(1):9-13.

Klassen, H. E. and A. M. Kadoum. 1979. Distribution and retention of atrazine and carbofuran in farm pond ecosystems. Arch. Environ. Contam. Toxicol. 8:345-353.

Kolpin, D. W. and S. J. Kalkoff. 1993. Atrazine degradation in a small stream in Iowa. Environ. Sci. Technol. 27:134-139.

Korte, F. and H. Greim. 1981. Überprüfung der Durchführbarkeit von Prüfungsvorschriften und der Aussagekraft der Grundprüfung des Ersten Chemikaliengestzes. Bericht der GSF München, Institut für ökologische Chemie und Institut für Biochemie und Toxikologie, Abteilung Toxikologie. An das Umweltbundesamt Berlin, Forschungsbericht Nr. 107 04 006/1.

Kruger, E. L., B. L. Zhu and J. R. Coats. 1996. Relative mobilities of atrazine, five atrazine degradates, metolachlor, and simazine in soils of Iowa. Environ. Toxicolog. Chem. 15(5):691-696.

Kumar, A., R. S. Kanwar and L. R. Ahuja. 1998. Evaluation of preferential flow component of RZWQM in simulating water and atrazine transport to subsurface drains. Trans. ASAE 41(3):627-639.

Laws, S.C., Ferrell, J.M., Stoker, T.E., Schmid, J., and Cooper, R.L. (2000).The effect of atrazine on puberty in female wistar rats: an evaluation in the protocol for the assessment of pubuertal development and thyroid function. *Tox. Sci*. In Press.

Laws, S.C., Ferrell, J.M., Stoker, T.E., Cooper, R.L. 2002. Pubertal Development in Female Wistar Rats Following Exposure to Propazine and Atrazine Metabolites, Diamino-S-Chlorotriazine and Hydroxyatrazine. Abstract. Society of Toxicology 2002.

Li, J. H., C. H. Langford and D. S. Gamble. 1996. Atrazine sorption by a mineral soil: Effects of soil size fractions and temperature. J. Agr. Food Chem. 44(11):3680-3685.

Li, J. H., C. H. Langford and D. S. Gamble. 1996. Atrazine sorption by a mineral soil: Processes of labile and nonlabile uptake. J. Agr. Food Chem. 44(11):3672-3680.

Liang, T. T. and E. P. Lichtenstein. 1975. Synergism of insecticides by herbicides: Effect of environmental factors. Science

Lorber, M., K. Johnson, B. Kross, P. Pinsky, L. Burmeister, M. Thurman, A. Wilkins and G. Hallberg. 1997. A study of the temporal variability of atrazine in private well water. 1. Study design, implementation, and database development. Environ. Monit. Assess. 47(2):175-197.

Ma, L. W. and H. M. Selim. 1997. Evaluation of nonequilibrium models for predicting atrazine transport in soils. Soil Sci. Soc. Amner. J. 61(5):1299-1308.

MacIntosh, D., Needham, L., Hammerstrom, K., et al. A Longitudinal Investigation of Selected Pesticide Metabolites in Urine. Journal of Exposure Analysis and Environmental Epidemiology, September/October 1999. pp 494-501.

MacLennan PA, Delzell E, Sathiakumar N, et al. 2002. Cancer incidence among triazine herbicide manufacturing workers. *J Occup Environ Med.* 44:1048-1058.

MacLennan PA, Delzell E, Sathiakumar N, et al. 2003. Mortality among triazine herbicide manufacturing workers. *J Toxicol Environ Health A* 66(6):501-517.

Marchini, S., L. Passerini, D. Cesareo and M. L. Tosato. 1988. Herbicidal trazines: Acute toxicity on *Daphnia*, fish, and plants and analysis of its relationships with structural factors. Ecotoxicol. Environ. Safety 16:148-157.

Masse, L., N. K. Patni, P. Y. Jui and B. S. Clegg. 1998. Groundwater quality under conventional and no tillage: II. Atrazine, deethylatrazine, and metolachlor. J. Environ. Qual. 27(4):877-884.

Matthem, R., S. Nelson and S. U. Khan. 1996. Transformation products distribution of atrazine in corn plants treated with radiolabelled herbicide. Chemosphere 33(12):2395-2403.

Mayasich, J. M., E. P. Karlander and D. E. Terlizzi, Jr. 1986. Growth responses of *Nannochloris oculata* Droop and *Phaeodactylum tricornutum* Bohlin to the herbicide atrazine as influenced by light intensity and temperature. Aquatic Toxicol. 8:175-184.

Mayasich, J. M., E. P. Karlander and D. E. Terlizzi, Jr. 1987. Growth responses of *Nannochloris oculata* Droop and *Phaeodactylum tricornutum* Bohlin to the herbicide atrazine as influenced by light intensity and temperature in unialgal and bialgal assemblage. Aquatic Toxicol. 8:175-184.

McDougal A, Wilson C, and Safe S. Induction of estradiol 2-hydroxylase activity in MCF-7 human breast cancer cell by pesticides and carcinogens. Environ. Toxicol. Pharmacol. 3: 195-199. 1997

McDougal A, and Safe S Induction of 16alpha-/2-hydroxy estrone metabolite ratios in MCF-7 cells by pesticides , carcinogens and antiestrogens does not predict mammary carcinogens Environ Health Perspect. 106:203-206. 1998

Mills PK. 1998. Correlation analysis of pesticide use data and cancer incidence rates in California counties. *Arch Environ Health*. 53:410-3.

Minnema, D. 2002. 52-week Toxicity Study of Simazine, Atrazine, and DACT Administered in the Diet to Female Rats. Covance Laboratories, Vienna, VA. Laboratory report number: 6117-399. Draft Report.

Moody, J. A. and D. A. Goolsby. 1993. Spatial variability of triazine herbicides in the lower Mississippi River. Environ. Sci. Technol. 27:2120-2126.

Moreau, C. and C. Mouvet. 1997. Sorption and desorption of atrazine, deethylatrazine, and hydroxyatrazine by soil and aquifer solids. J. Environ. Qual. 26(2):416-424.

Moreau-Kervevan, C. and C. Mouvet. 1998. Adsorption and desorption of atrazine, deethylatrazine, and hydroxyatrazine by soil components. J. Environ. Qual. 27(1):46-54.

Mouvet, C., L. Amalric, S. Broussard, G. Lang, A. Brecht and G. Gauglitz. 1996. Reflectometric interference spectroscopy for the determination of atrazine in natural water samples. Environ. Sci. Technol. 30(6):1846-1852.

Muir, D. C. G., J. Y. Yoo and B. E. Baker. 1978. Residues of atrazine and n-deethylated atrazine in water from five agricultural watersheds in Quebec. Arch. Environ. Contam. Toxicol. 7:221-235.

Nandi, S., Guzman, R. C., and Yang, J. 1995. Hormones and mammary carcinogenesis in mice, rats, and humans: a unifying hypothesis. *PNAS*: 25;92(9) 3650-7.

Narotsky M. G., Best, D.S., Guidici, D. L., and Cooper, R.L. (2000). Strain comparisons of atrazine-induced pregnancy loss in the rat. *Repro Toxicol.* In Press.

Narotsky, M. G., Best, D. S., Guidici, D. L., and Cooper, R. L. 2001. Strain comparisons of atrazine-induced pregnancy loss in the rat. Reprod. Toxicol. 15, 61-69.

Narotsky, M. G., Best, D. S., Bielmeier, S. R., Spangler, S.A., and Cooper, R. L. 2002. Pregnancy Loss and Delayed Parturition Caused by Atrazine and its Metabolites in F344 Rats. Abstract. Society for the Study of Reproduction.

Natural Resources Defense Council. 2003. Comments on the Atrazine IRED. May 5, 2003.

Ng, H. Y. F. and S. B. Clegg. 1997. Atrazine and metolachlor losses in runoff events from an agricultural watershed: The importance of runoff components. Sci. Total Environ. 193(3):215-229.

Noblet, J. A., L. A. Smith and I. H. Suffet. 1996. Influence of natural dissolved organic matter, temperature, and mixing on the abiotic hydrolysis of triazine and organophosphate pesticides. J. Agr. Food Chem. 44(1):3685-3694.

Novak, J. M., T. B. Moorman and C. A. Cambardella. 1997. Atrazine sorption at the field scale in relation to soils and landscape position. J. Environ. Qual. 26(5):1271-1277.

Nsabimana, E., J. Bohatier, A. Belan, D. Pepin and L. Charles. 1996. Effects of the herbicide atrazine on the activated sludge process: Microbiology and functional views. Chemosphere 33(3):479-495.

O'Kelly, J. C and T. R. Deason. 1976. Degradation of pesticides by algae. US EPA, Athens, GA. EPA-600/3-76-022. 41 pp.

Pape-Lindstrom, Pamela A. and Michael J. Lydy. 1997. Synergistic toxicity of atrazine and organophosphate insecticides contravenes the response addition mixture model. Environ. Toxicol. Chem. 16(11):2415-2420.

Papilloud, S., W. Haerdi, S. Chiron and D. Barcelo. 1996. Supercritical fluid extraction of atrazine and polar metabolites from sediments followed by confirmation with LC-MS. Environ. Sci. Technol. 30(6):1822-1827.

Parshley, Thomas J. 1990. Letter: Atrazine technical, EPA Reg. No. 100-529: Additional information on adsorption/ desorption data: Soil series names. 3 p. Submitted by Ciba-Geigy Corp., Greensboro, NC.

Parshley, T. Report of Potential Adverse Effects of Atrazine. FIFRA Section 6(a)(2) Letter from Tom Parshley to Office of Pesticide Programs, September 14, 2001.

Petit, F., Le Goff, J. Cravedi, Y. Valotaire and F. Pakdel. 1997. Two complementary bioassays for screening the estrogenic potency of xenobiotics: Recombinant yeast for trout estrogen receptor and trout hepatocyte cultures. J. Molecul. Endocrinol. 19:321-335.

Pinsky, P., M. Lorber, M., K. Johnson, B. Kross, L. Burmeister, A. Wilkins and G. Hallberg. 1997. A study of the temporal variability of atrazine in private well water. 2. Analysis of data. Environ. Monit. Assess. 47(2):197- .

Pinter, A., Torek, G., Borzonyi, M., Surjan, A., Csik, M., Kelecsenyi, Z., and Kocsis, Z. 1990. Long-term carcinogenicity bioassay of the herbicide atrazine in F-344 rats. *Neoplasma:* 37(5): 533- 544

Putam, A. R. and D. Penner. 1974. Pesticide interactions in higher plants. Pesticide Rev. 50:73-110.

Raveton, M., P. Ravanel, A. M. Serre, F. Nurit and M. Tissut. 1997. Kinetics of uptake and metabolism of atrazine in model plant systems. Pestic. Sci. 49(1):157-164.

Reimer, G. J., S. J. Gee and B. D. Hammock. 1998. Comparison of a time-resolved fluorescence immunoassay and an enzyme-linked immunosorbent assay for the analysis of atrazine in water. J. Agr. Food Chem. 46(8):3353-3359.

Richard, J. J., G. A. Junk, M. J. Avery, N. L. Nehring, J. S. Fritz and H. J. Svec. 1975. Residues in water. Pest. Monit. J. 9:117-123.

Ritter, W. F., H. P. Johnson, W. G. Lovely and M. Molnau. 1974. Atrazine, propachlor, and diazinon residues on small agricultural watersheds. Environ. Sci. Technol. 8:37-42.

Ritter, W. F., A. E. M. Chirnside and R. W. Scarborough. 1996. Movement and degradation of triazines, alachlor, and metolachlor in sandy soils. J. Environ. Sci. Health Part A 31(10):2699-2723.

Roberts, G. C., G. J. Sirons, R. Frank and H. E. Collins. 1979. Triazine residues in a watershed in southwestern Ontario, Canada (1973-1975). J. Great Lakes Res. 5:246-255.

Roberts, S., P. Vassseur and D. Dive. 1990. Combined ffects btween atrazine, copper and pH, on target and non target species. Water res. 24(4):485-491.

Rodriguez, C. J. and J. M. Harkin. 1997. Degradation of atrazine in subsoils, and groundwater mixed with aquifer sediments. Bull. Environ. Contam. Toxicol. 59(5):728-736.

Rogers, H. R., C. D. Watts and I. Johnson. 1996. Comparative predictions of Irgarol 1051 and atrazine fate and toxicity. Environ. Technol. 17(5):553-557.

Rothstein, E., T. S. Steenhuis, J. H. Peverly and L. D. Geohring. 1996. Atrazine fate on a tile drained field in northern New York: A case study. Agr. Water Manag. 31(3):195-205.

Rouchaud, J., F. Gustin, D. Callens and R. Bulcke. 1996. Atrazine soil metabolism in maize fields treated with organic fertilizers. Weed Res. 36(2):105-113.

Russo, J. and Russo, I. 1996. Experimentally induced mammary tumors in rats. *Breast Can. Res. and Treat.*: 39: 7-20.

Sanderson, J.T., Seinen, W., Giesy, J., and van den Berg, M. 2000. 2-Chloro-s-Triazine Herbicides Induce Aromatase (CYP19) Activity in H295R Human Adrenocortical Carcinoma Cells: A Novel Mechanism for Estrogenicity. Toxicol Sci 54: 121-127.

Sanderson, J.T., Letcher, R., Heneweer, M., Giesy, J.P., and van den Berg, M. 2001. Effects of Chloro-s-Triazine Herbicides and Metabolites on Aromatase Activity in Various Human Cell Lines and on Vitellogenin Production in Male Carp Hepatocytes. Environ Health Perspect 109(10): 1027-31.

Schottler, S. P. and S. J. Eisenreich. 1997. Mass balance model to quantify atrazine sources, transformation rates, and trends in the Great Lakes. Environ. Sci. Technol. 31(9):2616-2626.

Schulz, A., F. Wengenmayer and H. M. Goodman. 1990. Genetic engineering of herbicide resistance in higher plants. Plant Sci. 9:1-15.

Seta, A. K. and A. D. Karathanasis. 1997. Atrazine adsorption by soil colloids and Co-transport through subsurface environments. Soil Sci. Soc. Amer. J. 61(2):612-618.

Seybold, C. A. and W. Mersie. 1996. Adsorption and desorption of atrazine, dethylatrazine, deisopropylatrazine, hydroxyatrazine, and metolachlor in two soils from Virginia. J Environ. Qual. 25(6):1179-1186.

Shabana, E. F. 1987. Use of batch assays to assess the toxicity of atrazine to some selected cyanobacteria: I. Influence of atrazine on the growth, pigmentation and carbohydrate contents of *Aulosira fertilissima*, *Anabeana oryzae*, *Nostoc muscorum* and *Tolypothrix tenuis*. J. Basic Microbiol. 27(2):113-119.

Shafer, T.J., Ward, T.R., Meacham, C.A., Cooper, R.L. (1999) Effects of the chlorotriazine herbicide, cyanazine, on GABA(A) receptors in cortical tissue from rat brain. Toxicology 1999 Dec 20;142(1):57-68.

Sheldon, D. R., A. M. Sadeghi, J. S. Karns and C. J. Hapeman. 1995. Effect of wetting and drying of soil on sorption and biodegradation of atrazine. Weed Sci. 43(2):298-306.

Sparling, G., R. Dragten, J. Aislabie and R. Fraser. 1998. Atrazine mineralisation in New Zealand topsoils and subsoils: Influence of edaphic factors and numbers of atrazine-degrading microbes. Australian J. Soil Res. 36(4):557-571.

Sposito, G., L. Martin-Neto and A. Yang. 1996. Atrazine complexation by soil humic acids. J. Environ. Qual. 25(6):1203-1210.

Squillace, P. J., M. R. Burkart and W. W. Simpkins. 1997. Infiltration of atrazine and metabolites from a stream to an alluvial aquifer. J. Amer. Water Resour. Assoc. 33(1):89-97.

Stevenson, J. C. and N. M. Confer. 1978. Summary of available information on Chesapeake Bay submerged vegetation. U.S. Dept. Interior, Fish Wildl. Ser., Off. Biol. Survey. FWS/OBS-78/66. 335 p.

Stevenson, J. C., T. W. Jones, W. M. Kemp, W. R. Boynton and J. C. Means. 1982. An overview of atrazine dynamics in estuarine ecosystems, p. 79-94. *In*: Proceedings of the workshop on agrochemicals and estuarine productivity, Beaufort, North carolina, September 18-19,1980.

Stoker, T. E., Laws, S. C., Guidici, D. L., and Cooper, R. L. 2000. The effect of atrazine on puberty in male Wistar rats: an evaluation in the protocol for the assessment of pubertal

development and thyroid function. Toxicol. Sci. 58, 50-59.

Stoker, T.E., Guidici, D.L., Laws, S.C., and Cooper, R.L. In press. The Effects of Atrazine Metabolites on Puberty and Thyroid Function in the Male Wistar Rat. Toxicol Sci.

Stoker, T. E. Unpublished data. The Effects of Hydroxyatrazine on Puberty in Male Rats. US EPA/NHEERL/RTD.

Takahashi, M., M. Takano, T. Shiraishi, K. Asada and Y. Inoue. 1995. Cooperation of photosynthetic reaction center of photosystem II under weak light as shown by light intensity-dependence of the half-effective dose of atrazine. Biosci. Biotech. Biochem. 59(5):796-809.

Tang, J. X., K. D. Hoagland and B. D. Siegfried. 1997. Differential toxicity of atrazine to selected freshwater algae. Bull. Environ. Contam. Toxicol. 59(4):631-638.

Tasli, S., L. Patty, H. Boetti, P. Ravanel, G. Vachaud, C. Scharff, J. Favre-Bonvin, M. Kaouadji and M. Tissut. 1996. Persistence and leaching of atrazine in corn culture in the experimental site of La Cote Saint Andre (Isere, France). Arch. Environ. Contam. Toxicol. 30(2):203-213.

Thakur, A.K. (1999). Addendum 1 to study no. 2386-108: Chronic (12/24 month) study in rats with atrazine technical (EPA MRID No. 445701). Unaudited draft interim report of the estrous cycle data through week 46. Covance Lab, Vienna VA. Covance Lab No. 2386-108. Novartis Nexus # 810-95. March 12, 1999.

Taylor A G. 1992. Pre-Compliance Date Testing for Pesticides in Illinois' Surface Water Supplies. October 23, 1992.

Thurman, E. M., D. A. Goolsby, M. T. Meyer, M. S. Mills, M. L. Pomes and D. W. Kolpin. 1992. A reconnaissance study of herbicides and their metabolites in surface water of the midwestern United States using immunoassay and gas chromatography/mass spectroscopy. Environ. Sci. Technol. 26:2440-2447.

Thursby, G. B. and M. Tagliabue. 1990. Effect of atrazine on sexual reproduction in the kelp, *Laminaria saccharina*. (Memorandum to D. J. Hansen, US. EPA, Narragansett, RI. September 14.)Timchalk, C., Dryzga, M. D., Langvardt, P. W., Kastl, P. E., and Osborne, D. W. 1990. Determination of the effect of tridiphane on the pharmacokinetics of [14C]-atrazine following oral administration to male Fischer 344 rats. Toxicology 61: 27-40.

Trapp, S., M. Matthies, I. Sceunert and E. M. Topp. 1990. Modeling the bioconcentration of organic chemicals in plants. Environ. Sci. Technol. 24:1246-1252.

Trentacoste, S. V., Friedmann, A. S., Youker, R. T., Breckenridge, C. B., and Zirkin, B. R. 2001. Atrazine effects on testosterone levels and androgen-dependent reproductive organs in

peripubertal male rats. J. Androl. 22, 142-148.

Trochimowicz, H. J., Kennedy, G. L., and Krivanek, N. 1994. Heterocyclic and Miscellaneous Nitrogen Compounds. In Patty's Industrial Hygiene and Toxicology (G. D. Clayton, and F. E. Clayton, Eds.), pp. 3285-3521. John Wiley & Sons, New York.

Tucker, R. K. and D. G. Crabtree. 1970. Handbook of toxicity of pesticides to wildlife. U.S. Dept. Interior, Bureau Sport Fish. Wildlife, Denver Wildlife Res. Center. Submitted by Fison Corp.

Ukeles, R. 196. The effect of temperature on the growth and survival of several marine algal species. Biol. Bull. (Woods Hole, Mass.) 120:255-264.

Ursin G, London S Stanczyk FG, Gentzschein E, Pagannini-Hill A, Ross RK and Pike MC 1999 Urinary 2-hydroxy estrone ratio and risk of breast cancer in postmenopausal women. J. Nat. Cancer Institute 91(12) 1067-1072.

van den Brink, P. J., E. van Donk, R. Gylstra, S. J. H. Crum and T. C. M. Brock. 1995. Effects of chronic low concentrations of the pesticides chlorpyrifos and atrazine in indoor freshwater microcosms. Chemosphere 31(5):3181-3200. (MRID # 45087417).

van der Heyden, V., P. Debongnie and L. Pussemier. 1997. Accelerated degradation and mineralization of atrazine in surface and subsurface oil materials. Pest. Sci. 49(3):237-243.

van der Pas, L. J. T., M. Leistra and J. J. T. I. Boesten. 1998. Rate of transformation of atrazine and benazone in water-saturated sandy subsoils. Pesticide Sci. 53(3):223-233.

Van Zwieten, L. and I. R. Kennedy. 1995. Rapid degradation of atrazine by *Rhodococcus* sp. N186/21 and by an atrazine-perfused soil. J. Agr. Food Chem. 43(5):1377-1383.

Waldron, A. C. 1974. Pesticide movement from cropland into Lake Eire. US EPA, Athens, GA, EPA-660/2-74-03.

Walker, S. R., G. R. Robinson and P. A. Hargreaves. 1997. Weed control with atrazine and chlorsulfuron is determined by herbicide availability and persistence in soils. Australian J. Agr. Res. 48(7):1003-1011.

Walne, P. R. 1970. Studies on the food value of nineteen genera of algae to juvenile bivalves of the genera *Ostrea, Crassostrea, Mercenaria* and *Mytilus*. Fish Invest., London (Series 2) 26:1-62.

Watts, D. W. and J. M. Novak. 1997. Evaluation of atrazine positive and false positive immunoassay detections in ground water. J. Environ. Sci. Heal. Pt. B 32(5):659-673.

Wauchope, R. D. 1978. The pesticide content of surface water draining from agricultural fields – a review. J. Environ. Qual. 7:459-472.

Wetzel, R. G. 1975. Primary production. p. 230-247. *In*: B. A. Whitton (ed.). River ecology. Univ. of Calif. Press, Berkley.

Wilson, R., M. H. Barker, D. J. Schiffrin and R. Abuknesha. 1997. Electrochemiluminescenceflow injection imminoassay for atrazine. Biosen. Bioelect. 12(4):277-287.

Wu, T. L. 1980. Dissipation of the herbicides atrazine and alachlor in a Maryland corn field. J. Environ. Qual. 9:459-465.

Wu, T. L. 1981. Atrazine residues in estuarine water and the aerial deposition of atrazine into Rhode River, Maryland. Water, Air, Soil Poll. 15:173-184.

Wu, T. L., D. L. Correl and H. E. H. Remenapp. 1983. Herbicide runoff from experimental watersheds. J. Environ. Qual. 12:330-336.

Xing, B. S., J. J. Pignatello and B. Gigliotti. 1996. Competitive sorption between atrazine and other organic compounds in soils and model sorbents. Environ. Sci. Technol. 30:2342. [Correction 1997. 31(8):2442-2443]

Zahm SH, Wisenburger DD, Cantor KP, et al. 1993a. Role of the herbicide atrazine in the development of non-Hodgkin's lymphoma. *Scan J Work Environ Health* 19:108-114.

[see Crosignani P, Berrino F. 1994 for comment and additional analyses]

Zahm SH, Weisenburger DD, Saal RC, et al. 1993b. The role of agricultural pesticide use in the development of non- Hodgkin's lymphoma in women. *Arch Environ Health*. 48(5):353-358.

Appendix E: GENERIC DATA CALL-IN

Note that a complete Data Call-In (DCI), with all pertinent instructions, will be sent to registrants under separate cover.

Appendix F: PRODUCT SPECIFIC DATA CALL-IN

Note that a complete Data Call-In (DCI), with all pertinent instructions, will be sent to registrants under separate cover.

Appendix G: EPA'S BATCHING OF ATRAZINE PRODUCTS FOR MEETING ACUTE TOXICITY DATA REQUIREMENTS FOR REREGISTRATION

In an effort to reduce the time, resources and number of animals needed to fulfill the acute toxicity data requirements for reregistration of products containing **ATRAZINE** as the active ingredient, the Agency has batched products which can be considered similar for purposes of acute toxicity. Factors considered in the sorting process include each product's active and inert ingredients (identity, percent composition and biological activity), type of formulation (e.g., emulsifiable concentrate, aerosol, wettable powder, granular, etc.), and labeling (e.g., signal word, use classification, precautionary labeling, etc.). Note that the Agency is not describing batched products as "substantially similar" since some products within a batch may not be considered chemically similar or have identical use patterns.

Using available information, batching has been accomplished by the process described in the preceding paragraph. Notwith-standing the batching process, the Agency reserves the right to require, at any time, acute toxicity data for an individual product should the need arise.

Registrants of products within a batch may choose to cooperatively generate, submit or cite a single battery of six acute toxicological studies to represent all the products within that batch. It is the registrants' option to participate in the process with all other registrants, only some of the other registrants, or only their own products within a batch, or to generate all the required acute toxicological studies for each of their own products. If a registrant chooses to generate the data for a batch, he/she must use one of the products within the batch as the test material. If a registrant chooses to rely upon previously submitted acute toxicity data, he/she may do so provided that the data base is complete and valid by today's standards (see acceptance criteria attached), the formulation tested is considered by EPA to be similar for acute toxicity, and the formulation has not been significantly altered since submission and acceptance of the acute toxicity data. Regardless of whether new data is generated or existing data is referenced, registrants must clearly identify the test material by EPA Registration Number. If more than one confidential statement of formula (CSF) exists for a product, the registrant must indicate the formulation actually tested by identifying the corresponding CSF.

In deciding how to meet the product specific data requirements, registrants must follow the directions given in the Data Call-In Notice and its attachments appended to the RED. The DCI Notice contains two response forms which are to be completed and submitted to the Agency within 90 days of receipt. The first form, "Data Call-In Response," asks whether the registrant will meet the data requirements for each product. The second form, "Requirements Status and Registrant's Response," lists the product specific data required for each product, including the standard six acute toxicity tests. A registrant who wishes to participate in a batch must decide whether he/she will provide the data or depend on someone else to do so. If a registrant supplies the data to support a batch of products, he/she must select one of the following options: Developing Data (Option 1), Submitting an Existing Study (Option 4), Upgrading an Existing Study (Option 5) or Citing an Existing Study (Option 6). If a registrant depends on another's data, he/she must choose among: Cost Sharing (Option 2), Offers to Cost Share (Option 3) or Citing an Existing Study (Option 6). If a registrant does not want to participate in a batch, the choices are Options 1, 4, 5 or 6. However, a registrant should know that choosing not to participate in a batch does not preclude other registrants in the batch from citing his/her studies and offering to cost share (Option 3) those studies.

One hundred and thirty-five products were found which contain **Atrazine** as the active ingredient. These products have been placed into fourteen batches and a "No Batch" category in accordance with the active and inert ingredients and type of formulation. Furthermore, the following bridging strategies are deemed acceptable for this chemical:

- Batch 11: EPA Reg. No. 524-493 and 524-497 may cite the data generated with EPA Reg. No. 524-510.
- Batch 13: Each product in this Batch should generate their own primary eye irritation study utilizing the fertilizer with the highest levels of nitrogen.
- Batch 14: Each product in this Batch should generate their own primary eye irritation study utilizing the fertilizer with the highest levels of nitrogen.
- No Batch: Each product in this Batch should generate their own data.

NOTE: The technical acute toxicity values included in this document are for informational purposes only. The data supporting these values may or may not meet the current acceptance criteria.

Batch 1	EPA Reg. No.	% Active Ingredient
	100-529	98.00
	11603-32	98.81
	19713-7	97.00
	19713-375	97.00
	34704-784	97.00
	35915-6	98.50
	62719-456	97.60

Batch 2	EPA Reg. No.	% Active Ingredient
	100-585	90.0
	1381-159	90.0
	1386-660	90.0
	2749-485	90.0
	5905-522	90.0
	9779-253	90.1
	11773-13	90.0

Batch 2	EPA Reg. No.	% Active Ingredient
	19713-76	90.0
	19713-499	90.0
	33270-9	90.0
	34704-622	90.0
	34704-689	90.0
	35915-3	90.0
	42750-53	90.0
	55467-4	90.0
	59639-106	90.0
	62719-313	90.0
	66222-37	90.0

Batch 3	EPA Reg. No.	% Active Ingredient
	9779-254	80.0
	34704-490	80.0
	51036-9	80.0
	51036-159	80.0

Batch 4	EPA Reg. No.	% Active Ingredient
	19713-80	53.48
	19713-291	53.48

Batch 5	EPA Reg. No.	% Active Ingredient
	100-497	43.5
	534-97	43.5
	829-268	43.0
	1381-158	43.0

Batch 5	EPA Reg. No.	% Active Ingredient
	1386-647	43.0
	2749-336	43.0
	5905-470	43.0
	7401-318	43.0
	9404-72	43.0
	9779-255	43.0
	11773-1	43.6
	19713-11	43.0
	19713-498	43.0
	33270-10	43.5
	34704-69	43.0
	34704-690	43.0
	35915-4	43.0
	42750-44	43.0
	42750-45	43.0
	48273-11	43.5
	51036-158	43.0
	55467-5	43.5
	62719-312	43.0
	66222-36	43.6

Batch 6	EPA Reg. No.	% Active Ingredient
	100-817	Atrazine: 33.7 S-Metolachlor: 26.1
	100-886	Atrazine: 33.7 S-Metolachlor: 26.1

Batch 7	EPA Reg. No.	% Active Ingredient
	352-600	Atrazine: 28.4 Dimethenamid: 24.8
	7969-146	Atrazine: 28.4 Dimethenamid: 24.8

Batch 8	EPA Reg. No.	% Active Ingredient
	7969-136	Atrazine: 22.23 Dicamba K Salt: 13.42
	42750-41	Atrazine: 22.23 Dicamba K Salt: 13.42
	51036-307	Atrazine: 22.23 Dicamba K Salt: 13.42
	70907-16	Atrazine: 21.92 Dicamba K Salt: 13.45

Batch 9	EPA Reg. No.	% Active Ingredient
	264-477	Atrazine: 21.62 Bromoxynil Octanoate: 15.74
	9779-348	Atrazine: 21.62 Bromoxynil Octanoate: 15.74
	51036-255	Atrazine: 21.62 Bromoxynil Octanoate: 15.74
	71368-27	Atrazine: 21.62 Bromoxynil Octanoate: 15.74

Batch 10	EPA Reg. No.	% Active Ingredient
	51036-363	Atrazine: 25.0 Bentazon: 27.0
	60063-18	Atrazine: 25.0 Bentazon: 27.0

Batch 11	EPA Reg. No.	% Active Ingredient
	524-493	Atrazine: 16.1 Acetochlor: 21.5 Glyphosate: 8.1
	524-497	Atrazine: 16.2 Acetochlor: 21.6 Glyphosate: 8.2
	524-510	Atrazine: 15.9 Acetochlor: 21.2 Glyphosate: 15.9

Batch 12	EPA Reg. No.	% Active Ingredient
	19713-513	Atrazine: 16.6 Acetochlor: 24.8
	62719-371	Atrazine: 16.6 Acetochlor: 24.8

Batch 13	EPA Reg. No.	% Active Ingredient
	538-18	1.055
	538-163	0.600
	538-229	1.320
	538-234	0.600

Batch 13	EPA Reg. No.	% Active Ingredient
	9198-186	1.110

Batch 14	EPA Reg. No.	% Active Ingredient
	769-943	0.92
	7138-14	0.90
	7401-336	0.83
	8660-12	1.16
	8660-18	1.18
	8660-32	0.58
	8660-41	0.92
	8660-187	0.63
	8660-204	0.92
	8660-223	1.05
	8660-224	0.91
	8660-245	0.42
	9198-153	0.92
	9404-51	0.92
	9404-55	0.79
	9404-56	1.50
	9404-80	0.57
	9404-81	1.28
	9404-82	1.15
	9779-359	0.92
	9779-360	0.80
	10404-39	0.80
	10404-94	1.05
	10404-95	0.45
	10404-96	0.92
	34704-822	0.92

Batch 14	EPA Reg. No.	% Active Ingredient
	35512-14	0.80
	35512-34	0.57
	35512-41	1.22
	35512-42	0.44
	35512-46	0.92
	59144-32	1.16

No Batch	EPA Reg. No.	% Active Ingredient
	100-827	Atrazine: 28.7 S-Metolachlor: 35.8
	100-928	Atrazine: 23.3 Flumetsulam: 1.0 S-Metolachlor: 29.1
	100-956	Atrazine: 74.93 Prosulfuron: 1.78
	100-962	Atrazine: 25.7 Glyphosate: 18.0
	239-2618	14.0
	241-353	Atrazine: 32.54 Imazethapyr: 4.36
	264-573	Atrazine: 43.2 Isoxaflutole: 3.2
	264-668	Atrazine: 33.42 Glufosinate-ammonium: 10.00
	270-288	23.6
	352-585	Atrazine: 86.78 Nicosulfuron: 1.34 Rimsulfuron: 1.34
	524-329	Atrazine: 16.3 Alachlor: 27.2

No Batch	EPA Reg. No.	% Active Ingredient
	524-418	Atrazine: 15.3 Alachlor: 27.05
	524-480	Atrazine: 18.3 Acetochlor: 46.3
	524-485	Atrazine: 26.9 Acetochlor: 33.4
	524-509	Atrazine: 20.9 Glyphosate: 20.9
	524-511	Atrazine: 14.5 Acetochlor: 29.0
	3125-523	Atrazine: 50.5 Flufenacet: 19.6 Metribuzin: 4.9
	7969-192	Atrazine: 35.3 Dimethenamid-P: 18.2
	7969-200	Atrazine: 29.5 Dimethenamid-P: 24.1
	19713-6	80.0
	19713-171	Atrazine: 21.42 Simazine: 21.41
	34704-728	Atrazine: 25.00 2,4-D: 16.58
	42750-50	Atrazine: 21.62 Bromoxynil: 15.74
	62719-368	Atrazine: 21.1 Acetochlor: 31.6

Appendix H: ATRAZINE MONITORED WATERSHEDS

LA1047002	Iberville Water Works District #3	Louisiana
MO1010204	Dearborn	Missouri
IL1170400	Gillespie	Illinois
KY0280267	Marion Water Department	Kentucky
KY0710247	Lewisburg Water Works	Kentucky
IA5903011	Chariton Municipal Water Works	Iowa
MO2010112	Bucklin	Missouri
IN5299001	Batesville Water Utility	Indiana

US Environmental Protection Agency
Office of Pesticide Programs

Reregistration Eligibility Decision for Prometon

March 25, 2008

United States
Environmental Protection
Agency

Prevention, Pesticides
and Toxic Substances
(7508P)

EPA 738-R-08-004

Reregistration Eligibility Decision for Prometon

Reregistration Eligibility Decision (RED) for Prometon

List B

Case No. 2545

Approved by: _____

Date: 3/25/08

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Glossary of Terms and Abbreviations

ae	Acid Equivalent
ai	Active Ingredient
CFR	Code of Federal Regulations
CSF	Confidential Statement of Formula
DCI	Data Call-In
EDWC	Estimated Drinking Water Concentration
EEC	Estimated Environmental Concentration
EPA	Environmental Protection Agency
EUP	End-Use Product
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FFDCA	Federal Food, Drug, and Cosmetic Act
FQPA	Food Quality Protection Act
GENEEC	Tier I Surface Water Computer Model (Estimated Aquatic Environmental Concentrations)
LC_{50}	Median Lethal Concentration. A statistically derived concentration of a substance that can be expected to cause death in 50% of test animals. It is usually expressed as the weight of substance per weight or volume of water, air or feed, e.g., mg/l, mg/kg or ppm.
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation). It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LOC	Level of Concern
LOAEL	Lowest Observed Adverse Effect Level
mg/kg/day	Milligram Per Kilogram Per Day
mg/L	Milligrams Per Liter
MRID	Master Record Identification (number). EPA's system of recording and tracking studies submitted.
MUP	Manufacturing-Use Product
N/A	Not Applicable
NOAEL	No Observed Adverse Effect Level
OPP	EPA Office of Pesticide Programs
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
RED	Reregistration Eligibility Decision
REI	Restricted Entry Interval
RQ	Risk Quotient
TGAI	Technical Grade Active Ingredient
UV	Ultraviolet
WPS	Worker Protection Standard

I. Introduction

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was amended in 1988 to accelerate the reregistration of products with active ingredients registered prior to November 1, 1984. The amended Act calls for the development and submission of data to support the reregistration of an active ingredient, as well as a review of all submitted data by the U.S. Environmental Protection Agency, hereon referred to as EPA or "the Agency." Reregistration involves a thorough review of the scientific database underlying a pesticide's registration. The purpose of the Agency's review is to reassess the potential risks arising from the currently registered uses of the pesticide, to determine the need for additional data on health and environmental effects, and to determine whether or not the pesticide meets the "no unreasonable adverse effects" criterion of FIFRA.

This document summarizes EPA's human health and ecological risk assessments and reregistration eligibility decision (RED) for prometon. The document consists of six sections. Section I contains the regulatory framework for reregistration; Section II provides an overview of the chemical and a profile of its use and usage; Section III gives an overview of the human health and environmental effects risk assessments; Section IV presents the Agency's decision on reregistration eligibility and risk management; and Section V summarizes the label changes necessary to implement the risk mitigation measures outlined in Section IV. Finally, the Appendices list related information, supporting documents, and studies evaluated for the reregistration decision. The risk assessments for prometon and all other supporting documents are available in the Office of Pesticides Program (OPP) public docket at www.regulations.gov under docket number EPA-HQ-OPP-2007-1078.

II. Chemical Overview

A. Regulatory History

The prometon case (2545) contains only one ingredient, prometon, which was first registered as a pesticide in May 1959. Data call-ins (DCI) have been previously issued (January 1989, May 1991, September 1992, and March 1995) requiring data in support of reregistration, including several product chemistry studies, animal and ecological toxicity studies, environmental fate studies, spray drift studies, occupational exposure studies, and genotoxicity studies. Originally supported by Syngenta Crop Protection, prometon was then transferred to Makhteshim Agan of North America (MANA) in December 1998. MANA is the sole technical registrant to produce the generic data needed for the reregistration review of prometon.

B. Chemical Identification

Prometon is a non-selective herbicide that is part of the triazine group of herbicides. Chemical information and structure for prometon are presented in Table 1. Table 2 presents the physical and chemical properties of prometon.

Table 1. Prometon Chemical Information and Structure

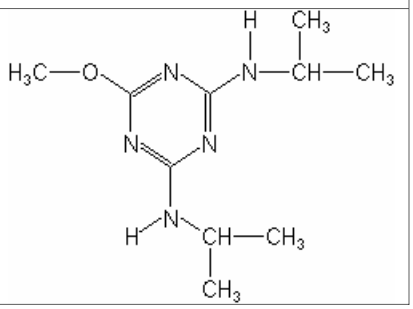
Compound Name	PC Code	CAS Number	Molecular Weight	Structure
Prometon; 1,3,5-Triazine-2,4-diamine, 6-methoxy-, N,N'-bis(1-methylethyl)-	080804	1610-18-0	225 g/mol	

Table 2. Physical and Chemical Properties of Prometon

Parameter	Value and Unit
CAS Chemical Name	6-methoxy-*N*,*N′*-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine
CAS Number	1610-18-0
Empirical Formula	$C_{10}H_{19}N_5O$
Molecular Weight	225 g/mol
Appearance	White crystalline solid
Density	1.088 g/ml at 20 ºC
Melting Point	91-92°C
Vapor pressure (20 ºC)	3.1×10^{-6} mm Hg
Water Solubility (20 ºC)	620 ppm

C. Use Profile

Products containing prometon are labeled for use as a non-selective herbicide for pre- and post-emergence spot treatment applications where total vegetation control is desired, resulting in a bare ground site. Because of the persistence of prometon, weed control lasts generally for one year or longer.

Type of Pesticide:	Herbicide
Target Pests:	Annual and perennial grasses and broadleaf weeds
Mode of Action:	Prometon is a photosynthesis inhibitor, disrupting carbon dioxide fixation and production of the intermediary energy components. Prometon affects photosystem II, competing with plastoquinone and modifying electron transport processes.
Use Sites:	Prometon is registered for weed control for use as a spot treatment around the home, driveways, patios, buildings, storage areas, fences, pumps, machinery, fuel tanks, recreational areas, roadways, guard rails, airports, military installations, highway medians, pipelines, railroads, lumberyards, rights-of-way, and industrial sites (such as cross connects, pedestals, transformers, vaults, buried cable closures, telephone booths, fire plugs).
Use Classification:	General Use
Formulation Types:	Emulsifiable concentrate, ready-to-use, water-based flowable concentrate, and pelleted granule
Application Methods:	Boom sprayers, handheld nozzle or wand sprayers, knapsack sprayers, and granular spreaders
Application Rates:	The maximum supported application rate is 20 lbs of prometon active ingredient per acre (lbs ai/A), with typical application rates that range from 12 to 20 lbs ai/A.
Application Timing:	Pre-emergence direct soil application or post-emergence, when weeds are actively growing. Prometon has herbicidal activity from foliar contact, but it is most effective from root uptake in susceptible plants. Therefore, adequate rainfall or water is required to move the chemical into the root zone.
Technical Registrant:	Makhteshim Agan of North America, Inc. (MANA).

D. Estimated Usage of Pesticide

The majority of prometon use is associated with weed control along fencerows and building perimeters, with smaller usage on other industrial sites (i.e., pump stations, tanks, pipelines, pipe storage areas), rights-of-way areas (i.e., airports, railroads, and medians), and residential areas. Based on usage information provided by the registrant, total annual sales of prometon are approximately 550,000 - 600,000 pounds of ai: approximately 60% is applied to building perimeters or fencerows; 30% is applied to industrial sites; and <10% is applied to rights-of-way areas. According to the registrant, geographical use areas representing the greatest use include the following: Midwest, South, and Southeast, with lower demand in the Northwest and the Northeast. Use of prometon-containing products are restricted in Texas, Colorado, and Washington.

III. Summary of Prometon Risk Assessments

The purpose of this summary is to assist the reader by identifying the key features and findings of these risk assessments, and to help the reader better understand the conclusions reached in the RED. The human health and ecological risk assessments and supporting documents listed below were used to formulate the safety finding and regulatory decision for the pesticidal use of prometon.

While the risk assessments and related addenda are not included in this document, they are available in the OPP Public Docket, docket number EPA-HQ-OPP-2007-1078, and may be accessed through the Agency's website at http://www.regulations.gov/. Hard copies of these documents may also be found in the OPP public docket under this same docket number.

- *HED Chapter of the Reregistration Eligibility Decision Document (RED). Phase 4 Revisions*. March 17, 2008.
- *Prometon: Phase 4 Revisions for "Prometon: Occupational and Residential Exposure Assessment for the Reregistration Eligibility Decision (Non-Food)*, March 13, 2008.
- *Response to Comments on the Ecological Risk Assessment in Support of the Re-registration Eligibility Decision for Prometon.* February 28, 2008.
- *Error Correction: Drinking Water Assessment and Ecological Risk Assessment for Prometon RED*. October 24, 2007.
- *Drinking Water Assessment for Prometon*, October 24, 2007.

A. Human Health Risk Assessment

The human health assessment addressed potential risks from all registered uses and sources. The Agency assessed exposures from both residential and occupational applications. Although prometon is not used on any food commodity in the U.S., potential dietary exposure via residues in drinking water was also assessed. For the complete human health risk assessment, refer to *HED Chapter of the Reregistration Eligibility Decision Document (RED). Phase 4 Revisions*, dated March 17, 2008, which is available in the public docket.

1. Toxicity of Prometon

The available toxicological data are adequate for selecting acute and chronic toxicity endpoints for the human health risk assessment. In the human health assessment, the Agency is presuming that the prometon parent compound and its respective degradates are of equal toxicity.

The Agency completed a cumulative risk assessment on certain triazine pesticides that met the criteria for being reviewed collectively; however, prometon did not meet those criteria. In the case of prometon, available studies did not demonstrate mammary gland tumors (refer to the document entitled "The Grouping of a Series of Triazine Pesticides Based on a Common Mechanism of Toxicity" prepared by U.S. EPA Office of Pesticide Programs Health Effects Division, dated March 2002). In addition to the lack of tumor formation, a clear structural difference between prometon and atrazine, simazine and propazine, the three triazine pesticides

that were considered in the cumulative assessment (refer to "Triazine Cumulative Risk Assessment," dated March 28, 2006). Prometon does not have chlorine substitutions on the triazine ring characteristic of the other three triazines. On these bases, prometon was not included in the cumulative risk assessment.

a. Toxicity Profile and Endpoint Selection

The available acute toxicity studies indicate that prometon is of relatively low oral and dermal toxicity. Prometon is not a dermal sensitizer and is a weak irritant to the skin, but is a moderate irritant to the eyes. It is classified as toxicity category III via the oral and dermal routes of exposure, and category II via the inhalation route of exposure. Table 3 lists the acute toxicity profile of prometon.

Table 3. Acute Toxicity Profile of Prometon

Study Type	MRID	Results	Toxicity Category
Acute oral - rat	42132103	LD_{50}= 4,345 mg/kg for males and 1,518 mg/kg for females.	III
Acute dermal - rabbit	41609112	>2,020 mg/kg	III
Acute inhalation - rat	42132104	LC_{50} = >0.52 mg/L	II
Acute eye irritation - rabbit	42144601	Conjunctivae redness and chemosis and discharge regressing by day 7	III
Acute dermal irritation - rabbit	41609113	Very slight erythema cleared by 24 hours	IV
Skin sensitization - guinea pig	41609114	Not a sensitizer	--

LD_{50} = A statistically-derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation) expressed in milligram per kilogram (mg/kg).
LC_{50} = A statistically-derived single concentration that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation) expressed in milligram per liter (mg/L).

Prometon is not classified as a carcinogen based on available animal studies. Prometon was negative in the mutagenicity/genetic toxicity studies including a bacterial mutagenicity (Ames) test, rat micronucleus test and an unscheduled DNA synthesis test. There were no indications of increased susceptibility to the fetuses or neonatal animals in either the rat or rabbit developmental toxicity studies or in the rat multi-generation reproduction study. Thus, prometon is classified as "Not likely to be Carcinogenic to Humans."

The No Observed Adverse Effects Level (NOAEL) of 5 milligrams per kilogram per day (mg/kg/day) derived from a dog chronic toxicity study was used to measure chronic dietary (drinking water only) risk and inhalation exposure risks. To account for any uncertainties in interspecies extrapolation (10X) and intraspecies variability (10X), a 100X uncertainty factor (UF) was applied in calculating the reference dose. To assess dermal short- and intermediate-term dermal exposures, the Agency relied on the Lowest Observed Adverse Effects Level (LOAEL) derived from a rabbit dermal toxicity study, with an additional 10X uncertainty factor, instead of using the available NOAEL of 25 mg/kg/day. At the LOAEL for the rabbit dermal toxicity study there is only a 10% to 12% decrease in body weight and there is little difference between the body weight effect at the high dose (12 to 13% decrease) of 1,050 mg/kg/day in

females. The Agency does not believe that there will be a decrease in body weight at a dose that is 10 times lower than the LOAEL established for this dermal toxicity study. Thus, the resulting Point of Departure (PoD) used in the dermal exposure assessment is 0.50 mg/kg/day. No indication of toxicity was apparent following a single dose of prometon; therefore, no acute toxicity endpoints were selected. The toxicological doses and endpoints used in the human health risk assessment for prometon are listed in Table 4.

Table 4. Summary of Toxicological Doses and Endpoints for Prometon

Exposure/Scenario	Point of Departure Uncertainty Factor RfD/Level of Concern	Study and Toxicological Effects
Acute Dietary (General population, including Infants and Children)	No toxicity endpoint for a single dose exposure was identified.	
Acute Dietary (Females 13-49 years of age)		
Chronic Dietary (All Populations)	NOAEL = 5 mg/kg/day Chronic RfD = 0.05 mg/kg/day UF = 100	Chronic study with dogs. LOAEL = 20 mg/kg/day based on emesis and body weight effects with three studies.
Dermal Short-Term and Intermediate	LOAEL = 500 mg/kg/day UF = 1000 LOC = 1000	21-day dermal toxicity study in rabbits with a NOAEL of 25 mg/kg/day and a LOAEL of 500 mg/kg/day based on decreased body weight and food consumption in females.
Inhalation - all durations	NOAEL= 5 mg/kg/day UF = 100 LOC = 100	Chronic study with dogs. LOAEL = 20 mg/kg/day based on emesis and body weight effects with three studies.
Cancer (oral, dermal, inhalation)	Classification: "Not likely to be Carcinogenic to Humans" based on the absence of significant tumor increases in two adequate rodent carcinogenicity studies.	

NOAEL = No Observed Adverse Effects Level
LOAEL = Lowest Observed Adverse Effects Level
LOC = Level of Concern
mg/kg/day = milligram per kilogram per day
RfD = Reference Dose
UF = Uncertainty Factor

2. Dietary Exposure (Drinking Water Only)

As there are no food use applications of prometon, the Agency assessed potential dietary exposure to prometon residues resulting only from drinking water exposure. Since there are no acute toxicity concerns, only chronic drinking water was assessed. For more details on the toxicological database and Agency's drinking water determination, refer to the *HED Chapter of the Reregistration Eligibility Decision Document (RED). Phase 4 Revisions*, dated March 17, 2008, and the *Drinking Water Assessment for Prometon*, dated October 24, 2007.

Exposure to pesticides from drinking water can occur through contamination in surface and groundwater sources. Prometon is persistent and highly mobile in soil, giving it the potential to move from the application site into adjacent terrestrial and aquatic environments. The Agency

considers potential risks from both acute (one-day) and chronic (long-term) drinking water exposures and uses either modeling or actual monitoring data, if available. There are no acute toxicity concerns; thus, only potential chronic exposures to prometon in drinking water exposures were assessed.

The Agency evaluated available non-targeted monitoring data taken from several data sources, including the United States Geological Survey National Water Quality Assessment Program (USGS NAWQA), USGS/EPA Pilot Reservoir Monitoring data for surface water occurrences, USGS Data Warehouse, Pesticide Data Program, and State of California surface water monitoring. Prometon was frequently detected (between 10% - 60%) in various monitoring programs with reported peak concentrations at 40 micrograms per liter (µg/L), or parts per billion (ppb), found in groundwater and 25.1 µg/L in surface water. The majority (99th percentile of reported detections) of prometon concentrations range between 0.1 to 0.5 µg/L.

Estimated prometon concentrations were modeled for potential movement of prometon into groundwater and surface water. To estimate prometon concentrations in surface water, the Agency used the Tier II PRZM/EXAMS model. Because prometon is used to maintain smaller bare-ground areas, a percent crop area (PCA) factor was applied to drinking water concentrations estimated using PRZM/EXAMS, which more closely reflects a typical application to smaller treatment areas, rather than broadcast applications to an acre. The resulting EEC for surface water prometon residues is 24 ppb.

The Tier I Screening Concentration in Ground Water model (SCI-GROW, Version 2.3) model was used to estimate prometon residues in groundwater, which resulted in an estimated concentration of 236 ppb. Because the estimated screening-level model results for groundwater residues are higher than those of surface water (24 ppb) and reported concentrations from available monitoring data, only risk estimates to groundwater residues are presented here and are considered to be protective of potential exposure to drinking water from surface water sources. For details on the calculation of this PCA, refer to the *Drinking Water Assessment for Prometon*, October 24, 2007.

Chronic Drinking Water Assessment

Exposure estimates less than the chronic reference dose (cRfD) of 0.05 mg/kg/day are not of concern to the Agency. The exposure estimated for the U.S. population was 0.005 mg/kg/day, which is 10% of the (cRfD). The exposure for the most highly exposed population subgroup (infants), was 0.016 mg/kg/day, which is 33% of the cRfD. Thus, all potential chronic exposures to prometon residues in drinking water are below the Agency's level of concern (LOC). Table 5 includes the estimated chronic drinking water exposures and risks for all populations.

Table 5. Estimated Chronic Drinking Water (Groundwater) Exposure and Risk for Prometon

Population Subgroup	cRfD (mg/kg/day)	Dietary Exposure (mg/kg/day)	% cRfD
General U.S. Population	0.05	0.005	10
Infants (<1 year)		0.016	33
Children 1-2 years		0.007	15

mg/kg/day = milligram per kilogram per day cRfD = Chronic Reference Dose

3. Residential and Occupational Assessment

The residential (non-occupational) exposure assessment considered all potential exposures from applying pesticide products, other than those from residues in drinking water. Likewise, workers can be exposed when mixing, loading, and applying prometon, as well as post-application exposure when re-entering a treated site. To measure potential dermal or inhalation exposures from making pesticide applications, EPA calculates a margin of exposure (MOE), which is then compared to a LOC to measure potential risk. For both dermal and inhalation exposure, the UF of 100X is applied to the respective PoD of a particular toxicity study to account for interspecies extrapolation (10X) and intraspecies variability (10X). In addition to the 100X UF for dermal exposure only, an additional 10X UF was applied to account for using the LOAEL, which resulted in a target MOE of 1000 for dermal exposure. Since LOCs for dermal and inhalation routes of exposure are not the same (an MOE of 1000 defines dermal, while inhalation is defined by an MOE of 100), an aggregate risk index (ARI) was required to combine estimated MOEs. ARIs greater than 1 are not of concern to the Agency. ARIs were calculated using the formula below:

Aggregate Risk Index (ARI) = (1/(1/(Dermal MOE/ Dermal LOC))+(1/(Inhalation MOE/ Inhalation LOC))

In the preliminary occupational and residential assessment, the exposures were based on the previously supported maximum use rate of 20 lbs ai/A, which resulted in some exposure scenarios that were of potential risk concern to the Agency. In efforts to reduce potential exposures, the registrant voluntarily reduced their maximum supported rate to 18 lbs ai/A. This rate reduction was incorporated into this assessment and is reflected in the MOEs for the residential and occupational handler exposure and risk assessments.

To assess exposures from occupational applications, the risk assessment relied in part on data from studies in which adult human subjects were intentionally exposed to a pesticide or other chemical. EPA's use of occupational and residential exposure studies in the prometon risk assessment is in accordance with the Agency's Final Rule promulgated on January 26, 2006, related to Protections for Subjects in Human Research, which is codified in 40 CFR Part 26. For specific details, refer to the *Prometon: Phase 4 Revisions for "Prometon: Occupational and Residential Exposure Assessment for the Reregistration Eligibility Decision (Non-Food)*, dated March 13, 2008.

a. Residential Assessment

The Agency determined that there is a potential for exposures to occur in residential settings (i.e., applications made to driveways and sidewalks) for those (i.e., homeowners) who handle (mix, load, and apply) products containing prometon. Exposures during applications of prometon are expected to be short-term in duration, as treatments are only permitted generally once a year.

Residential Handler Exposure and Risk Assessment

The Agency determined that there is a potential for short-term (up to 30 days) dermal and inhalation exposure in residential settings for those who handle (mix, load, and apply) products containing prometon. The scenarios, listed in Table 6, were selected based on all the possible application methods that would be available to a residential handler and the types of available formulations of products containing prometon. Because products containing prometon are generally only applied once a year, neither intermediate (1 - 6 months) or long-term (>6 months) exposures are expected. Thus, only short-term handler exposures were assessed. The maximum application rate and size treatment area assessed for residential handlers was 0.41 lb ai/1000 ft^2 (the equivalent to 18 lbs ai/A). Many of the residential short-term scenarios assessed do not pose any risk concerns. However, two residential scenarios result in ARIs less than 1 and, therefore, are of potential risk concern. Table 6 presents the MOEs for the individual dermal and inhalation exposures and the respective ARIs for all residential handler exposure scenarios.

Table 6. Prometon Short-Term Combined Residential Handler Exposures

Scenario	Dermal MOEs	Inhalation MOEs	ARI
Liquid: Mix/Load/Apply with a Hose-end Sprayer/ Sprinkling Can (Mix Your Own)	7800	50000	7.6
Liquid: Mix/Load/Apply with a Hose-end Sprayer (RTU)	33000	78000	32
Liquid: Mix/Load/Apply with a Low-Pressure Handwand	810	28000	2.2
Liquid: Mix/Load/Apply with a Hand Held Sprayer (Trigger Pump)	2200	320000	1.6
Granular: Hand Application	800	1800	0.76
Granular: Belly Grinder	780	14000	0.77
Granular: Push-type Spreader	130000	970000	130

MOE ≥ 100 = no risk of concern Aggregate Risk Index (ARI) ≥ 1 = no risk of concern

Residential Post-application Assessment

The Agency considered the potential for exposures to individuals that can occur as a result of entering into treated areas. In order to be efficacious, prometon needs to be watered into the soil to be available for plant root uptake. Based on these application instructions, significant post-application prometon exposures from previously treated areas would be unlikely as the prometon residues would predominantly be located below the soil surface. Further, since prometon is used as a spot/edging treatment along fences, curbs, pathways, etc., the likelihood of residential post-application contact is further minimized. Considering the current uses and the lack of potential significant exposures, the Agency concluded that a quantitative post-application assessment was not necessary and exposures would not pose any risk of concern.

b. Occupational Exposures and Risk

The Agency assessed exposure and risk to occupational handlers and workers in the same manner as is used to assess risks to residential users. The target MOE for potential inhalation

risk is 100 and the target MOE for potential dermal risk is 1000. LOCs for dermal and inhalation routes of exposure are not the same (an MOE of 1000 defines dermal, while inhalation is defined by an MOE of 100); thus, an aggregate risk index (ARI) was required to combine estimated MOEs. ARI estimates less than 1 are of potential concern to the Agency.

Occupational Handler Exposure and Risk Assessment

To assess the handler risks, the Agency used surrogate unit exposure data from the Pesticide Handler Exposure Database (PHED) and the Outdoor Residential Exposure Task Force (ORETF) studies. The PHED data were used to assess applications to larger industrial and commercial areas (i.e., roadsides and rights-of-way), which are more representative of the total amount of applications a professional applicator may make. The ORETF data were used to assess exposures to professional applicators that apply to smaller areas, such as sidewalks and building perimeters. The exposure scenarios, listed in Table 7, were selected based on all the possible occupational uses and the types of available formulations of products containing prometon. The Agency assumed that a treatment area equal to one acre would represent an upper-bound exposure estimate from applications made with mechanical application (vehicle-driven) equipment. For applications made manually (with a backpack sprayer or push-type granular spreader), EPA assumed a smaller treatment area equal to 0.25 acre.

Only short- and intermediate-term exposures were assessed because long-term (>6 months) exposures are not expected based on the use pattern. Based on the assessed exposure scenarios, all of the ARIs are greater than 1 with baseline personal protective equipment (PPE), except for mixers and loaders of liquid applications using rights-of-way equipment, which require baseline PPE with gloves. With the respective PPE in place, these exposures do not pose any risks of concern to the Agency. A summary of the MOEs and its respective ARIs are listed in Table 7.

Table 7. Prometon Exposures for Occupational Handlers and Applicators

Scenario		Area Treated (acre)	Dermal MOEs	Inhalation MOEs	ARIs	Level of PPE
M/L	Liquids: Rights of Way Equipment	1	670	16000	0.7	Baseline
			85000	16000	56	SL/GL/NR
	Granular: Tractor Drawn Spreader		600000	29000	200	Baseline
A	Liquids: Rights of Way Equipment	1	1500	5000	1.5	Baseline
	Granular: Tractor Drawn Spreader		510000	42000	230	Baseline
M/L/A	Liquid: Backpack Sprayer	0.25	3100	2600	2.8	Baseline
	Granular: Push Type Spreader		57000	27000	47	Baseline

SL/GL/NR = single layer PPE (long pants, long-sleeved shirt, shoes, and socks), gloves, no respirator
MOE = margin of exposure
PPE = personal protective equipment
M/L/A = mixer, loader, applicator
Aggregate Risk Index (ARI) ≥ 1 = no risk of concern
Baseline = long pants, long-sleeved shirt, shoes, and socks

Occupational Post-application Exposures

The Agency determined that post-application exposures to workers are minimal and are unlikely to pose any risks of concern. Because prometon residues would predominantly be located below the soil surface, significant post-application exposures to these residues from reentering previously treated areas would be unlikely. Additionally, the types of applications of prometon (i.e., fencerows, rights-of-ways, building perimeters) do not warrant the need for workers to re-enter the application site. Based on these factors, the Agency does not anticipate significant post-application exposure. Thus, the Agency concluded that a quantitative assessment was not necessary and all potential post-application exposures do not pose any risks of concern.

4. Aggregate Exposure and Risk

The Agency considered the potential for aggregate exposures and whether there is a concern for these combined exposure and risk concerns. Although an aggregate risk assessment is not required under current Agency policies for non-food use chemicals, to ensure that the public health is adequately protected, a screening-level aggregate risk assessment to consider combined dietary and non-occupational or residential exposures was conducted for prometon. For chronic aggregate risks, the only potential exposure is from drinking water. The dietary exposures (drinking water only) do not exceed 10% of the cRfD for adults and 33% of the cRfD for children. For short-term aggregate risks, no aggregate assessment is needed for children since there are no expected residential (post-application or handler) exposures to children. For short-term aggregate risk for adults when considering the dietary exposure (drinking water only) as a background exposure, the level of dietary exposure (0.005 mg/kg/day) is small and considered negligible when compared to the maximum residential handler exposure (0.64 mg/kg/day) from belly grinder application of granules. No intermediate-term residential post-application or residential handler exposure scenarios were identified.

5. Incident Reports

The Agency reviews various databases to determine if any substantiated reported incidents warrant further investigation for effects not considered. Databases searched include the Office of Pesticides Program Incident Data System (IDS), Poison Control Center (PCC), California Department of Pesticide Regulation (CDPR), and the National Institute of Occupational safety and Health's Sentinel Event Notification system for Occupational Risks (NIOSH SENSOR). A relatively large number of incidents including prometon were identified in the PCC Database and in IDS. The symptoms were concentrated in five areas as follows:

1. Gastrointestinal: nausea, vomiting and throat irritation
2. Neurological: headache and dizziness/vertigo
3. Respiratory: dyspnea and cough/choke
4. Ocular: eye irritation/pain, lacrimation, and corneal abrasion
5. Dermal: skin irritation/pain

The frequency and severity of events reported to PCC (data available 1993 - 2005) is comparable in magnitude to the composite average of all pesticides for occupational and childhood exposures. Although a higher than average number of non-occupational incidents was seen at a health care facility, the severity of outcome was comparable to the composite average of all pesticides. A total of 86 IDS (1999 - present) individual prometon human incident reports were reviewed. A descriptive tally of the types of exposures showed: 30 dermal exposure cases, 4 eye exposures, 12 inhalation exposure cases, 2 ingestion cases, with 1 being a possible suicide but not so designated in the reporting (known suicides are excluded), 29 systemic multiple organ system effects cases by multiple routes of exposure, and 11 systemic cases with unknown routes of exposure, and 1 possible misuse. The NIOSH SENSOR (1998 - 2003) database only reported 3 incidents involving prometon, with symptoms as described above. A large number of incidents involve irritation as a symptom, which is not seen in animal studies with prometon. Thus, these incidents could be due to another component of the pesticide formulation, either another active ingredient or an inert ingredient. CDPR (1999 - 2004) provided a summary report of 33 incidents for the above period of record. Many incidents are old and only 2 were reported since 2000. Skin and eye exposures predominate with 14 systemic symptoms cases.

Based on the reported information, there are a number of uncertainties of whether it is prometon active ingredient that is the direct cause of these reported incidents. Some of the uncertainties include determining which component of the product caused irritation incidents (i.e., irritation from exposure to a product's inert ingredient), the scenario in which exposure had occurred (i.e., misuse or inappropriate use of product), and if there were other products that the person had been exposed to.

B. Ecological Risk Assessment

The ecological risk assessment on prometon addressed potential exposures and risks from all registered uses in the U.S. The full assessment, *Response to Comments on the Ecological Risk Assessment in Support of the Re-registration Eligibility Decision for Prometon (080804)*, dated February 28, 2008, and the *Error Correction: Drinking Water Assessment and Ecological Risk Assessment for Prometon RED*, dated October 24, 2007, and response to public comments is available on the internet and in the public docket at www.regulations.gov (EPA-HQ-OPP-2007-1078).

1. Environmental Fate and Transport

Available environmental fate data indicates that prometon is persistent and mobile in both soil and aquatic environments. The likely routes of movement from the application site are through runoff into surface water and leaching into groundwater. Prometon is resistant to abiotic hydrolysis, photodegradation in water, aerobic soil metabolism, and anaerobic soil metabolism, where half-lives range from 462 to 932 days in aerobic soil. In anaerobic soil the half-life is 557 days. Major degradation products of prometon include 2 amino-4-(isopropylamino)-6-methyoxy-s-triazine (GS-14626), 2,4-diamino-6-methoxy-s-triazine (GS-12853), and 2-hydroxy-4,6 bis (isopropylamino)-s-triazine (GS-11526). Although information on the toxicity of these degradates are not available, the Agency is assuming that degradates are of equal or lesser toxicity to that of the parent compound.

2. Ecological Risk

The pesticide use profile, exposure data, and toxicity information are used to determine risk estimates to non-target aquatic and terrestrial organisms. As applicable, acute and chronic terrestrial toxicity studies are used to establish the potential toxicity (hazard) of prometon to non-target species. Estimated Environmental Concentrations (EECs) measure the potential residue concentrations from the maximum or typical application rate of prometon to which an organism may be exposed. A risk quotient (RQ) is the ratio of the EECs to the organism's toxicity endpoint, which would yield the maximum exposure estimates. The RQ is then compared to the level of concern (LOC) to determine if that particular exposure scenario would pose a risk to the non-target organism. Table 8 lists the Agency's LOCs and the corresponding risk presumptions.

Table 8. Agency's LOCs and Risk Presumptions

Risk Presumption	LOC Terrestrial Animals	LOC Aquatic Animals	LOC Plants
Acute Risk - there is potential for acute risk; regulatory action may be warranted.	0.5	0.5	1
Acute Endangered Species – there is potential for endangered species risk; regulatory action may be warranted.	0.1	0.05	1
Chronic Risk - there is potential for chronic risk; regulatory action may be warranted.	1	1	N/A

a. Terrestrial Organisms

Terrestrial animals (birds, mammals, reptiles, insects, and terrestrial-phase amphibians) that are located in or near the treated area may be exposed to prometon by feeding on food items with prometon residues from overspray, runoff, and from spray drift onto areas adjacent to treated sites. The Agency estimates exposures and potential risk to birds and mammals, which also serve as surrogates for exposures to terrestrial-phase amphibians and reptiles, and to dryland and semi-aquatic plants. For exposure to terrestrial animals and plants, pesticide residues on food items are estimated based on the assumption that organisms are exposed to a single pesticide residue in a given exposure scenario.

EPA estimated EECs of prometon residues that may occur on avian and mammalian food items. Although prometon is a "bare ground" herbicide, animals can be exposed to prometon residues that are available on plant foliage surfaces shortly after application and prior to plant death. The greatest prometon residues and exposure levels are likely to occur in the surface soil and on plant foliage (e.g., grasses and broadleaf plants), seeds, and insects on treated areas immediately following applications. In addition to exposure through spray residues on and adjacent to the application area, direct terrestrial exposure is also expected through granular applications, as animals may ingest the granules on soil surfaces. Bioaccumulation of prometon in the food chain is not expected to be a significant exposure source to non-target terrestrial organisms.

In estimating foliar residues for this screening-level assessment, the Agency assessed a maximum exposure scenario based on the maximum application rate and prometon fate

properties. These upper-bound estimates result in higher EECs that represent dose-based exposures to various food sources (grasses, fruit, seed, and insects). Dietary-based EECs can be more representative of actual exposures, and typically indicate lower residue estimates, as EECs are adjusted based on the size of the animal and its typical eating habits (i.e., amount of a certain food item). The EECs on food items may be compared directly with dietary toxicity data or converted to a single oral dose. Single oral dose estimates represent an exposure scenario where there is complete absorption of the pesticide in the animal over a single ingestion event and represents a conservative estimate.

i. Avian and Mammalian Assessment

Residues of prometon from single application scenarios are expected to occur on avian and mammalian food items. Predicted maximum EECs of pesticide residues from a single application of prometon were used in the screening-level ecological assessment. Exposures are estimated using the Terrestrial Exposure Model (TREX, version 1.2.3). The TREX model uses the Kenaga nomogram to determine the amount of pesticide residues on food items and corresponding avian acute and chronic RQs are based on the most sensitive acute and chronic endpoints, respectively, for birds. Dose estimates are based on the upper bound dose and the assumptions that the organism exclusively eats one type of food item and forages only in the treated and/or overspray areas, whereas dietary-based EECs are an estimation of actual deposition on the food item. On an acute basis, prometon is practically non-toxic to slightly toxic to birds and mammals. On a chronic basis, it can cause weight reduction in both parent and offspring at concentrations of 175-500 mg/kg for these organisms. Table 9 lists the toxicity endpoints used in the avian and mammalian assessments.

Table 9. Summary of Avian and Mammalian Toxicity Data Conducted with Prometon

Assessment Endpoint	Species	Toxicity Value Used	MRID	Effects
Vertebrates				
Acute Risk to Mammals	Rat (Sprague-Dawley)	LD_{50}=1,518 mg/kg bw (Females)	42132103	Males are less sensitive
Chronic Risk to Mammals	Rat	NOAEC=20 mg/kg/day LOAEC=500 mg/kg/day	40361501	Changes in body weight gain for both parents and pups.
Acute Risk to Birds, Terrestrial-phase Amphibians, and Reptiles	Bobwhite quail (oral dose)	LD_{50}>2,264 mg/kg bw	41609104	Ruffled appearance and lethargy at lowest dose (294 mg/kg bw)
	Bobwhite quail (dietary)	LD_{50}>5,620 mg/kg	41609105	Sublethal effects include lethargy, ruffled appearance, and reduced weight gain

Table 9. Summary of Avian and Mammalian Toxicity Data Conducted with Prometon				
Chronic Risk to Birds, Terrestrial phase Amphibians, and Reptiles	Mallard duck	NOAEC=50 mg/kg diet LOAEC=175 mg/kg diet	42132102	Eggshell thickness most sensitive endpoint; reduced female body weight post-treatment.
Invertebrates				
Acute Risk to Invertebrates	Honey bee (acute contact)	LD_{50}= 36 µg/bee 95% CI=31-45 µg/bee	41609115	None

mg/kg bw = milligrams of active ingredient per kilogram body weight, dose-based
mg/kg diet = milligrams of active ingredient per kilogram body weight, dietary-based
NOAEC = no observed adverse effect concentration LOAEC = lowest observed adverse effect concentration
LD_{50} = a statistically derived single dose that can be expected to cause death in 50% of the test animals

Birds

Dose-based RQs for the respective different-sized birds were calculated for both spray and granular applications. Although a granular pesticide does not deposit on plant surfaces in the same fashion as a liquid spray does, the granules may be ingested by organisms foraging in the treated area. For birds the acute risk LOC is 0.5, the endangered species risk LOC is 0.1, and the chronic risk LOC for birds is 1.0. Calculations for dietary-based RQs are not adjusted for body weight variations. The chronic LOCs for non-endangered birds are exceeded for many of the scenarios, where chronic RQs range from 6 to 96. Although the acute dose-based avian RQs range from 0.1 to 3.4 and acute dietary RQs range from 0.1 to 1.1, the significance of these values presents an uncertainty as to the potential acute risk because the toxicity studies did not indicate any mortality at the highest test dose. Because the median lethal dose (LD_{50}) values only established as greater than (>) a particular concentration, RQs are reported as less than (<) values. Table 10 summarizes the acute and chronic RQs for avian species.

Table 10. Avian Acute and Chronic RQ Summary for Spray and Granular Prometon Applications									
Body Weight	Spray								Granular
	Short grass		Tall grass		Broadleaf plants/small insects		Fruits/pods/ large insects		LD_{50}/ft^2
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	RQ
Acute, dose-based									
20 g	5478	<3.4	2511	<1.5	3081	<1.9	342	<0.2	<6.4
100 g	3124	<1.5	1432	<0.7	1757	<0.9	195	<0.1	<1.0
1,000 g	1398	<0.5	641	<0.2	786	<0.3	87	<0.1	<0.1
Acute, dietary-based									
All birds	4810	<1.1	2204	<0.5	2705	<0.6	301	<0.1	n/a
Chronic, dietary-based									
All birds	4810	96	2204	33	2705	54	301	6	n/a

Acute non-endangered LOC for terrestrial animals ≥ 0.5, endangered LOC ≥ 0.1. RQ = risk quotient
Chronic non-endangered and endangered LOC for terrestrial animals is ≥ 1.0 n/a = not assessed
LD_{50} = a statistically derived single dose that can be expected to cause death in 50% of the test animals
EEC = estimated environmental concentration

Mammals

As with birds, EPA assesses acute and chronic risk to mammals based on an acute LOC of 0.5, acute endangered LOC of 0.1, and a chronic LOC of 1.0. Dose-based acute RQs for mammals, ranging from 0.1 to 4.2, exceed the LOC for some of the scenarios based on prometon spray applications. For both the prometon granular and spray applications, mammalian chronic dietary- (RQs ranging from 15 to 241) and dose-based RQs (ranging from 13 to 2,086) exceed the LOC. The acute and chronic RQs are presented in Table 11 with LOC exceedances identified.

Table 11. Mammalian Acute and Chronic RQ Summary for Spray and Granular Prometon Applications

Body Weight	Spray Applications										Granular Application
	Short grass		Tall grass		Broadleaf plants/small insects		Fruits/pods/ large insects		Seeds (granivores)		LD_{50}/ft^2
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	RQ
Acute, dose-based											
15 g	4586	1.4	2102	0.6	2579	0.8	287	0.1	64	<0.1	4.2
35 g	3170	1.2	337	0.5	413	0.7	46	0.1	44	<0.1	2.2
1,000 g	735	0.6	667	0.3	413	0.4	46	<0.1	10	<0.1	0.2
Chronic, dietary-based											
All mammals	4810	241	2204	110	2705	135	301	15	n/a	n/a	n/a
Chronic, dose-based											
15 g	4586	2086	2102	956	2579	1174	287	130	64	29	n/a
35 g	3170	1782	337	817	413	1002	46	111	44	25	
1,000 g	735	955	667	438	413	537	46	60	10	13	

Acute LOCs for terrestrial animals for non-endangered ≥ 0.5, endangered ≥ 0.1. n/a = not assessed
Chronic non-endangered and endangered LOC for terrestrial animals is ≥ 1.0.
LD_{50} = a statistically derived single dose that can be expected to cause death in 50% of the test animals
EEC = estimated environmental concentration

ii. Terrestrial and Semi-Aquatic Plant Assessment

Non-target terrestrial and semi-aquatic plants can be exposed to prometon from spray drift and runoff moving to off-target field foliage and surface soil. Using TERRPLANT 1.2.1 modeling, EECs for terrestrial and semi-aquatic plants were derived for areas adjacent to the treatment site that may receive that runoff. The Agency also estimated potential EECs from overspray or drift from ground spray applications. The AgDrift model considers the method of application and droplet size to estimate potential spray drift deposition to areas outside of the treatment area. The acute RQs for terrestrial plants are calculated by dividing the EEC by the toxicity value (EC_{25}) from available Tier II seedling emergence and vegetative vigor toxicity tests. To calculate acute RQs for endangered species, EECs are divided by the NOAEC value. In the case of prometon, submitted studies indicate that dicots appear to be slightly more

sensitive than monocots. Table 12 lists the toxicity data used to evaluate risks to terrestrial and semi-aquatic plants.

Table 12. Summary of Terrestrial Plant Toxicity Data Conducted with Prometon.

Species	Toxicity (lb ai/A)	Most Sensitive Endpoint	MRID
Seedling Emergence	Most sensitive monocot: Oat EC_{25} = 0.027 NOAEC = 0.005	Radicle length	41725303
	Most sensitive dicot: Lettuce EC_{25} = 0.010 NOAEC = 0.009		
Vegetative Vigor	Most sensitive monocot: Oat EC_{25} = 0.016 NOAEC = 0.012		
	Most sensitive dicot: Lettuce EC_{25} = 0.008 NOAEC = 0.005		

Lb ai/A = pound of active ingredient per acre NOAEC = no observed adverse effect concentration
EC_{25} = effective concentration that can be expected to cause death in 25% of the test plants

RQs were calculated for terrestrial (dryland) plants based on prometon runoff and drift from one treated hectare moving to adjacent areas, whereas semi-aquatic areas were based on movement from a treated ten-hectare site. The difference in the model values (1 versus 10 hectares) were reflected in the ten-fold difference in resulting RQs, presented in Table 13. As expected with an herbicide, all RQs exceeded the Agency's LOC of 1 for non-endangered and endangered plant species, where RQs for non-endangered plants range from 37 to 1,022 and from 107 to 2,175 for endangered plants. Table 13 is a summary of the RQs for terrestrial and semi-aquatic plants exposed to prometon.

Table 13. Terrestrial Plant RQs for Ground Spray and Granular Applications of Prometon

Application	Adjacent Areas			Semi-aquatic Areas		
	lbs ai/A	RQs		lbs ai/A	RQs	
		M	D		M	D
Non-Endangered, ground spray	1.2	45	120	10.2	379	1022
Non-Endangered, granular	1.0	37	100	10.0	371	1002
Endangered, ground spray	1.2	256	128	10.2	2175	1087
Endangered, granular	1.0	213	107	10.0	2132	1066

n/a = not applicable M = monocot D = dicot

iii. Spray Drift

Although it is expected that the highest concentrations of prometon would occur in directly treated areas, spray drift from liquid applications to adjacent non-treated areas may still present the potential for exposures to non-target organisms. Potential exposures to non-target

organisms include movement of prometon to off-target surface soil, foliage, and insects. Spray drift into water bodies adjacent to treated areas can also affect sensitive aquatic organisms.

The Agency used Tier I AgDRIFT (version 2.01) modeling to evaluate potential risk at several distances from the field, simulating typical applications with a ground sprayer. Using estimated point deposition of prometon, plant RQs were calculated based on the more sensitive vegetative vigor endpoint. To estimate EECs from spray drift, EPA assumed that spray applications were made using a high boom sprayer and nozzles that produce spray droplets ranging in fine to medium-coarse sizes. Using the most sensitive endpoint (vegetative vigor EC_{25}) for the most sensitive monocot (0.016 lb ai/A), all RQs exceed the LOC of 1, with RQs ranging from 13 to 43. Based on this AgDRIFT analysis, effects could occur at greater than 995 feet away from the use site, which is the maximum distance that the model can estimate. However, this may be an overestimate of typical applications of products containing prometon, as most applications are spot treatments. Table 14 presents the RQs for terrestrial and semi-aquatic plants from estimated spray drift exposure.

Table 14. Terrestrial Plant RQs for Spray Drift Exposure

Plant Type	Non-endangered Plants		Endangered Plants		Clearance Distance (ft)	
	EEC	RQ	EEC	RQ	Acute LOC	Endangered Species LOC
Monocot	0.2 lb ai/A	13	0.2 lb ai/A	17	>995	>995
Dicot		25		43	>995	>995

Acute non-endangered and endangered LOC for aquatic plants ≥ 1.

b. Aquatic Organisms Risk

Fish, amphibians, and aquatic invertebrates in aquatic environments can be exposed to prometon in surface water by direct residue contact with their integument and via uptake through their gills or integument. Immediately following applications of prometon, the highest residue levels are expected to be located in surface waters adjacent to treated areas due to spray drift at the time of application and/or from runoff after a rain event. With the persistence of prometon residues in some terrestrial environments, there is also the likelihood of transport by runoff and leaching.

Prometon EECs for aquatic ecosystems were predicted using the Tier II PRZM/EXAMS models. PRZM uses the chemical's physical and environmental fate properties and the site characteristics to predict the concentration of pesticide in runoff and entrained sediment from the field. EXAMS considers the environmental data and transport of pesticides. The exposure values used in the ecological risk assessment are based on the "standard pond" scenario, intended to better represent the spatial and physical qualities of habitats relevant to risk assessment for non-target organisms in ponds or streams that may be in or adjacent to treated areas. The resulting EECs predict high-end values of pesticide concentrations that may be found in environments following pesticide applications and, thus, represent conservative exposure estimates to which non-target organisms may be exposed. The EEC values determined for impact to non-target aquatic organisms are specific to ecological and fate properties in the respective scenarios assessed and, therefore, are different from those used to assess human

exposures in the drinking water assessment. To simulate runoff in a mixed grass and shrub environment to represent the range of application scenarios, the Agency modeled the following scenarios:

- rights-of-way in Texas and California;
- rangeland/hay in Texas and California; and
- turf in Florida and Pennsylvania.

One of the assumptions of the PRZM/EXAMs modeling is that EECs are estimated based on the maximum application rate and movement of the pesticide from a 10-hectare application site. Because prometon is used to maintain a bare ground on smaller areas, a PCA factor 2.6% of an acre was applied to water concentrations estimated using PRZM/EXAMS, which more closely reflects typical spot treatment applications, rather than broadcast applications over an acre. Estimated water concentrations of prometon for assessing ecological exposures are listed in Table 15.

Table 15. PRZM/EXAMS EECs of Prometon in Water for Aquatic Exposure

Application Scenario	Application Rate (lbs ai/A)	1-in-10 Year Peak Acute (µg/L)	1-in-10 Year 21 Day Chronic (µg/L)	1-in-10 Year 60 Day Chronic (µg/L)
California Rangeland/Hay				
Ground Spray	20	1179	1178	1157
Granular		1079	1078	1057
California Rights-of-Way				
Ground Spray	20	1549	1539	1527
Granular		1440	1439	1426
California Turf (no irrigation)				
Ground Spray	20	1408	1399	1399
Granular		1058	1058	1049
Florida Turf				
Ground Spray	20	423	422	420
Granular		333	332	330
Pennsylvania Turf				
Ground Spray	20	539	537	534
Granular		404	403	401
Texas Range				
Ground Spray	20	2468	2458	2447
Granular		2397	2387	2368
Texas Rangeland				
Ground Spray	20	726	724	719
Granular		644	641	637

Lbs ai/A = pounds of active ingredient per acre EEC = estimated environmental concentration

1. Aquatic Organisms Assessment

Prometon is slightly toxic to both freshwater and saltwater fish and invertebrates. The LC_{50} for freshwater non-vascular aquatic plants (represented by a green alga) is 0.098 mg/L. Based on available data, freshwater vascular aquatic plants and saltwater non-vascular aquatic plants (represented by a diatom) appear to be less sensitive than non-vascular freshwater plants. Table 16 is a summary of aquatic toxicity studies the Agency used in the ecological assessment.

Table 16. Summary of Aquatic Organism Toxicity Data for Prometon

Assessment Endpoint	Species	Toxicity Value Used	Source Citation
Freshwater			
Acute Toxicity to Fish and Aquatic-phase Amphibians	Rainbow trout	LC_{50} = 12 mg/L	ECOTOX 546
		LC_{50} =19.6 mg/L	MRID 41609108
Chronic Toxicity Fish and Aquatic-phase Amphibians	Fathead minnow	NOAEC = 9.5 mg/L LOAEC = 19.7 mg/L	MRID 41810902
Acute Toxicity to Aquatic Invertebrates	Water flea	LC_{50} = 25.7 mg/L	MRID 41609109
Chronic Toxicity Aquatic Invertebrates	Water flea	NOAEC = 3.5 mg/L LOAEC = 6.8 mg/L	MRID 41810903
Acute Toxicity to Aquatic Plants (non-vascular)	Green alga	LC_{50} = 0.098 mg/L NOAEC=0.032 mg/L	MRID 41725305
Acute Toxicity to Aquatic Plants (vascular)	Duckweed	LC_{20} = 0.246 mg/L LC_{50} = 0.624 mg/L	ECOTOX 81431
Saltwater			
Acute Toxicity to Fish	Sheepshead minnow	LC_{50} =47.3 mg/L	MRID 41725301
Chronic Toxicity to Fish	Based on ACR of 4.0 (Rainbow/ fathead)	NOAEC = <11.8 mg/L*	ACR
Acute Toxicity to Aquatic Invertebrates	Mysid shrimp	LC_{50} = 18.0 mg/L	MRID 41810910
Chronic Toxicity Aquatic Invertebrates	Based on ACR of 7.34 (Water flea/ water flea)	(18.0 mg/L/7.34) NOAEC = 2.5 mg/L	ACR
Acute Toxicity to Aquatic Plants	SW diatom	LC_{50} = 0.25 mg/L	ECOTOX 9211

mg/L = milligrams per liter ACR = acute-to-chronic ratio
LC_{50} = Lethal Concentration: a statistically derived concentration of a substance that can be expected to cause death in 50% of test animals
*Endpoint expressed as "less than" value because freshwater endpoint was non-definitive.

Freshwater Fish and Invertebrates

Similar to the way that RQs are calculated for terrestrial organisms, aquatic acute RQs were derived by dividing the peak EECs by the LC_{50}. Chronic RQs for freshwater invertebrates

were derived by dividing the 21-day EECs by the NOAEC values. For prometon, the peak modeled aquatic concentrations ranged from 2,468 µg/L (TX BSS Right of Way scenario, ground spray) to 333 µg/L (FL Turf scenario, granular). These two scenarios were used as upper- and lower-bound estimates to calculate the range of RQs.

Based on predicted modeling, which assessed both ground spray and granular applications, neither the acute LOC (0.5) nor the chronic LOC (1.0) was exceeded for any aquatic animal in the scenarios modeled. However, the endangered species acute risk LOC (0.05) was exceeded for both freshwater and marine/estuarine animals in all but one of the scenarios modeled based on the highest EEC modeled. Acute RQs for fish and invertebrates ranged from 0.01 to 0.09. Chronic RQs for both freshwater and saltwater fish and invertebrates ranged from 0.02 to 0.67. The aquatic animal LOC was not exceeded for any animal in any scenario modeled. Table 17 summarizes the acute and chronic RQs for freshwater and saltwater animals.

Table 17. Summary of Fish and Invertebrate Acute and Chronic RQs

Species	Acute RQ	Chronic RQ
Texas BSS Right of Way Ground Spray (highest EEC)		
FW Aquatic Invertebrates	0.06	0.48
FW Fish	0.09	0.34
SW Aquatic Invertebrates	0.05	0.67
SW Fish	0.04	0.14
Florida Turf Granular (lowest EEC)		
FW Aquatic Invertebrates	0.01	0.10
FW Fish	0.02	0.07
SW Aquatic Invertebrates	0.02	0.02
SW Fish	0.01	0.33

FW - freshwater SW - saltwater EEC - estimated environmental concentration RQ = Risk Quotient

2. Aquatic Plants

Surface water concentrations were predicted using PRZM/EXAMS modeling for prometon applications to surrogate turf scenarios, which considered both ground spray and granular applications. Aquatic plants toxicity data were available to determine potential toxicity of prometon to non-target aquatic plants. For vascular and nonvascular plants, peak EECs were compared to acute EC_{50} toxicity endpoints for the most sensitive plant species. For prometon, RQs for endangered plants were calculated using the EC_{05} toxicity endpoint, as NOAECs could not be determined from available submitted data.

For aquatic plants, both the acute risk and endangered species acute risk LOC is 1. The endangered species RQ is calculated based on the NOAEC instead of the LC_{50}, which is used for the acute risk RQ. In all cases modeled, RQs for both freshwater and saltwater non-vascular plants exceeded both the acute and endangered species risk LOCs. RQs for freshwater vascular plants exceeded the endangered species LOC in all scenarios, and exceeded the acute risk LOC in 10 out of 14 scenarios modeled. Acute RQs ranged from 0.53 to 17, whereas endangered plant RQs range from 1.6 to 52. Table 18 summarizes the RQs for aquatic plants.

Table 18. Summary of Aquatic Plant RQs		
Species	Acute RQ	Endangered Species RQ
TX BSS Right of Way Ground Spray (highest EEC)		
FW Algae	17.0	52.2
FW Vascular Plants	2.7	8.2
SW Algae	6.7	20.4
FL Turf Granular (lowest EEC)		
FW Algae	3.40	10.4
FW Vascular Plants	0.53	1.6
SW Algae	1.33	4.1

FW - freshwater SW - saltwater EEC - estimated environmental concentration
Acute non-endangered and endangered LOC for aquatic plants ≥ 1.0.

c. Ecological Incidents

Ecological incidents are voluntarily reported to the Agency by local, state, other federal agencies, or at times, submitted under FIFRA section 6(a)2. EPA's incident database contained only two incidents related to prometon. Based on information reported, one of these incidents (Incident ID I014409-078) appears to have been a case of misuse, where a paving contractor used prometon on a roadway and the resulting runoff killed trees and lawn plants near the road. The report notes that the application was not in accordance with the label. The second incident (Incident ID I005895-355) was a fish kill. The magnitude of the kill is listed as unknown, and the kill is attributed to an accidental spill of a prometon product into a contained pond. EPA's incident database contains information regarding adverse effects associated with particular pesticide applications that are reported to the manufacturer/distributor of the chemical. While the registrant is required by law to report adverse effects to the Agency, reporting of incidents by the public and/or state and local agencies is largely voluntary. Thus, there may be incidents that are not reported to the Agency. Generally, a large number of reported incidents may indicate a high degree of hazard for non-target species exposed to the pesticide. However, the converse is not necessarily true, and a small number of reported incidents should not be interpreted as implying any degree of "safety" for non-target species.

IV. Risk Management and Reregistration Decision

A. Determination of Reregistration Eligibility

Section 4(g)(2)(A) of FIFRA calls for the Agency to determine, after submission of relevant data concerning an active ingredient, whether or not products containing the active ingredient are eligible for reregistration. The Agency has previously identified and required the submission of the generic (i.e., active ingredient-specific) data required to support reregistration of products containing prometon as an active ingredient. The Agency has completed its review of these generic data, and has determined that the data are sufficient to support reregistration of all products containing prometon.

The Agency has determined that prometon-containing products are eligible for reregistration provided that the required risk mitigation measures, which are outlined below in Section C, are adopted and label amendments are made to implement these mitigation measures, as outlined in Chapter V. Appendix A summarizes the uses of prometon that are eligible for reregistration. Appendix B identifies the generic data requirements that the Agency reviewed as part of its determination of reregistration eligibility of prometon, and lists the submitted studies that the Agency found acceptable. Data gaps are identified as generic data requirements that have not been satisfied with acceptable data. Should a registrant fail to implement any of the reregistration requirements identified in this document, the Agency may take regulatory action to address these concerns.

B. Public Comments and Responses

When making its reregistration decision, the Agency considered all comments received in the docket during the public participation phase. EPA also worked with stakeholders and the public to reach the regulatory decisions for prometon. During the public comment period, which closed on January 7, 2008, the Agency received comments from interested stakeholders. These comments in their entirety are available in the public docket (EPA-HQ-OPP-2007-1078) at www.regulations.gov. The RED document, supporting documents for prometon, and the Agency's response to received comments are also available in the docket. In addition, the prometon RED document may be downloaded or viewed through the Agency's website at http://www.epa.gov/pesticides/reregistration/status.htm.

C. Risk Mitigation and Regulatory Position

With the exception of granule applications that may be applied by hand or a belly grinder, currently registered products containing prometon are eligible for reregistration provided that the risk mitigation measures and label amendments are adopted as outlined in Table 20 (Label Table) and mitigated use patterns in Appendix A. The following is a summary of the rationale for mitigation measures necessary for managing risks associated with the use of prometon products to be eligible for reregistration. Table 19 summarizes the human and ecological risks of concern and the respective mitigation measure.

Table 19. Prometon Human and Ecological Risk Mitigation Measures	
Risk of Concern	Mitigation Measure
Dermal exposure risks from residential applications for hand application of granules and belly grinder application of granules.	These two application methods, as well as all other residential sites (i.e., patios, driveways, and areas around the home), are no longer supported by the registrant and will be prohibited on all labels.
Dermal exposure risks for occupational mixers and loaders of liquid formulations intended for applications using rights-of-way spray equipment.	The requirement to use gloves in addition to baseline PPE.
Non-target terrestrial exposures to animals and plants, including spray drift.	The maximum use rate is reduced to the equivalent to 16 lbs ai/A for applications under block or solid paving.
	The maximum use rate is reduced to the equivalent of 18 lbs ai/A for all other industrial sites.
	End-use product labels will include language requiring that weeds greater than 4 inches must be mowed, removed, or hoed into the soil prior to application.
	End-use product labels will include language requiring that immediately after application, treatment areas must be watered in with at least 1/4" of water or treatments will be made just prior to a rain event.
	Applications must be made using medium- to coarse-sized droplets.
	Applications must not be made to sloped areas where desirable vegetation or adjacent water bodies are located downhill of the treatment area.
	Products containing prometon are limited to one application per year.

1. Human Health Risk Management

The Agency determined that all potential exposures (dietary and handlers) and risks are not of concern. The only potential dietary exposure to prometon residues were chronic exposures drinking water, which are below EPA's LOC for all populations. All currently registered assessed residential and occupational uses of prometon, with the exception of some residential applications (handler exposures), do not pose risks of concern. In the preliminary occupational and residential risk assessments, all exposure values were based on the originally supported maximum rate of 20 lbs ai/A. The Agency identified two residential scenarios where there are dermal exposure concerns: for granules applications applied by hand and granule applications made with a belly grinder. Even with the reduction of the maximum use rate to 18 lbs ai/A, both application scenarios are of risk concern to the Agency (i.e., ARIs < 1).

To reduce exposures from these application methods, the registrant voluntarily and agreed to cancel these application methods. Additionally, the registrant also agreed to cancel all other residential use sites, including, but not limited to, "areas around the home," patios, play areas, and driveways. Although there are some uncertainties of whether prometon was the direct cause of the various effects identified in the incident reports, the cancellation of all residential uses of these products will significantly reduce potential exposures to adults, as well as to

children. For spray applications made with rights-of-way equipment, the requirement for mixers and loaders to use gloves in addition to baseline PPE mitigates any remaining occupational risks of concern. Thus, there are no additional human health risk concerns from using prometon-containing products.

2. Ecological Risk Management

Based on available toxicological data and mitigated use rates, the ecological risk assessment identified some exposure scenarios with prometon that may pose ecological risks of concern to the Agency, including potential effects on endangered species. The registrant agreed to decrease the maximum application rate from 20 lbs ai/A to 18 lbs ai/A for bare-ground areas, a decrease in the application rate by 10%. Specific to soil applications made under solid or block paving, the supported maximum rate has been further decreased to 16 lbs ai/A. Even with these reductions, there were still exceedances identified in the terrestrial assessment, described in further detail below. However, considering the conservative assumptions made in the ecological assessment, the mitigation measures adopted, and the nature of the weed control activity of this herbicide, the risks can be significantly reduced with the adoption of the proposed modifications to label use directions. The following sections summarize the risks identified for each respective affected organism identified earlier in Chapter III, as well as a presentation of refined risk estimates based on use rate reductions, and characterization of the actual usage of prometon.

a. Terrestrial Organisms

<u>Birds and Mammals</u>

The ecological assessment identified potential risk to some non-target terrestrial animals. Based on the originally maximum supported rate of 20 lbs ai/A, EPA's avian and mammalian assessments showed that there were acute and chronic LOC exceedances for certain food items from both granular and liquid application scenarios. In the avian and mammalian assessments, EECs based on granular applications are significantly lower than those based on liquid applications. When the Agency considered the use rate reduction of approximately 10% to 18 lbs ai/A, the resulting acute avian RQs ranged from 0.03 to 2.92, and chronic RQs ranged from 5.2 to 83.6. For mammalian exposures, the 10% reduction in application rate resulted in acute RQs ranging from 0.01 to 1.2 and chronic RQs ranging from 11.5 to 1,814. Based on prometon residues that drift from the application area, even with the application rate reduction of 10%, modeling a spray application using a low boom (30 inches above the target area), and fitted with nozzles to produce a very coarse spray, spray drift models estimated chronic effects on mammals that can occur up to 500 feet from the application site.

In addition, there are some conservative assumptions made in the bird and mammalian assessments that may overestimate potential risks. To estimate upper-bound exposures, the Agency assumes that the animal's diet is comprised solely of food (i.e., plant foliage, insects, fruit, and seeds) from potential forage areas that may contain residues from recent prometon applications. However, wildlife organisms typically consume a variety of foodstuff from multiple locations, rather than from a single location. Second, because prometon is a non-selective herbicide intended to maintain a treatment area devoid of any forage plants or other

vegetation, it is expected that there should be minimal-to-no plants available for animals to forage on much longer after an application of prometon. Although at a likely lesser exposure, animals that may encounter a treated area, namely birds, can still be exposed to prometon residues that feed on remaining seeds or insects.

Some limitations of the modeling may have overestimated prometon exposures. Although the acute dose-based avian RQs (based on 20 lbs ai/A) range from 0.1 to 3.4 and acute dietary RQs range from 0.1 to 1.1, the significance of these values presents an uncertainty as to the potential acute risk because the toxicity studies did not indicate any mortality at the highest test dose. Thus, this may be an overestimate of potential acute risk to birds. The chronic assessment assumes that the animal repeatedly returns to the treated area to feed or forage. Considering that prometon is intended for spot treatments and maintaining bare ground areas, rather than reliance on prometon as a knock-down herbicide, there should be limited food availability in treated areas that would be attractive for animals to feed. There is some uncertainty as to how long plants in treated areas may survive from the time of application. The sensitivity of the target weed to prometon can vary, resulting in differing rates of plant death from the time of treatment. Since these times and efficacy on different weed species are variable, the models used to assess exposures cannot consider these factors. As prometon is used to maintain barren grounds, the model does not account for any timeframe duration as forage supplies decrease.

To reduce the amount of available prometon granules or residues from spray applications in treated areas on food items that animals may consume in treated areas, additional measures must be adopted to reduce the remaining residues on plant surfaces. In order for prometon to be the most efficacious, it must be taken up by plant roots from the soil. The requirement of watering the treated area after an application of prometon-containing products will reduce the amount of prometon residues remaining on plant surfaces immediately after liquid applications or dissolving granules after application. For areas that have more dense vegetation with plants that are taller than four inches, labeling will include requirements to mechanically remove or mow the area to better ensure that prometon applications reach the soil. Adopting these measures will substantially reduce the amount of prometon residues on plants available to animals.

Terrestrial Plants

As expected with a terrestrial herbicide, there are some risks of concern for effects to non-target terrestrial plants. Specific to semi-aquatic areas, RQs estimated for terrestrial (dryland) plants are significantly higher based on prometon runoff and drift from one treated hectare moving to adjacent areas, whereas semi-aquatic areas (wetlands) are based on movement from a treated 10 acre site. The highest RQ estimates for terrestrial plants effects resulted from combined runoff and drift; however, the majority of RQs exceeded the LOC even for drift alone at the highest originally supported maximum rate (20 lbs ai/A) assessed. With the persistence and solubility of prometon, non-target plants in the immediate area surrounding the application site may also be affected.

Specific to spray drift, risk is estimated in two ways; the amount of pesticide that could be deposited onto non-target plant surfaces and the distance from the target application area where pesticide drift could occur. Depending on the type of application equipment and the type of nozzles used, finer droplets may be produced. Droplet size can influence the distance a pesticide drifts from the application area. In Chapter III, RQs for spray drift was assessed based on the originally supported maximum use rate of 20 lbs ai/A, a range of fine to medium-coarse droplet sizes that can occur from spray applications made using a high ground boom (four feet above the treatment area), and spray applications made with a high ground boom. Because of the very small dose needed to adversely affect plants, spray drift models estimated potential effects that can occur as far as over 1,000 feet away from the application site.

The sensitivity of the non-target plant's exposure to prometon can vary, resulting in varying severity of effects on plants. The registrant indicated that although there is some foliar activity when prometon is applied, the majority of herbicidal activity is by root uptake from prometon in the soil. Because the predominant use of prometon is for smaller areas, typically around building perimeters or along fence lines, liquid applications are more likely to be made using handheld equipment (i.e., backpack sprayer or sprinkling can) or other application equipment that would be lower to the ground and closer to the target area. Because prometon is intended as a soil sterilant that works primarily via plant root uptake, nozzles that produce larger droplets would move more readily into the soil and the prometon would be available for plant root uptake. Thus, in order for prometon to be available for plant root uptake, spray applications using nozzles to produce larger droplets will produce less fine droplets that can potentially drift off-site.

b. Aquatic Organisms

Although prometon products are not registered for use in aquatic settings, the high persistence and solubility of prometon can result in its movement into adjacent aquatic areas via runoff from treated areas. Spray drift droplets can also deposit prometon into nearby aquatic areas. Based on the originally maximum supported use rates, estimated exposures to fish and aquatic invertebrates do not pose any risks of concern. Based on both the modeled highest and lowest EECs, prometon residues can affect both vascular and non-vascular aquatic plants. The Agency believes that the modeling represents an upper bound assessment, as the modeling includes the assumption that the receiving water body and the application site are adjacent to each other. This is apparent when comparing modeling results with the monitoring data, where estimated peak exposures are approximately 1 - 2 orders of magnitude above the highest reported detections in the monitoring data. To further reduce inadvertent movement of prometon into water bodies, labeling language will include recommendations to avoid applications made to sloped areas where desirable vegetation or nearby water bodies may be located downhill of the application area.

c. Endangered Species

The Agency has developed the Endangered Species Protection Program to identify pesticides whose use may cause adverse impacts on endangered and threatened species and to implement mitigation measures that address these impacts. The Endangered Species Act (ESA)

requires federal agencies to ensure that their actions are not likely to jeopardize listed species or adversely modify designated critical habitat. To analyze the potential of registered pesticide uses that may affect any particular species, EPA uses basic toxicity and exposure data and considers ecological parameters, pesticide use information, geographic relationship between specific pesticide uses and species locations, and biological requirements and behavioral aspects of the particular species. When conducted, these analyses take into consideration any regulatory changes recommended in this RED being implemented at that time.

The ecological assessment that EPA conducted for this RED does not, in itself, constitute a determination as to whether specific species or critical habitat may be harmed by the pesticide. Rather, this assessment serves as a screen to determine the need for any species-specific assessment that will evaluate whether exposure may be at levels that could cause harm to specific listed species and their critical habitat. The species-specific assessment refines the screening-level assessment to take into account information such as the geographic area of pesticide use in relation to the listed species and the habits and habitat requirements of the listed species. If the Agency's specific assessments for prometon result in the need to modify use of the pesticide, any geographically specific changes to the pesticide's registration will be implemented through the process described in the Agency's *Federal Register* Notice (54 FR 27984) regarding implementation of the Endangered Species Protection Program.

Based on EPA's screening level assessment for prometon, RQs exceed the LOCs for mammals, birds, and terrestrial and aquatic plants. However, these findings are based solely on EPA's screening-level assessment and do not constitute "may affect" findings under the ESA. A determination that there is a likelihood of potential effects to a listed species may result in limitations on the use of the pesticide, other measures to mitigate any potential effects, and/or consultations with the Fish and Wildlife Service or National Marine Fisheries Service, as necessary. If the Agency determines that the use of prometon "may affect" listed species or their designated critical habitat, EPA will employ the provisions in the Services regulations (50 CFR Part 402). To reduce potential effects to non-target endangered species, EPA is requiring various mitigation measures, including rate reductions and additional labeling language to reduce the movement of pesticide away from target application areas.

D. Labeling Requirements

In order to be eligible for reregistration, various use and safety information will be included in the labeling of all end-use products containing prometon. For the specific labeling statements, refer to Table 20 of this RED document.

V. What Registrants Need to Do

For end-use products containing the active ingredient prometon, registrants need to submit the following items for each product.

Within 90 days from receipt of the product-specific data call-in (PDCI):

(1) completed response forms to the PDCI (i.e. DCI response form and requirements status and registrant's response form); and

(2) submit any time extension and/or waiver requests with a full written justification.

Within eight months from receipt of the PDCI:

(1) submit two copies of the confidential statement of formula, EPA form 8570-4;

(2) a completed original application for reregistration (EPA form 8570-1). Indicate on the form that it is an "application for reregistration";

(3) five copies of the draft label incorporating all label amendments outlined in Table 20 of this document;

(4) a completed form certifying compliance with data compensation requirements (EPA Form 8570-34);

(5) if applicable, a completed form certifying compliance with cost share offer requirements (EPA Form 8570-32); and

(6) the product-specific data responding to the PDCI.

Please contact Karen Jones at 703-308-8047 with questions regarding product reregistration and/or the PDCI. All materials submitted in response to the PDCI should be addressed:

By U.S. mail:
Document Processing Desk (DCI/SRRD)
Karen Jones
U.S. EPA (7508P)
1200 Pennsylvania Ave., NW
Washington, D.C. 20460

By express or courier service:
Document Processing Desk (DCI/SRRD)
Karen Jones
U.S. EPA (7508P)
2777 South Crystal Drive
Arlington, VA 22202

A. Manufacturing-Use Products

1. Additional Generic Data Requirements

Within the scope of the uses and currently registered products subject to reregistration, the generic database supporting the reregistration of prometon has been reviewed and determined

to be substantially complete. At this time, no additional studies are required for reregistration of currently approved products containing prometon.

2. Labeling for Manufacturing-Use Products

To ensure compliance with FIFRA, manufacturing-use product (MUP) labeling should be revised to comply with all current EPA regulations, PR Notices, and applicable policies. The MUP labeling should bear the labeling contained in Table 20.

B. End-Use Products

1. Additional Product-Specific Data Requirements

Section 4(g)(2)(B) of FIFRA calls for the Agency to obtain any needed product-specific data regarding the pesticide after a determination of eligibility has been made. The Registrant must review previous data submissions to ensure that they meet current EPA acceptance criteria and if not, commit to conduct new studies. If a registrant believes that previously submitted data meet current testing standards, then the study MRID numbers should be cited according to the instructions in the Requirement Status and Registrants Response Form provided for each product. The Agency intends to issue a separate product-specific data call-in (PDCI), outlining specific data requirements. For any questions regarding the PDCI, please contact Karen Jones at 703-308-8047.

2. Labeling for End-Use Products

To be eligible for reregistration, labeling changes are necessary to implement measures outlined in Section IV above. Specific language to incorporate these changes is specified in Table 20. Generally, conditions for the distribution and sale of products bearing old labels/labeling will be established when the label changes are approved. However, specific existing stocks time frames will be established case-by-case, depending on the number of products involved, the number of label changes, and other factors.

C. Labeling Changes Summary Table

In order to be eligible for reregistration, amend all product labels to comply with the required language show in the following table. Table 20 describes how language on the labels should be amended.

Table 20. Prometon Labeling Requirements Table		
Description	Prometon: Required Labeling Language	Placement on Label
Manufacturing-Use Products		
For all Manufacturing Use Products	"Only for formulation as an ***herbicide*** for the following use(s) [fill blank only with those uses that are being supported by MP registrant]." "Only for formulation into end-use liquid products with directions for use that prohibit aerial application." "Only for formulation into end-use granular products with directions for use that prohibit application by hand or with belly grinder (rotary spreader) equipment." "Only for formulation into end-use products with directions for use that prohibit application in residential settings." "Only for formulation into end-products with directions for use that prohibit applications greater than the equivalent of 18 lbs of prometon per acre, or 0.2 lb of prometon per 500 ft^2."	Directions for Use
One of these statements may be added to a label to allow reformulation of the product for a specific use or all additional uses supported by a formulator or user group.	"This product may be used to formulate products for specific use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)." "This product may be used to formulate products for any additional use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)."	Directions for Use
Environmental Hazards Statements Required by the RED and Agency Label Policies	"Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollution Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA."	Precautionary Statements
End-Use Products Intended for Occupational Use (Non-WPS)		

PPE Requirements Established by the RED for granular formulations	"Personal Protective Equipment (PPE)" All loaders, applicators, and other handlers must wear the following PPE: - long-sleeved shirt and long pants, and - shoes plus socks."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals
PPE Requirements Established by the RED for liquid formulations	"Personal Protective Equipment (PPE)" "Some materials that are chemical-resistant to this product are" (*registrant inserts correct chemical-resistant material*). "If you want more options, follow the instructions for category" *[registrant inserts A,B,C,D,E,F,G,or H*] "on an EPA chemical-resistance category selection chart." "All mixers, loaders, applicators, and other handlers must wear: - long-sleeved shirt and long pants, and - shoes plus socks. In addition, mixers and loaders supporting motorized ground equipment and handlers cleaning up spill or equipment must wear chemical-resistant gloves, such as (*registrant insert correct chemical-resistant materials)*."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals
General Application Restrictions	"Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application."	Place in the Direction for Use directly above the Agricultural Use Box.
Entry Restrictions for Uses for Products Applied as a Spray	"Do not enter or allow entry until sprays have dried."	Directions for Use Under General Precautions and Restrictions.
Entry Restrictions for Granular Products	Instructions for watering in, include the following statement: "Do not enter or allow entry to the treated areas (except those involved in the watering) until the watering in is complete and the surface is dry."	Directions for Use Under General Precautions and Restrictions.
User Safety Requirement	"Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry." "Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them."	Precautionary Statements: Hazards to Humans and Domestic Animals Immediately following the PPE requirements

User Safety Recommendations	"USER SAFETY RECOMMENDATIONS" "Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet." "Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing." "Users should remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing."	Precautionary Statements: Hazards to Humans and Domestic Animals (Must be placed in a box.)
Environmental Hazard Statement	"This pesticide may adversely affect non-target plants. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters or rinsate. This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Application around a cistern or well may result in contamination of drinking water or groundwater."	Precautionary Statements immediately following the User Safety Recommendations
Other Application Restrictions (Risk Mitigation)	For treatments made under solid or block paving , include the following: "Limited to 1 application per year. The maximum use rate is 0.18 lb ai/500 ft^2, or the equivalent to a maximum of 16 lbs ai/A." For all other applications to industrial sites: "Limited to 1 application per year. The maximum use rate is 0.20 lb ai/500 ft^2, or the equivalent to a maximum of 18 lbs ai/A."	Directions for Use Associated with the Specific Use Pattern
Other Application Restrictions (Risk Mitigation)	"Do not apply this product in a residential setting."	Directions for Use under Other Use Precautions

General Application Restrictions	Include the following instructions for treatment areas with greater weed density: “Weeds greater than 4 inches must be mowed, removed, or hoed into the soil prior to application.”	Directions for Use under Other Use Precautions
General Application Restrictions	Include the following instructions for watering-in requirement: “This product will not provide herbicidal action in the treated area unless application is immediately followed by watering the area with at least ¼" of water or application of the product just prior to a rain event sufficient to penetrate to the root system of the target vegetation.”	Directions for Use under Other Use Precautions
General Application Restrictions	“Do not use this product on or near desirable plants, including within the dripline of the roots of desirable trees and shrubs, since injury to desirable plants and other vegetation may result.”	Directions for Use under Other Use Precautions
General Application Restrictions	“Do not use this product to sloped areas where desirable vegetation or nearby water bodies may be located downhill of the application area, since injury to desirable plants and other vegetation may result.”	Directions for Use under Other Use Precautions
Spray Drift Management for spray applications	“SPRAY DRIFT MANAGEMENT” “A variety of factors including weather conditions (e.g. wind direction, wind speed, temperature, relative humidity) and method of application (e.g. groundboom, sprayer) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.” Droplet Size “Use only Medium or coarser spray nozzles according to ASAE (S572) definition for standard nozzles.” Wind Speed “Do not apply at wind speeds greater than 10 mph.”	Directions for Use under Use Precautions

APPENDIX A. Prometon Use Patterns Eligible for Reregistration

Table of Prometon Use Patterns Eligible for Reregistration (Case #2545)					
Use Site	Formulation	Maximum Application Rate	Restrictions	Timing	Application Equipment
Treatment to soil prior to/ under solid or block paving	- Granular (pelleted), - Emulsifiable concentrate - liquid, - Ready-to-use - Water-soluble flowable concentrate	16 lbs ai/A (0.18 lb/500 ft^2)	Maximum of 1 application per year	- pre-emergence - post-emergence	- Low boom sprayer - low-pressure handwand sprayer - high pressure hose-end sprayer - backpack sprayer - push-type granular spreader
Spot treatments in industrial areas including around buildings, storage areas, fences, pumps, machinery, fuel tanks, recreational areas, roadways, guard rails, airports, military installations, highway medians, pipelines, railroads, lumberyards, rights-of-way, and industrial sites (such as cross connects, pedestals, transformers, vaults, buried cable closures, telephone booths, fire plugs).	- Granular (pelleted), - liquid, - Ready-to-use - Water-soluble flowable concentrate	18 lbs ai/A (0.20 lb/500 ft^2)	Maximum of 1 application per year	- pre-emergence - post-emergence	- Low boom sprayer - low-pressure handwand sprayer - handheld nozzle sprayer - knapsack sprayer - push-type granular spreader

lbs ai/A or 500 ft^2 = pounds of active ingredient per acre or 500 ft^2

APPENDIX B. Data Supporting Guideline Requirements for Prometon

Data Supporting Guideline Requirements for the Reregistration of Prometon				
New Guideline Number	**Old Guideline Number**	**Study Description**	**Use Pattern**	**Citation(s)**
ECOLOGICAL EFFECTS				
850.2100	71-1a	Avian Acute Oral Toxicity - Quail	All	41609104
850.2200	71-2a	Avian Dietary Toxicity - Quail	All	41609105
850.2300	71-4B	Avian Reproduction - Duck	All	42132102
850.1075	72-1a	Fish Toxicity Bluegill	All	ECOTOX 546
850.1075	72-1c	Fish Toxicity Rainbow Trout	All	ECOTOX 546 41609108
850.1010	72-2a	Invertebrate Toxicity - Water flea	All	41609109
850.1300	72-4	Invertebrate Chronic Toxicity	All	41810903
850.1075	72-3A	Estuarine/Marine Toxicity - Fish		41725301
850.1035 850.1045	72-3C	Estuarine/Marine Toxicity - Shrimp	All	41810910
850.1400	72-4A	Fish- Early Life Stage	All	41810902
850.4400	122-2	Aquatic Plant Toxicity	All	ECOTOX 9211
850.4225	123-1a	Seed Germ./ Seedling Emergence	All	41725302-3
850.4250	123-1b	Vegetative Vigor	All	41725304
850.4400	123-2	Aquatic Plant Growth	All	41725305
850.5400	123-2	Algal Toxicity	All	ECOTOX 81431
TOXICOLOGY				
870.1100	81-1	Acute Oral Toxicity-Rat	All	42132103
870.1200	81-2	Acute Dermal Toxicity-Rabbit	All	41609112
870.1300	81-3	Acute Inhalation Toxicity-Rat	All	42132104
870.2400	81-4	Primary Eye Irritation-Rabbit	All	42144601
870.2500	81-5	Primary Skin Irritation	All	41609113
870.2600	81-6	Dermal Sensitization	All	41609114
870.3100	82-1a	Repeated dose 90-Day Feeding - Rodent	All	00129985 - Supplemental
870.3200	82-2	21-Day Dermal - Rabbit	All	42144602
870.4300	82-4	Combined chronic feeding/carcinogenicity	All	40488101 40488102
870.4100	83-1a	Chronic Feeding Toxicity - Rodent	All	40361501
870.4100	83-1b	Chronic Feeding Toxicity - Non-Rodent	All	40097901 42581201
870.3800	83-4	Multi-generation Reproduction, Rat	All	40361501
ENVIRONMENTAL FATE				
835.2110	161-1	Hydrolysis as a function of pH	All	41114801
835.2240	161-2	Photodegradation - Water	All	40225801
835.2410	161-3	Photodegradation - Soil	All	41114802
835.4100	162-1	Aerobic Soil Metabolism	All	40145501 42313501

Data Supporting Guideline Requirements for the Reregistration of Prometon				
835.4400	162-3	Anaerobic Aquatic Metabolism	All	40145501
835.1240	163-1	Leaching/Adsorption/Desorption	All	40225803
835.6100	164-1	Terrestrial Field Dissipation	All	00162534 - 36
OTHER				
850.3020	141-1	Honey Bee Acute Contact	All	41609115

APPENDIX C. Technical Support Documents

Additional documentation in support of the Prometon RED is maintained in the OPP Regulatory Public Docket, located in Room S-4400 One Potomac Yard (South Building), 2777 S. Crystal Drive, Arlington, VA. It is open Monday through Friday, excluding legal holidays, from 8:30 a.m. to 4:00 p.m. All documents may be viewed in the OPP Docket room or viewed and/or downloaded via the Internet at http://www.regulations.gov. The Agency's documents in support of this RED include the following:

1. US EPA. HED Chapter of the Reregistration Eligibility Decision Document (RED). Phase 4 Revisions. March 17, 2008.

2. US EPA. Prometon: Phase 4 Revisions for "Prometon: Occupational and Residential Exposure Assessment for the Reregistration Eligibility Decision (Non-Food), March 13, 2008.

3. US EPA. Response to Comments on the Ecological Risk Assessment in Support of the Re-registration Eligibility Decision for Prometon (080804), February 28, 2008.

4. US EPA. Error Correction: Drinking Water Assessment and Ecological Risk Assessment for Prometon RED, dated October 24, 2007.

4. US EPA. Drinking Water Assessment for Prometon, October 24, 2007.

APPENDIX D. Bibliography

In addition to the MRID study references listed in Appendix B, this bibliography contains the expanded study citations as well as additional literature citations considered to be part of the database supporting the reregistration decision for prometon.

MRID	Citation Reference
129983	Florek, C.; Christian, M.; Christian, G.; et al. (1981) Teratogenicity Study of Prometon Technical in Pregnant Rats: Argus Project 203-003. (Unpublished study received Aug 4, 1983 under 100-544; prepared by Argus Research Laboratories, Inc., submitted by Ciba-Geigy Corp., Greensboro, NC; CDL:250917-B)
129984	Lightkep, G.; Christian, M.; Christian, G.; et al. (1982) Teratogenic Potential of Prometon Technical in New Zealand White Rabbits (Segment II Evaluation): Project No. 203-002. Final rept. (Unpublished study received Aug 4, 1983 under 100-544; prepared by Argus Research Laboratories, Inc., submitted by Ciba-Geigy Corp., Greensboro, NC; CDL:250917-C)
129985	Johnson, W.; Becci, P. (1982) 90-Day Subchronic Feeding Study with Prometon Technical in Sprague-Dawley Rats: FDRL Study No. 6805. (Unpublished study received Aug 4, 1983 under 100-544; prepared by Food and Drug Research Laboratories, Inc., submitted by Ciba-Geigy Corp., Greensboro, NC; CDL:250917-D; 250918)
148609	Ciba-Geigy Corp. (1985) Ciba-Geigy's Response to EPA Toxicology Branch Review Dated March 26, 1984, on Prometon Rat and Rabbit Teratology Studies and 90-Day Rat Feeding Study. Unpublished compilation. 52 p.
40097901	Breckenridge, C.; Green, J. (1986) Prometon: Chronic Study in Dogs: Laboratory Study No. 100-84. Unpublished study prepared by Ciba-Geigy Corp. 540 p.
40361501	Salamon, C. (1987) Prometon Technical: Two-generation Reproduction Study in Rats: Laboratory Study No. 450-2208. Unpublished study prepared by American Biogenics Corp. 901 p.
40488101	Osheroff, M. (1988) Lifetime Oncogenicity Study in Mice with Prometon Technical: Final Report: Study Number 483-234. Unpublished study performed by Hazleton Laboratories America, Inc. 2778 p.
40488102	O'Connor, D.; McCormick, G.; Green, J. (1988) Prometon Technical: Combined Chronic Toxicity/Oncogenicity Study in Rats: Study Number 852003. Unpublished study performed by Ciba-Geigy Corporation. 2094 p.
40636401	Giknis, M. (1986) Prometon Technical: Salmonella/Mammalian - Microsome Mutagenicity Assay: Laboratory Study No. 852196. Unpublished study prepared by Ciba-Geigy Corp. 19 p.
40636402	Strasser, F. (1988) Prometon Technical: Micronucleus Test (Rat): Laboratory Study No. 871355. Unpublished study prepared by Ciba-Geigy Limited. 32 p.
40636403	Hertner, T. (1987) Prometon Technical: Autoradiographic DNA-repair Test on Rat Hepatocytes: Laboratory Study No. 871354. Unpublished study prepared by Ciba-Geigy Ltd. 95 p.

41609104 Campbell, S. (1990) Prometon: An Acute Toxicity Study with the Northern Bobwhite: Lab Project Number: 108-326. Unpublished study prepared by Wildlife International Ltd. 22 p.

41609105 Long, R. (1990) Prometon: A Dietary LC_{50} Study with the Northern Bobwhite: Lab Project Number: 108-324. Unpublished study prepared by Wildlife International Ltd. 52 p.

41609108 Murphy, D. (1990) Prometon: A 96-hour Static Acute Toxicity Test with the Rainbow Trout (Oncorhyncus mykiss): Lab Project Number: 108A-102B. Unpublished study prepared by Wildlife International Ltd. 49 p.

41609109 Bellantoni, D. (1990) Prometon: A 48-hour Static Acute Toxicity Test with the Cladoceran (Daphnia magna): Lab Project Number: 108A-101. Unpublished study prepared by Wildlife International Ltd. 50 p.

41609112 Kuhn, J. (1989) Acute Dermal Toxicity Study in Rabbits: Lab Project Number: 6658-89. Unpublished study prepared by Ciba-Geigy Corp. 13 p.

41609113 Kuhn, J. (1990) Prometon Technical FL 892529: Primary Dermal Irritation Study in Rabbits: Lab Project Number: 6659-89. Unpublished study prepared by Stillmeadow, Inc. 13 p.

41609114 Kuhn, J. (1990) Prometon Technical FL 892529: Dermal Sensitization Study in Guinea Pigs: Lab Project Number: 6660-89. Unpublished study prepared by Stillmeadow, Inc. 19 p.

41725301 Murphy, D. (1990) A 96-Hour Static Acute Toxicity Test with the Sheepshead Minnow (Cyprinodon variegatus): Amended Report to: Lab Project Number: 108A-104. Unpublished study prepared by Wildlife International Ltd. 52 p.

41725302 Chetram, R. (1990) Tier 2 Seed Germination Nontarget Phytotoxicity Study Using Prometon Technical: Lab Project Number: LR90-04. Unpublished study prepared by Pan-Agriculutural Laboratories. 149 p.

41725303 Chetram, R. (1990) Tier 2 Seedling Emergence Nontarget Phytotoxicity Study Using Prometon Technical: Lab Project Number: LR90-05. Unpublished study prepared by Pan-Agricultural Laboratories. 274 p.

41725304 Chetram, R. (1990) Tier 2 Vegetative Vigor Nontarget Phytotoxicity Study Using Prometon Technical: Lab Project Number: LR90-03. Unpublished study prepared by Pan-Agricultural Laboratories, Inc. 224 p.

41725305 Hughes, J. (1990) The Toxicity of Prometon to Selenastrum capricornutum: Lab Project Number: B267-47-1. Unpublished study pre- pared by Malcolm Pirnie, Inc. 33 p.

41810901 Ward, T. (1991) Acute Flow Through Mollusc Shell Deposition Test with Prometon: Lab Project Number: 9113-CG. Unpublished study prepared by Resource Analysts, Inc., Envirosystems Div. 36 p.

41810902 Peters, G. (1991) An Early Life-Stage Toxicity Test with the Fathead Minnow (Pimephales promelas): Lab Project No: 108A-115A. Unpublished study prepared by Wildlife International Ltd. 47 p.

41810903 Peters, G. (1991) A Flow-through Life-cycle Toxicity Test with the Cladoceran (Daphnia magna): Lab Project Number: 108A-114E. Unpublished study prepared by Wildlife International Ltd. 49 p.

42132102 Beavers, J. (1991) Prometon: A One-Generation Reproduction Study with the Mallard (Anas platyrhynchos): Lab Project Number: 108-319. Unpublished study prepared by Wildlife International Ltd. 142 p.

42132103 Kuhn, J. (1990) Prometon Technical: Acute Oral Toxicity Study in Rats Lab Project Number: 7171-90. Unpublished study prepared by Stillmeadow, Inc. 30 p.

42132104 Holbert, M. (1990) Prometon Technical: Acute Inhalation Toxicity Study in Rats: Lab Project Number: 7306-90. Unpublished study prepared by Stillmeadow, Inc. 19 p.

42144601 Griffiths, J. (1980) Primary Eye Irritation Study in Rabbits: Lab- oratory Study No. 6600A. Unpublished study prepared by Food and Drug Research Laboratories, Inc. 15 p.

42144602 Schiavo, D. (1987) 21-Day Dermal Toxicity Study in Rabbits: [Prometon Technical]: Laboratory No. MIN 852152; Tox. Path. Report 86021. Unpublished study prepared by Ciba-Geigy Corp. Pharmaceutical Div. 156 p.

42581201 Tisdel, M. (1992) Additional Information Requested for Prometon: Chronic Study in Dogs. Unpublished study prepared by Ciba-Geigy Corp. 587 p.

44972201 45663703 Klonne, D. (1999) Integrated Report for Evaluation of Potential Exposures to Homeowners and Professional Lawn Care Operators Mixing, Loading, and Applying Granular and Liquid Pesticides to Residential Lawns: Lab Project Number: OMAOO1/2/3/4/5. Unpublished study prepared by Ricerca, Inc., and Morse Laboratories. 2213 p. MRID 44972201, supplemented and corrected by MRID 45663703.

92149002 Atherton, N.; Tisdel, M. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 00129985 and Related MRIDs 00148609. 90-Day Subchronic Feeding Study with Prometon Technical in Sprague-Dawley Rats: Study No. 6805. Prepared by FOOD AND DRUG RESEARCH LABS.INC. 10 p.

92149003 Atherton, N. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 92149020. 21-Day Dermal Toxicity Study in Rabbits: Prometon: Study #852152. Prepared by Ciba-Geigy Pharmaceuticals Div. 9 p.

92149004 Atherton, N.; Tisdel, M. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 40488102. 104-Week Chronic Toxicity and Carcinogenicity Study in Rats: Prometon: Study No. SEF 852003. Prepared by CIBA-GEIGY PHARMACEUTICALS PRODUCTS,INC. 10 p.

92149006 Atherton, N. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 40488101. Lifetime Oncogenicity Study in Mice with Prometon Technical: Study #483-234. Prepared by HAZLETON LABS. AMERICA, INC. 11 p.

92149007 Gillis, J.; Tisdel, M. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 00129983 and Related MRIDs 00148609. Teratogenicity Study of Prometon Technical in Pregnant Rats: Study #203-003. Prepared by ARGUS RESEARCH LABS. INC. 10 p.

92149008 Gillis, J.; Tisdel, M. (1990) Ciba-Geigy Corp. Phase 3 Summary of MRID 00129984 and Related MRIDs 00148609. Teratogenic Potential of Prometon Technical in New Zealand White Rabbits (Segment II Evaluation): Study #203-002. Prepared by ARGUS RESEARCH LABS. INC. 10 p.

"55672-R" Ciba-Geigy Chemical Corporation (1971) Metabolism of s-Triazine Herbicides. (Unpublished study including letter dated Dec 29, 1971 from J.R. Forsythe to Harold G. Alford, received Dec 29, 1971 under 100-437; CDL:231915-A)

Bathe, R., Ullmann, L., and Sachsse, K. (1973). Determination of Pesticide Toxicity to Fish. Schriftenr.Ver.Wasser-Boden-Lufthyg.Berlin-Dahlem 37: 241-256 (ENG TRANSL). ECOTOX #546.

Blomquist, J.D., J.M. Denis, J.L. Cowles, J.A. Hetrick, R.D. Jones, and N.B. Birchfield. 2001. Pesticide in Selected Water-Supply Reservoirs and Finished Drinking Water, 1999-2000: Summary of Results from a Pilot Monitoring Program. USGS Open file Report 01-456, Baltimore, MD.

Drost, W., Backhaus, T., Vassilakaki, M., and Grimme, L. H. (2003). Mixture Toxicity of s-Triazines to Lemna minor Under Conditions of Simultaneous and Sequential Exposure. Fresenius Environ. Bull. 12: 601-607. ECOTOX #84131

Fletcher, J.S., J.E. Nellesson and T. G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ. Tox. And Chem. 13(9):1383-1391.

Klonne, D. (1999) Integrated Report for Evaluation of Potential Exposures to Homeowners and Professional Lawn Care Operators Mixing, Loading, and Applying Granular and Liquid Pesticides to Residential Lawns: Lab Project Number: OMAOO1/2/3/4/5. Unpublished study prepared by Ricerca, Inc., and Morse Laboratories. 2213 p. MRID 44972201, supplemented and corrected by MRID 45663703.

The PHED Task Force, 1995. The Pesticide Handlers Exposure Database, Version 1.1. Task Force members Health Canada, U.S. Environmental Protection Agency, and the National Agricultural Chemicals Association, released February, 1995.

U.S. EPA. 2004. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs. Office of Prevention, Pesticides, and Toxic Substances. Office of Pesticide Programs. Washington, D.C. January 23, 2004.

US EPA, 2000. "Science Advisory Council for Exposure, Policy #: 9. Standard Values for Daily Acres Treated in Agriculture." Science Advisory Council for Exposure, Office of Pesticide Programs, U. S. Environmental Protection Agency, Washington, DC. July, 2000.

US EPA. 1997. "Draft Standard Operating Procedures (SOPs) for Residential Exposure Assessments." Science Advisory Council for Exposure, Office of Pesticide Programs. U.S. Environmental Protection Agency. Washington, DC. December, 1997.

US EPA. 1998a. "PHED Surrogate Exposure Guide. Estimate of Worker Exposure from the Pesticide Handlers Exposure Database," Version 1.1. Science Advisory Council for Exposure, Office of Pesticide Programs. U.S. Environmental Protection Agency. Washington, DC. August, 1998.

US EPA. 2003. “Summary of Exposure Data for all Mixer/Loader/Applicator Studies Conducted or Purchased by the ORETF: Professional Lawn Care Operators Applying Pesticides to Residential Turf and Homeowners Applying Pesticides to Residential Turf, Home Gardens, and Ornamental Plants." Gary Bangs, March, 2003.

Walsh, G. E. (1972). Effects of Herbicides on Photosynthesis and Growth of Marine Unicellular Algae. Hyacinth Control J. 10: 45-48 (Author Communication Used). ECOTOX #9211.

APPENDIX E. Generic Data Call-in (GDCI)

With respect to the current uses and registered products containing prometon subject to reregistration, the generic database supporting the reregistration of prometon has been reviewed and determined to be substantially complete. At this time, no additional studies are required for reregistration of currently approved products containing prometon and no GDCI will be issued for this pesticide.

APPENDIX F. Product-specific Data Call-in (PDCI)

The following pages include the list of product-specific data that are required for reregistration that will be sent to all registrants that have currently registered end-use products containing prometon.

United States Environmental Protection Agency Washington, D.C. 20460

DATA CALL-IN RESPONSE

OMB Approval 2070-0107
OMB Approval 2070-0057

INSTRUCTIONS: Please type or print in ink. Please read carefully the attached instructions and supply the information requested on this form. Use additional sheet(s) if necessary.

1. Company Name and Address	2. Case # and Name	3. Date and Type of DCI and Number
SAMPLE COMPANY NO STREET ADDRESS NO CITY, XX 00000	2545 Prometon Chemical # and Name 080804 Prometon	DD-MMM-YYYY PRODUCT SPECIFIC ID # PDCI-080804-NNNN

4. EPA Product Registration	5. I wish to cancel this product registration voluntarily	6. Generic Data		7. Product Specific Data	
		6a. I am claiming a Generic Data Exemption because I obtain the active ingredient from the source EPA registration number listed below.	6b. I agree to satisfy Generic Data requirements as indicated on the attached form entitled "Requirements Status and Registrant's Response."	7a. My product is an MUP and I agree to satisfy the MUP requirements on the attached form entitled "Requirements Status and Registrant's Response."	7b. My product is an EUP and I agree to satisfy the EUP requirements on the attached form entitled "Requirements Status and Registrant's Response."
NNNNNN-NNNNN		N.A.	N.A.		

8. Certification I certify that the statements made on this form and all attachments are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine, imprisonment or both under applicable law.

Signature and Title of Company's Authorized Representative_____

9. Date

10. Name of Company

11. Phone Number

United States Environmental Protection Agency Washington, D.C. 20460

OMB Approval 2070-0107
OMB Approval 2070-0057

REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE

INSTRUCTIONS: Please type or print in ink. Please read carefully the attached instructions and supply the information requested on this form. Use additional sheet(s) if necessary.

1. Company Name and Address	2. Case # and Name	3. Date and Type of DCI and Number
SAMPLE COMPANY NO STREET ADDRESS NO CITY, XX 00000	2545 Prometon EPA Reg. No. NNNNNN-NNNNN	DD-MMM-YYYY PRODUCT SPECIFIC ID # PDCI-080804-NNNN

4. Guideline Requirement Number	5. Study Title		PROTOCOL	Progress Reports 1	2	3	6. Use Pattern	7. Test Substance	8. Time Frame (Months)	9. Registrant Response
	Product Chemistry Data Requirements (Conventional Chemical									
830.1550	Product Identity and composition	(1)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.1600	Description of materials used to produce the product	(2)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.1620	Description of production process	(3)					HH, II, K, Q, R, T, U	TGAI	8	
830.1650	Description of formulation process	(4)					HH, II, K, Q, R, T, U	MP/EP	8	
830.1670	Discussion of formation of impurities	(5)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.1700	Preliminary analysis	(6 ,7 ,8)					HH, II, K, Q, R, T, U	TGAI	8	
830.1750	Certified limits	(9 ,10)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.1800	Enforcement analytical method	(11)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.1900	Submittal of samples	(12 ,13)					HH, II, K, Q, R, T, U	EP, PAI & TGAI	8	
830.6302	Color	(14)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.6303	Physical state	(15)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.6304	Odor	(16)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	

10. Certification I certify that the statements made on this form and all attachments are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine, imprisonment or both under applicable law

Signature and Title of Company's Authorized Representative_____

11. Date

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13. Phone Number

United States Environmental Protection Agency Washington, D.C. 20460

OMB Approval 2070-0107
OMB Approval 2070-0057

REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE

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1. Company Name and Address	2. Case # and Name	3. Date and Type of DCI and Number
SAMPLE COMPANY NO STREET ADDRESS NO CITY, XX 00000	2545 Prometon EPA Reg. No. NNNNNN-NNNNN	DD-MMM-YYYY PRODUCT SPECIFIC ID # PDCI-080804-NNNN

4. Guideline Requirement Number	5. Study Title	PROTOCOL	Progress Reports 1	2	3	6. Use Pattern	7. Test Substance	8. Time Frame (Months)	9. Registrant Response
830.6313	Stability to sunlight, normal and elevated temperatures (17 ,18) metals, and metal ions					HH, II, K, Q, R, T, U	TGAI	8	
830.6314	Oxidizing or reducing action (19)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6315	Flammability (20)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6316	Explodability (21)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6317	Storage stability of product (22)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6319	Miscibility (23)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6320	Corrosion characteristics (24)					HH, II, K, Q, R, T, U	MP/EP	8	
830.6321	Dielectric breakdown voltage (25)					HH, II, K, Q, R, T, U	MP/EP	8	
830.7000	pH of water solutions or suspensions (26 ,27)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.7050	UV/Visible absorption					HH, II, K, Q, R, T, U	TGAI/PAI	8	
830.7100	Viscosity (28)					HH, II, K, Q, R, T, U	MP/EP	8	
830.7200	Melting point/melting range (29 ,30)					HH, II, K, Q, R, T, U	TGAI	8	
830.7220	Boiling point/boiling range (31 ,32)					HH, II, K, Q, R, T, U	TGAI	8	

Initial to indicate certification as to information on this page (full text of certification is on page one).

Date

United States Environmental Protection Agency Washington, D.C. 20460

OMB Approval 2070-0107
OMB Approval 2070-0057

REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE

INSTRUCTIONS: Please type or print in ink. Please read carefully the attached instructions and supply the information requested on this form. Use additional sheet(s) if necessary.

1. Company Name and Address	2. Case # and Name	3. Date and Type of DCI and Number
SAMPLE COMPANY NO STREET ADDRESS NO CITY, XX 00000	2545 Prometon EPA Reg. No. NNNNNN-NNNNN	DD-MMM-YYYY PRODUCT SPECIFIC ID # PDCI-080804-NNNN

4. Guideline Requirement Number	5. Study Title		PROTOCOL	Progress Reports 1	2	3	6. Use Pattern	7. Test Substance	8. Time Frame (Months)	9. Registrant Response
830.7300	Density/relative density	(33 ,34)					HH, II, K, Q, R, T, U	TGAI/MP/EP	8	
830.7370	Dissociation constant in water	(35 ,36)					HH, II, K, Q, R, T, U	TGAI or PAI	8	
830.7520	Particle size, fiber length, and diameter distribution	(37)					HH, II, K, Q, R, T, U	TGAI or PAI	8	
830.7550	Partition coefficient (n-octanol/water), shake flask method	(38)					HH, II, K, Q, R, T, U	TGAI/PAI	8	
830.7560	Partition coefficient (n-octanol/water), generator colum method	(39)					HH, II, K, Q, R, T, U	TGAI/PAI	8	
830.7570	Partition coefficient (n-octanol/water), estimation by liquid chromatography	(40)					HH, II, K, Q, R, T, U	TGAI/PAI	8	
830.7840	Water solubility: Column elution method, shake flask method	(41)					HH, II, K, Q, R, T, U	TGAI or PAI	8	
830.7860	Water solubility, generator column method	(42)					HH, II, K, Q, R, T, U	TGAI or PAI	8	
830.7950	Vapor pressure	(43 ,44)					HH, II, K, Q, R, T, U	TGAI or PAI	8	
	Toxicology Data Requirements (Conventional Chemical)									
870.1100	Acute Oral Toxicity	(45)					HH, II, K, Q, R, T, U	TGAI,EP,dilute EP?	8	
870.1200	Acute dermal toxicity	(46 ,47)					HH, II, K, Q, R, T, U	TGAI,EP,dilute EP?	8	
870.1300	Acute inhalation toxicity	(48)					HH, II, K, Q, R, T, U	TGAI & EP	8	

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Date

United States Environmental Protection Agency Washington, D.C. 20460

OMB Approval 2070-0107
OMB Approval 2070-0057

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1. Company Name and Address	2. Case # and Name	3. Date and Type of DCI and Number
SAMPLE COMPANY NO STREET ADDRESS NO CITY, XX 00000	2545 Prometon EPA Reg. No. NNNNNN-NNNNN	DD-MMM-YYYY PRODUCT SPECIFIC ID # PDCI-080804-NNNN

4. Guideline Requirement Number	5. Study Title	PROTOCOL	Progress Reports 1	2	3	6. Use Pattern	7. Test Substance	8. Time Frame (Months)	9. Registrant Response
870.2400	Acute eye irritation (49)					HH, II, K, Q, R, T, U	TGAI & EP	8	
870.2500	Acute dermal irritation (50 ,51)					HH, II, K, Q, R, T, U	TGAI & EP	8	
870.2600	Skin sensitization (52 ,53)					HH, II, K, Q, R, T, U	TGAI & EP	8	
830.1000	Background for product properties test guidelines					HH, II, K, Q, R, T, U			

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Date

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Agency Washington, D.C. 20460

FOOTNOTES AND KEY DEFINITIONS FOR GUIDELINE REQUIREMENTS

Case # and Name: 2545 Prometon

DCI Number: PDCI-080804-NNNN

Key: EP, PAI & TGAI = End-Use Product, Pure Active Ingredient, and Technical Grade Active Ingredient; MP/EP = Manufacturing-Use Product, Pure Active Ingredient; TGAI = Technical Grade Active Ingrec [TGAI]; TGAI & EP = Technical Grade of the Active Ingredient and End-Use Product; TGAI or PAI = Technical Grade of the Active Ingredient or Pure Active Ingredient; TGAI,EP,dilute EP? = Technical Grade of the Active Ingredient, End Use Product, and possibly diluted End Use Product; TGAI/MP/EP = Manufacturing-Use Product, Pure Active Ingredient and Technical Grade Active Ingredient; TGA = Technical Grade Active Ingredient, Pure Active Ingredient

Use Categories Key:

K -	Residential	T -	Commercial, institutional and inc	II -	Residential Use Conventional C
Q -	Residential outdoor use	U -	Residential and public access pr		
R -	Agricultural premises and equipr	HH -	Occupational Use Conventional		

Footnotes: [The following notes are referenced in column two (5. Study File) of the REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE form.]

1 Data must be provided in accordance with the "Product Composition" Section.(158.155)

2 Data must be provided in accordance with the "Description of Materials used to Produce the Product" Section.(158.160)

3 Data must be provided in accordance with the "Description of Production Process" Section.(158.162)

4 Data must be provided in accordance with the "Description of Formulation Process" Section.(158.165)

5 Data must be provided in accordance with the "Description of Formation of Impurities" Section(158.167)

6 Data must be provided in accordance with the "Preliminary Analysis" Section.(158.170)

7 Required for TGAIs and products produced by an integrated system.

8 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

9 Data must be provided in accordance with the "Certified Limits" Section(158.175)

10 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

11 Data must be provided in accordance with the "Enforcement Analytical Method" Section.(158.180)

12 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

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FOOTNOTES AND KEY DEFINITIONS FOR GUIDELINE REQUIREMENTS

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Footnotes: **[The following notes are referenced in column two (5. Study File) of the REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE form.]**

13 Basic manufacturers are required to provide the Agency with a sample of each TGAI used to formulate a product produced by an integrated system when the new TGAI is first used as a formulati ingredient in products registered under FIFRA. A sample of the active ingredient (PAI) suitable for use as an analytical standard is also required at this time. Samples of end-use products produc an integrated system must be submitted on a case-by-case basis.

14 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

15 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

16 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

17 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

18 Data on the stability to metals and metal ions is required only if the active ingredient is expected to come in contact with either material during storage.

19 Required if the product contains an oxidizing or reducing agent

20 Required when the product contains combustible liquids.

21 Required when the product is potentially explosive.

22 Please see attached "Additional Information and Requirements Pertaining to Storage Stability (OPPTS 830.6317) and Corrosion Characteristics (OPPTS 830.6320) Data Requirements of the Pro Specific Data Call-Ins issued under the Reregistration Eligibility Decision (RED)/Interim Reregistration Eligibility Decision (IRED) Documents."

23 Required if the product is an emulsifiable liquid and is to be diluted with petroleum solvents.

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FOOTNOTES AND KEY DEFINITIONS FOR GUIDELINE REQUIREMENTS

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Footnotes: **[The following notes are referenced in column two (5. Study File) of the REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE form.]**

24 Please see attached "Additional Information and Requirements Pertaining to Storage Stability (OPPTS 830.6317) and Corrosion Characteristics (OPPTS 830.6320) Data Requirements of the Pro Specific Data Call-Ins issued under the Reregistration Eligibility Decision (RED)/Interim Reregistration Eligibility Decision (IRED) Documents."

25 Required if the end-use product is a liquid and is to be used around electrical equipment.

26 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

27 Required if the product is dispersible with water.

28 Required if the product is a liquid.

29 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

30 Required when the TGAI is solid at room temperature.

31 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

32 Required if the TGAI is liquid at room temperature.

33 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

34 True density or specific density are required for all test substances. Data on bulk density is required for MPs that are solid at room temperature.

35 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

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FOOTNOTES AND KEY DEFINITIONS FOR GUIDELINE REQUIREMENTS

Case # and Name: 2545 Prometon

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Footnotes: **[The following notes are referenced in column two (5. Study File) of the REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE form.]**

36 Required when the test substance contains an acid or base functionality (organic or inorganic) or an alcoholic functionality (organic).

37 Required for water insoluble test substances (<0.000010 g/l) and fibrous test substances with diameter >= 0.1 m.

38 Required if the TGAI or PAI is organic and non-polar.

39 Required if the TGAI or PAI is organic and non-polar.

40 Required if the TGAI or PAI is organic and non-polar.

41 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

42 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

43 If the TGAI cannot be isolated, data are required on the practical equivalent of the TGAI (i.e., if the active ingredient is either an acid, base or ionic form, and it is formulated into salts or esters, the concentration of the active ingredient in these products must be expressed in acid equivalent or active equivalent).

44 Not required for salts.

45 Not required if test material is a gas or a highly volatile liquid.

46 Not required if test material is a gas or a highly volatile liquid.

47 Not required if test material is corrosive to skin or has a pH of less than 2 or greater than 11.5.

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FOOTNOTES AND KEY DEFINITIONS FOR GUIDELINE REQUIREMENTS

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DCI Number: PDCI-080804-NNNN

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Footnotes: **[The following notes are referenced in column two (5. Study File) of the REQUIREMENTS STATUS AND REGISTRANT'S RESPONSE form.]**

48 Required if the product consists of, or under conditions of use will result in, a respirable material (e.g., gas, vapor, aerosol, or particulate).

49 Not required if test material is corrosive to skin or has a pH of less than 2 or greater than 11.5.

50 Not required if test material is a gas or a highly volatile liquid.

51 Not required if test material is corrosive to skin or has a pH of less than 2 or greater than 11.5.

52 Not required if test material is corrosive to skin or has a pH of less than 2 or greater than 11.5.

53 Required if repeated dermal exposure is likely to occur under conditions of use.

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LIST OF ALL REGISTRANTS SENT THIS DATA CALL-IN NOTICE

Case # and Name: 2545,Prometon

Co. Nr.	Company Name	Agent For	Address	City & State	Zip
4	BONIDE PRODUCTS, INC.		6301 SUTLIFF ROAD	ORISKANY	NY 13424
192	VALUE GARDENS SUPPLY, LLC		PO Box 585	SAINT JOSEPH	MO 64502
228	NUFARM AMERICAS INC.		150 HARVESTER DRIVE, SUITE 200	BURR RIDGE	IL 60527
239	THE ORTHO BUSINESS GROUP		PO Box 190	MARYSVILLE	OH 43040
769	VALUE GARDENS SUPPLY, LLC		PO Box 585	SAINT JOSEPH	MO 64502
802	CENTRAL GARDEN & PET D/B/A LILLY MILLER BRANDS/EXCEL GARDEN	REGISTRATIONS BY DESIGN, INC.	1181/2 EAST MAIN ST., SUITE 1	SALEM	VA 241533805
869	GREEN LIGHT COMPANY		PO Box 17985	SAN ANTONIO	TX 78217
1459	THE BULLEN COMPANIES		PO Box 37	FOLCROFT	PA 19032
2217	PBI/GORDON CORP		PO Box 014090 1217 WEST 12TH STREET	KANSAS CITY	MO 641010090
3862	ABC COMPOUNDING CO, INC		PO Box 16247	ATLANTA	GA 303210247
4170	BETCO CORP LTD		PO Box 3127	TOLEDO	OH 43607
6186	DAMON INDUSTRIES INC		PO Box 2120	ALLIANCE	OH 446010120
9688	CHEMSICO		PO Box 142642	ST LOUIS	MO 631140642
10088	ATHEA LABORATORIES INC		PO Box 240014	MILWAUKEE	WI 53224
10807	AMREP, INC		990 INDUSTRIAL PARK DRIVE	MARIETTA	GA 30062
11603	AGAN CHEM MFG, LTD	MAKHTESHIM-AGAN OF NORTH AMERICA INC	4515 FALLS OF NEUSE RD STE 300	RALEIGH	NC 27609
33955	PBI/GORDON CORP		PO Box 014090 1217 WEST 12TH STREET	KANSAS CITY	MO 641010090
40849	ENFORCER PRODUCTS		1420 SEABOARD INDUSTRIAL BOULEVARD	ATLANTA	GA 30318
46515	CELEX, DIVISION OF UNITED INDUSTRIES CORP		PO Box 142642	ST LOUIS	MO 631140642
53883	CONTROL SOLUTIONS, INC.		5903 GENOA-RED BLUFF	PASADENA	TX 775071041
66222	MAKHTESHIM-AGAN OF NORTH AMERICA INC		4515 FALLS OF NEUSE RD, SUITE 300	RALEIGH	NC 27609
69204	TOPAZ TURF CORP	ADAMS TECHNOLOGY SYSTEMS	5145 FOREST RUN TRACE - SUITE B	ALPHARETTA	GA 300224504
70799	STATE INDUSTRIAL PRODUCTS		3100 HAMILTON AVE	CLEVELAND	OH 44114
84396	SUNGRO PRODUCTS, LLC		810 E. 18TH STREET	LOS ANGELES	CA 90021

APPENDIX G. EPA's Batching of Prometon Products for Meeting Acute Toxicity Data Requirements for Reregistration

In an effort to reduce the time, resources and number of animals needed to fulfill the acute toxicity data requirements for reregistration of products containing prometon as the active ingredient, the Agency has batched products which can be considered similar for purposes of acute toxicity. Factors considered in the sorting process include each product's active and inert ingredients (identity, percent composition and biological activity), type of formulation (e.g., emulsifiable concentrate, ready-to-use, granular, etc.), and labeling (e.g., signal word, use classification, precautionary labeling, etc.). Note that the Agency is not describing batched products as "substantially similar" since some products within a batch may not be considered chemically similar or have identical use patterns.

Registrants of products within a batch may choose to cooperatively generate, submit or cite a single battery of six acute toxicological studies to represent all the products within that batch. It is the registrants' option to participate in the process with all other registrants, only some of the other registrants, or only their own products within a batch, or to generate all the required acute toxicological studies for each of their own products. If a registrant chooses to generate the data for a batch, he/she must use one of the products within the batch as the test material. If a registrant chooses to rely upon previously submitted acute toxicity data, he/she may do so provided that the data base is complete and valid by today's standards (see acceptance criteria attached), the formulation tested is considered by EPA to be similar for acute toxicity, and the formulation has not been significantly altered since submission and acceptance of the acute toxicity data. Regardless of whether new data is generated or existing data is referenced, registrants must clearly identify the test material by EPA Registration Number. If more than one confidential statement of formula (CSF) exists for a product, the registrant must indicate the formulation actually tested by identifying the corresponding CSF.

Because of the number of products to consider in this batching process, the batching report will be made available at a later date and posted on-line in the Public Docket.