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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

Date: August 31, 2005

SUBJECT: PROPAZINE: Occupational and Residential Exposure Assessments for the Proposed Sorghum Use and the Existing Greenhouse Uses Updated with New Toxicity Endpoints

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The attached assessment includes the updated occupational and residential exposure and risk estimates for propazine to support: 1) the proposed new use of propazine on sorghum and 2) to update the existing exposure and risk assessments for greenhouse uses with new toxicity endpoint selections.

SEP - 6 2005

TABLE OF CONTENTS

Executive Summary

Propazine is a triazine herbicide that is applied before planting, at planting, and after crop emergence for control of broadleaf weeds. This document includes an assessment of the risk from occupational exposure for sorghum and containerized ornamentals grown in greenhouses only. There are no current or proposed residential uses of propazine.

Propazine is formulated for occupational use as a liquid product (4 lbs ai per gallon. It is applied with several types of application equipment – including aerial and groundboom sprayer applications. Applications to smaller areas may be made with handheld equipment, including low-pressure handwand, handgun, and back-pack sprayers.

Hazard information for atrazine was used in the exposure assessment of propazine. HED's Hazard Identification Assessment Review Committee (HIARC) met to determine appropriate toxicological endpoints of concern for atrazine. The toxicological endpoints that were used to complete the occupational and residential risk assessments are summarized below, which have been extracted from the atrazine HIARC report (4/5/02). Adverse effects were identified at durations of exposure ranging from short-term (up to 30 days) to intermediate-term durations (up to 6 months) and long-term durations (> 6 months).

The short-term (non-cancer) dermal and inhalation occupational and residential risk assessment for propazine is based on a NOAEL of 6.25 mg/kg/day, based on a delay in preputial separation at the LOAEL of 12.5 mg/kg/day. The intermediate-term (non-cancer) dermal and inhalation occupational risk assessment for propazine is based on a NOAEL of 1.8 mg/kg/day, based on attenuation of the pre-ovulatory LH surge (indicative of hypothalamic disruption) in a subchronic study in Sprague-Dawley rats. A dermal absorption factor of 6% (rounded up from 5.6%) was selected based on a human dermal penetration study in which 10 human volunteers were exposed to a single topical dose of atrazine. An inhalation absorption factor of 100 percent was applied.

HED's level of concern (LOC) for propazine dermal and inhalation exposures is 100 (i.e., a margin of exposure [MOE] less than 100 is a risk concern) for occupational scenarios. The level of concern is based on 10x to account for interspecies extrapolation to humans from the animal test species and 10x to account for intraspecies sensitivity. The dermal and inhalation margins of exposure were combined, because the toxicity endpoints for the dermal and inhalation routes of exposure are the same.

The anticipated use patterns and current labeling indicate several occupational handler exposure scenarios based on the types of equipment and techniques that can potentially be used for propazine applications. Eight scenarios representing typical handler exposures were assessed using surrogate exposure data from the Pesticide Handler Exposure Database (PHED). For eight scenarios assessed, the risk for combined dermal plus inhalation short- and intermediate-term exposure are not a risk concern at some level of risk mitigation. MOEs for handler who mix/load and apply with high pressure hand-wand of 1000 gallons of a 2% spray is a risk concern for maximum mitigation (short- and intermediate Total MOE are 26 and 7, respectively).

The exposure from anticipated postaplication activities for sorghum and containerized ornamentals grown in greenhouses was estimated. The restricted entry interval (REI) on all labels provided by the registrant is 24 hours. Dislodgable foliar residue (DFR) data was estimated by assuming initial and daily dissipation of 20% and 10%, respectively. Applicable transfer coefficients (TCs) from the Agricultural Re-entry Task Force (ARTF) were also used. MOEs estimated for postapplication activities are not a concern on day of application (i.e. REI of 12 hours). Based on the atrazine's acute toxicity (category III/IV), 12 hours is the minimum REI permitted by EPA's Worker Protection Standard.

1.0 Occupational and Residential Exposure Assessment for Propazine

1.1 Purpose

This document is the occupational and residential non-dietary exposure and risk assessment for propazine from its use as an herbicide. In this document, which is for use in EPA's development of the HED chapter of the propazine RED Document, EPA presents the results of its review of the potential human health effects of occupational exposure to propazine.

1.2 Criteria for Conducting Exposure Assessments

An occupational and/or residential exposure assessment is required for an active ingredient if (1) certain toxicological criteria are triggered and (2) there is a potential for exposure to handlers (mixers, loaders, applicators) during use or to persons entering treated sites or exposed to residues after application is complete. Toxicological endpoints were selected for short- and intermediate-term dermal and inhalation exposures to propazine. There is a potential for exposure in a variety of occupational agricultural and commercial settings. Therefore, risk assessments are required for occupational handlers as well as for postapplication activties. There are no current or proposed residential uses of propazine

1.3 Summary of Hazard Concerns for Propazine

Hazard information for atrazine was used in the exposure assessment of propazine. HED's Hazard Identification Assessment Review Committee (HIARC) met to determine appropriate toxicological endpoints of concern for atrazine. The toxicological endpoints that were used to complete the occupational and residential risk assessments are summarized below, which have been extracted from the atrazine HIARC report (4/5/02). Adverse effects were identified at durations of exposure ranging from short-term (up to 30 days) to intermediate-term durations (up to 6 months) and long-term durations (> 6 months).

Dermal Route (non-cancer)

For short-term dermal exposures, an endpoint was selected based on a 30-day pubertal screening study in male rats. A NOAEL of 6.25 mg/kg/day was determined, based on a delay in preputial separation at the LOAEL of 12.5 mg/kg/day. This study is appropriate for this scenario since it demonstrates an endpoint in the young animal that is consistent with atrazine's mode of toxicity. The endpoint, delayed puberty, is relevant to the population of concern. This endpoint is appropriate to evaluate incidental oral exposures (e.g., hand-to-mouth) in children. The endpoint is a biomarker for a neuroendocrine effect and is therefore also appropriate for all age groups and both sexes for short-term exposures to atrazine.

For intermediate-term or long-term dermal exposure, an oral endpoint was selected based on attenuation of the pre-ovulatory LH surge (indicative of hypothalamic disruption) in a subchronic study in Sprague-Dawley rats with a NOAEL of 1.8 mg/kg/day. The endpoint of concern was seen after four to five months of exposure and is appropriate for this exposure period of concern. These endocrine effects are biomarkers of atrazine's potential to disturb hypothalamic-pituitary function,

which may lead to various health consequences. The 21-day dermal study was not selected since estrous cycle evaluations and LH measurements (both of which have been shown to be very sensitive endpoints following atrazine exposure) were not performed in this study.

A dermal absorption factor of 6% (rounded up from 5.6%) was selected for all exposure durations based on a human dermal penetration study in which 10 human volunteers were exposed to a single topical dose of atrazine (MRID 44152114).

Inhalation Route (non-cancer)

With the exception of an acute inhalation study, no inhalation studies are available for evaluation. Therefore, the HIARC selected oral studies for inhalation risk assessments. For short-term inhalation exposures, the oral NOAEL of 6.25 mg/kg/day, described above, is applicable. For intermediate and long-term inhalation exposure, the oral endpoint of 1.8 mg/kg/day was chosen. An inhalation absorption factor of 100 percent is applied.

Non-cancer Level of Concern (LOC)

HED's level of concern (LOC) for propazine dermal and inhalation exposures is 100 (i.e., a margin of exposure (MOE) less than 100 is a risk concern) for occupational scenarios. The level of concern is based on 10X to account for interspecies extrapolation to humans from the animal test species and10X to account for intraspecies sensitivity. For residential scenarios, an additional FQPA factor of 3X is applied to account for concerns about the effect of the neuroendocrine mode of action on the development of the young.

Combined Routes of Exposure

The dermal and inhalation margins of exposure were combined for the handler assessment, because the toxicity endpoints for the dermal and inhalation routes of exposure are the same.

Cancer

Propazine has been grouped with atrazine and other chlorinated triazines as sharing a common mechanism of toxicity. The carcinogenic potential of atrazine was discussed by the Science Advisory Panel (SAP) on June 27, 28 and 29th, 2000. The Cancer Assessment Review Committee (CARC) considered the comments of the SAP in meetings on November 1 and December 13, 2000. The CARC classified atrazine as "Not Likely to Be Carcinogenic to Humans". As a result of the determination that atrazine and propazine share a common mechanism of toxicity, which is not likely to result in cancer in humans, propazine will be reclassified similarly as atrazine as "Not Likely to Be Carcinogenic to Humans". Therefore, no cancer exposure assessment has been performed in this document.

Acute Toxicity

Propazine has low acute toxicity (toxicity category IV) for acute oral and dermal exposures and for exposures to the skin and eye irritation, and dermal sensitization. It is moderately toxic

(Toxicity category III) for exposure by the inhalation route.

Body Weight

The adverse effects for the short-term dermal and inhalation endpoints are based on a study where the effects were observed in males and females, therefore, the body weight of an average adult (i.e., 70 kg) was used to estimate exposure. Since the adverse effects for the intermediate-term dermal and inhalation endpoints are based on neuroendocrine effects in the female, the body weight of an average adult female (i.e., 60 kg) was used to estimate exposure.

Table 1. Summary of Toxicological Doses and Endpoints

Exposure Scenario	Dose used in Risk Assessment, UF	Special FQPA SF and Level of Concern for Risk Assessment	Study and Toxicological Effects
Dermal short-term (1-30 days)	NOAEL = 6.25 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**28-day Pubertal study in rats w/ Atrazine** LOAEL = 12.5 mg/kg/day based on delayed preputial separation
Dermal intermediate-term (30-180 days)	NOAEL = 1.8 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**6-month LH surge study in rat w/ Atrazine** LOAEL = 3.65 mg/kg/day based on estrous cycle alterations and LH surge suppression
Dermal long-term (30-180 days)	NOAEL = 1.8 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**6-month LH surge study in rat w/ Atrazine** LOAEL = 3.65 mg/kg/day based on estrous cycle alterations and LH surge suppression
Inhalation short-term (1-30 days)	NOAEL = 6.25 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**28-day Pubertal study in rats w/ Atrazine** LOAEL = 12.5 mg/kg/day based on delayed preputial separation
Inhalation intermediate-term (30-180 days)	NOAEL = 1.8 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**6-month LH surge study in rat w/ Atrazine** LOAEL = 3.65 mg/kg/day based on estrous cycle alterations and LH surge suppression
Inhalation long-term (30-180 days)	NOAEL = 1.8 mg/kg/day UF = 100	LOC is a MOE of 100 for Occupational Exposure LOC is a MOE of 300 for Residential Exposure	**6-month LH surge study in rat w/ Atrazine** LOAEL = 3.65 mg/kg/day based on estrous cycle alterations and LH surge suppression
Dermal absorption = 6% (based on human data for atrazine)			

1.4 Summary of Use Patterns and Formulations

Table 2 summarizes the crops, maximum application rates, application equipment, and assumed daily area treated per day. Only one application per year per crop growing season/planting cycle may be made. Rates are based on labels provided by the registrant (June 17, 2004 letter from R Ashley/Dupont to E. Olsen/EPA/SRRD). The daily area treated/amount handled is based on standard EPA/OPP/HED values.

Table 2. Summary of Propazine Use Patterns

Crop or Target	Maximum Application Rate	Application Equipment	Daily Area Treated or Amount Handled
Sorghum	1.2 lb ai per acre	groundboom	200 acres
		aerial	1200 acres
Containerized ornamentals grown in greenhouses	0.15 lb ai per gallon[1]	low pressure hand-wand	40 gallons
		backpack	40 gallons
		high pressure hand-wand	1000 gallons

[1]Based on 2.25 Tbs of product per 1000 ft^2 in 10 gallons of water per acre

2.0 Occupational Exposures and Risks

There is a potential for exposure to propazine in occupational scenarios from handling propazine products during the application process (i.e., mixer/loaders, applicators, flaggers, and mixer/loader/applicators) and a potential for postapplication worker exposure from entering into areas previously treated with propazine. As a result, risk assessments have been completed for occupational handler scenarios as well as occupational postapplication scenarios.

2.1 Occupational Handler Exposures and Risks

HED uses the term "handlers" to describe those individuals who are involved in the pesticide application process. HED believes that there are distinct job functions or tasks related to applications and that exposures can vary depending on the specifics of each task. Job requirements (e.g., amount of chemical to be used in an application), the kinds of equipment used, the target being treated, and the level of protection used by a handler can cause exposure levels to differ in a manner specific to each application event.

HED uses exposure scenarios to describe the various types of handler exposures that may occur for a specific active ingredient. The use of scenarios as a basis for exposure assessment is very common as described in the *U.S. EPA Guidelines For Exposure Assessment* (U.S. EPA; Federal Register Volume 57, Number 104; May 29, 1992). Information from the current labels,

use and usage information, toxicology data, and exposure data were all key components in the development of the exposure scenarios. HED has developed a series of general descriptions for tasks that are associated with pesticide applications. Tasks associated with occupational pesticide handlers are categorized using one of the following terms:

- **Mixers and/or Loaders:** these individuals perform tasks in preparation for an application. For example, prior to application, mixer/loaders would mix the Propazine and load it into the holding tank of the airplane or groundboom..

- **Applicators:** these individuals operate application equipment during the release of a pesticide product into the environment. These individuals can make applications using equipment such as airplanes or groundboom..

- **Mixer/Loader/Applicators and or Loader/Applicators:** these individuals are involved in the entire pesticide application process (i.e., they do all job functions related to a pesticide application event). These individuals would transfer Propazine into the application equipment and then also apply it.

- **Flaggers:** these individuals guide aerial applicators during the release of a pesticide product onto an intended target.

A chemical can produce different effects based on how long a person is exposed, how frequently exposures occur, and the level of exposure. HED classifies exposures up to 30 days as short-term and exposures greater than 30 days up to six months as intermediate-term. HED completes both short- and intermediate-term assessments for occupational scenarios in essentially all cases, because these kinds of exposures are likely and acceptable use/usage data are not available to justify deleting intermediate-term scenarios. Based on use data and label instructions, HED believes that occupational propazine exposures may occur over a single day or up to weeks at a time for many use-patterns and that intermittent exposures over several weeks also may occur. Some applicators may apply propazine over a period of weeks, because they are custom or commercial applicators who are completing a number of applications for a number of different clients. Long-term handler exposures are not expected to occur for propazine.

Other parameters are also defined from use and usage data such as application rates and application frequency. HED always completes non-cancer risk assessments using maximum application rates for each in order to ensure there are no concerns for each specific use.

Occupational handler exposure assessments are completed by HED using different levels of risk mitigation. Typically, HED uses a tiered approach. The lowest tier is designated as the baseline exposure scenario (i.e., long-sleeve shirt, long pants, shoes, socks, and no respirator). If risks are of concern at baseline attire, then increasing levels of personal protective equipment or PPE (e.g., gloves, double-layer body protection, and respirators) are evaluated. If risks remain a concern with maximum PPE, then engineering controls (e.g., enclosed cabs or cockpits, water-soluble packaging, and closed mixing/loading systems) are evaluated. This approach is used to ensure that the lowest level of risk mitigation that provides adequate protection is selected, since the addition of PPE and engineering controls involves an additional expense to the user and – in

the case of PPE – also involves an additional burden to the user due to decreased comfort and dexterity and increased heat stress and respiratory stress.

2.1.1 Data and Assumptions For Handler Exposure Scenarios

2.1.1.1 Assumptions for Handler Exposure Scenarios

A series of assumptions and exposure factors served as the basis for completing the occupational handler risk assessments. Each assumption and factor is detailed below on an individual basis. The assumptions and factors used in the risk calculations include:

- Occupational handler exposure estimates were based on surrogate data from the Pesticide Handlers Exposure Database (PHED)

- The adverse effects for the short-term dermal and inhalation endpoints are based on a study where the effects were observed in males and females, therefore the average body weight of an adult handler (i.e., 70 kg) is used to complete the noncancer risk assessment. The toxicological endpoint of concern for intermediate-term dermal and inhalation risks is based on neuroendocrine effects in the female, therefore the average body weight of an adult female handler (i.e., 60 kg) is used to complete the noncancer risk assessment.

- Generic protection factors (PFs) were used to calculate exposures when data were not available. For example, a filtering facepiece dustmask is assumed to have a PF of 5 (i.e. reduces inhalation exposure by 80%). A half face elastomeric respirator with appropriate cartridges is assumed to have a PF of 10 (i.e. reduces inhalation exposure by 90%).

- For non-cancer assessments, HED assumes the maximum application rates allowed by labels in its risk assessments.

- The average occupational workday is assumed to be 8 hours.

- The daily areas treated were defined for each handler scenario (in appropriate units) by determining the amount that can be reasonably treated in a single day (e.g., acres, square feet, cubic feet, or gallons per day). When possible, the assumptions for daily areas treated are taken from the Health Effects Division Science Advisory Committee on Exposure SOP #9: Standard Values for Daily Acres Treated in Agriculture, which was completed on July 5, 2000.

2.1.1.2 Exposure Data for Handler Exposure Scenarios

HED uses *unit exposure* to assess handler exposures to pesticides. *Unit exposures* are estimates of the amount of exposure to an active ingredient a handler receives while performing various handler tasks and are expressed in terms of micrograms or milligrams of active ingredient per pounds of active ingredient handled. HED has developed a series of unit exposures that are unique for each scenario typically considered in our assessments (i.e., there are different unit exposures for different types of application equipment, job functions, and levels of protection).

The *unit exposure* concept has been established in the scientific literature and also through various exposure monitoring guidelines published by the U.S. EPA and international organizations such as Health Canada and OECD (Organization For Economic Cooperation and Development).

Pesticide Handler Exposure Database (PHED) Version 1.1 (August 1998): PHED was designed by a task force of representatives from the U.S. EPA, Health Canada, the California Department of Pesticide regulation, and member companies of the American Crop Protection Association. PHED is a software system consisting of two parts – a database of measured exposures for workers involved in the handling of pesticides under actual field conditions and a set of computer algorithms used to subset and statistically summarize the selected data. Currently, the database contains values for over 1,700 monitored individuals (i.e., replicates).

Users select criteria to subset the PHED database to reflect the exposure scenario being evaluated. The subsetting algorithms in PHED are based on the central assumption that the magnitude of handler exposures to pesticides are primarily a function of activity (e.g., mixing/loading, applying), formulation type (e.g., liquids, granulars), application method (e.g., aerial, groundboom), and clothing scenarios (e.g., gloves, double layer clothing).

Once the data for a given exposure scenario have been selected, the data are normalized (i.e., divided by) by the amount of pesticide handled resulting in standard unit exposures (milligrams of exposure per pound of active ingredient handled). Following normalization, the data are statistically summarized. The distribution of exposure for each body part (e.g., chest, upper arm) is categorized as normal, lognormal, or "other" (i.e., neither normal nor lognormal). A central tendency value is then selected from the distribution of the exposure for each body part. These values are the arithmetic mean for normal distributions, the geometric mean for lognormal distributions, and the median for all "other" distributions. Once selected, the central tendency values for each body part are composited into a "best fit" exposure value representing the entire body.

The unit exposures calculated by PHED generally range from the geometric mean to the median of the selected data set. To add consistency and quality control to the values produced from this system, the PHED Task Force has evaluated all data within the system and has developed a set of grading criteria to characterize the quality of the original study data. The assessment of data quality is based on the number of observations and the available quality control data. While data from PHED provide the best available information on handler exposures, it should be noted that some aspects of the included studies (e.g., duration, acres treated, pounds of active ingredient handled) may not accurately represent labeled uses in all cases. HED has developed a series of tables of standard unit exposure for many occupational scenarios that can be utilized to ensure consistency in exposure assessments. Unit exposures are used which represent different levels of personal protection as described above. Protection factors were used to calculate unit exposures for varying levels of personal protection if data were not available.

2.1.2 Propazine Handler Exposure Scenarios

It has been determined that exposure to pesticide handlers is likely during the occupational use of propazine in a variety of occupational environments. The anticipated use patterns and

current labeling indicate several occupational exposure scenarios based on the types of equipment and techniques that can potentially be used for propazine applications. The quantitative exposure/risk assessment developed for occupational handlers is based on the following scenarios. [Note: The scenario numbers correspond to the tables of risk calculations included in the occupational risk calculation aspects of the appendices.]

Mixer/Loaders:
(1) Liquids for Groundboom Applications
(2) Liquids for Aerial Applications

Applicators:
(3) Groundboom Spray Applications
(4) Aerial Spray Applications

Flaggers:
(5) Flagging for Aerial Spray Applications

Mixer/Loader/Applicators:
(6) Liquid: Low Pressure Handwand Sprayer
(7) Liquid: Backpack Sprayer
(8) Liquid: Handgun Sprayer

2.1.3 Non-cancer Propazine Handler Exposure and Assessment

2.1.3.1 Non-cancer Propazine Handler Exposure and Risk Calculations

Daily Exposure: Daily dermal or inhalation handler exposures are estimated for each applicable handler task (except applying impregnated collars) with the application rate, the area treated in a day, and the applicable dermal or inhalation unit exposure using the following formula:

$$\textit{Daily Exposure}\left(\frac{mg\ ai}{day}\right) = \textit{Unit Exposure}\left(\frac{mg\ ai}{lb\ ai\ handled}\right) \times \textit{Application Rate}\left(\frac{lbs\ ai}{area}\right) \times \textit{Daily Area Treated}\left(\frac{area}{day}\right)$$

Where:

Daily Exposure	=	Amount (mg or μg ai/day) deposited on the surface of the skin that is available for dermal absorption or amount inhaled that is available for inhalation absorption;
Unit Exposure	=	Unit exposure value (mg or μg ai/lb ai) derived from August 1998 PHED data
Application Rate	=	Normalized application rate based on a logical unit treatment, such as acres, square feet, or gallons. Maximum values are generally used (lb ai/A, lb ai/sq ft, lb ai/gal) and
Daily Area Treated	=	Normalized application area based on a logical unit treatment such as acres (A/day), square feet (sq ft/day), OR gallons per day (gal/day).

Daily Dose: The daily dermal or inhalation dose is calculated by normalizing the daily

exposure by body weight and adjusting, if necessary, with an appropriate dermal or inhalation absorption factor. For all short-term exposure scenarios for propazine, an average adult body weight of 70 kilograms was used, since the toxicological endpoint of concern is not sex-specific. For all intermediate-term exposure scenarios for propazine, an average female body weight of 60 kilograms was used, since the toxicological endpoint is female-specific. Since the dermal toxicological endpoints of concern are based on oral studies, a dermal absorption rate is used to estimate the amount of propazine likely to be absorbed through the skin following dermal exposures. A dermal absorption factor of 6 percent was used for all dermal calculations based on atrazine dermal absorption studies. Since the inhalation toxicological endpoint of concern is based on an oral study, an absorption factor of 100% was used for inhalation dose calculations. Daily dose was calculated using the following formula:

$$\textit{Average Daily Dose\_mg /kg /day} = \textit{Daily Exposure}\left(\frac{\textit{mg ai}}{\textit{day}}\right) x \left(\frac{\textit{Absorption Factor (\% /100)}}{\textit{Body Weight (kg)}}\right)$$

Where:

Average Daily Dose	=	Absorbed dose received from exposure to a pesticide in a given scenario (mg pesticide active ingredient/kg body weight/day);
Daily Exposure	=	Amount (mg ai/day) deposited on the surface of the skin that is available for dermal absorption or amount inhaled that is available for inhalation absorption;
Absorption Factor	=	A measure of the amount of chemical that crosses a biological boundary such as the skin or lungs (% of the total available absorbed); and
Body Weight	=	Body weight determined to represent the population of interest in a risk assessment (kg).

Margins of Exposure: Non-cancer dermal and inhalation risks for each applicable handler scenario are calculated using a Margin of Exposure (MOE), which is a ratio of the daily dose to the toxicological endpoint of concern. All MOE values were calculated separately for dermal and inhalation exposure levels using the formula below:

$$\textit{MOE} = \frac{\textit{NOAEL v LOAEL\_mg/kg/day}}{\textit{Average Daily Dose\_mg/kg/day}}$$

Where:

MOE	=	Margin of Exposure, value used by HED to represent risk or how close a chemical exposure is to being a concern (unitless);
ADD	=	Average Daily Dose or the absorbed dose received from exposure to a pesticide in a given scenario (mg pesticide active ingredient/kg body weight/day); and
NOAEL or LOAEL	=	Dose level in a toxicity study, where no observed adverse effects (NOAEL) or where the lowest observed adverse effects (LOAEL) occurred in the study

Risk values are presented for each route of exposure (i.e., dermal or inhalation) in each

scenario, because risk mitigation measures are specific to the route of exposure.

2.1.3.2 Propazine Non-cancer Risk Summary

For eight scenarios assessed, the risk for combined dermal plus inhalation short- and intermediate-term exposure are not a risk concern at some level of risk mitigation. MOEs for handler who mix/load and apply with high pressure hand-wand of 1000 gallons of a 2% spray is risk concern for maximum mitigation (short- and intermediate Total MOE are 26 and 7, respectively). A summary of the short- and intermediate-term MOEs at baseline (single layer protection, no gloves, no respirator), PPE1 (baseline + gloves), PPE 6 (double layer protection, gloves, PF10 respirator), and with engineering controls is presented below in **Tables 3** and **4.** All of the non-cancer risk calculations for occupational propazine handlers completed in this assessment are included in the appendices (mitigation levels: baseline, PPE1, PPE2, PPE3, PPE4, PPE5, PPE6, and engineering controls).

Table 3. Short-term Handler MOEs														
Exposure Scenario (Scenario #)	Application rates	Area Treated	Baseline (Single Layer Protection, No Gloves, No Respirator)			PPE1 (Single Layer Protection, Gloves, No Respirator)			PPE6 or Max PPE (Double Layer Protection, Gloves, PF10 Respirator)			Engineering Controls (Single Layer Protection, No Gloves, No Respirator)		
			Dermal	Inhalation	Total	Dermal	Inhalation	Total	Dermal	Inhalation	Total	Dermal	Inhalation	Total
Mixer/Loader														
Mixing/Loading Liquids for Groundboom application (1)	1.2 lb ai per acre	200 Acres per day	10	1500	10	1300	1500	710	1800	15000	1600	3500	22000	3000
Mixing/Loading Liquids for Aerial application (2)	1.2 lb ai per acre	1200 Acres per day	2	250	1.7	220	250	120	300	2500	270	590	3700	510
Applicator														
Sprays for Groundboom application (3)	1.2 lb ai per acre	200 Acres per day	2200	2500	1200	2200	2500	1200	2800	25000	2500	6100	42000	5300
Sprays for Aerial application (4)	1.2 lb ai per acre	1200 Acres per day	No data									1000	4500	830
Flagger														
Flagging for Sprays application (5)	1.2 lb ai per acre	1200 Acres per day	460	870	300	510	870	320	510	8700	480	23000	43000	15000
Mixer/Loader/App														
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (6)	0.15 lb ai per gallon	40 Gallons per day	12	2400	12	2800	2400	1300	3200	24000	2800	No Data		
Mixing/Loading/Applying Liquids for Backpack sprayer application (7)	0.15 lb ai per gallon	40 Gallons per day	480	2400	400	480	2400	400	750	24000	720			
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (8)	0.15 lb ai per gallon	1000 Gallons per day	14	24	8.7	19	24	11	30	240	26			

Application rates are the maximum application rates determined from EPA registered labels for propazine
Amount handled per day values are HED estimates of acres treated per day based on Exposure SAC SOP #9 "Standard Values for Daily Acres Treated in Agriculture," industry sources, and HED estimates.
Baseline = No gloves and no respirator
Gloves, single layer is baseline attire plus chemical-resistant gloves.
PF 5 Respirator is quarter-face dust/mist respirator that provides 80% reduction of inhalation exposure
PF 10 Respirator is half-face dust/mist respirator that provides 90% reduction of inhalation exposure
Gloves, double layer is coveralls worn over long-sleeve shirt and long pants, plus chemical-resistant gloves.
Engineering control is closed mixing/loading system, enclosed cab, or enclosed cockpit.
Dermal MOE = NOAEL (6.25 mg/kg/day) / dermal daily dose (mg/kg/day), where dermal dose = daily unit exposure (mg/lb ai) x application rate x amount handled per day / body weight (70 kg adult). Applied dermal absorption factor of 6%.
Inhalation MOE = NOAEL (6.25 mg/kg/day) / inhalation daily dose (mg/kg/day), where inhalation dose = daily unit exposure (μg/lb ai) x application rate x amount handled per day x conversion factor (1mg/1,000 μg / body weight (70 kg adult). Applied inhalation absorption factor of 100%.
Total MOE =1/[(1/Dermal MOE) + (/Inhalation MOE)]

Table 4. Intermediate-term Handler MOEs														
Exposure Scenario (Scenario #)	Application rates	Area Treated	Baseline (Single Layer Protection, NoGloves, No Respirator)			PPE1 (Single Layer Protection, Gloves, No Respirator)			Max PPE (Double Layer Protection, Gloves, PF10 Respirator)			Engineering Controls (Single Layer Protection, NoGloves, No Respirator)		
			Dermal	Inhalation	Total	Dermal	Inhalation	Total	Dermal	Inhalation	Total	Dermal	Inhalation	Total
Mixer/Loader														
Mixing/Loading Liquids for Groundboom application (1)	1.2 lb ai per acre	200 Acres per day	3	380	3	330	380	170	440	3800	390	870	5400	750
Mixing/Loading Liquids for Aerial application (2)	1.2 lb ai per acre	1200 Acres per day	< 1	62	0	54	62	29	74	630	66	150	900	130
Applicator														
Sprays for Groundboom application (3)	1.2 lb ai per acre	200 Acres per day	540	610	280	540	610	280	680	6100	610	1500	10000	1300
Sprays for Aerial application (4)	1.2 lb ai per acre	1200 Acres per day	No Data									250	1100	200
Flagger														
Flagging for Sprays application (5)	1.2 lb ai per acre	1200 Acres per day	110	210	74	130	210	79	130	2100	120	5700	11000	3700
Mixer/Loader/App														
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (6)	0.15 lb ai per gallon	40 Gallons per day	3	590	3	680	590	320	800	5900	700	No Data		
Mixing/Loading/Applying Liquids for Backpack sprayer application (7)	0.15 lb ai per gallon	40 Gallons per day	120	590	98	120	590	98	180	5900	180			
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (8)	0.15 lb ai per gallon	1000 Gallons per day	3	6	2	5	6	3	7	59	7			

Application rates are the maximum application rates determined from EPA registered labels for propazine
Amount handled per day values are HED estimates of acres treated per day based on Exposure SAC SOP #9 "Standard Values for Daily Acres Treated in Agriculture," industry sources, and HED estimates.
Baseline = No gloves and no respirator
Gloves, single layer is baseline attire plus chemical-resistant gloves.
PF 5 Respirator is quarter-face dust/mist respirator that provides 80% reduction of inhalation exposure
PF 10 Respirator is half-face dust/mist respirator that provides 90% reduction of inhalation exposure
Gloves, double layer is coveralls worn over long-sleeve shirt and long pants, plus chemical-resistant gloves.
Engineering control is closed mixing/loading system, enclosed cab, or enclosed cockpit.
Dermal MOE = NOAEL (1.8 mg/kg/day) / dermal daily dose (mg/kg/day), where dermal dose = daily unit exposure (mg/lb ai) x application rate x amount handled per day / body weight (60 kg adult).
Applied dermal absorption factor of 6%.
Inhalation MOE = NOAEL 1.8 mg/kg/day) / inhalation daily dose (mg/kg/day), where inhalation dose = daily unit exposure (μg/lb ai) x application rate x amount handled per day x conversion factor (1mg/1,000 μg / body weight (60 kg adult). Applied inhalation absorption factor of 100%.
Total MOE =1/[(1/Dermal MOE) + (/Inhalation MOE)]

2.1.4 Data Gaps for Occupational Handlers

There are no occupational handler scenarios for propazine that have data gaps.

2.2 Occupational Postapplication Exposures and Risks

HED uses the term "postapplication" to describe exposures to individuals that occur as a result of being in an environment that has been previously treated with a pesticide (also referred to as reentry exposure). HED believes that there are distinct job functions or tasks related to the kinds of activities that occur in previously treated areas. Job requirements (e.g., the kinds of jobs to cultivate a crop), the nature of the crop or target that was treated, and how the chemical residues degrade in the environment can cause exposure levels to differ over time. Each factor has been considered in this assessment.

2.2.1 Data and Assumptions for Postapplication Exposure Scenarios

A series of assumptions and exposure factors served as the basis for completing the occupational postapplication worker risk assessments. Each assumption and factor is detailed below on an individual basis. In addition to these values, transfer coefficient values were used to calculate risk estimates. The transfer coefficients were taken from HED's revised policy entitled *Policy 003.1 Science Advisory Council For Exposure Policy Regarding Agricultural Transfer Coefficients* (August 7, 2000). The assumptions and factors used in the risk calculations are presented below:

- There are many factors that are common to handler and postapplication risk assessments such as body weights, duration, and application rates. See Section 2.1.1.1 for these values. In the postapplication risk assessment, maximum application rates were considered.

- Levels of Concern: HED has established levels of concern (LOC) for occupational postapplication risks – margins of exposure of less than 100 for occupational non-cancer dermal risks are a concern.

- Exposures were calculated to reflect default DFR values over time coupled with surrogate transfer coefficients as outlined in HED's revised policy and from studies submitted to the Agency by the Agricultural Reentry Task Force.

- Postapplication risks from short-term exposures were assessed. HED does not expect intermediate-term (>30 days) postapplication occupational exposures to occur based on the crops involved and the long interval between applications.

2.2.2 Occupational Postapplication Exposure and Noncancer Risk Estimates

Occupational non-cancer risks were calculated using a Margin of Exposure (MOE), which is a ratio of the daily dose to the toxicological endpoint of concern. Postapplication risks diminish over time because propazine residues eventually dissipate in the environment. As a result, risks were calculated over time based on changing residue levels.

Daily Exposure: Daily dermal exposures were calculated on each postapplication day after application using the following equation (see equation D2-20 from *Series 875-Occupational and Residential Test Guidelines: Group B-Postapplication Exposure Monitoring Test Guidelines* and *Residential SOP 3.2: Postapplication Dermal Potential Doses From Pesticide Residues On Gardens*):

$$DE_{(t)}\ (mg/day) = (TR_{(t)}\ (\mu g/cm^2) \times TC\ (cm^2/hr) \times Hr/Day)/1000\ (\mu g/mg)$$

Where:

DE(t)	=	Daily exposure or amount deposited on the surface of the skin at time (t) attributable for activity in a previously treated area, also referred to as potential dose (mg ai/day);
TR(t)	=	Transferable residues that can either be dislodgeable foliar or turf transferable residue at time "t" ($\mu g/cm^2$);
TC	=	Transfer Coefficient (cm^2/hour); and
Hr/day	=	Exposure duration meant to represent a typical workday (hours).

Note that the ($TR_{(t)}$) input may represent levels on the day of application in the case of short-term risk calculations.

Daily Dose and Margins of Exposure: The use of dissipation data and the manner in which daily postapplication dermal exposures were calculated are inherently different than with handler exposures. However, once daily exposures are calculated, the calculation of daily absorbed dose and the resulting Margin of Exposures use the same algorithms that are described for the handler exposures. These calculations are completed for each day or appropriate block of time after application.

2.2.3 Noncancer Risk Summary

A summary of the noncancer postapplication risks are provided in **Table 8.** For the postapplication activities assessed, there is no risk concern for re-entry on day 0.

Table 3. Summary of Days After Treatment[1] to Reach the Target MOE

Crop Grouping (1)	Crops	Max Foliar Rate	Transfer Coefficient (cm^2/hr)	Activities	Day After Application when Target MOE= 100
Field / row crops, tall	Sorghum	1.2 lb ai/A	100	Scouting, Weeding (hand)	0
			400	Scouting	0
			1000	Irrigation, Scouting, Weeding (hand)	0
Flowers, cut (ornamental)[1]	Container Grown Ornamentals in Greenhouses	1.5 lb ai/gallon	110	Pruning, Tying	0
			175	Pinching (hand)	0
			400	Harvest (hand), Replanting	0

[1] transfer coefficient data are not available for this use; therefore information from the cut flower crop group have

been used

2.2.4 Data Gaps for Postapplication Activities

There are no data gaps for assessing postapplication activities.

APPENDICES

Short Term Baseline Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	2.9	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.60	10	0.0041	1500	10
Mixing/Loading Liquids for Aerial application (2)	2.9	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	3.6	2	0.025	250	1.7
Applicator										
Sprays for Groundboom application (3)	0.014	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0029	2200	0.0025	2500	1200
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.011	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	460	0.0072	870	300
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	100	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.52	12	0.0026	2400	12
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.013	480	0.0026	2400	400
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	3.5	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.46	14	0.26	24	8.7

[1]Baseline dermal unit exposures represent long pants, long sleeved shirts, shoes, and socks. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]Baseline inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate Baseline Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	2.9	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.70	3	0.0048	380	2.6
Mixing/Loading Liquids for Aerial application (2)	2.9	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	4.2	< 1	0.029	62	0.43
Applicator										
Sprays for Groundboom application (3)	0.014	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0034	540	0.0030	610	280
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.011	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.016	110	0.0084	210	74
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	100	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.61	3	0.0031	590	2.9
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.015	120	0.0031	590	98
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	3.5	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.54	3	0.31	6	2.1

[1]Baseline dermal unit exposures represent long pants, long sleeved shirts, shoes, and socks. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]Baseline inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 1 (Single Layer Protection, Gloves, No Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0047	1300	0.0041	1500	710
Mixing/Loading Liquids for Aerial application (2)	0.023	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.028	220	0.025	250	120
Applicator										
Sprays for Groundboom application (3)	0.014	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0029	2200	0.0025	2500	1200
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.0072	870	320
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	2800	0.0026	2400	1300
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.013	480	0.0026	2400	400
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.33	19	0.26	24	11

[1]PPE1 dermal unit exposures represent long pants, long sleeved shirts, and chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE1 inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 1 (Single Layer Protection, Gloves, No Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0055	330	0.0048	380	170
Mixing/Loading Liquids for Aerial application (2)	0.023	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.033	54	0.029	62	29
Applicator										
Sprays for Groundboom application (3)	0.014	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0034	540	0.0030	610	280
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.0084	210	79
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0026	680	0.0031	590	320
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.015	120	0.0031	590	98
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.38	5	0.31	6	2.6

[1]PPE1 dermal unit exposures represent long pants, long sleeved shirts, and chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE1 inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 2 (Single Layer Protection, Gloves, PF5 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	0.24	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0047	1300	0.00082	7600	1100
Mixing/Loading Liquids for Aerial application (2)	0.023	0.24	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.028	220	0.0049	1300	190
Applicator										
Sprays for Groundboom application (3)	0.014	0.15	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0029	2200	0.00051	12000	1800
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.07	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.0014	4300	450
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	2800	0.00052	12000	2200
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.013	480	0.00052	12000	460
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	24	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.33	19	0.052	120	16

[1]PPE2 dermal unit exposures represent long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE2 inhalation unit exposures represent a dust/mist respirator with a protection factor of 5. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 2 (Single Layer Protection, Gloves, PF5 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	0.24	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0055	330	0.00096	1900	280
Mixing/Loading Liquids for Aerial application (2)	0.023	0.24	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.033	54	0.0058	310	46
Applicator										
Sprays for Groundboom application (3)	0.014	0.15	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0034	540	0.0006	3000	450
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.07	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.0017	1100	110
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0026	680	0.00061	2900	550
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.015	120	0.00061	2900	110
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	24	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.38	5	0.061	29	4.1

[1]PPE2 dermal unit exposures represent long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE2 inhalation unit exposures represent a dust/mist respirator with a protection factor of 5. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 3 (Single Layer Protection, Gloves, PF10 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	0.12	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0047	1300	0.00041	15000	1200
Mixing/Loading Liquids for Aerial application (2)	0.023	0.12	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.028	220	0.0025	2500	200
Applicator										
Sprays for Groundboom application (3)	0.014	0.074	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0029	2200	0.00025	25000	2000
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.035	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.00072	8700	480
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	2800	0.00026	24000	2500
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.013	480	0.00026	24000	470
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	12	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.33	19	0.026	240	18

[1]PPE3 dermal unit exposures represent long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE3 inhalation unit exposures represent a respirator with a protection factor of 10. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 3 (Single Layer Protection, Gloves, PF10 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.023	0.12	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0055	330	0.00048	3800	300
Mixing/Loading Liquids for Aerial application (2)	0.023	0.12	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.033	54	0.0029	630	50
Applicator										
Sprays for Groundboom application (3)	0.014	0.074	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0034	540	0.00030	6100	490
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.035	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.00084	2100	120
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.43	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0026	680	0.00031	5900	610
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	2.5	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.015	120	0.00031	5900	120
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	2.5	12	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.38	5	0.031	59	4.4

[1]PPE3 dermal unit exposures represent long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE3 inhalation unit exposures represent a respirator with a protection factor of 10. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 4 (Double Layer Protection, Gloves, No Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0035	1800	0.0041	1500	820
Mixing/Loading Liquids for Aerial application (2)	0.017	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.021	300	0.025	250	140
Applicator										
Sprays for Groundboom application (3)	0.011	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0023	2800	0.0025	2500	1300
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.0072	870	320
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0019	3200	0.0026	2400	1400
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0084	750	0.0026	2400	570
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.21	30	0.26	24	13

[1]PPE4 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE4 inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 4 (Double Layer Protection, Gloves, No Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	1.2	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0041	440	0.0048	380	200
Mixing/Loading Liquids for Aerial application (2)	0.017	1.2	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.024	74	0.029	62	34
Applicator										
Sprays for Groundboom application (3)	0.011	0.74	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0026	680	0.0030	610	320
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.35	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.0084	210	79
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	800	0.0031	590	340
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	30	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0098	180	0.0031	590	140
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	120	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.24	7	0.31	6	3.3

[1]PPE4 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE4 inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 5 (Double Layer Protection, Gloves, PF5 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	0.24	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0035	1800	0.00082	7600	1400
Mixing/Loading Liquids for Aerial application (2)	0.017	0.24	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.021	300	0.0049	1300	240
Applicator										
Sprays for Groundboom application (3)	0.011	0.15	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0023	2800	0.00051	12000	2300
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.07	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.0014	4300	450
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0019	3200	0.00052	12000	2500
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0084	750	0.00052	12000	700
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	24	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.21	30	0.052	120	24

[1]PPE5 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE5 inhalation unit exposures represent a dust/mist respirator with a protection factor of 5. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 5 (Double Layer Protection, Gloves, PF5 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	0.24	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0041	440	0.00096	1900	360
Mixing/Loading Liquids for Aerial application (2)	0.017	0.24	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.024	74	0.0058	310	60
Applicator										
Sprays for Groundboom application (3)	0.011	0.15	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0026	680	0.0006	3000	560
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.07	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.0017	1100	110
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	800	0.00061	2900	630
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	6	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0098	180	0.00061	2900	170
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	24	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.24	7	0.061	29	5.9

[1]PPE5 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE5 inhalation unit exposures represent a dust/mist respirator with a protection factor of 5. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term PPE 6 (Double Layer Protection, Gloves, PF10 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE[7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	0.12	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0035	1800	0.00041	15000	1600
Mixing/Loading Liquids for Aerial application (2)	0.017	0.12	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.021	300	0.0025	2500	270
Applicator										
Sprays for Groundboom application (3)	0.011	0.074	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0023	2800	0.00025	25000	2500
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.035	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	510	0.00072	8700	480
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0019	3200	0.00026	24000	2800
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0084	750	0.00026	24000	720
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	12	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.21	30	0.026	240	26

[1]PPE6 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE6 inhalation unit exposures represent a respirator with a protection factor of 10. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate PPE 6 (Double Layer Protection, Gloves, PF10 Respirator) Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.017	0.12	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0041	440	0.00048	3800	390
Mixing/Loading Liquids for Aerial application (2)	0.017	0.12	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.024	74	0.0029	630	66
Applicator										
Sprays for Groundboom application (3)	0.011	0.074	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0026	680	0.00030	6100	610
Sprays for Aerial application (4)	No Data	No Data	Sorghum	1.20 lb ai per acre	1200 Acres per day	No Data	No Data	No Data	No Data	No Data
Flagger										
Flagging for Sprays application (5)	0.01	0.035	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.014	130	0.00084	2100	120
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	0.37	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0023	800	0.00031	5900	700
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	1.6	3	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	0.0098	180	0.00031	5900	180
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	1.6	12	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	0.24	7	0.031	59	6.5

[1]PPE6 dermal unit exposures represent coveralls worn over long pants and long sleeved shirts plus chemical-resistant gloves. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]PPE6 inhalation unit exposures represent a respirator with a protection factor of 10. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Short Term Eng Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.0086	0.083	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0018	3500	0.00028	22000	3000
Mixing/Loading Liquids for Aerial application (2)	0.0086	0.083	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.011	590	0.0017	3700	510
Applicator										
Sprays for Groundboom application (3)	0.005	0.043	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0010	6100	0.00015	42000	5300
Sprays for Aerial application (4)	0.005	0.068	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.0062	1000	0.0014	4500	830
Flagger										
Flagging for Sprays application (5)	0.00022	0.007	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.00027	23000	0.00014	43000	15000
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	No Data	No Data	No Data	No Data	
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	No Data	No Data	No Data	No Data	
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	No Data	No Data	No Data	No Data	

[1]Engineering controls dermal unit exposures represent long pants and long sleeved shirts. For mixers and loaders, chemical-resistant gloves are also included. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]Engineering controls inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[7]Dermal MOE = oral NOAEL (6.25 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (70 kg).

[9]Inhalation MOE = oral NOAEL (6.25 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

Intermediate Eng Table

Exposure Scenario (Scenario #)	Dermal Unit Exposure (mg/lb ai)[1]	Inhalation Unit Exposure (Ug/lb ai)[2]	Crop[3]	Application Rate[4]	Daily Area Treated[5]	Dermal Dose (mg/kg/day)[6]	Dermal MOE [7]	Inhalation Dose (mg/kg/day)[8]	Inhalation MOE[9]	Total MOE[10]
Mixer/Loader										
Mixing/Loading Liquids for Groundboom application (1)	0.0086	0.083	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0021	870	0.00033	5400	750
Mixing/Loading Liquids for Aerial application (2)	0.0086	0.083	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.012	150	0.0020	900	130
Applicator										
Sprays for Groundboom application (3)	0.005	0.043	Sorghum	1.20 lb ai per acre	200 Acres per day	0.0012	1500	0.00017	10000	1300
Sprays for Aerial application (4)	0.005	0.068	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.0072	250	0.0016	1100	200
Flagger										
Flagging for Sprays application (5)	0.00022	0.007	Sorghum	1.20 lb ai per acre	1200 Acres per day	0.00032	5700	0.00017	11000	3700
Mixer/Loader/App										
Mixing/Loading/Applying Liquids for Low Pressure Handwand application (5)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	No Data	No Data	No Data	No Data	
Mixing/Loading/Applying Liquids for Backpack sprayer application (6)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	40 Gallons per day	No Data	No Data	No Data	No Data	
Mixing/Loading/Applying Liquids for High-Pressure HandWand application (7)	No Data	No Data	Containerized Ornamentals	0.15 lb ai per gallon	1000 Gallons per day	No Data	No Data	No Data	No Data	

[1]Engineering controls dermal unit exposures represent long pants and long sleeved shirts. For mixers and loaders, chemical-resistant gloves are also included. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[2]Engineering controls inhalation unit exposures represent no respirator. Values are reported in the PHED Surrogate Exposure Guide dated August 1998 or are from data submitted by the Outdoor Residential Exposure Task Force dated May 2000.

[3]Crops and use patterns are from 4/20/05 LUIS Rpt

[4]Application rates are based on maximum values found in various sources including LUIS and various labels.

[5]Amount treated is based on the area or gallons that can be reasonably applied in a single day for each exposure scenario of concern based on the application method and formulation/packaging type. (Standard EPA/OPP/HED values).

[6]Dermal dose (mg/kg/day) = [unit exposure (mg/lb ai) * Dermal absorption (6%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[7]Dermal MOE = oral NOAEL (1.8 mg/kg/day) / Daily Dermal Dose. Target Dermal MOE is 100.

[8]Inhalation dose (mg/kg/day) = [unit exposure (ug/lb ai) * 0.001 mg/ g unit conversion * Inhalation absorption (100%) * Application rate (lb ai/acre or lb ai/gallon) * Daily area treated (acres or gallons)] / Body weight (60 kg).

[9]Inhalation MOE = oral NOAEL (1.8 mg/kg/day) / Daily Inhalation Dose. Target Inhalation MOE is 100.

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Chemical:	**Propazine**
PC Code:	**080808**
HED File Code	**12000 Exposure Reviews**
Memo Date:	**08/31/2005**
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