US Environmental Protection Agency
Office of Pesticide Programs

Reregistration Eligibility Decision (RED) for Chloropicrin

July 9, 2008

United States
Environmental Protection
Agency

Prevention, Pesticides
and Toxic Substances
(7508P)

EPA 738-R-08-009
July 2008

Reregistration Eligibility Decision (RED) for Chloropicrin

Reregistration Eligibility Decision (RED) for Chloropicrin

List [A]

Case No. 0040

Approved by:

Steven Bradbury, Ph.D.
Director
Special Review and Reregistration Division

Date: 7/09/08

Glossary of Terms and Abbreviations

AGDCI	Agricultural Data Call-In
ai	Active Ingredient
aPAD	Acute Population Adjusted Dose
BCF	Bioconcentration Factor
CFR	Code of Federal Regulations
cPAD	Chronic Population Adjusted Dose
CSF	Confidential Statement of Formulation
CSFII	USDA Continuing Surveys for Food Intake by Individuals
DCI	Data Call-In
DEEM	Dietary Exposure Evaluation Model
DFR	Dislodgeable Foliar Residue
DNT	Developmental Neurotoxicity
EC	Emulsifiable Concentrate Formulation
EDWC	Estimated Drinking Water Concentration
EEC	Estimated Environmental Concentration
EPA	Environmental Protection Agency
EUP	End-Use Product
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FFDCA	Federal Food, Drug, and Cosmetic Act
FQPA	Food Quality Protection Act
GLN	Guideline Number
IR	Index Reservoir
LC_{50}	Median Lethal Concentration. A statistically derived concentration of a substance that can be expected to cause death in 50% of test animals. It is usually expressed as the weight of a substance per weight or volume of water, air, or feed, e.g., mg/l, mg/kg, or ppm.
LD_{50}	Median Lethal Dose. A statistically derived single dose that can be expected to cause death in 50% of the test animals when administered by the route indicated (oral, dermal, inhalation). It is expressed as a weight of substance per unit weight of animal, e.g., mg/kg.
LOC	Level of Concern
LOAEL	Lowest Observed Adverse Effect Level
MATC	Maximum Acceptable Toxicant Concentration
µg/g	Micrograms Per Gram
µg/L	Micrograms Per Liter
mg/kg/day	Milligram Per Kilogram Per Day
mg/L	Milligram Per Liter
MOE	Margin of Exposure
MRID	Master Record Identification Number. EPA's system for recording and

	tracking studies submitted.
MUP	Manufacturing-Use Product
NOAEL	No Observed Adverse Effect Level
OPP	EPA Office of Pesticide Programs
OPPTS	EPA Office of Prevention, Pesticides, and Toxic Substances
PAD	Population Adjusted Dose
PCA	Percent Crop Area
PDP	USDA Pesticide Data Program
PHED	Pesticide Handler's Exposure Data
PHI	Pre-harvest Interval
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PRZM/EXAMS	Tier II Surface Water Computer Model
RAC	Raw Agriculture Commodity
RED	Reregistration Eligibility Decision
REI	Restricted Entry Interval
RfD	Reference Dose
RQ	Risk Quotient
SCI-GROW	Tier I Ground Water Computer Model
SAP	Science Advisory Panel
SF	Safety Factor
SLC	Single Layer Clothing
TGAI	Technical Grade Active Ingredient
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UF	Uncertainty Factor
UV	Ultraviolet
WPS	Worker Protection Standard

Table of Contents

Chloropicrin Reregistration Eligibility Decision Team

Office of Pesticide Programs:

Biological and Economic Analysis Assessment
T J Wyatt, Ph.D., Senior Agricultural Economist
Jonathan Becker, Ph.D., Senior Science Advisor
Bill Chism, Ph.D., Senior Agronomist
David Donaldson, Agricultural Economist, Team Leader
Colwell Cook, Ph.D., Entomologist
Nicole Zinn, Biologist
Stephen Smearman, Economist
Leonard Yourman, Ph.D., Plant Pathologist
John Faulkner, Ph.D., Economist
William Phillips, II, Ph.D., Agronomist
Tara Chandgoyal, Ph.D., Plant Pathologist
Jin Kim, Ph.D., Economist
Andrew Lee, Ph.D., Economist
Angel Chiri, Ph.D., Entomologist, Team Leader
Elisa Rim, Economist
Nikhil Mallampalli, Ph.D., Entomologist
Sunil Ratnayake, Ph.D., Botanist

Environmental Fate and Effects Risk Assessment
Mah Shamim, Ph. D. Branch Chief
Faruque Khan, Ph.D. Senior Fate Scientist
James Felkel, M.S. Wildlife Biologist
Gabriel Rothman, M.S. Environmental Scientist

Health Effects Risk Assessment
Elissa Reaves, Ph.D., Toxicologist/Risk Assessor
Charles Smith, Environmental Scientist/Risk Assessor
Yvonne Barnes, Chemist
Ruth Allen, MPH, Epidemiologist
Monica Hawkins, MPH, Environmental Health Scientist

Antimicrobial Risk Assessment Team
Heather Garvie, Chemical Review Manager
Diane Isbell, Reregistration Team Leader
Timothy Leighton, Environmental Scientist
Cassi Walls, Ph.D., Chemist
Timothy Dole, Industrial Hygienist

Chloropicrin Reregistration Eligibility Decision Team, cont.

Registration Support
Mary Waller, Product Manager
Tamue Gibson, Product Manager
Kathy Monk, Senior Advisor

Risk Management
Andrea Carone, Chemical Review Manager
Steven Weiss, Industrial Hygienist, Chemical Review Manager for Methyl Bromide
Eric Olson, Team Leader
John Leahy, Senior Advisor

Office of General Council:
Andrea Medici

Office of Enforcement and Compliance:
David Stangel

Abstract

This document presents the Environmental Protection Agency's (hereafter the Agency or EPA) decision regarding the reregistration eligibility of the registered uses of chloropicrin (trichloronitromethane).

The Agency has determined that chloropicrin is eligible for reregistration provided that the risk mitigation measures identified in this document are adopted and labels are amended to implement these measures. Throughout this document measures described as "required" are the measures necessary to be eligible for reregistration. Additionally registrants must address data gaps identified in this document.

Concurrent to EPA's review of the soil fumigant uses of chloropicrin, EPA assessed the risks and developed risk management decisions for four other soil fumigants: dazomet, methyl bromide, metam sodium/potassium, and a new active ingredient, iodomethane. Risks of a fifth soil fumigant, 1,3-dichloropropene (1,3-D), were also analyzed along with the other soil fumigants for comparative purposes. The Reregistration Eligibility Document (RED) for 1,3-D was completed in 1998. The Agency evaluated these soil fumigants concurrently to ensure that human health risk assessment approaches are consistent, and that risk tradeoffs and economic outcomes were considered appropriately in reaching risk management decisions. This review is part of EPA's program to ensure that all pesticides meet current health and safety standards.

Chloropicrin acts as a nonselective soil fumigant with fungicidal, herbicidal, insecticidal, and nematicidal properties. The supported uses of chloropicrin include: (1) pre-plant soil fumigations (e.g., agricultural and commercial greenhouse); (2) empty grain bins and empty potato storage house/cellar fumigations; (3) residential uses (warning agent for sulfuryl fluoride); and (4) other specialized fumigations (e.g., spot tree replant sites and remedial wood treatments). Of the supported uses, chloropicrin is mainly used as an agricultural pre-plant soil fumigant. The Agency has received requests to voluntarily cancel the empty grain bin and empty potato storage/house cellar fumigations. Because these uses will be cancelled, this document does not propose mitigation for these scenarios.

Due to chloropicrin's volatility there is no reasonable expectation that finite residues will be incurred in/on any raw agricultural commodity when these products are applied according to label directions. Therefore, this fumigant does not require food tolerances and there is no expectation of risk from dietary exposure.

The Agency has identified potential human health risks associated with the above supported uses of chloropicrin. Due to chloropicrin's potential to move off-site, EPA is concerned with inhalation exposure to handlers, bystanders, and workers. To reduce inhalation exposures and to address associated risks of concern for pre-plant soil fumigations, EPA is requiring a number of mitigation measures such as:

- buffer zones,
- posting,
- monitoring and respiratory protection,
- restrictions on the timing of tarp perforation and removal operations,

- entry prohibitions,
- mandatory good agricultural practices (GAPs),
- fumigant management plans (FMPs),
- emergency preparedness and response,
- training, and
- community outreach and education programs.

To address bystander and occupational risks for remedial wood treatments, the Agency is requiring a number of label statements and respiratory protection.

The Agency also has concerns regarding ecological and environmental risk when chloropicrin is used as a pre-plant soil fumigant. The Agency believes that many of the mitigation measures required above to address human health risk (e.g., buffer zones, timing of tarp perforation and removal, GAPs), will indirectly address ecological risk. The Agency is also requiring label statements to mitigate chloropicrin's potential to leach into ground and/or surface water.

Some chloropicrin end-use products are packaged as 100% chloropicrin, while other products contain mixtures of chloropicrin with methyl bromide, 1,3-D, and iodomethane. In these combination products the percent active ingredient for chloropicrin ranges from 20-67% when combined with methyl bromide, 15-60% when combined with 1,3-D, and 2-75% when combined with iodomethane. In addition, chloropicrin is used solely as a warning agent to indicate possible hazardous concentrations of methyl bromide[1] (chloropicrin is formulated at 2% or less by weight for pre-plant soil fumigations) and sulfuryl fluoride (chloropicrin is introduced into residential structures prior to the sulfuryl fluoride fumigation).

Separate RED documents have been completed for methyl bromide (will be published concurrently with chloropicrin), sulfuryl fluoride (1993), and 1,3-D (1998). Iodomethane was granted a one year time-limited registration while chloropicrin, methyl bromide, metam sodium/potassium, and dazomet were going through reregistration. The time-limited iodomethane registration will be extended as necessary to allow submission of revised labels which will include, as appropriate, general mitigation required in the REDs for the other soil fumigants. Upon approval of those labels, the time limit will be removed. In accordance with Agency policy, if the required risk mitigation measures differ for two active ingredients in a product, the more stringent mitigation measure is required on product labels.

The Agency is issuing this decision document for chloropicrin, as announced in a Notice of Availability published in the Federal Register. Due to the broad scope of the decision for the soil fumigant group, there will be a 60-day public comment period for this document to allow stakeholders the opportunity to review and provide comments on issues related to the implementation of the risk mitigation measures.

[1] Current labels reflect use of chloropicrin as a warning agent for methyl bromide during structural fumigations. The use of methyl bromide for structural fumigations is not eligible for reregistration. As a result the warning agent use for chloropicrin formulations with methyl bromide for structural fumigations was not evaluated.

I. Introduction

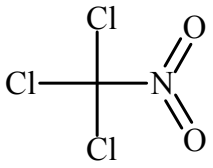
The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was amended in 1988 to accelerate the reregistration of products with active ingredients registered prior to November 1, 1984. The amended Act calls for the development and submission of data to support the reregistration of an active ingredient, as well as a review of all submitted data by the EPA. Reregistration involves a thorough review of the scientific database underlying a pesticide's registration. The purpose of the Agency's review is to reassess the potential risks arising from the currently registered uses of the pesticide, to determine the need for additional data on health and environmental effects, and to determine whether or not the pesticide meets the "no unreasonable adverse effects" criteria of FIFRA.

This document presents the Agency's reregistration eligibility decision for the supported soil (agricultural, greenhouse, and tree replant), warning agent, and antimicrobial wood preservative uses of chloropicrin. The document consists of five sections. Section I contains the regulatory framework for reregistration. Section II provides chloropicrin's use and usage profile. Section III provides a general fumigant overview and also summarizes chloropicrin's human health and ecological risk assessments, as well as benefit assessments. Section IV presents the Agency's reregistration eligibility and risk management decisions. Section V summarizes label changes necessary to implement the risk mitigation measures outlined in Section IV. The revised risk assessment documents and related addenda are not included in this document, but are available in the chloropicrin docket EPA-HQ-OPP-2007-0350 at https://www.regulations.gov. Unless otherwise noted, all Agency documents are available for review in the chloropicrin docket. Documents published during Phases 1-4 are available at https://www.regulations.gov, docket number EPA-HQ-OPP-2006-0661.

II. Chemical Overview

A. Chemical Identity

Chemical Structure:



Empirical Formula:	CCl_3NO_2
Common Name:	Chloropicrin
CAS Registry Number:	76-06-2
OPP Chemical Code:	081501
Case Number:	0040
Technical Registrants:	Niklor Chemical Company, Inc., Arysta Life Sciences North America Corporation, ASHTA Chemicals, Inc., and Trinity Manufacturing, Inc. All 4 companies are part of the Chloropicrin Manufacturers' Task Force (CMTF).

B. Use and Usage Profile:

Pesticide Type:	Chloropicrin is a broad spectrum fumigant with fungicidal, herbicidal, insecticidal, and nematicidal properties. Chloropicrin supported uses include: pre-plant soil fumigant use at agricultural sites, tree replant sites, and greenhouses; a warning agent use in residential structures before sulfuryl fluoride fumigations; and an antimicrobial remedial wood treatment use. Chloropicrin is currently labeled for use in empty grain bins and empty potato storage/house cellars, but the Agency has received requests to voluntarily cancel these uses.
Target Pests:	When used as a pre-plant soil fumigant in agricultural settings and in greenhouses, chloropicrin is used to control weeds, nematodes, insects, and various soil borne pathogens. In existing orchards chloropicrin is used to treat small areas to control weeds, nematodes, insects, and various soil borne pathogens.

Chloropicrin is also used to control internal wood decay caused by fungi and insects in wood poles, timbers, pilings, and glue-laminated beams.

Formulations:

Chloropicrin can be formulated as a soluble concentrate/liquid, pressurized gas, pressurized liquid, emulsifiable concentrate, and a ready-to-use product. All chloropicrin products are classified as restricted use pesticides (RUP). The "Restricted Use" classification restricts a product, or its uses, to use by certified pesticide applicators or those working under the direct supervision of a certified applicator.

Methods of Application:

As a pre-plant soil fumigant chloropicrin is either injected (e.g., by shank) into the soil or applied via drip irrigation. These applications can either be tarped or untarped.

Chloropicrin is used in existing orchards for tree replant purposes. Tree site applications take place in small treated areas (10' x 10') where chloropicrin is injected at least 18 inches into the soil using a replant wand.

When used as a warning agent prior to sulfuryl fluoride residential structure fumigations, a tent must first be put up around the structure. Chloropicrin is then placed in the center of the structure in either a shallow pan or onto absorbent material. A fan is then placed to direct the air stream over the pan or absorbent material to accelerate the chloropicrin's evaporation. Chloropicrin should be applied 5-10 minutes before sulfuryl fluoride is introduced into the structure.

For remedial wood treatment, chloropicrin is either poured/injected or applied with encapsulated vials into pre-drilled holes. For utility pole treatment, holes are drilled at a 45 degree angle and chloropicrin is poured/injected or applied with encapsulated vials into all of the holes. After the chloropicrin has been applied, the holes are immediately plugged.

Application Rates:

For pre-plant soil fumigation use the following are the supported maximum application rates:

- 350 lbs active ingredient (ai) per acre for tarped, shank injection applications;
- 175 lbs ai per acre for untarped, shank injection applications;
- 350 lb ai per acre for deep (at least 18 inches) untarped, shank injection applications;

- 300 lbs ai per acre for drip irrigation applications (including greenhouses);
- 500 lbs ai per acre for tree hole replant applications, this is equivalent to 1 lb of chloropicrin per 100 square feet.

When used as a warning agent prior to sulfuryl fluoride residential fumigations 1 fluid ounce ai of chloropicrin is used per 10,000-15,000 cubic feet.

Labels indicate that the amount of chloropicrin used for remedial wood treatment is based on the size of the pole. Pole applications range from 4 ounces ai up to 1 ¼ pints ai for larger poles.

Annual U.S. Usage: According to 2007 Agency use information, about 10 million pounds of chloropicrin are used annually for pre-plant soil fumigations. This amount may differ from what has been presented in the Agency's revised risk assessments since that data reflected usage data from 2002-2004.

C. Regulatory History

- First registered in the U.S. in 1975.
- A registration standard was issued in 1982.
- Data Call-In's (DCIs) issued in September 1990 and October 1995.

III. Summary of Risk and Benefit Assessments and Links to Agency Documents

A. General Overview of Soil Fumigants

Soil fumigants are pesticides that form gasses when applied to soil. Once in the soil, the fumigants work by controlling pests that can disrupt plant growth and crop production. Soil fumigants play a very important role in agriculture, but they also have the potential to pose risk concerns to people involved in the application (handlers), workers who re-enter fumigated fields (workers), and people who may be near the treated area (bystanders).

B. Human Health Risk from Chloropicrin

The main risk of concern for handlers, workers, and bystanders associated with the soil uses of chloropicrin is from acute inhalation exposure as a result of fumigant off-gassing. Chloropicrin handlers also are at risk from direct fumigant exposure during applications. The term *handler* refers to persons involved in the application of chloropicrin. For soil applications, handlers also include persons involved in tarp perforation and removal. The term *worker* in this document refers to persons performing non-handler tasks (e.g., planting) within the application block, after the fumigation process has been completed. The term *bystander* refers to any person who lives or works in the vicinity of a fumigation site.

In addition to the soil uses of chloropicrin, there are other uses that the Agency has assessed and included in this RED. Chloropicrin's use as a warning agent was also evaluated in the Agency's revised human health risk assessment. Chloropicrin is also used as an antimicrobial to control internal wood decay in wood poles, timbers, pilings, and glue-laminated beams. These uses were assessed in a different document than the pre-plant soil and warning agent uses.

Estimating exposure to fumigants is different from non-fumigant pesticides due to fumigants' volatility and ability to move off site during and after application. For example, pesticide spray drift is the physical movement of pesticide particulate or droplets from the target site during the application and soon thereafter. In the case of soil fumigants, the pesticide moves as a gas (not as particulate or droplets) and movement off-site can occur for an extended period after application. Importantly, fumigants have a well-documented history of causing large-scale human exposure incidents up to several thousand feet from treated fields. Assessing fumigant exposure takes into account the size of the fumigated field, the amount of fumigant applied, and the rate at which the fumigant escapes from the treated field.

The term "flux rate" or "emission rate" defines the rate at which a fumigant off-gasses from a treated field. Many factors influence the emission rate from treated fields. Factors such as the application method, soil moisture, soil temperature, organic matter levels, water treatments, the use of tarps, biological activity in the soil, soil texture, weather conditions, soil compaction, and others influence the amount of fumigant that comes off the field and is available to move off-site to areas where bystanders may be located.

Chloropicrin can cause eye, nose, throat, and upper respiratory irritation. Results from a chloropicrin human sensory irritation study indicate that eye irritation is the most sensitive effect. The Agency selected a reversible acute endpoint from the human study. EPA used this study to determine a bench mark concentration level ($BMCL_{10}$) of 73 ppb [0.073 parts per million (ppm)]. At this level EPA does not expect eye or nose irritation, or upper respiratory changes. Most of the study participants detected chloropicrin within 20-30 minutes at 0.15 ppm. This level corresponds to mild irritation without leading to more severe irritation and respiratory effects. In addition, the human study shows that persons exposed to 0.15 ppm of chloropicrin, did not experience irritation effects 1 hour after the exposure ended, and also no irritation effects were seen the following day.

Based on the human study, a margin of exposure (MOE) of 1 defines the Agency's level of concern (LOC) for acute inhalation exposure. The uncertainty factors have been removed due to a) chloropicrin's mode of action (MOA) of sensory irritation,[2] and b) evaluation of the most sensitive human subpopulation to sensory irritants (young adults, average age 23).[3]

The Agency has high quality data that shows at 0.15 ppm (which corresponds to an MOE of 0.50) humans begin to sense chloropicrin without leading to more serious effects. While there are uncertainties about the effects of chloropicrin at higher concentrations and at exposure durations longer than 1 hour, data do suggest that effects would not become more severe unless the concentration of chloropicrin increases. Therefore, the Agency is confident that the human study provides high quality information regarding the dose-response in humans at the levels that lead to minor, reversible effects.

In assessing risks from chloropicrin, the Agency considered multiple lines of evidence, using the best available information from monitoring studies, modeling tools, and from incident reports.

- Monitoring: For the human health risk assessments completed for chloropicrin and the other soil fumigants within the group, several field-scale monitoring studies were considered, as well as monitoring of workers and handlers involved in various tasks. These studies quantify chloropicrin concentrations in and around fields at various times and distances during and after applications. Many of these data indicate that there can be risks of concern associated with chloropicrin use at a broad range of distances from treated fields. However, these data are limited in their utility because they provide results only for the specific conditions under which the study was conducted.

- Modeling: Models enable the use of data from monitoring studies to estimate concentrations and potential risks under a wide range of conditions and use patterns. EPA used Version 2.1.4 of the **P**robabilistic **E**xposure and **R**isk model for **Fum**igants (also called the PERFUM model), to evaluate potential risks at distances around treated

[2] For details on guidance documents and framework the Agency used to determine chloropicrin's see, "MOA Mode of Action, Eye Irritation, and the Intra-Species Factor: Comparison of Chloropicrin and MITC" June 25, 2008. (DP Barcode 293356)

[3] For a more detailed explanation of the study see, "Chloropicrin: Final Revised HED Human Health Risk Assessment. June 18, 2008. (DP Barcode 348674).

fields. PERFUM incorporates actual weather data and flux distribution estimates, then accounts for changes and altering conditions. Analyses based on a variety of model outputs were used to compare the potential risks at a range of distances. The PERFUM model and users manual are public domain and can be downloaded at http://www.exponent.com/perfum/.

- Bystander, handler and worker incident reports: Incidents for the soil fumigants generally occur at a low frequency relative to the total number of fumigant applications performed annually. However, when incidents occur, there are often many people involved. Incidents involving handlers and workers tend to occur more often than incidents with bystanders.

  Reconstructing incidents to examine the exact factors which led to the incident can be difficult, especially when bystanders are involved since all the factors that contributed to the incident may not have been documented. Some of the factors that have been linked to incidents in the past have included equipment failure, handler accidents, applicator failure to adhere to label recommendations and/or requirements, and temperature inversions. Bystander incidents have occurred both close to fumigated fields and up to two miles away from the fumigated field.

Based on these lines of evidence, and as described in more detail in the risk assessments, EPA has determined that chloropicrin risks to handlers, workers, and bystanders are of concern given current labels and use practices. The human health risk assessments indicate that inhalation exposures to bystanders who live and work near agricultural fields and greenhouses where chloropicrin fumigations occur have the potential to exceed the Agency's LOC without additional mitigation measures. There are also risks of concern for occupational handlers involved in chloropicrin applications and tarp perforation/removal activities, and for workers who may re-enter treated areas shortly after fumigation or tarp perforation has been completed.

The Agency does not have risk concerns for bystanders when chloropicrin is used prior to sulfuryl fluoride residential structure fumigations. When chloropicrin is used to treat wood decay, the Agency has identified potential acute inhalation risks to bystanders and handlers. The Agency's concern for acute inhalation exposure to bystanders and handlers is based on the same data described above. The Agency also does not have a risk concern for dietary exposure (including drinking water exposure).

For more information about the specific information in the Agency's human health risk analyses, refer to the documents listed below:

- Chloropicrin Final Revised HED Human Health Risk Assessment June 18, 2008. (DP Barcode 348674)
- MOA Mode of Action, Eye Irritation, and the Intra-Species Factor: Comparison of Chloropicrin and MITC. June 25, 2008. DP Barcode 293356.
- Factors Which Impact Soil Fumigant Emissions - Evaluation For Use In Soil Fumigant Buffer Zone Credit Factor Approach. June 9, 2008. (DP Barcode 306857)
- EPA-HQ-OPP-2007-0350-0009, Review of Fumigants Group Incident Reports.

- EPA-HQ-OPP-2007-0350-0010, Summary Fumigants Group Incident Reports.
- EPA-HQ-OPP-2007-0350-0011, Summary Fumigants Group Incidents DP Barcode D326938.

For more information on the antimicrobial use of chloropicrin please see the following documents:

- Revised Occupational and Residential/Bystander Assessment of the Antimicrobial Use (Remedial Wood Treatment) of Chloropicrin for the Reregistration Eligibility Decision (RED) Document (Phase 3 Comment Period). PC Code 081501, DP Barcode D314399. February 14, 2008.
- Updated Label Language for the Antimicrobial Uses of Chloropicrin (PC Code 081501) for the Reregistration Eligibility Decision Document. May 13, 2008.

C. Environmental Fate and Ecological Risks

The Agency's environmental fate and ecological effects risk assessment indicates that there are some concerns for non-target organisms that may be exposed to fumigants.

Since chloropicrin is highly volatile and is a gas at room temperature and standard pressure, inhalation is the major exposure pathway for non-target terrestrial animals. For aquatic organisms, exposure in surface water could result from runoff with dissolved chloropicrin from fumigated fields.

The Agency evaluated the potential exposure of birds and mammals through inhalation exposure to chloropicrin using air monitoring data and values derived from exposure modeling. The Agency has not established LOCs for inhalation risk in animals; standard dietary LOCs were used. Comparison of modeled exposure concentrations to acute mammalian inhalation toxicity data did not result in exceedence of the endangered species LOC when exposure concentrations from PERFUM were used. Chronic exposure to chloropicrin from treatment of individual fields is not expected.

The potential for inhalation risk to birds was not quantified, because avian inhalation toxicity data were not available. The potential risk to non-target terrestrial plants was also not evaluated due to lack of toxicity data.

Exposure to aquatic animals and plants was simulated using the Pesticide Root Zone Model (PRZM) and Exposure Analysis Modeling System (EXAMS), although there is some uncertainty in their ability to fully account for the transport of chemicals as volatile as chloropicrin. Risk quotients exceeded the acute LOC for fish for two of six modeled scenarios (FL strawberry and FL tomato) and the endangered species LOC for all six scenarios modeled. The acute LOCs for aquatic invertebrates (endangered species and non-endangered species LOCs) were exceeded for two of six scenarios (FL strawberry and FL tomato) although the lack of a definitive toxicity endpoint means that risk could not be completely discounted from the other four scenarios modeled. Chronic risk to aquatic animals was not evaluated due to lack of

data, but volatilization of chloropicrin from surface water would greatly reduce residues of chloropicrin over time.

1. Hazard

Based on limited data, chloropicrin is considered very highly toxic to both fish (lowest LC50 = 5.14 ppb) and aquatic invertebrates (lowest LC50 < 71 ppb). Chloropicrin is also considered highly toxic to mammals. The acute mammal inhalation LD50 is 0.114 mg/L (male rats) and the developmental NOAEL in rabbits is 0.003 mg/L (LOAEL 0.008 mg/L, based on abortions and decreased fetal weights). The mammal acute oral LD50 value (used in a preliminary analysis) is 37.5 mg/kg (highly toxic). The Agency does not have avian inhalation, terrestrial/aquatic plant, or estuarine/marine aquatic life data.

2. Exposure

a. Environmental Fate

The high vapor pressure (23.8 mm @ 25°C), high Henry's Law Constant (2.05 X 10^{-3} atm M^3/mole), and low soil adsorption coefficient (K_{oc} 36.05 L kg^{-1}) of chloropicrin suggest that volatilization is the most important environmental route of dissipation. Direct photolytic degradation ($t_{1/2}$ <8 hrs) of chloropicrin is the primary route of dissipation in the atmosphere, which suggest it is not a significant threat to deplete stratosphere ozone layer. Due to the fact that volatilization is significant and occurs rapidly, the importance of other competing processes such as leaching, biotic and abiotic degradation, and adsorption to the soil particles will certainly depend on chloropicrin's emission rate from fumigated fields. This is because the emission rate determines the amount of chloropicrin left for other processes and its residence time in the soil system. However, if chloropicrin remains in soil, it also degrades with half-lives ranging from 3.7 to 4.5 days with CO_2 being the terminal breakdown product. Since chloropicrin is highly soluble in water and has low adsorption in soil, it can potentially leach into groundwater and to surface water through runoff under a flooded condition. The low octanol/water partition coefficient of chloropicrin also indicates that it is not likely to be bioconcentrated in tissues of aquatic organisms.

b. Terrestrial Exposure

The Industrial Source Complex Short Term Version 3 (ISCST3) model was used to calculate potential air concentrations to which terrestrial animals might be exposed via inhalation. Air concentrations at the field edge and at distances away from a 40-acre field edge were simulated, considering various application rates and methods, including if tarps were used. The highest air concentration of 0.019 mg/L was estimated. The values used for this assessment yield conservative air concentration estimates because considering a constant flux rate does not allow for diurnal/nocturnal changes that may occur, which when coupled with the appropriate wind speed and stability category, can result in lower concentrations. The meteorological inputs also will provide a conservative estimate of exposure because the wind direction is considered to be perpendicular (pointed downwind) to the treated field for the entire 24 hours represented in the calculation. This is not a normal situation in the atmosphere for most locations.

PERFUM was used to refine the potential risks to terrestrial organisms. Twelve different application scenarios (e.g., broadcast, bedded, tarped, untarped, drip irrigation, Bakersfield/Ventura sites, application rates up to 350 lb ai/A) were modeled. The highest 90th percentile air residue across these scenarios is 0.004219 mg/ m^3, for 40 acres, broadcast, untarped, 0 – 5 meters radius from the field edge, 8 – 12 hours after application at 175 lb ai/A. This value is significantly less than the greatest value simulated using the ISCST3 model.

Available ambient monitoring data for chloropicrin indicates a maximum ambient air concentration of 0.000014 mg/L. Although it is possible that birds and mammals could be exposed to chloropicrin repeatedly by ranging between treated fields, the historical ambient air concentration was considered to determine the potential for chronic inhalation exposure.

c. Aquatic Exposure

Aquatic exposure was simulated using the combined PRZM and EXAMS surface water models. Estimated environmental concentrations (EECs) resulting from application of 350 lb ai/A and 175 lb ai/A were simulated for six crop scenarios (CA tomatoes, CA onions, FL tomatoes, FL strawberries, NC sweet potatoes, and NC tobacco). The calculated EECs were on the order of 1.0 µg/L or less for the California and North Carolina scenarios, but were on the order of 70 µg/L for the Florida scenarios.

There is an uncertainty in estimating chloropicrin exposure in water bodies due to post-application tarping of the treated area. If tarping is used to minimize the volatilization of chloropicrin, the loading of the chemical through runoff will be limited until the tarp is perforated or removed from the field. The present version of the PRZM model and the selected crop scenarios have limited capabilities in capturing the load of applied chemical under a post-application tarp scenario. Therefore, the estimated concentrations of chloropicrin in water bodies may be upper bound for tarped scenarios since the load of chloropicrin from runoff is considered in the PRZM/EXAMS simulation.

Because chloropicrin is highly soluble in water and has low adsorption in soil, residual chloropicrin in soil can potentially leach into groundwater under continuous irrigation and/or high rainfall events. However, consideration of the potential for groundwater contamination must take into account the fact that irrigation is applied with the intent of keeping chloropicrin within a small depth range around the root zone (and not below to groundwater). In addition, degradation of chloropicrin under a tarped field, and limited dissipation of material though a tarp would reduce the amount of residues which might be transported to groundwater by a potential heavy rainfall soon after the tarp is removed.

3. Risk

a. Terrestrial Risk

A risk quotient derived from the maximum EEC from the ISCST3 model and acute mammalian toxicity data was 0.17. Although the Agency has not set LOCs for inhalation risk to

terrestrial animals, this value exceeds the standard endangered species LOC used in ecological dietary risk assessments. The maximum EEC from the refined PERFUM model, however, results in a maximum RQ below the endangered species LOC. Comparison of ambient chloropicrin concentrations in air from historical monitoring data to chronic rabbit inhalation toxicity data resulted in a RQ below the standard chronic LOC of 1.0.

Risk to birds from inhalation exposure to chloropicrin could not be assessed using the ISCST3 or PERFUM exposure estimates because avian inhalation toxicity data were not available. The potential for risk to non-target terrestrial plants was also not evaluated due to lack of toxicity data.

b. Aquatic Risk

Risk quotients exceeded the acute LOC for fish for two of six modeled scenarios (FL strawberry and FL tomato), and the endangered species LOC for all six scenarios. The acute LOCs for aquatic invertebrates (endangered species and non-endangered species) were exceeded for two of six scenarios (FL strawberry and FL tomato), although the lack of a definitive toxicity endpoint means that risk could not be completely discounted from the other four scenarios modeled. Chronic risk to aquatic animals was not evaluated due to a lack of data, but volatilization of chloropicrin from surface water would greatly reduce residues of chloropicrin over time.

For more information about the specific information in the Agency's assessment of environmental fate and ecological risks, refer to the following document:

- Revised Screening Ecological Risk Assessment for the Reregistration of Chloropicrin. DP Barcode 348669. April 16, 2008.

D. Benefits

Soil fumigation can provide benefits to both food consumers and growers. For consumers it means more fresh fruits and vegetables can be cheaply produced year-round because severe pest problems can be efficiently controlled. Growers benefit because crops grown in fumigated soil produce fewer blemished products, which translates into an increase in marketable yields. Fumigation can also provide benefits to growers by increasing crop management flexibility. This includes shorter crop rotational intervals (i.e., less time when fields are left fallow), improved ability to meet quarantine requirements (which are imposed when states or other jurisdictions require a pest-free harvested product), and consistent efficacy against critical pests. The magnitude of benefits depends on pest pressure, which varies over space and time, and the availability and costs associated with the use of alternatives.

Since chloropicrin is often used in combination with other fumigants, it is difficult to estimate an exact benefit for chloropicrin alone. Agency assessments (e.g., chloropicrin's use in pepper production) indicate that if chloropicrin were no longer available, growers could experience large yield losses. These losses combined with increases in production costs that are higher than revenue could cause growers to stop pepper production.

Other benefits of chloropicrin include its use as a methyl bromide alternative and chloropicrin's role as a warning agent which makes people aware of potential exposures to other fumigants such as methyl bromide.

There are a number of benefit assessments that have been completed by the Agency to estimate the value of fumigants to various industries. Below is a list of the specific benefit assessments that include chloropicrin.

- EPA-HQ-OPP-2007-0350-0017, Summary of the Benefits of Soil Fumigation with Chloropicrin in Crop Production.
- EPA-HQ-OPP-2007-0350-0018, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Cucurbit Production.
- EPA-HQ-OPP-2007-0350-0019, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Eggplant Production
- EPA-HQ-OPP-2007-0350-0020, Assessment of the Benefits Soil Fumigants (Methyl Bromide, Chloropicrin, Metam-Sodium, Dazomet) Used by Forest Tree Seedling Nurseries.
- EPA-HQ-OPP-2007-0350-0021, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, Dazomet, and Metam Sodium for Use in Raspberry Nurseries, Fruit and Nut Deciduous Tree Nurseries, and Rose Bush Nurseries in California.
- EPA-HQ-OPP-2007-0350-0022, Assessment of the Benefits of Soil Fumigation with Chloropicrin and Metam-sodium in Onion Production.
- EPA-HQ-OPP-2007-0350-0023, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, and Metam Sodium in Grape Production.
- EPA-HQ-OPP-2007-0350-0024, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin and Metam Sodium in Tree Nut Production.
- EPA-HQ-OPP-2007-0350-0025, Assessment of the Benefits of Soil Fumigation with Chloropicrin and Metam Sodium in Pome Fruits Production.
- EPA-HQ-OPP-2007-0350-0026, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, and Metam Sodium in Stone Fruit Production.
- EPA-HQ-OPP-2007-0350-0027, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Bell Pepper Production.
- EPA-HQ-OPP-2007-0350-0028, Assessment of the Benefits of Soil Fumigation with Metam Sodium in Potato Production.
- EPA-HQ-OPP-2007-0350-0029, Assessment of Soil Fumigation with Chloropicrin, Methyl Bromide and Metam-sodium in Strawberry Production.
- EPA-HQ-OPP-2007-0350-0030, Assessment of the Benefits of Chloropicrin, Methyl Bromide, Metam-sodium and Dazomet Use In Strawberry Nursery Runner Production.
- EPA-HQ-OPP-2007-0350-0031, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam-sodium on Sweet Potato Production.
- EPA-HQ-OPP-2007-0350-0032, Assessment of the Benefits of Soil Fumigation with Chloropicrin in Tobacco Production.

- EPA-HQ-OPP-2007-0350-0033, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Tomato Production.
- EPA-HQ-OPP-2007-0350-0034, Assessment of the Benefits of Soil Fumigation with Metam-Sodium in Carrot Production.
- EPA-HQ-OPP-2007-0350-0035, Assessment of the Benefits of Soil Fumigation with Metam Sodium in Peanut Production.
- EPA-HQ-OPP-2007-0350-0036, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, Metam Sodium and Dazomet in Ornamental Production.
- EPA-HQ-OPP-2007-0350-0037, BEAD's Planned Impact Assessments on Agricultural Sites with Significant Use of Soil Fumigants (Chloropicrin, Dazomet, Methyl Bromide, Metam Potassium, and Metam Sodium.

IV. Risk Management and Reregistration Decision

A. Determination of Reregistration Eligibility

Section 4(g)(2)(A) of FIFRA calls for the Agency to determine, after submission of relevant data concerning an active ingredient, whether pesticides containing the active ingredient are eligible for reregistration. The Agency has previously identified and required the submission of the generic (i.e., active ingredient specific) data required to support reregistration of products containing chloropicrin.

The Agency has completed its assessment of the dietary (including drinking water), residential, occupational, and ecological risks associated with the use of pesticides containing the active ingredient chloropicrin. Dietary (food) risks were not quantitatively assessed because there are no food/feed uses of chloropicrin. In addition to the risk assessments, the Agency completed benefit assessments on crops with significant chloropicrin usage.[4]

In Phase 5, the Agency published a risk mitigation options paper.[5] This document detailed potential mitigation options and sought public comment on these options. The following is the list of mitigation options discussed in the Agency's paper:

- Buffer zones;
- Sealing methods;
- Timing of applications;
- Application block size limitations;
- Respiratory protection;
- Tarp cutting/removal procedures;
- Entry-restricted period;
- Application method/practice restrictions;
- Fumigant management plans (FMPs);
- FMP certification;
- Responsible parties;
- Record keeping/reporting/tracking;
- Restricted Use Pesticide Classification (this option does not apply to chloropicrin, since it is already a RUP);
- Notification and posting;
- Good agricultural practices(GAPs);
- Fumigant manuals; and
- Stewardship programs.

[4] EPA-HQ-OPP-2007-0350-0037, BEAD's Planned Impact Assessments on Agricultural Site with Significant Use of Soil Fumigants

[5] EPA-HQ-OPP-2007-0350-0003, Risk Mitigation Options to Address Bystander and Occupational Exposures from Soil Fumigant Applications

Based on a review of the chloropicrin data and public comments on the Agency's assessments for the active ingredient chloropicrin, the Agency has sufficient information on the human health and ecological effects as well as the benefits of chloropicrin to make a decision as part of the reregistration process under FIFRA. The Agency has determined that most of the supported uses of chloropicrin will not pose unreasonable risks or adverse effects to humans or the environment provided that the risk mitigation measures and label changes outlined in this RED are implemented. The Agency does not have adequate data to evaluate the risks associated with untarped chloropicrin drip applications that are buried a minimum of 5 inches. The CMTF has just submitted a study, and provided the study is acceptable and the Agency can determine appropriate risk mitigation, this use will be eligible for reregistration.

Based on its evaluation of chloropicrin, the Agency has determined that chloropicrin products, unless labeled and used as specified in this document, would present risks inconsistent with FIFRA. Accordingly, should a registrant fail to implement any of the risk mitigation measures identified in this document, the Agency may take regulatory action to address the risk concerns from the use of chloropicrin. If all changes outlined in this document are incorporated into the product labels, then current risks for chloropicrin will be adequately mitigated for the purposes of this determination under FIFRA.

A substantial amount of research is currently underway or is expected to begin in the near term to (1) address current data gaps, and (2) refine understanding of factors that affect fumigant emissions. Additionally, a number of new methods and technologies for fumigation are emerging. EPA plans to move the soil fumigants forward in Registration Review, from 2017 to 2013, which will allow EPA to consider new data and information relatively soon, determine whether the mitigation included in this decision is effectively addressing the risks as EPA believes it will, and to include other soil fumigants which are not part of the current fumigant group review.

The Registration Review process for chloropicrin and the other soil fumigants will also include a comprehensive endangered species assessment. Once that endangered species assessment is completed, further changes to chloropicrin labels may be necessary.

B. Public Comments and Responses

The Phase 3 public comment period on the preliminary risk assessments and related documents commenced November 29, 2006 and ended on February 28, 2007. The Agency documents and comments can be found in the chloropicrin docket, EPA-HQ-OPP-2006-0661. The Agency's responses to comments received are available in the new chloropicrin docket, EPA-HQ-OPP-2007-0350. Both dockets can be found at www.regulations.gov.

After the Phase 3 comment period, the Agency revised the human health risk assessment, completed benefit assessments, and developed risk mitigation options. These documents were put out for public comment on May 2, 2007 and the comment period ended on November 3, 2007. Comments on issues which were significant to many stakeholders and directly influenced EPA's decisions are highlighted in this decision document, as well as EPA's responses to those

comments. The following documents include the EPA's responses to comments. These documents are located in the chloropicrin docket, EPA-HQ-OPP-2007-0350.

- RESPONSE TO PUBLIC COMMENTS. The Health Effects Division's Response to Comments on the Agency's April 12, 2007 document, *Chloropicrin: Revised HED Human Health Risk Assessment for Phase 5* (Docket EPA-HQ-OPP-2007-0350). June 18, 2008. DP Barcode 348676.
- Response to Phase 5 Public Comments on the Phase 4 Chloropicrin Reregistration Risk Assessment. April 16, 2008. DP Barcode 348669.
- Review of Stakeholder Submitted Impact Assessments of Proposed Fumigant Buffers, Comments on Initial Buffer Zone Proposal, and Case Studies of the Impact of a Flexible Buffer System for Managing By-Stander Risks of Fumigants. June 25, 2008. DP Barcode 353940.
- Response to Phase 5 BEAD Related Public Comments Received on the Reregistration of Chloropicrin, Dazomet, Metam Potassium, Metam Sodium, and Methyl Bromide. June 25, 2008. DP Barcode 353940.
- Phase 6 Response to Substantive Public Comments on Antimicrobials Division's Occupational and Residential Assessments for the Reregistration Eligibility Decision (RED) Documents for the following chemicals: Methylisothiocyanate (MITC), Metam Sodium, Dazomet, and Chloropicrin. February, 14, 2008.
- SRRD's Response to Phase 5 Public Comments for the Soil Fumigants, July 2008.

C. Regulatory Position

1. Regulatory Rationale

The Agency has determined that the supported uses of chloropicrin are eligible for reregistration provided the risk mitigation measures outlined in this document are adopted and label amendments are made to reflect these measures. This decision considers the risk assessments conducted by the Agency and the significance of chloropicrin use.

a. Chloropicrin Pre-Plant Soil Uses

As summarized in Section III, there are risks of concern to humans and the environment resulting from chloropicrin use. Understanding these risks, and also the benefits of chloropicrin (also outlined in Section III), the Agency's goal for this decision is to be protective, especially of severe and irreversible effects, encourage best practices, and to reduce the potential impacts on benefits. To reach this goal, EPA considered a range of factors including:

- exposure characteristics of bystander and other populations exposed to chloropicrin;
- hazard characteristics of chloropicrin (the chloropicrin endpoint is based on a minor and reversible effect, eye irritation);
- hazard characteristics of other fumigants that are combined with chloropicrin;
- available information on levels of exposure, feasibility, cost, and effectiveness of various risk mitigation options;
- bystander, handler and worker incident reports;

- potential impacts of mitigation on growers' ability to produce crops;
- uncertainties and assumptions underlying the risk and benefit assessments; and
- public comments.

Considering these factors, EPA determined that a suite of complimentary measures designed to reduce risks, along with a flexible approach allowing for some site-specific decisions, would best meet the overall objective of reducing risk and minimizing impacts on users.

The following is a summary of the rationale for managing risks associated with the supported uses of chloropicrin. Where labeling revisions are warranted, specific language is set forth in the summary tables in Section V of this document.

i. Human Health Risk Management

The human health risk assessment indicates that inhalation exposures to bystanders, handlers, and workers who live and work near agricultural fields and greenhouses where chloropicrin fumigations occur have the potential to exceed the Agency's level of concern without additional mitigation measures. To reduce the potential for chloropicrin exposure to bystanders, handlers, and workers and to address associated risks of concern, EPA is requiring a number of mitigation measures which include:

- buffer zones,
- posting,
- monitoring and respiratory protection,
- restrictions on the timing of tarp perforation and removal operations,
- entry prohibitions,
- mandatory good agricultural practices (GAPs),
- fumigant management plans (FMPs),
- emergency preparedness and response, and
- notice to state lead agencies.

The Agency also believes that registrant developed training and community outreach and education programs, which are also implemented by the registrant, will help reduce risk. Additionally, EPA is interested in working with registrants to identify additional measures that could be implemented as part of product stewardship. These additional measures should include efforts to assist users' transition to the new label requirements.

Some of the required mitigation measures only address one group of potentially exposed individuals (i.e., bystanders, handlers, or workers), while other measures will help reduce risk to more than one group. All mitigation measures are designed to work together to reduce exposures, enhance safety, and facilitate compliance and enforcement. The Agency has based its risk mitigation decision on a flexible approach which EPA believes will be protective and allow users to make site-specific choices to reduce potential impacts on benefits of the use. While some of these measures, buffer zones for example, can be used to estimate MOEs, others such as emergency preparedness and response and community outreach and education will contribute to bystander safety, but are difficult to express in terms of changes to quantitative risk estimates

such as MOEs. However, EPA has determined that these measures, working together, will prevent unreasonable adverse effects on human health.

1. Bystander Risk Mitigation

Bystanders are persons who live and/or work near fumigated fields and could be potentially exposed to fumigant emissions that travel off-site. In some cases the bystanders are workers performing agricultural tasks in nearby fields. If they are employed by the grower who has control of the fumigated field, they are more likely to be aware that a fumigant application has occurred.

Bystander risks for people that live near treated fields differ from other human health risks evaluated under FIFRA, for example residential and worker reentry risks. Unlike residential exposures resulting from use of products to control pests in and around the home, non-occupational bystanders receive no direct benefit from the pesticide which was applied elsewhere. These bystanders have not made a decision to purchase a pest control product or service, and as a result they have little access to information about the product (e.g., hazards, safety information, first aid, etc.) or symptoms of exposure. Additionally, non-occupational bystander exposures to fumigants are largely involuntary and unanticipated. In this regard non-occupational bystander exposure is similar to dietary exposure in that people consuming foods or drinking water expect to be safe from possible adverse effects associated with pesticide residues that could be present in their food and drinking water.

Unlike workers, non-occupational bystanders typically receive no safety information or training related to the pesticide to which they may be exposed. Whereas workers are generally expected to play an active role in protecting themselves from pesticide risk, no such expectation exists for non-occupational bystanders. Workers who experience symptoms of pesticide exposure are also more likely to link their symptoms to the pesticide and take steps to receive appropriate treatment. Conversely, bystanders are much less likely to attribute adverse effects to pesticide exposures or to have access to information needed to take appropriate steps to mitigate the effects of the exposure. Thus, EPA's mitigation includes elements of emergency preparedness and response, notice to state lead agencies, training, and community outreach and education as well as labeling changes.

a. Buffer Zones

The human health risk assessment indicates that bystanders may be exposed to chloropicrin air concentrations that exceed the Agency's level of concern. In general, the risk from inhalation exposures decreases as the distance between bystanders and the treated field increases. Because of this relationship, the Agency is requiring that a buffer zone be established around the perimeter of each application block where chloropicrin is applied. The Agency acknowledges that buffer zones alone will not mitigate all bystander inhalation risks or eliminate incidents caused by equipment failure, human error, and weather or other events (e.g., temperature inversions). The Agency, however, does believe that buffer zones along with the other mitigation measures required by this decision will mitigate risks so that bystanders will not experience unreasonable adverse effects.

The Agency considered various buffer zone schemes ranging from fixed buffer zones for every chloropicrin application to site-specific buffer zones. During the most recent comment period, the Agency received input in favor of a flexible buffer approach that would allow fumigant users to determine the buffer zone distance based on site conditions and application practices. While the Agency believes that site-specific buffer zones would provide the most flexibility for users, the EPA currently does not have sufficient data to support this scheme. As a result, the Agency developed a scalable buffer zone system that does provide flexibility by setting buffer zones for different application methods at various acreages and application rates. These distances have been captured in "Look-up Tables" presented below in Tables 2, 3, 4, 5, 6, 7, and 8 in the *Buffer Zone Distances* section on page 35.

Version 2.1.4 of the **P**robabilistic **E**xposure and **R**isk model for **Fum**igants (also called the PERFUM model) combined with monitoring data and incident data were used to characterize the risk for specific buffer zone distances corresponding to the range of application scenarios anticipated. A CD containing all of the PERFUM input/output files and files with the PERFUM MOE/air concentration analysis that were considered for this decision are available upon request at the OPP Docket Office. Additional information on the PERFUM inputs and outputs can be found in the Agency's risk assessment[3], in a June 2006 a peer-reviewed article describing the model (http://www.sciencedirect.com/science/journal/13522310), and/or the PERFUM user's guide which can be download from the internet (http://www.exponent.com/perfum/)

i. General Buffer Zone Requirements

The following describes the general buffer zone requirements for chloropicrin and other soil fumigants currently going through the reregistration process:

- "Buffer zone" is an area established around the perimeter of each application block or greenhouse where a soil fumigant is applied. The buffer zone must extend from the edge of the application block or greenhouse perimeter equally in all directions.
- All non-handlers including field workers, nearby residents, pedestrians, and other bystanders, must be excluded from the buffer zone during the buffer zone period, except for transit (see exemptions section).
- An "application block" is a field or portion of a field treated with a fumigant in any 24-hour period (see Figures 1 and 2 for further explanation).
- The "buffer zone period" starts at the moment when any fumigant is delivered/dispensed to the soil within the application block and lasts for a minimum of 48 hours after the fumigant has stopped being delivered/dispensed to the soil.

Buffer zone distances

- Buffer zone distances must be based on look-up tables on product labels (25 feet is the smallest distance regardless of site-specific application parameters).
- For selective replant fumigations in an orchard using hand held application methods (e.g., deep injection auger probes), the minimum buffer zone will be 25 feet measured from the center of each injection site (i.e., tree hole).

Authorized entry into buffer zones

- Only authorized handlers who have been properly trained and equipped according to EPA's Worker Protection Standard (WPS) and label requirements may be in the buffer zone during the buffer zone period.

Buffer zone proximity

- To reduce the potential for off-site movement from multiple fumigated fields, buffer zones for products containing chloropicrin from multiple application blocks may not overlap (including blocks fumigated by adjacent property owners; see below for exemptions for areas not under the control of owner/operator of application block). Prohibiting buffer zones from overlapping will address potential for bystander exposure from multiple fields.
- No fumigant applications will be permitted within 0.25 miles of schools, state licensed day care centers, nursing homes, assisted living facilities, elder care facilities, hospitals, in-patient clinics and prisons if occupied during the buffer zone period.

Exemptions for transit through buffer zones

- Vehicular and bicycle traffic on public and private roadways through the buffer zone is permitted. "Roadway" means that portion of a street or highway improved, designed or ordinarily used for vehicular travel, exclusive of the sidewalk or shoulder even though such sidewalk or shoulder is used by persons riding bicycles. In the event a highway includes two or more separated roadways, the term "roadway" shall refer to any such roadway separately. (This definition is based on the definition of roadway in the Uniform Vehicle Code prepared by the National Committee on Uniform Traffic Laws and Ordinances. See http://www.ncutlo.org/ for more details)
- Bus stops or other locations where persons wait for public transit are not permitted within the buffer zone.
- See *Posting* section on page 47 for additional requirements that may apply.

Structures under the control of owner/operator of the application block

- Buffer zones may not include buildings used for storage such as sheds, barns, garages, etc., **UNLESS,**
  1. The storage buildings are not occupied during the buffer zone period, and
  2. The storage buildings do not share a common wall with an occupied structure.
- See *Posting* section on page 47 for additional requirements that may apply.

Areas not under the control of owner/operator of the application block

- Buffer zones may not include residential areas (including employee housing, private property, buildings, commercial, industrial, and other areas that people may occupy or outdoor residential areas, such as lawns, gardens, or play areas), **UNLESS,**
  1. The occupants provide written agreement that they will voluntarily vacate the buffer zone during the entire buffer zone period, and
  2. Reentry by occupants and other non-handlers must not occur until,
     - The buffer zone period has ended, and
     - Two consecutive air samples for chloropicrin taken in the structure at least 1 hour apart indicate less than 0.15 ppm chloropicrin is present.

- Buffer zones may not include agricultural areas owned/operated by persons other than the owner/operator of the application block, **UNLESS,**
  1. The owner/operator of the application block can ensure that the buffer zone will not overlap with a buffer zone from any adjacent property owners, and
  2. The owner/operator of the areas that are not under the control of the application provides written agreement to the applicator that they, their employees, and other persons will stay out of the buffer zone during the entire buffer zone period.

- Buffer zones may not include publicly owned and/or operated areas (e.g., parks, rights of way, side walks, walking paths, playgrounds, athletic fields, etc), **UNLESS,**
  1. The area is not occupied during the buffer zone period,
  2. Entry by non-handlers is prohibited during the buffer zone period, and
  3. Written permission to include the public area in the buffer zone is granted by the appropriate state and/or local authorities responsible for management and operation of the area.
- See *Posting* section on page 47 for additional requirements that apply.

ii. PERFUM Model Inputs

The major input parameters for the PERFUM model were: application rates, application block sizes, application method emission studies, weather conditions, and target air concentration (based on acute inhalation endpoint and uncertainty factors). The following summarizes the key points for each of these input parameters.

- Rates
  - Agricultural Field

Although labels currently allow higher rates, the Agency modeled the maximum rates supported by the CMTF. These rates are listed in Section II B on page 12 . Buffer zones were determined for the maximum rates as well as increments less than the maximum application rate. This was done to allow flexibility in the buffer approach while taking into consideration current typical use patterns. According to 2007 Agency proprietary data about 93% of chloropicrin usage is at rates less than 125 lbs ai/A. The Agency completed a series of benefit assessments by crop and region that include a more detailed analysis of use rates.

  - Greenhouse

The maximum application rate for greenhouse drip applications is 300 lbs ai/A. This is the same rate used in outdoor agricultural field drip applications.

Rates for bedded or strip applications (lb ai per treated area) were converted to broadcast equivalent application rate to determine the minimum buffer zone distance. In Figures 1 and 2 (shown below), the dashed line represents the perimeter of the field, the shaded area is the portion of the field that is treated, and the un-shaded area is the untreated portion of the field. Assuming both fields are 10 acres, and only 50% of field in Figure 2 is fumigated, the *rate per*

treated acre is 400 lbs ai/A for both Figure 1 and 2. The *broadcast rate* for Figure 1 is 400 lb ai/A but the *effective broadcast equivalent rate* for Figure 2 is 200 lbs ai/A.

Labels may express rates as lbs per treated acre under the application instructions but they must identify buffer zone distances based on the broadcast or effective broadcast equivalent rates.

Figure 1. Broadcast Application

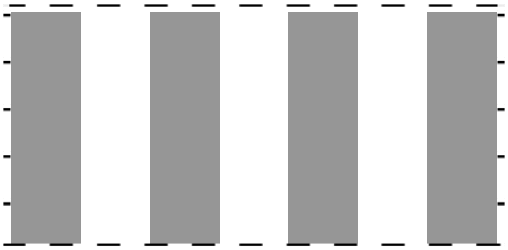


Figure 2. Bedded Application

- Block Size
    - Agricultural Field

The Agency has limited information regarding the size of the application blocks typically treated in a given day, but estimates that each crew or application rig treats less than 40 acres for most scenarios. However several commercial applicators have indicated that they sometimes use multiple rigs and crews to treat blocks greater than 80 acres per day.

Buffer zone distances were determined for 1, 5, 10, 20, 30, 40, 50, 60, 80, and 120 acres.

The application block size pertains to size of the field and not the size of the area treated. The area inside the dashed lines in both Figures 1 and 2 is the application block. In this example the application block size for both figures is 10 acres. For both figures, 10 acres would be used to determine the buffer zone distance.

- Greenhouse

Greenhouse soil fumigations can take place in a wide range of structure sizes. The Agency modeled the following 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40;000; 45,000; and 50,000 ft^2.

- Emission Studies and Weather Data
    - Agricultural Field

The Phase 5 risk assessment modeled the following emissions studies combined with the listed weather data sets for pre-plant agricultural field soil use.

Table 1. Emission Studies and Weather Data for Chloropicrin Applications

Application Method	Emission Study Location	Weather Data Modeled
Shank, bed, tarp	Phoenix, AZ	• Ventura, CA • Bakersfield, CA • Yakima, WA • Flint, MI • Tallahassee, FL • Bradenton, FL
Shank, bed, untarp	Phoenix, AZ*	• Ventura, CA • Bakersfield, CA • Yakima, WA • Flint, MI • Tallahassee, FL • Bradenton, FL*
Shank, broadcast, tarp	Phoenix, AZ*	• Ventura, CA* • Bakersfield, CA • Flint, MI
	Yakima, WA	• Yakima, WA • Flint, MI
	Bradenton, FL	• Flint, MI • Tallahassee, FL • Bradenton, FL
Shank, broadcast, untarp	Phoenix, AZ*	• Ventura, CA* • Bakersfield, CA • Yakima, WA • Flint, MI • Tallahassee, FL • Bradenton, FL
Drip, surface, tarp	Salinas, CA (virtually impermeable film, VIF, tarp)	• Ventura, CA • Bakersfield, CA • Yakima, WA • Flint, MI • Tallahassee, FL • Bradenton, FL
	Salinas, CA (poly tarp)*	• Ventura, CA • Bakersfield, CA • Yakima, WA* • Flint, MI • Tallahassee, FL • Bradenton, FL
	Douglas, GA (poly tarp)	• Yakima, WA • Flint, MI • Tallahassee, FL • Bradenton, FL

The asterisks (*) in Table 1 represent the emission studies and weather data that were used to frame the buffer zone distances. These are the most conservative estimates based on the

Agency's risk assessment, which used all of the valid and available emissions studies for chloropicrin, as well as weather data that are representative of regions of the country where chloropicrin is commonly used. Please note that the Agency did not use the Salinas, CA drip irrigation study with the VIF tarp for a baseline even though the human health risk assessment shows that the PERFUM outputs are the largest. The Salinas, CA poly tarp study was used instead because the VIF study was conducted in 2000, and the Agency does not believe that the study reflects current high barrier film technology. The Agency also used the shank untarped broadcast emission study as a surrogate to help frame the buffer zones for the deep (at least 18 inches) untarped broadcast application method. Each modeling run used five years of weather data (i.e., 1825 potential application days) for each location. The Agency realizes that emissions studies vary regionally and that more regionally representative emissions data would reduce uncertainty in determining buffer zone distances. While the Agency has emissions studies for the shank, broadcast, application method in Phoenix, AZ, Yakima, WA, and Bradenton, FL, the buffer zones are based on the most conservative results from the Phoenix, AZ study. At this time, the Agency did not use a site-specific approach for this decision because of data gaps for many of the application methods, the variation among regions, and the complexity of implementation.

The Agency did not use the Phoenix, AZ shank, bed, tarp emission study as the baseline for the shank, bed, tarp buffers presented in Table 2. Instead the Phoenix, AZ broadcast, shank, tarp study was used. This is because the Phoenix, AZ tarp-bedded study began at 7:00 pm, and the Agency does not believe that nighttime applications are a common practice. In response to an Agency question regarding limiting applications to the daytime, the CMTF commented that, "Currently all field applications of chloropicrin are conducted during daylight hours.[6]" Because of the late start time, the peak flux rates occurred during the night when atmospheric conditions are typically more stable which therefore generated larger buffer distances. The Agency is not restricting chloropicrin applications to daylight hours, however the Agency is requiring that the buffer zone distance increase 25% for all products containing chloropicrin for shank, bedded, tarp applications if applications are made between one hour before sunset and one hour after sunrise.

- Greenhouse

A flux study was not used. Instead a 24-hour continuous single emission was used in the modeling runs. This is based upon current California permit conditions. Ventura, CA weather data was used.

- Target Air Concentration
  - Agricultural Field and Greenhouse

Based on several factors including the severity and reversibility of the effect, and the quality of the hazard database, the buffer zone distance target is to reach an air concentration of 0.073 ppm which equates to an MOE of 1. At minimum, if the target MOE was not reached, half

[6] EPA-HQ-OPP-2007-0350-0150. Comments on USEPA's Chloropicrin Revised Risk Assessments Phase 5. Chloropicrin Manufacturers' Task Force.

of the target (MOE 0.5), which corresponds to minor, reversible effects, was achieved with the buffer zone distance selected.

iii. PERFUM Model Outputs

The PEFRUM model outputs are presented in percentiles for "whole field" and the "maximum distance" distributions. The model also provides outputs as distributions of air concentrations from which MOEs can be estimated. The following summarizes the key points for each of these *output* parameters.

The maximum distance distribution is a compilation of the farthest predicted distances (i.e., the farthest downwind points) over 5 years of weather. The whole field distribution differs because it includes all points around the perimeter of the application block for the same period. Another way to consider the difference between the distributions is that maximum distance results are a subset of the whole field results and that maximum distances allow for more resolution at the upper percentiles of this distribution. Version 2.1.4 of PERFUM also allows for direct consideration of air concentrations at various distances around treated fields. These air concentrations and MOEs were also considered in the decision making process.

An analysis based on a variety of PERFUM outputs was used in the buffer distance determinations. This involved consideration of the typical maximum and whole-field results, which are predictions of the distances where a target concentration of concern is achieved at varying percentiles of exposure. In addition, a complementary approach, which determined the percentiles of exposure for maximum and whole-field buffers at predetermined buffer distances, was employed. Air concentration data were also used to calculate risk estimates (i.e., MOEs) at predefined buffer distances and varied percentiles of exposure.

The chloropicrin buffers focused on reaching upper percentiles of the whole field distribution from PERFUM modeling outputs, as well as achieving an MOE of 1 at the 95th percentile air concentration or an MOE of 0.50 at the 99th percentile air concentration from PERFUM outputs.

This overall approach allowed the Agency to utilize more of the information available from PERFUM so that a more comprehensive view of the risks could be considered. Buffer distances indicated by this type of analysis along with information from monitoring studies and incidents were valuable in determining buffer distances to manage potential risks from chloropicrin use when coupled with other mitigation measures.

iv. Buffer Zone Distances

- Agricultural Field

The Agency has developed buffer zones for different application methods, application rates, and application block sizes. The buffer zones for the supported chloropicrin use scenarios are presented in Tables 2, 3, 4, 5, 6, and 7. It should be noted that the distances in the lookup

tables are not model outputs, although as described above the model outputs were used to inform the selection of buffer zone distances.

- Greenhouse

The Agency has developed buffer zones for the different size structures (up to 50,000 ft^2) for greenhouse pre-plant soil fumigations. The maximum size greenhouse that can be fumigated is 50,000 ft^2. Also, all pre-plant greenhouse fumigations must be tarped.

The "greenhouse" industry sector is extremely varied because of the breadth of the facilities that are used across the country and because of the nature of the products that are produced. As a result, some clarification is required to interpret the buffer zone distances for "greenhouses." In common "greenhouse" operations, many types of containerized ornamental plants and vegetable starter sets are produced in either closed structures that will be referred to as "greenhouses" or in other related nursery operations such as small fields, or in what are commonly known as "shade" houses (i.e., essentially fields with an overhead sunblock, typically a semi-transluscent black shade cloth). In the latter type of operation, cultural practices related to chloropicrin use are essentially identical to the pre-plant field uses except they typically occur on a smaller scale (e.g., 1 acre applications or less). As a result, the minimum buffer zone distances for these types of use patterns must be determined from the applicable outdoor lookup tables. For "greenhouses" the buffer zone distances will be based on Table 8.

- Minimum and Maximum Buffer Zone Distances for Agricultural Field and Greenhouse

A minimum buffer zone distance of 25 feet will be required regardless of site-specific application parameters. In some instances the PERFUM model predicts that the risks reach the target at the edge of the field, but the Agency believes that a 25 foot minimum buffer is a good agricultural practice. While modeling may support no buffer in some cases, a minimum buffer is being required because of variability in the emission rate over a field and other factors not accounted for in the modeling. Application scenarios requiring buffer zones greater than ½ mile (2,640 feet), with or without credits, are prohibited. EPA believes that for areas where chloropicrin is used, buffers greater than ½ mile are not practical and are difficult to enforce. In addition, application scenarios where the model reached its maximum distance before an acceptable concentration was reached are prohibited.

- Distances for Combination Products

As mentioned previously, products containing chloropicrin often include other active ingredients, for example methyl bromide, 1,3-D, and iodomethane. Buffer distances have also been developed for these fumigants. In accordance with Agency policy, when a pesticide product contains more than one active ingredient, the product shall bear labeling for the active ingredient with the more restrictive measures. When chloropicrin is formulated with methyl bromide, the buffers generally are based on the fumigant with the greater amount of active ingredient in the product, for example products with 67% methyl bromide and 33% chloropicrin, methyl bromide has the larger buffer zone.

Table 2. Tarp Bedded and Broadcast Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	25	25	25	25	25	50	75	100	125	135	150	175	225	250	275	325
5	25	25	25	25	50	75	125	175	225	275	300	375	450	475	550	625
10	25	25	50	75	100	175	250	350	400	450	550	650	700	750	900	1000
20	25	35	50	125	250	350	450	550	650	750	850	1025	1150	1225	1375	1575
30	25	35	70	200	350	475	600	750	900	1000	1100	1400	1500	1575	1825	2075
40	25	50	100	275	425	600	750	900	1050	1200	1400	1675	1775	1975	2250	2500
50	35	50	150	350	500	700	900	1100	1250	1425	1575	1975	2175	2375	2675	2950
60	50	75	200	400	600	800	1050	1225	1450	1625	1825	2275	2375	2575	2950	3350
80	50	100	275	500	750	1000	1250	1475	1775	2175	2325	2775	2950	3150	3750	4150
120	75	175	400	700	1050	1375	1675	2050	2375	2775	3150	3725	4000	4350	P	P

Table 3. Tarp Bedded Buffer Zone Distances (feet) with 25% Increase																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	31	31	31	31	31	63	94	125	157	169	188	219	281	313	344	406
5	31	31	31	31	63	94	156	219	281	344	375	469	562.5	594	388	781
10	31	31	63	94	125	219	313	438	500	563	688	813	875	938	1125	1250
20	31	44	63	156	313	438	563	688	813	938	1063	1281	1438	1531	1719	1969
30	31	44	88	250	438	594	750	938	1125	1250	1375	1750	1875	1969	2281	2594
40	31	63	125	344	531	750	938	1125	1313	1500	1750	2094	2219	2469	2813	3125
50	44	63	188	438	625	875	1125	1375	1563	1781	1969	2469	2719	2969	3344	3688
60	63	94	250	500	750	1000	1313	1531	1813	2031	2281	2844	2969	3219	3688	4188
80	63	125	344	625	938	1250	1563	1844	2219	2719	2906	3469	3688	3938	4688	5188
120	94	219	500	875	1313	1718	2094	2563	2968	3469	3938	4656	5000	P	P	P

The 25 percent increase is only for tarped bedded applications that occur between 1 hour before sunset and 1 hour after sunrise.

Table 4. Untarp Bedded Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	17.5	**26.25**	**35**	**43.75**	**52.5**	**61.25**	**70**	**78.72**	**87.5**	**96.25**	**105**	**122.5**	**131.3**	**140**	**157.5**	**175**
1	25	25	25	25	50	100	125	150	175	175	200	250	275	300	325	350
5	25	25	25	50	100	175	225	275	325	375	400	500	525	575	625	700
10	25	25	50	150	200	300	375	450	550	600	650	750	825	875	1000	1100
20	25	35	125	275	375	500	600	725	825	925	1000	1175	1225	1350	1475	1650
30	25	50	200	350	550	675	800	925	1050	1175	1300	1475	1625	1700	1925	2175
40	25	75	300	450	650	800	975	1100	1275	1425	1575	1775	1975	2175	2350	2550
50	25	125	350	550	725	925	1100	1275	1475	1625	1775	2075	2225	2375	2750	3000
60	35	175	400	650	825	1025	1250	1475	1675	1875	2000	2375	2575	2775	3075	3550
80	50	250	500	775	1000	1225	1475	1775	2025	2475	2550	2800	2900	3200	3750	4350
120	50	350	650	1025	1400	1650	2000	2375	2575	2950	3200	3750	3975	4350	4725	P

Table 5. Untarp Broadcast Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	17.5	**26.25**	**35**	**43.75**	**52.5**	**61.25**	**70**	**78.75**	**87.5**	**96.25**	**105**	**122.5**	**131.3**	**140**	**157.5**	**175**
1	25	25	25	50	100	150	175	200	225	275	300	350	375	400	450	500
5	25	25	50	75	175	275	350	400	475	550	600	700	750	800	900	1000
10	25	25	75	250	350	450	600	700	800	900	950	1125	1200	1300	1450	1575
20	25	50	250	450	625	800	975	1125	1250	1375	1500	1775	1875	1975	2225	2575
30	25	125	400	625	850	1100	1250	1475	1625	1825	1975	2375	2550	2600	2950	3400
40	35	250	500	800	1025	1275	1575	1775	1975	2250	2400	2850	3050	3225	3750	4325
50	50	275	600	900	1225	1575	1825	2100	2375	2575	2850	3300	3550	3950	4350	P
60	50	350	700	1050	1400	1775	2075	2375	2550	2950	3200	3800	4175	4350	P	P
80	75	450	900	1275	1775	2150	2600	2950	3275	3575	3950	P	P	P	P	P
120	125	600	1200	1775	2375	2950	3350	3950	4350	P	P	P	P	P	P	P

Table 6. Untarp Broadcast Deep Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	25	90	175	225	300	350	400	450	500	525	600	700	750	800	878	975
5	50	175	350	475	600	700	800	900	1000	1050	1200	1400	1475	1575	1775	1975
10	75	350	600	800	950	1125	1300	1450	1575	1675	1875	2200	2350	2550	2800	3150
20	250	625	975	1250	1500	1775	1975	2225	2575	2775	2950	3550	3750	4000	P	P
30	400	850	1250	1625	1975	2375	2600	2950	3400	3650	3800	4350	4575	4725	P	P
40	500	1025	1575	1975	2400	2850	3225	3750	4325	4500	P	P	P	P	P	P
50	600	1225	1825	2375	2850	3300	3950	4350	P	P	P	P	P	P	P	P
60	700	1400	2075	2550	3200	3800	4350	P	P	P	P	P	P	P	P	P
80	900	1775	2600	3275	3950	P	P	P	P	P	P	P	P	P	P	P
120	1200	2375	3350	4350	P	P	P	P	P	P	P	P	P	P	P	P

Table 7. Drip Irrigation Tarped Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	30	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**	**210**	**225**	**240**	**270**	**300**
1	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	50
20	25	25	25	25	25	25	25	25	25	25	25	35	35	50	65	75
30	25	25	25	25	25	25	25	25	25	25	25	35	50	65	85	125
40	25	25	25	25	25	25	25	25	25	25	35	35	50	75	125	150
50	25	25	25	25	25	25	25	25	35	35	50	50	75	125	145	175
60	25	25	25	25	25	25	25	25	35	50	50	50	100	125	175	225
80	25	25	25	25	25	25	25	50	50	50	50	75	125	150	225	275
120	25	25	25	25	25	25	25	50	75	100	100	175	225	275	325	400

- P = Prohibited
- Distances greater than ½ mile (2,640 feet) are listed in the above tables. However, these

buffers are prohibited if buffer zone credits, as described later in this document, do not result in a buffer that is ½ mile (2,640 feet) or less.

Table 8. Buffer Zones for Pre-Plant Greenhouse Tarped Soil Fumigations

Structure Size	Buffer Zone
≤ 25,000 square feet	25 feet
> 25,000 square feet and ≤ 30,000 square feet	50 feet
> 30,000 square feet and ≤ 35,000 square feet	75 feet
> 35,000 square feet and ≤ 40,000 square feet	100 feet
> 40,000 square feet and ≤ 45,000 square feet	115 feet
> 45,000 square feet and up to 50,000 square feet	130 feet

The buffer zones distances were not based on the selection of a specific percentile or distribution from the PERFUM modeling results. Rather, EPA used a weight of evidence approach to set the buffers which included consideration of the hazard profile of chloropicrin, information from incident reports in particular factors that led to the incident and the effects seen in people who were exposed, monitoring data (e.g., actual concentration measured at ranges of distances in studies), stakeholder comments, along with comprehensive analysis of results from PERFUM modeling and consideration of results using other models (e.g., Industrial Source Complex model[7]). The analysis of PERFUM results considered distances at various percentiles of the whole field and maximum distance distributions, and predicted MOEs for various distances. The risk assessment characterizes additional types of analysis that were performed. The following characterizes the risks associated with the buffer zones distances listed in Tables 2, 3, 4, 5, 6, 7 and 8:

- Buffer zone distances are based on a reversible endpoint.
- The PERFUM model was modified since the Agency last released its risk assessment for public comment. Version 2.1.4 now provides outputs that show air concentrations at each of the modeled ring distances. The Agency has used this information to estimate the MOEs at various distances for each of the five weather stations. The buffer zone distances selected for agricultural field and greenhouse pre-plant soil fumigations generally reach the target MOE of 1 at high percentiles (>90%).
- Buffers are protective of more severe effects. The MOEs at high percentiles (99th) of the whole field reach half of the target MOE. This MOE corresponds to the 0.15 ppm concentration of chloropicrin that can cause irritation without leading to more serious respiratory effects.
- It was assumed that chloropicrin air concentrations inside homes and other occupied structures are equal to outside concentrations. These structures could act as a barrier which in some cases may reduce potential inside air concentrations. However, there is insufficient data to quantify differences between indoor and outdoor concentrations.
- The use of GAPs, FMPs, and other mitigation measures required by this decision will contribute to an additional decrease in risk (see *GAP* section on page 59 and *FMP* section on page 65).

    - Projected Buffer Zone Distances for Major Crops

[7] http://www.epa.gov/scram001/dispersion_alt.htm#isc3

Table 9 shows the various buffer distances for the pre-plant soil uses assessed by the Agency during Phase 5 of the reregistration process. It also shows the percentile for the whole and maximum field distributions for each buffer distance, as well as the MOE at the 95th and 99th percentile air concentration of PERFUM.

Chloropicrin's target MOE is 1, and the MOEs in the table range from 0.50 to 6.9. Although the buffer zone distances do not always reach the target at the 95th percentile air concentration in PERFUM, the distances do reach half of the target at the 99th percentile air concentration. This concentration corresponds to minor, reversible irritation effects observed in the human study. Please note that the MOEs in the table are estimations. This is because the buffer zones do not correspond exactly to PERFUM model outputs. For example, the buffer for forest seedlings in the southeast for 10 acres at 135 lbs ai/A is 250 feet. The corresponding MOE at the 95th percentile air concentration is based on a buffer zone of 230 feet, therefore this number is an underestimation.

All of the whole field percentiles in Table 9 are above 90 percent, and the maximum percentiles range from 50 to 99 percent. Similar to the MOEs, the whole and maximum percentiles presented in Table 9 are estimations. This is because the typical rates presented do not exactly correspond to the rates modeled. For example for forest seedlings in the southeast, the typical rate is 135 lbs ai/A. The closest rate modeled is 140 lbs ai/A. As a result the whole and maximum field percentiles correspond to a rate of 140 lbs ai/A, and not 135 lbs ai/A. Therefore 90% whole field and 55% maximum field are underestimations. That is, if the actual rate is lower than the modeled rate, actual percentiles would be higher and the risk would be lower.

- Example

Table 9 shows the corresponding maximum and whole field distribution for each buffer zone based on an MOE of 1, as well as the MOE from the air concentration outputs from PERFUM at the 95th percentile and 99th percentile.

Focusing on peppers as an example, the buffer zone for a 10 acre plot in California or Michigan at a rate of 100 lbs ai/A is 100 feet.

At 100 feet, the PERFUM model predicts the 90th percentile for the whole field distribution and the 55th percentile for the maximum field distribution. The risk level corresponding to this buffer zone distance at the 90th percentile whole field distribution is equivalent to saying a person at any location on the perimeter of the buffer zone during the 24 hour period following the fumigation of a specific field during a 5-year period would have at least a 90 percent chance of having of an exposure below the level of concern (i.e., MOE of 1or higher). The risk level corresponding to the buffer zone distances at the 55th percentile maximum distribution is equivalent to saying a person at the location on the perimeter of the buffer zone where the maximum concentration occurs during the worst case 24 hour period following the fumigation of a specific field during a 5-year period would have a 55 percent chance of having of an exposure below the level of concern (i.e., MOE of 1 or higher).

Using the PERFUM model outputs of air concentrations to predict MOEs at the 95th and 99th percentile, at 100 feet for these application parameters, the MOE at the 95th percentile is about 0.9 which is not significantly below the target MOE of 1. Also at the 99th percentile the MOE is above 0.50.

Table 9. Projected Buffer Zone Distances for Crops with Significant Chloropicrin Usage

Crop	Region	Application Method	Rate (lb ai/A)	Block Size (acres)	Buffer Zone (ft) Distances without credits	Whole and Maximum Field Percentiles (MOE=1)		MOE at 95th and 99th Percentile of PERFUM 2	
						Whole	Max	95th	99th
Cucurbits	CA & Southeast	Tarp Broadcast/Bed	50	10	25	95	75	1.4	0.9
				40	50	90	55	1	0.6
	Michigan	Tarp Broadcast/Bed	70	10	50	95	75	1.1	0.7
				40	100	90	55	0.8	0.5
Carrot	CA	Bed	18	80	50	90	65	0.9	0.6
Eggplant	CA & Southeast	Tarp Bed	75	10	75	95	75	1	0.7
				40	275	95	70	1	0.6
Forest Seedling	Southeast	Tarp Broadcast	135	10	250	90	55	0.9	0.5
				20	450	90	55	1	0.6
	West	Tarp Broadcast	116	10	175	90	50	0.9	0.5
				20	350	90	55	1	0.6
Onion	Oregon	Bed Compaction	34	40	300	90	50	0.9	0.5
	Washington	Bed Compaction	22	40	100	97	80	0.9	0.6
Orchard Replant-Grape &Nut	CA	Deep Bed Compaction	12	20	25	97	85	1.8	1.3
				30	25	95	75	1.6	1.1
Orchard Replant-Pome	Pacific NW	Deep Bed Compaction	50	5	100	90	50	0.9	0.5
Orchard Replant-Stone	CA	Tarp Bed (Deep)	43	20	35	99	97	1.3	0.9
				30	35	99	90	1.2	0.8
	Pacific NW	Deep Bed Compaction	68	5	225	90	50	0.9	0.5
Pepper	CA & MI	Tarp Bed	100	10	100	90	55	0.9	0.5
				40	425	90	55	0.9	0.5
	Southeast	Tarp Bed	75	10	75	95	70	1.1	0.7
				40	275	95	70	1	0.6
Strawberry	CA	Tarp Bed	117	10	175	90	50	0.9	0.5
				20	350	90	55	0.9	0.5
	FL	Tarp Bed	143	10	350	95	60	1.1	0.6
				20	550	90	55	1	0.5
Strawberry Nursery	CA & Southeast	Tarp Broadcast	200	10	550	95	65	1	0.5
				40	1400	95	65	1.1	0.5
Sweet Potato	Texas	Tarp Bed	10	10	25	99	99	6.9	4.7
				40	25	99	99	4.5	3.1
Tobacco	All States	Tarp Bed	80	10	75	90	60	1	0.6
				40	275	90	55	0.9	0.6
Tomato	CA & FL	Tarp Bed	133	10	250	90	55	0.9	0.5
				40	750	90	55	1	0.5
	MI	Tarp Bed	114	10	175	90	50	1	0.5
				40	600	90	55	1	0.5

The Agency believes that the buffer zone distances described above, combined with other risk mitigation measures detailed herein, will provide protection against any unreasonable adverse effects.

v. Buffer Zone Reduction Credits

The Agency has undertaken a significant effort to evaluate available empirical data, modeling, and literature regarding the factors and control methods that may reduce emissions from soil fumigants. For details on the Agency's analysis please see, "Factors Which Impact Soil Fumigant Emissions - Evaluation for Use In Soil Fumigant Buffer Zone Credit Factor Approach,"[8] in the chloropicrin docket. The Agency has also coordinated and led forums to discuss this issue at the 2006 and 2007 Methyl Bromide Alternatives Outreach (MBAO) Conferences with leading researchers and other stakeholders. A general description of the MBAO sessions can be found at http://mbao.org.

Based on the Agency's analysis of the current data, the Agency has developed chloropicrin buffer zone reduction credits for: high barrier tarps (40%), high barrier tarps used in combination with the Symmetry™ application system (50%), potassium thiosulfate (KTS) applied over tarped fields (5%), soils with high organic matter (10%), and soils with high clay content (10%). The chloropicrin buffer zone credits are additive, but the total credit cannot exceed 50 percent. To take advantage of the credits for high barrier tarps, Symmetry™, and KTS, users can modify their current application practices. Organic matter and clay content are difficult to change and this credit may only be applicable for areas where these characteristics already exist. Changing current practices or site conditions to utilize these credits comes with a cost, but the Agency believes that in addition to reducing bystander risk and the size of buffer zones, the credits for high barrier tarps, Symmetry™ application system, and KTS have the potential to increase efficacy. Also the use of high barrier tarps could reduce application rates.

- High Barrier Tarps

EPA has determined that a 40% buffer credit for chloropicrin is appropriate for the following high barrier tarps: Bromostop® (1.38 mil), IPM Clear VIF (1.38 mil), Eval/Mitsui (1.38 mil), Hytiblock 7 Black (0.00125"), XL Black Blockade (0.00125"), and Hytibar (1.5 mil). This credit is based on several field studies detailed in the Agency's factors document.[8] The field studies include work by Dr. Husein Ajwa from the University of California Davis,[9] researchers from the United States Department of Agriculture's Agricultural Research Service (USDA-ARS) and the University of California, Riverside,[10] and studies sponsored by Arysta Life Sciences North America Corporation.[11, 12] In addition, laboratory studies completed by

[8] Factors Which Impact Soil Fumigant Emissions - Evaluation for Use in Soil Fumigant Buffer Zone Credit Factor Approach, June 9, 2008, DP Barcode: 306857

[9] Ajwa, H. Fumigant emission Reductions by using Low Permeability Film and Thiosulfate Water Seal. 2007 Methyl Bromide Alternatives Outreach Conference. http://mbao.org/2007/PDF/Preplant/PP1/Ajwa(6).pdf.

[10] Papiernik, S., et al. (2004) Effect of Surface Tarp on Emissions and Distribution of Drip Applied Fumigants. Environmental Science Technology. 38, 4254-4262.

[11] EPA MRID 472952-03 Baker, F.; Arndt, T. (2007) Direct and Indirect Flux Determination of Iodomethane and Chloropicrin Under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection of Midas 50:50 in

Ajwa which are also described in the Agency's factors document, were used to support the credit.[13] The Agency believes that the actual percent of emission reduction could be higher, but that a 40% credit is appropriate based on uncertainties in the available data. Other high barrier tarps could qualify for credits if supporting data are provided to the Agency.

The use of high barrier tarps may not be feasible or applicable to all situations where chloropicrin is currently used. For example, growers using broadcast applications have reported that high barrier tarps are difficult to use because of problems with gluing or bonding the edges of the tarps together. Researchers and other stakeholders are reportedly exploring alternate methods to accomplish this task (e.g., using propane gas to weld the tarps together).

Tarp emission reduction data reviewed by EPA show that tarps have varying degrees of effectiveness. There is no current standard to evaluate tarps, and in the absence of a standard, EPA has established conservative buffer reduction factors based on available data. EPA requested assistance from USDA's Agricultural Research Service (ARS) in this effort to identify those tarps that have demonstrated low permeability and reduced emissions under field conditions.[14] USDA's research includes a hybrid field-lab performance test where tarps are stretched out over beds, subjected to atmospheric and soil conditions, and then tested in the lab. The Agency believes that this approach to evaluating the permeability of agricultural tarps could simulate more realistic field conditions, and EPA requested the results of tarp permeability testing currently being conducted in support of USDA's Area-wide Pest Management Projects for both the Pacific Region and the South Atlantic Regions.

In a response to EPA's request, USDA indicated that at least several months are needed for external peer review, and that it was not able to provide the data in a timeframe useful for EPA's current decisions.[15] USDA did offer to provide samples of tarps taken from its ARS experiments for testing in EPA laboratories. EPA is pursuing the feasibility of this option.

EPA plans to work with USDA, registrants, and other stakeholders to develop a protocol for measuring the performance of tarp materials (i.e., using the mass transfer coefficient for each fumigant) and performance criteria that could be used to evaluate additional tarps to derive emission credits. Although there are several protocols being evaluated, there is no consensus on a method. The Agency's factors document[8] discusses methods that could be employed. Guidelines for conducting flux studies in the field to use as point of comparison to performance testing are already well established.

Bainbridge, GA. Project Number: 1619W, 1619W/1. Unpublished study prepared by PTRL West, Inc, Paragon Research Services, Pacific Ag Group. 590 p. [Black Hytiblock]

[12] EPA MRID 472952-04; Baker, F.; Arndt, T. (2007) Direct and Indirect Flux Determination of Iodomethane and Chloropicrin Under Field Conditions Following Tarped/Raised Bed/Shallow Shank Injection of Midas 50:50 in Hart Michigan. Project Number: 1646W, 1646W/1. Unpublished study prepared by PTRL West, Inc, Paragon Research Services, Pacific Ag Group. 590 p. [Black Blockade]

[13] Ajwa, H., A. 2007. Testing Film Permeability to Fumigants Under Laboratory and Field Conditions. 2007 Methyl Bromide Alternatives Outreach Conference. **http://mbao.org/2007/PDF/Preplant/PP3/Ajwa(16).pdf**

[14] EPA-HQ-OPP-2007-0350-0161. USDA's Agricultural Film Testing

[15] EPA-HQ-OPP-2007-0350-0162. USDA Letter to Pete Caulkins on Agricultural Film Testing.

EPA (through OPP's Environmental Stewardship Branch) has proposed to co-fund a grant with USDA-ARS for several flux studies in the southeastern U.S. These studies would provide (1) field data on the emission reduction potential of certain low permeability barrier films to support possible, additional, buffer reduction credits as well as to (2) help develop an affordable and reliable hybrid field-lab test to evaluate the many barrier films available to growers. EPA has also prepared a document to describe possible research and study designs to reduce uncertainties in understanding emission factors in the context of different films and seals, agricultural practices, and environmental conditions.[16] During the 60-day comment period the Agency anticipates learning more about ongoing and planned research from the scientific community that will address these uncertainties to help the Agency identify potential studies that would help refine the current risk-based mitigation decisions. The EPA will defer decisions regarding calling-in any data to address uncertainties identified with regard to these and other factors until comments provided during the 60-day comment period have been reviewed.

- High Barrier Tarps with Symmetry™ Application System

The Agency has determined that a 50% credit is appropriate when the Symmetry™ application system is used with approved high barrier tarps (which currently includes only the tarps listed above) and the application rate is less than 100 lbs ai/A. The high barrier tarps receive a 40% credit and Symmetry™ receives a 10% credit. This credit is based on studies sponsored by Arysta Life Sciences North America Corporation.[11, 12] Due to limited information regarding how the application system reduces emissions without high barrier tarps or at higher application rates, the Agency believes the credit, while conservative, is appropriate.

- Potassium Thiosulfate (KTS) and Tarps

EPA has determined that a 5% credit is appropriate for applications of potassium thiosulfate. A field study conducted by Dr. Husein Ajwa[9] indicates reductions in chloropicrin emissions when KTS is applied to the top of tarps after the fumigation. If KTS is used in conjunction with one of the approved high barrier tarps, the buffer zone can be reduced by 45%. If KTS is used with any other tarp, the buffer zone reduction credit is 5%.

To receive the KTS credit, immediately following the fumigation, users must apply 25 gallons of KTS per acre with enough water to wet the soil to a depth of 10 mm by sprinkler.

- Soil Conditions

Inherent soil conditions (e.g. organic matter and soil type) like high barrier tarps and KTS do have an impact on fumigant emissions. However, soil conditions differ from the high barrier tarp and KTS credits because soil conditions are factors that are essentially beyond a grower's ability to change. Although a grower may not be able to manipulate organic matter or soil type, the Agency's factors document indicates that soil conditions can reduce fumigant emissions, and is offering credits for these conditions. EPA acknowledges that some variability in soil characteristics within a given field is likely. If users are unsure whether the fields they intend to

[16] Health Effects Division Recommendations for Fumigant Data Requirements. June 2008. DP Barcode 353724

treat meet the criteria for a credit, they may consult with their local agriculture extension office or soil conservation district for assistance in determining soil characteristics.

The Agency's factors document not only reviews available literature regarding soil conditions, but also describes modeling exercises that estimate the impact of organic matter and soil type using the Chain_2D model.[8] Chain_2D is a first principles model that takes into consideration factors such as boundary layers or moisture that could impact fumigant emissions. The Agency used Chain_2D as modified by Dow AgroSciences' Steve Cryer and Ian van Wesenbeek in the sensitivity analysis.[17] Cryer and van Wesenbeek modified the original source code to create a more usable graphical user interface, this included incorporating a new air/soil boundary condition proposed by Wang in 1998.[18] See the Agency's factors document for details about the model.[8]

Based on the review of available literature and modeling with CHAIN_2D, EPA believes a 10% buffer zone credit is appropriate if the application block contains soil with organic matter of greater than or equal to 3%, and a 10% credit is appropriate if clay content is at least 27%.

The Agency's Chain_2D sensitivity analysis suggests that organic matter can have a small impact on emissions. There is generally a high correlation between the organic matter content of the soils and the dissociation constant (K_d) value. Increasing K_d value by 10 or 25% generally reduced emissions by 10 or 20% (figures 141-147 of the Agency's factors document[8]).

Generally, clay loam and sandy clay loam soils tended to show significantly lower emissions than other soil types, sometimes showing 50% lower reductions. Conversely, loamy sand and loam soils tended to show higher emissions than other soil types (figures 161-167 of the Agency's factors document[8]).

- Buffer Zone Credit Example

The Agency's analysis of the available data indicate that credits for high barrier tarps, the Symmetry™ application system with high barrier tarps, KTS used with tarps, organic matter and soil type are appropriate for chloropicrin. Below is an example of how the credits could be applied.

Focusing on peppers again as an example, the buffer zone for a 10 acre plot in California or Michigan at a rate of 100 lbs ai/A is 100 feet without credits. If the grower uses Bromostop® (1.38 mil) high barrier tarp, the buffer zone can be reduced by 40 percent. The resulting buffer for this example is 60 feet. If KTS is used in conjunction with the Bromostop® (1.38 mil) high barrier tarp the resulting buffer would be 55 feet.

[17] Cryer, S.A. (2007) Air/Soil Boundary Conditions For Coupling Soil Physics and Air Dispersion Modeling. Unpublished report of Dow AgroSciences LLC (Report # DN241493)

[18] Wang, D; Yates, S.R.; Jury, W.A. (1998) Temperature Effect on Methyl Bromide Volatilization: Permeability of Plastic Cover Films. J. Environ. Qual. 27, 821-827.

- Other Buffer Zone Credits Considered

Other factors such as soil moisture content, field preparation, water sealing, and application injection depth could not be used to justify credits based on the available data. However, EPA has established mandatory good agricultural practices (GAPs) for these conditions. See the *GAP* section on page 59 of this document for further discussion.

The Agency has used the best available data to estimate potential chloropicrin bystander risks and has both quantitatively and qualitatively evaluated the impact of potential emission control measures on bystander risk. The Agency recognizes that there is substantial research being conducted by stakeholders to further quantify emission reductions, and will consider such data in future decisions if new data becomes available. Such data may also support the Agency's decisions on additional emission credits in the future.

vi. Buffer Zone Impacts

EPA acknowledges that even with the use of credits, there could be significant economic impacts to some growers who may not be able to accommodate large buffers based on their current application practices. As part of the most recent public comment period on fumigant risk assessments and proposed mitigation, several stakeholders submitted analyses estimating the impact of buffer zones around fumigated agricultural fields. The Agency's review of these studies and discussion of an EPA contracted study using the same approach for Kern County, California is included in the docket.[19] While buffers may restrict certain application practices, this decision allows growers the flexibility to modify their practices to achieve smaller buffers; for example treat smaller application blocks, or switch to a lower emission application method. Available data indicate that for some crops and regions, pest control efficacy may be improved with high barrier tarps that may enable growers to use the buffer zone credits and utilize lower application rates, resulting in further reductions of the buffer zone distances. Some growers in the southeast are commonly using high barrier tarps and lower rates at present.

The Agency has also looked at how buffer zones have impacted California practices[19]. Buffer zones are currently required in California for methyl bromide pre-plant soil fumigations. While there is no required buffer zone for chloropicrin in California, some counties require the methyl bromide buffer zones for chloropicrin, other counties have larger restrictions, and still some counties have no buffer zone requirements. The Agency's document explains how California strawberry growers have modified their fumigation practices as a result of the buffer zones, and also the impact of these changes.

b. Posting

Posting is recognized as an effective means of informing workers and others about areas where certain hazards and restrictions exist. Current soil fumigant labels require treated areas to

[19] Review of Stakeholder Submitted Impact Assessments of Proposed Fumigant Buffers, Comments on Initial Buffer Zone Proposal, and Case Studies of the Impact of a Flexible Buffer System for Managing By-Stander Risks of Fumigants. June 25, 2008. (DP Barcode 353940)

be posted, and handlers are required to wear specific PPE when they are in a treated area. For buffer zones to be effective risk mitigation, bystanders, including agricultural workers in nearby areas, need to be informed of the location and timing of the buffer to ensure they do not enter areas designated as part of the buffer zone.

i. Posting Requirements

In addition to alerting bystanders, posting a buffer zone will help handlers determine where and when they are required to use PPE. As described below, handlers working in buffers during the buffer zone period must use label-specified PPE and meet other requirements under the WPS. Therefore, EPA has determined that to ensure the protectiveness of buffers for bystanders and handlers, the perimeter of the fumigant buffer zones must be posted as described below and in the example that follows.

- Posting of a **buffer zone** is required **except** when one of the following conditions exist:
  (1) a physical barrier that is reasonably likely to prevent bystander access to the buffer zone (e.g., a fence or wall) separates the edge of the buffer zone from bystander access.
  OR
  (2) the area within 300 feet of the edge of the buffer zone is controlled by the application block owner/operator. That is, if land under someone else's control is within 300 feet from the edge of the buffer zone, the buffer zone must be posted.

  A buffer within 300 feet of an area that includes worker housing must be posted even if the area is under the control of the land owner/operator.

- Buffer zone posting signs must:
  - Be placed at all usual points of entry and along likely routes of approach from areas where people not under the land operator's control may approach the buffer zone.
  - When there are no usual points of entry, be posted in the corners of the buffer zone, between the corners of the buffer zone, and along sides so that one sign can be viewed (not read) from the previous one. Some examples of points of entry include, but are not limited to, roadways, sidewalks, paths, and bike trails.

- Buffer zone posted signs must meet the following criteria:
  - The printed side of the sign must face away from the treated area toward areas from which people could approach.
  - Signs must remain legible during entire posting period and must meet the general standards outlined in the WPS for text size and legibility (see 40 CFR §170.120).
  - Signs must be posted before the application begins and remain posted until the buffer zone period has expired.
  - Signs must be removed within 3 days after the end of the buffer zone period.
  - Registrants must provide generic buffer zone posting signs which meet the criteria above at points of sale for applicators to use.

Exception: If multiple contiguous blocks are fumigated within a 14-day period, the entire periphery of the contiguous blocks' buffer zones may be posted. The signs must remain posted

until the last buffer zone period expires and signs may remain posted until 3-days after the buffer zone period for the last block has expired.

Additional requirements for treated area posting:

- The treated area posted signs must remain posted for no less than the duration of the *entry restricted period* after treatment.
- Treated area signs must be removed within 3 days after the end of the entry-restricted period.
- Signs must meet the general standards in the WPS for placement, text size, and location (40 CFR §170.120).

Contents of Signs

The **treated area** sign (currently required for fumigants) must state the following:
-- Skull and crossbones symbol

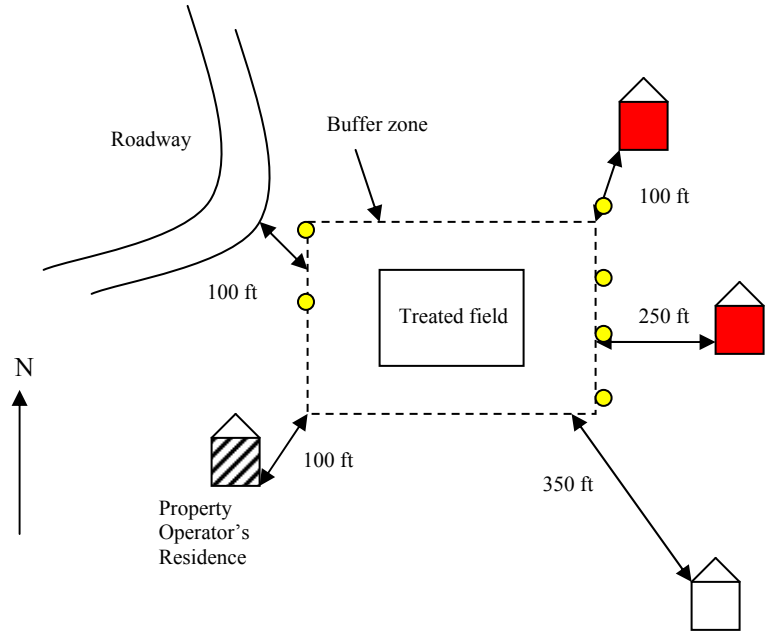
-- "DANGER/PELIGRO,"
-- "Area under fumigation, DO NOT ENTER/NO ENTRE,"
-- "[*Name of fumigant*] Fumigant in USE,"
-- the date and time of fumigation,
-- the date and time entry prohibition is lifted
-- Name of this product, and
-- name, address, and telephone number of the certified applicator in charge of the fumigation.

The **buffer zone** sign must include the following:
-- Do not walk sign

-- "DO NOT ENTER/NO ENTRE,"
-- "[*Name of fumigant*] Fumigant BUFFER ZONE,"
-- the date and time of fumigation,
-- the date and time buffer zone restrictions are lifted (i.e., buffer zone period expires)
-- Name and EPA registration number of the product applied, and
-- name, address, and telephone number of the certified applicator in charge of the fumigation

To clarify the posting requirements, the following example has been included.

Figure 3. Posting Example



Red Houses = Structure within 300 feet of the buffer zone edge. Yellow dots = posted signs

- The structures in **red** are (1) within 300 feet of the edge of the buffer zone, and (2) there is no physical barrier between the two structures and the buffer zone, and (3) the land operator does not control these structures.
- Although the **property operator's building** (striped building) is within 100 feet of the edge of the buffer zone, since it is controlled by the property operator, **no posting** of the buffer zone is necessary here.
- There is a **road** within 100 feet of the edge of the buffer zone. Since there is a possibility of people from the road entering the buffer zone area, the buffer zone needs to be posted in the northwest corner.

    - Buffer Zone Posting Considerations

The Agency received comments on the burden for applicators to post the entire perimeter of a buffer zone due to the large distance it covers. In an effort to reduce the burden on growers, but retain the posting requirement for situations where people are most likely to enter a buffer zone, EPA believes posting an area where people are most likely to enter buffers will be protective. USDA also noted that as growers break their fields into smaller application blocks to result in smaller buffer zones, the posting requirements would be burdensome in that users would need to put up and take down signs for multiple adjacent, sequential applications. To address this concern, EPA is allowing signs for contiguous application blocks to be placed on the edge of the buffer zone area for all blocks treated within a 14-day period. EPA believes this will be protective and potentially less burdensome.

c. Use Prohibitions

The Agency does not have adequate data to evaluate the following application scenario: untarped, drip, buried (a minimum of 5 inches). The CMTF has recently submitted a study to the Agency. If data are acceptable and allow EPA to develop appropriate mitigation for this use pattern, this use will be eligible for reregistration; otherwise it will be prohibited.

2. Occupational Mitigation

a. Handler Definition

Based on stakeholder comments, a clarification of EPA's definition of *handler* activities, as currently defined in the WPS and fumigant labels, is needed. Persons engaged in any of the following activities will be defined as *handlers* on product labels.

- Persons participating in the application as supervisors, loaders, drivers, co-pilots, shovelers, or as other direct application participants;
- Persons taking air samples to monitor fumigant air concentrations;
- Persons cleaning up fumigant spills;
- Persons handling or disposing of fumigant containers;
- Persons cleaning, handling, adjusting, or repairing the parts of fumigation equipment that may contain fumigant residues;
- Persons installing, repairing, operating irrigation equipment in the fumigant application block or surrounding buffer zone during the buffer zone period;
- Persons entering the application site or surrounding buffer zone during the buffer zone period to perform scouting or crop advising tasks;
- Persons installing, perforating (cutting, punching, slicing, poking), removing, repairing, or monitoring tarps – until
    - After tarps are perforated and removed if tarp removal is completed less than 14 days after application, or
    - 14 days after application is complete if tarps are not perforated and removed during those 14 days, or
    - 48 hours after tarps are perforated if they will not be removed prior to planting.

b. Handler Requirements

Currently all handlers involved in a chloropicrin application must be under the supervision of a certified applicator who may not necessarily be on-site. Since many incidents are caused by human error and equipment failure, EPA believes the presence of onsite trained personnel will help to reduce these risks. Therefore, a certified applicator must maintain visual contact with any fumigant handler while the fumigant is being incorporated into the soil. The person monitoring other handlers may also be engaged in fumigant handling tasks during the monitoring period and two qualified monitors may monitor one another simultaneously.

Before applying this product, the certified applicator supervising that application must have, within the preceding 12 months, successfully completed a chloropicrin training program made available by the registrant (see *Soil Fumigation Training for Applicators and Other Handlers* section on page 74). The FMP as described on page 65 must document when and where the training program was completed.

For cases when the certified applicator leaves the site after the application portion of the fumigation process is complete and other parties will be performing handler tasks (e.g., tarp perforation/removal, water application, etc.), the certified applicator must communicate in writing to the site owner/operator and other handlers key information needed to comply with label requirements (e.g. PPE requirements, location of buffers, when buffer zone ends, reentry restrictions, minimum times for perforating tarps, etc.).

When handlers are fixing tarps, moving irrigation equipment or performing other handling tasks as defined above, the Agency is requiring at least two WPS trained handlers be present for all activities. Due to the volatile nature of the fumigants there is a possibility that handlers could be overcome with the vapors and have difficulty leaving the area while they are performing handling tasks. Therefore, EPA is requiring at least two WPS trained handlers be on site during all post-fumigation handling activities.

c. Respiratory Protection

The Agency's risk assessment indicates that inhalation risks exceed the Agency's level of concern for many handler activities. The human study indicates that the eye and nose irritation associated with acute chloropicrin exposure do not carryover, and therefore the Agency is most concerned about protecting handlers and workers from acute inhalation exposure. Taking into account the risks identified in addition to stakeholder comments, the Agency has developed the respiratory protection scheme below. In addition to the respiratory protection requirements, the Agency believes that GAPs, FMPs, and other mitigation measures will reduce inhalation risks to levels below the EPA's level of concern.

During the most recent public comment period, the Agency received comments from fumigant applicators that respirators are not necessary because (1) chloropicrin's warning properties are sufficient to alert handlers if there has been an unsafe exposure, (2) respirators inhibit communication which could cause an accident; and (3) in warm weather respirators can cause heat stress and other ailments. On the other hand, some stakeholders are in favor of mandatory respiratory protection because they believe if fumigants are continued to be used that respirators are the only effective means to protect workers from chloropicrin exposures. These stakeholders have also stated that handlers will not be given access to respirators and other PPE unless it is required on the label.

Current chloropicrin labels state that the acceptable air concentration is 0.1 ppm, and require air-purifying respirators when the air concentration of chloropicrin exceeds 0.1 ppm, and SCBA when the air concentration exceeds 4 ppm. The labels, however, do not require

monitoring. The 4 ppm level was the old IDLH (immediately dangerous to life and health) level. This level has since been revised to 2 ppm.[20]

i. Respiratory Requirements

The following air monitoring procedures must be followed for all agricultural field and greenhouse pre-plant soil applications of chloropicrin. When chloropicrin is used in combination with other fumigants like methyl bromide, iodomethane, and 1,3-D, the mitigation may differ due to the different risks of the other fumigant. According to Agency policy, the most stringent mitigation must be followed.

- Air monitoring samples for chloropicrin must be collected at least every 2 hours in the breathing zone of a handler performing a representative handling task.
- If at any time: (1) chloropicrin concentrations are greater than or equal to 0.15 ppm, or (2) any handler experiences sensory irritation, then an air-purifying respirator must be worn by all handlers at the handling site.
- If two consecutive breathing zone samples taken at least 30 minutes apart, show levels have decreased to less than 0.15 ppm for chloropicrin, then handlers may remove the respirators.
- If at any time: (1) a handler experiences any sensory irritation when wearing a respirator, or (2) any air sample is greater than or equal to 1.5 ppm for chloropicrin, then all handler activities must cease and handlers must be removed from the application block and surrounding buffer zone until corrective action has been taken.
- During the corrective actions if chloropicrin air concentrations are greater than or equal to 1.5 ppm, a SCBA must be worn.
- In order to resume work activities:
    - Two consecutive air samples for chloropicrin taken at the handling site at least 30 minutes apart must be less than 1.5 ppm for chloropicrin.
    - During the collection of air samples an air purifying respirator must be worn by the handler taking air samples.
    - If chloropicrin concentrations are greater than or equal to 0.15 ppm, then handlers resuming their handler activities must wear air-purifying respirator.

There are several commercial systems for monitoring chloropicrin air concentrations. Chloropicrin colorimetric tubes are available from varied manufacturers including: Matheson/Kitagawa, Sensidyne, and Draeger. The devices used to meet the monitoring requirements in this decision must have sensitivity of at least 0.15 ppm for chloropicrin.

- Respirator cartridges used with air-purifying respirators

Currently, there are no air-purifying respirator cartridges certified by the Mine Safety and Health Administration-National Institute for Occupational Safety and Health (MSHA-NIOSH) for protection against chloropicrin. NIOSH/OSHA does recommend respirators with organic vapor cartridges for chloropicrin use. The EPA is requiring half-face respirators with organic-

[20] http://www.cdc.gov/Niosh/idlh/76062.html

cartridges be used when a respirator is necessary. The EPA assumes that half-face respirators have a protection factor of 10, therefore the respiratory protection will only be protective up to chloropicrin concentrations of 1.5 ppm, and if measured concentrations exceed 1.5 ppm work operations must cease. A self-contained breathing apparatus (SCBA) has a protection factor of 1,000, but must only be used for brief durations to take actions to reduce air concentration levels or in case of an emergency. As a result the new IDLH of 2 ppm will not be a trigger to put on SCBA. Respirator APR-cartridge combinations from other manufacturers will also be considered by the Agency, provided written certification of their efficiency against chloropicrin is provided.

- Tarp Repair

An air purifying respirator must be worn by handlers performing tarp repair operations before the entry prohibitions have ended. The Agency is requiring respiratory protection during tarp repair since the duration of the activity is likely to be short and because chloropicrin concentrations are unknown, but could be high, especially if the tarp repair occurs shortly after the fumigation is completed.

- Respirator fit testing, medical qualification, and training

The respirator protection factors described above are based on the following assumptions: 1) the respirator is fit-tested, 2) proper respirator training occurs, and 3) an annual medical evaluation and clearance is done. Without these requirements, it is unclear whether the reduction in inhalation exposure that is assumed by the protection factor will be achieved. In order to ensure that the respiratory protection EPA is assuming is being achieved in the field, respiratory requirements will include fit testing, respirator training, and annual medical evaluation. The following language must be added to product labels:

"Employers must also ensure that all handlers are:

- Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29CFR Part 1910.134)
- Trained using a program that confirms to OSHA's requirements (see 29CFR Part 1910.134)
- Examined by a qualified medical practitioner to ensure physical ability to safely wear the style of respirator to be worn. A qualified medical practitioner is a physician or other licensed health care professional (PLHCP) who will evaluate the ability of a worker to wear a respirator. The initial evaluation consists of a questionnaire that asks about medical conditions (such as a heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. It does not need to be repeated unless the health status or respirator use conditions change."

- Respirator availability

The handler employer must confirm and document in the FMP that the following are immediately available:

- at least one air rescue device (e.g., SCBA) on-site in case of an emergency, and

- air-purifying respirators and cartridges for each handler.

d. Tarp Perforation and Removal

The Agency's risk assessment indicates that there is a risk concern for handlers during the perforation (cutting, poking, punching, or slicing) and removal of tarps, particularly when high barrier tarps are used. In addition to respiratory protection requirements described in the *Respiratory Requirements* section on page 53, the Agency is requiring the following to mitigate risks from inhalation exposure:

- Tarps cannot be perforated until a minimum of 5 days (120 hours) have elapsed after the fumigant injection into the soil is complete (e.g., after shank injection of the fumigant product and tarps (if used) have been laid or after drip lines have been purged and tarps have been laid, unless an adverse weather condition exists for broadcast applications).
- If tarps will be removed after perforation, tarp removal cannot begin until at least 24 hours after tarp perforation is complete.
- If tarps will not be removed after perforation, planting or transplanting cannot begin until at least 48 hours after tarp perforation is complete.
- If tarps are left intact for at least 14 days after fumigation injection into the soil is complete, planting or transplanting may occur while the tarps are being perforated.
- Adverse Weather Conditions Exemption for Broadcast Applications Only, see Figure 8: Tarps may be removed before the required 5 days (120 hours) if adverse conditions will compromise the integrity of the tarp, provided that:
    - At least 48 hours have passed after the fumigant injection is complete,
    - The buffer zone period is extended until 24 hours after tarp removal is complete, and
    - Subsequent fumigations of untreated areas within the application block do not occur for at least 24 hours after tarp removal is complete.
- To reduce exposure to handlers perforating tarps
    - Tarps used for fumigations must be perforated only by mechanical methods.
    - Perforation by hand or with hand-held tools is prohibited.
- Each tarp panel used for broadcast fumigations must be perforated using a lengthwise cut. This measure is to reduce the likelihood of the tarp blowing away prior to tarp removal.

e. Entry Prohibitions

Most of the current chloropicrin labels allow reentry to the treated field by workers 48 hours after application. When chloropicrin is used in combination with 1,3-D the labels permit worker reentry into the treated field 5 days after application. The risk assessment indicates that risks exceed EPA's LOC for workers entering fields after 48 hours. However, the risk assessment indicates that extending this period decreases this risk. In addition, stakeholder comments indicate that non-handler entry to perform post-application (i.e., non-handler) tasks is generally not needed for at least 10 to 14 days following the completion of the application.

Due to the volatile nature of chloropicrin and the potential for worker exposure, the Agency is prohibiting entry into the treated area by anyone other than a protected handler. The

prohibition differs from a Restricted Entry Interval (REI), that are currently required for most conventional pesticides, which contains exceptions for workers doing certain tasks before the REI has expired (e.g., scouting). Workers permitted entry under the REI are prohibited for soil fumigants.

EPA believes that risks will not exceed the Agency's LOC provided entry (including early entry that would otherwise be permitted under the WPS) by any person – other than a correctly trained and PPE-equipped handler who is performing a handling task – is prohibited from the start of the application until:

- 5 days (120 hours) after application has ended for untarped applications, or
- After tarps are perforated and removed if tarp removal is completed less than 14 days after application, or
- 48 hours after tarps are perforated if they will not be removed prior to planting, or
- 5 days (120 hours) after application is complete if tarps are not perforated and removed 14 days after the application is complete.

Figures 4, 5, 6, 7, and 8 provide illustrations of tarp perforation/removal and entry prohibition mitigation required for various chloropicrin applications. The intervals depicted are the minimum that must be followed.

Figure 4. Untarp Bed or Broadcast Applications

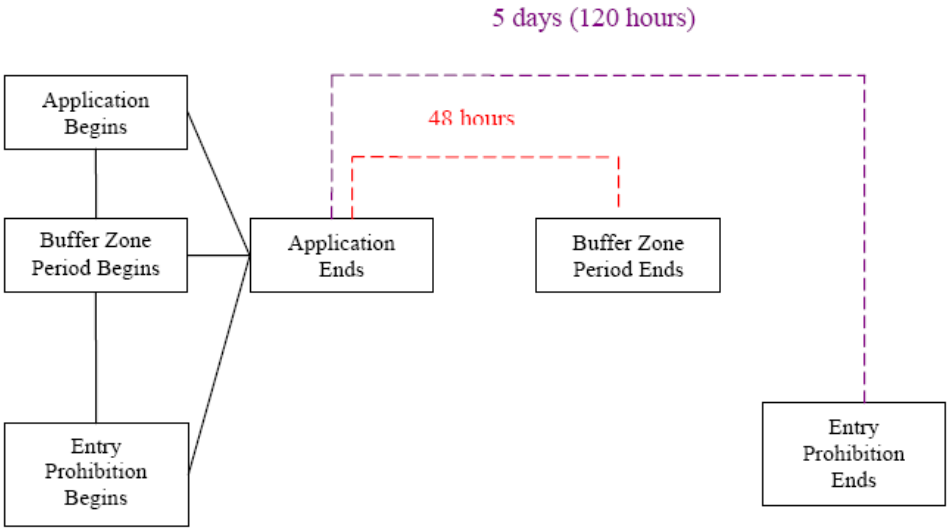


Figure 5. Tarps Removed Before Planting

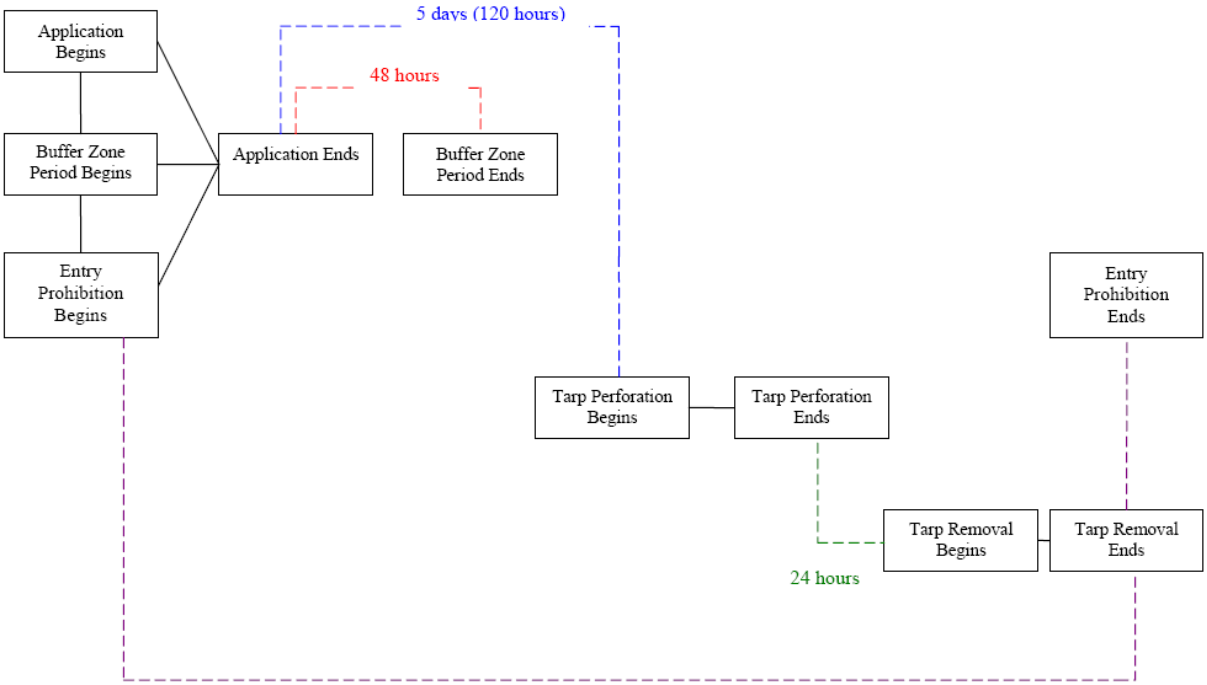


Figure 6. Tarps NOT Removed Before Planting

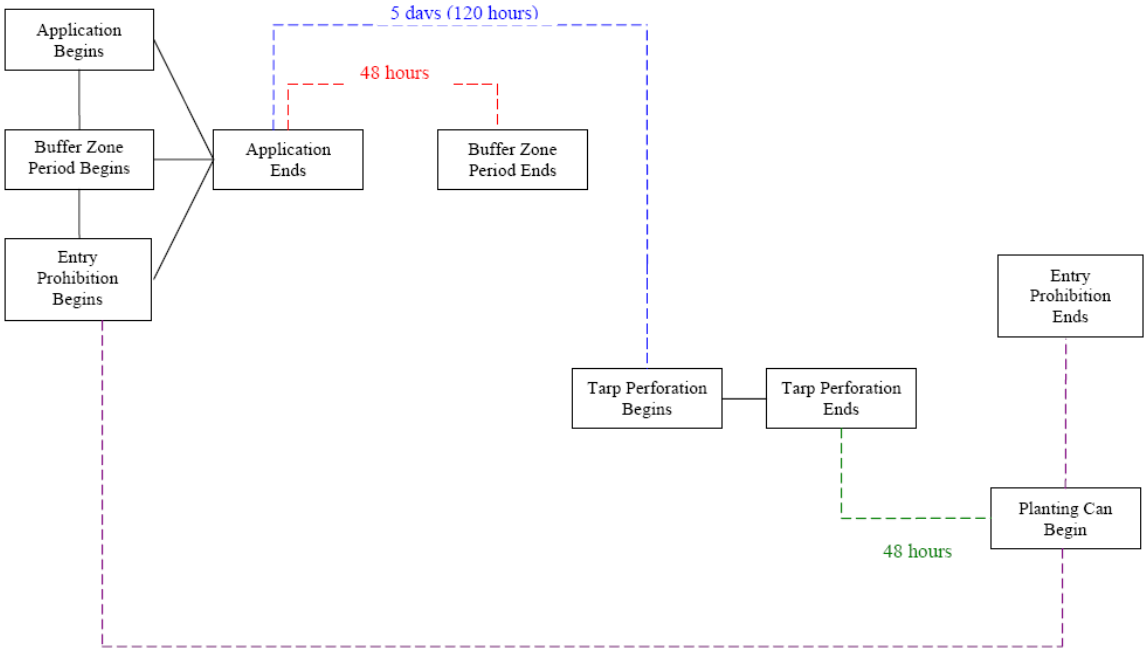


Figure 7. Tarps NOT Removed Before Planting and NOT Perforated Until 14 days after the application

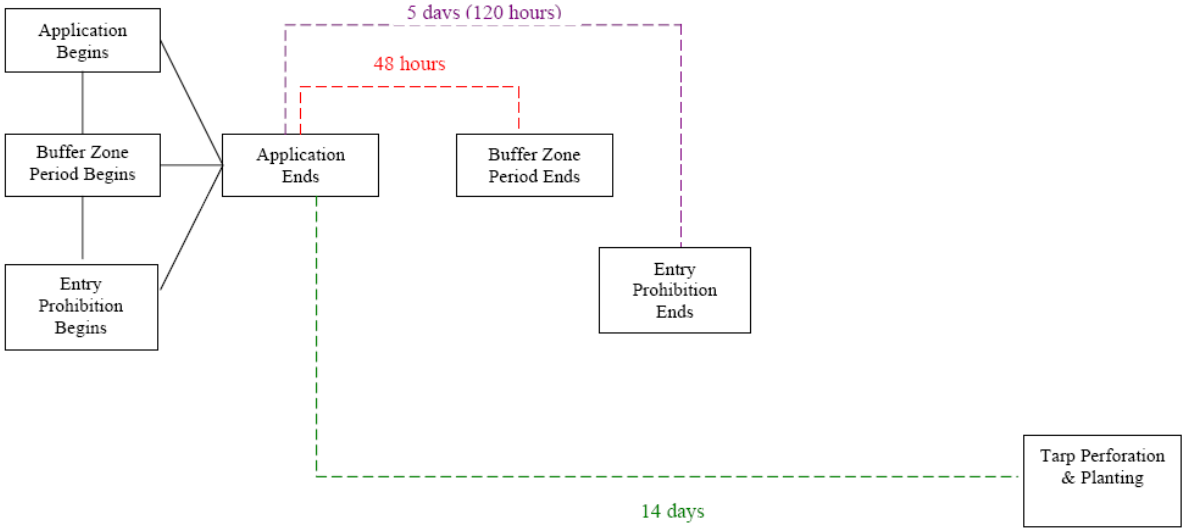
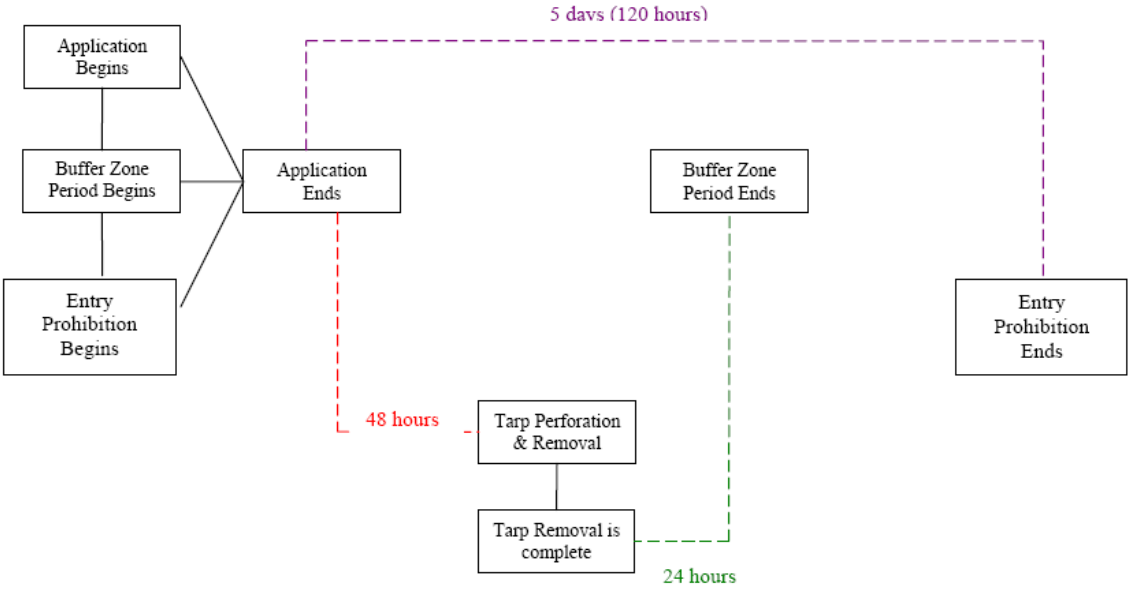


Figure 8. Adverse Weather Condition Exemption (Broadcast applications only)



ii. Other Mitigation

Below are requirements for mandatory GAPs, FMPs, emergency preparedness and response, and training and outreach that the Agency concludes are needed to mitigate risks and the likelihood of incidents caused by human error, equipment failure, and weather events such as temperature inversions.

1. Good Agricultural Practices (GAPs)

Since the application methods and work practices of the handlers have direct impact on the amount of fumigant applied and emitted, the Agency believes that labeling should describe proven practices that will reduce risks to handlers, bystanders, and the environment. Registrants, applicators, growers, and other stakeholders have consistently reported to the Agency that GAPs are the best mitigation measure to reduce the amount of fumigants applied and emitted.

The following GAPs must be followed during all fumigant applications. The registrants have the option to develop additional optional GAPs to be listed on product labels. All measurements and other documentation planned to ensure that the mandatory GAPs are achieved must be recorded in the FMP and/or the post-application summary report.

Tarps (when tarps are used in chloropicrin applications)

- A written tarp plan must be developed that includes:
  - schedule and procedures for checking tarps for damage, tears, and other problems
  - plans for determining when and how repairs to tarps will be made, and by whom
  - minimum time following injection that tarp will be repaired
  - minimum size of tarp damage that will be repaired
  - other factors used to determine when tarp repair will be conducted:
    - schedule, equipment, and methods used to perforate tarps
    - aeration plans and procedures following perforation of tarp, but prior to tarp removal or planting/transplanting
    - schedule, equipment, and procedures for tarp removal

The written tarp plan must be included in the site specific FMP as described in the *FMP* section on page 65.

Weather Conditions

- Prior to fumigation the weather forecast for the day of the application and the 48-hour period following the fumigant application must be checked.
- Do not apply fumigant if ground-level winds are less than 2 mph.
- Applications must not occur during a temperature inversion or when temperature inversions are forecasted to persist for more than 6 consecutive hours for the 36-hour period after application.
  - Visual features that could indicate an inversion is occurring are misty conditions during day or night, and clear night skies.

- Detailed local forecasts for sky conditions, weather conditions, wind speed, and forecasted temperature inversions may be obtained on-line at http://www.nws.noaa.gov.
- For further guidance, contact the local National Weather Service Forecasting Office.

Soil Temperature

- The maximum soil temperature at the depth of injection shall not exceed 90 degrees F at the beginning of the application.
  - If air temperatures have been above 100 degrees F for more than three hours in any of the three days prior to application, then soil temperature shall be measured and recorded in the FMP.

Soil Moisture

- The soil must be moist two to six inches below the surface. The amount of moisture needed in this zone will vary according to soil type and shall be determined using standard feel testing methods (see below). Surface soil generally dries rapidly and must not be considered in this determination.
- If there is insufficient moisture two to six inches below the surface, the soil moisture must be adjusted. If irrigation is not available and there is adequate soil moisture below six inches, soil moisture can be brought to the surface by discing or plowing before injection. To conserve existing soil moisture, pretreatment or treatment tillage should be done as close to the time of application as possible.

Soil Moisture Determination

- The soil shall contain at the time of application enough moisture two to six inches below the surface to meet the following criteria as appropriate for the soil texture.
- For **fine textured soils** (clay loam, silty clay loam, sandy clay, silty clay, sandy clay loam and clay) there must be enough moisture so that the soil is pliable, not crumbly, but does not form a ribbon when squeezed between the thumb and forefinger.
- For **coarse soils** (sand and loamy sand) there must be enough moisture to allow formation of a weak ball when compressed in the hand. Due to soil texture, this ball is easily broken with little disturbance.
- For **medium textured soils** (coarse sandy loam, sandy loam, and fine sandy loam) there must be enough moisture to allow formation of a ball which holds together with moderate disturbance, but does not stick between the thumb and forefinger.
- For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. Whenever possible, the field should be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, local extension service or soil conservation service specialist or pest control advisor (ag consultant) should be consulted for assistance.

Soil Preparation

- Soil shall be properly prepared and at the surface generally be free of clods that are golf ball size or larger. The area to be fumigated shall be tilled to a depth of 5 to 8 inches.
- Field trash must be properly managed. Residue from a previous crop must be worked into the soil to allow for decomposition prior to fumigation. Little or no crop residue shall be present on the soil surface. Crop residue that is present must not interfere with the soil seal.

Soil Sealing

- *For Broadcast Untarped Applications:* Use a disc or similar equipment to uniformly mix the soil to at least a depth of 3 to 4 inches to eliminate the chisel or plow traces. Following elimination of the chisel trace, the soil surface must be compacted with a cultipacker, ring roller, and roller in combination with tillage equipment.
- *For Bedded Applications*: Performed beds shall be sealed by disruption of the chisel trace using press sealers, bed shapers, cultipackers, or by re-shaping (relisting, lifting and replacing, etc.) the beds immediately following injection. Beds formed at the time of application shall be sealed by disrupting the chisel trace using press sealers, or bed shapers.
- *Soil Sealing for Tarped Applications*: The use of a tarp does not eliminate the need to minimize chisel traces prior to application of the tarp, such as by using a nobel plow or other injection shank that disrupts the chisel traces.

Chloropicrin Bedded and Broadcast Shank Applications: Additional GAPs

In addition to the GAPs required for all chloropicrin soil fumigation applications, the following GAPs apply for injection applications:

Tarps (when tarps are used in chloropicrin applications)

- Tarps must be installed immediately after the fumigant is applied to the soil.

Soil Preparation

- Trash pulled by the shanks to the ends of the field must be covered with tarp, or soil, depending on the application method before making the turn for the next pass.

Application Depth

- *For Tarped-Broadcast and Tarped-Bedded Applications:* The injection point shall be a minimum of 8 inches from the nearest final soil/air interface.
- *For Untarped-Bedded Applications*: The injection point shall be a minimum of 12 inches from the nearest final soil/air interface.
- *For Untarped-Broadcast Applications*: The injection point shall be a minimum of 10 inches from the nearest final soil/air interface.

Prevention of End Row Spillage

- Do not apply or allow fumigant to drain onto the soil surface. For each injection line either have a check valve located as close as possible to the final injection point, or drain/purge the line of any remaining fumigant prior to lifting injection shanks from the ground.
- Do not lift injection shanks from the soil until the shut-off valve has been closed and the fumigant has been depressurized (passively drained) or purged (actively forced out via air compressor) from the system.

Calibration, Set-up, Repair, and Maintenance for Application Rigs

- Brass, carbon steel or stainless steel fittings must be used throughout. Polyethylene tubing, polypropylene tubing, Teflon® tubing or Teflon® -lined steel braided tubing must be used for all low pressure lines, drain lines, and compressed gas or air pressure lines. All other tubing must be Teflon® -lined steel braided.
- Galvanized, PVC, nylon or aluminum pipe fittings must not be used.
- All rigs must include a filter to remove any particulates from the fumigant, and a check valve to prevent backflow of the fumigant into the pressurizing cylinder or the compressed air system.
- Rigs must include a flowmeter or a constant pressure system with orifice plates to insure the proper amount of fumigant is applied.
- To prevent the backflow of fumigant into the compressed gas cylinder (e.g. nitrogen, other inert gas or compressed air), if used, applicators must:
    - Ensure that positive pressure is maintained in the cylinder at not less than 200 psi during the entire time it is connected to the application rig, if a compressed gas cylinder is used. (*This is not required for a compressed air system that is part of the application rig because if the compressor system fails the application rig will not be operable*).
    - Ensure that application rigs are equipped with properly functioning check valves between the compressed gas cylinder or compressed air system and the fumigant cylinder. The check valve is best placed on the outlet side of the pressure regulator, and is oriented to only allow compressed gas to flow out of the cylinder or compressed air out of the compressed air system.
    - Always pressurize the system with compressed gas or by use of a compressed air system before opening the fumigant cylinder valve.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator must check the following items carefully:
    - Check the filter, and clean or replace the filter element as required.
    - Check all tubes and chisels to make sure they are free of debris and obstructions.
    - Check and clean the orifice plates and screen checks, if installed.
    - Pressurize the system with compressed gas or compressed air, and check all fittings, valves, and connections for leaks using soap solution.
- Install the fumigant cylinder, and connect and secure all tubing. Slowly open the compressed gas or compressed air valve, and increase the pressure to the desired level. Slowly open the fumigant cylinder valve, always watching for leaks.
- When the application is complete, close the fumigant cylinder valve and blow residual fumigant out of the fumigant lines into the soil using compressed gas or compressed air. At the end of the application, disconnect all fumigant cylinders from the application rig. At the end of the season, seal all tubing openings with tape to prevent the entry of insects and dirt.

Application equipment must be calibrated and all control systems must be working properly. Proper calibration is essential for application equipment to deliver the correct amount of fumigant uniformly to the soil. Refer to the manufacturer's instructions on how to calibrate your

equipment, usually the equipment manufacturer, fumigant dealer, or Cooperative Extension Service can provide assistance.

Chloropicrin Drip Applications: Additional GAPs

In addition to the GAPs required for all chloropicrin soil fumigation applications, the following GAPs apply for drip applications:

Soil Preparation

- Till fields with known plowpans because they can lead to puddling of the fumigant due to inadequate soil drainage.

Product and Dosage

- Plan the application by calculating the amount of fumigant required at the appropriate rate for the crop, acreage and target pest. Fumigant must be metered into the water supply line and then passed through a mixing device, such as a centrifugal pump or static mixer, to assure proper agitation.

System Controls and Integrity

- The irrigation system (main lines, headers, drip tape) must be thoroughly checked for leaks before the start of application. Leak detection requires that the irrigation system be at full operating pressure. The amount of time needed at full operating pressure will vary by irrigation system design. Look for puddling along major pipes (holes in pipes or leaky joints), at the top and ends of rows (leaky connection, open drip tape), and on the bed surface (damaged drip tape, malfunctioning emitters). Any leaks discovered during the pre-application check must be repaired prior to fumigant application.
- To inject fumigant, use a metering system (such as a positive pressure system, positive displacement injection pump, diaphragm pump, or a Venturi system) effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls. Do not use containers pumps or other equipment made of aluminum, magnesium or their alloys as chloropicrin can be corrosive to such metals.
- The system must contain:
    - A functional check valve and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination and backflow;
    - A functional, automatic, quick-closing check valve to prevent the flow of fluids back toward the fumigant container;
    - A functional, normally closed valve located on the intake side of the injection point and connected to the system interlock to prevent the fumigant from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down;
    - Functional interlocking controls to automatically shut off the fumigant injection when the irrigation water flow stops or decreases to the point where fumigant distribution is adversely affected.

Site of Injection and Irrigation System Layout

- Site of injection must be as close as practical to the area being treated (such as direct injection of fumigant into the header pipe/manifold or into an aboveground delivery pipe attached to the header). If the fumigant is injected into a main line, make sure the irrigation pipe is able to be cleared of all fumigant as the fumigant may pool in low sections of the pipe. Also make sure that valves on lateral lines of the main line are closed, if these lateral lines lead to areas not being fumigation at the time of the application.

System Flush

- After application of the fumigant, continue to drip-irrigate the area with water to flush the irrigation system. Do not allow the fumigant to remain in the irrigation system after the application is complete. The total volume of water, including the amount used for flushing the irrigation system, must be adequate to completely remove the fumigant from the lines, but should be less than the amount that could over-saturate the beds (bed collapse can occur from over-saturation). If common lines are used for both the fumigant application and water seal (if a water seal is applied) these lines must be adequately flushed before starting the water seal and/or normal irrigation practices.

Soil Sealing

- Tarps must be put in place before the fumigation begins.
- Tarps must be used for drip applications.
    - Based on the Agency's review of the recently submitted data for untarped drip applications, this GAP may change.
- Tarp edges must be buried along the furrow and at the ends of rows.

<u>Chloropicrin Tree Replant Application: GAPs</u>

This application method is used when chloropicrin is applied to individual tree sites in an existing orchard where shank or drip application are not possible.

In addition to the GAPs required for all chloropicrin soil fumigation applications, the following GAPs apply for chloropicrin tree replant applications:

Site Preparation

- Each individual tree-site must remove the tree stump and primary root system with a back-hoe or other similar equipment, for example an auger.
- The hole must be backfilled with soil before application.

Application Depth

- The fumigant must be injected at least 18 inches into the soil.

System Flush

- Before removing the application wand from the soil the wand must be cleared using nitrogen or compressed air.

Soil Sealing

- After the wand is cleared and removed from the soil, the injection hole must be either covered with soil and tamp or the soil must be compacted over the injection hole.

2. Fumigant Management Plans (FMPs)

The Agency is requiring FMPs to be completed before a fumigant application occurs. FMPs will reduce risks by requiring that applicators develop a series of performance criteria for their given application situation. These criteria are intended to minimize risks according to the Agency's guidance provided below. Applicators must then review those criteria before a fumigation occurs. The FMPs will also require that applicators verify compliance with the criteria after application events are completed. In cases where errors may have occurred, a post-application summary may also prevent similar problems from occurring during future applications. As an additional benefit, the Agency believes FMPs will ensure that directions on the product labels have been followed and that the conditions for the fumigation are documented.

FMPs should aide in the proper response of the applicator or others involved in the application should an incident occur. A proper and prompt response will reduce the potential risk to bystanders from potential high exposure situations (e.g., readily available first responder contact information could reduce response times to impacted bystanders and carefully thought out emergency response plans can help ensure appropriate actions are taken in case of unforeseen events).

There is information from various sources that health and safety plans, FMPs in this context, typically reduce workplace injuries and accidents by prescribing a series of operational requirements and criteria. In fact, these plans are widely implemented in a variety of industries and are recommended as standard approaches for occupational health and safety management by groups such as American Industrial Hygiene Association[21] (i.e., through "Administrative" and "Workplace" controls). The Centers for Disease Control provides guidance for developing health and safety plans in agricultural settings.[22] The effectiveness of similar plans has also been evaluated in the literature. Examples include "lookback" reviews conducted by the Occupational Safety and Health Administration (OSHA) which essentially implemented standards in various industries then reviewed their effectiveness in this process as they are required to determine whether the standards should be maintained without change, rescinded or modified. OSHA is required by Section 610 of the Regulatory Flexibility Act (5 U.S.C. 610) and Executive Order 12866 to conduct the lookback reviews. These reviews are conducted to make the final standards more effective or less burdensome in achieving their objectives, to bring them into better alignment with the objectives of Executive Order 12866, and to make them consistent with the objectives of the Regulatory Flexibility Act. Two examples of "lookback" reviews that support

[21] Ignacio and Bullock (2006) A Strategy For Assessing and Managing Occupational Exposures (Third Edition), American Industrial Hygiene Association, AIHA Press 2700 Prosperity Avenue, Suite 250 Fairfax VA 22031 (ISBN 1-931504-69-5)

[22] Karsky (2002) Developing a Safety and Health Program to Reduce Injuries and Accident Losses, Centers For Disease Control National Ag Safety Database, available at http://www.cdc.gov/nasd/docs/d001501-d001600/d001571/d001571.html

the use of FMPs for soil fumigant health and safety management include: ethylene oxide use as a fumigant/sterilant, and grain handling facilities requirements.[23]

According to stakeholder comments, most of the information required for the site-specific FMP is already being documented by users. Most industry stakeholders support mandatory FMPs provided they are not too restrictive and do not result in an excessive administrative burden.

Each site-specific FMP must contain the following elements:

- General site information
  - Site address or description of location
  - Site operator/owner's name, address, and, phone number
  - Map, aerial photo, or detailed sketch showing field location, dimensions, buffer zones, property lines, public roads, bus stops, water bodies, wells, rights-of-ways inside buffers, nearby application blocks, surrounding structures (occupied and non-occupied), locations of posted signs for buffers, and sites requiring ¼ mile buffer zones (e.g., prisons, schools, hospitals, state licensed day care centers) with distances from the application site labeled
- Applicator information (license number, address, phone number, contact information for person supervising the fumigation with location and date for completing the registrant's chloropicrin training program)
- Authorized on-site personnel (Names of all handlers and the tasks they are authorized and trained to perform)
- Application procedures
  - Fumigation window (target application date, earliest and latest possible date of fumigation)
  - Product information (brand name, registration number)
  - Type of fumigation (e.g., shank, broadcast, drip, raised bed, strip, etc.)
  - Target application rate and application block size
- Good Agricultural Practices (GAPs)
  - Description of applicable mandatory GAPs (registrants may also include optional GAPs)
  - Measurements and other documentation planned to ensure GAPs are achieved (e.g. measurement of soil and other site conditions, tarp repair/perforation/removal plans, etc.)
- Buffer zones
  - Calculations and rationale for buffer zones distances (e.g. specify table from label that distances are based on, rate and block size, applicable credits applied)
  - Start and stop times for buffer zones
- Respirators and other personal protective equipment (PPE) for handlers (respirator type, respirator cartridge, and other PPE selection; verification that respirator training/fit-testing/medical exams is current; and maintenance/storage procedures)

[23] United States Department of Labor, Occupational Safety and Health Administration (2008) Lookback Reviews available at http://www.osha.gov/dea/lookback.html

- Air monitoring
    - Type of samples that will be collected (e.g., occupational, in occupied structures, outside buffer zone area if site monitoring is conducted, etc.)
    - When and where samples will be collected
    - Duration of samples
    - Sampling methods and equipment
    - Name, address, and, phone number of person taking samples
- Posting (names of persons who will post signs, location of posting signs, procedures for posting and sign removal)
- Site-specific response and management
    - Fumigant site monitoring
        - Description of who, when, where, and procedures for monitoring buffer zone perimeter
    - Response information for neighbors
        - List of residences and businesses informed (neighboring property owners)
        - Method of sharing information
- State and tribal lead agency notification
    - Include the information that is sent to the lead agency
- Plan describing how communication will take place between applicator, land owner/operator, and other on-site handlers (tarp cutters/removers, irrigators, etc.)
- Record keeping procedures
- Emergency procedures (evacuation routes, locations of telephones, contact information for first responders, local/state/federal contacts, key personnel and emergency procedures/responsibilities in case of an incident, equipment/tarp/seal failure, odor complaints or elevated air concentration levels outside buffer zone suggesting potential problems, or other emergencies).
- Hazard communication (product labels, material safety data sheets, etc.)

For situations where an initial FMP is developed and certain elements do not change for multiple fumigation sites (e.g. applicator information, authorized on-site personnel, record keeping procedures, emergency procedures, etc.) only elements that have changed need to be updated in the site-specific FMP provided the following:

- The certified applicator supervising the application has verified that those elements are current and applicable to the application block before it is fumigated and has documented the verification in the site-specific FMP.
- Recordkeeping requirements are followed for the entire FMP (including elements that do not change).

Once the application begins, the certified applicator and owner/operator of the application block must provide a copy of the FMP to handlers who are involved in the fumigation, workers in adjacent areas to the application block, and federal/state/local enforcement personnel, upon request.

Within 30 days of completing the application portion of the fumigation process, the certified applicator supervising the application must complete a post fumigation application summary that describes any deviations from FMP that have occurred, measurements taken to comply with GAPs as well as any complaints and/or incidents that have been reported to him/her. The summary must include the actual date of the application, application rate, and size of application block fumigated.

In addition to recordkeeping requirements from 7 CFR part 110 "Recordkeeping Requirements for Certified Applicators of Federally Restricted Use Pesticides," this decision requires that both the applicator and owner/operator of the application block must keep a signed copy of the site-specific FMPs and the post-application summary record for 2 years from the date of application.

Applicators and other stakeholders have the flexibility to prepare FMPs templates or use software with certain elements listed above in check-list and/or fill in the blank format. Below are examples of other FMP templates available on the internet for structural fumigations that may be useful to users when developing FMPs for chloropicrin soil applications:

- http://www.cardinalproproducts.com/Misc/FMP%20Version%203.pdf
- http://www.pestcon.com/techlibrary/fum_mgmt_plan.doc
- http://www.agr.state.ne.us/division/bpi/pes/fumigation_plan.pdf
- http://www.agr.state.ne.us/division/bpi/pes/fumigation_plan2.pdf
- http://nmdaweb.nmsu.edu/pesticides/Management%20Plans%20Required%20for%20Fumigations.html

3. Emergency Preparedness and Response

EPA believes measures for ensuring preparedness for situations when accidents or emergencies occur are an important part of the suite of measures necessary to address risks posed by fumigants. Therefore, EPA is requiring such measures at the community level in the form of education for first responders, and information for specific sites to ensure early detection and quick response to situations as they arise.

Although EPA believes buffers and other mitigation will prevent many future incidents, it is likely that some incidents will still occur due to accidents, errors, and/or unforeseen weather conditions. Early detection and appropriate response to accidental chemical releases is an effective means of reducing risk, as well as addressing the source of the release. Reducing risks associated with incidents that may occur in the future is a key part of EPA's soil fumigant decisions. By combining buffers with GAPs, FMPs, and effective emergency response, EPA is able to reach a "no unreasonable adverse effects" finding under FIFRA.

To ensure that appropriate response mechanisms are in place in the event of a fumigant exposure incident, EPA is requiring that registrants provide training and information, in the context of their community outreach and education programs (see the *Community Outreach and Education Programs* section on page 78), to first responders in high-fumigant use areas and areas with significant interface between communities and fumigated fields. In addition,

applicators must provide on-site monitoring of buffer zone perimeters in areas where residences and other occupied structures are present. As an alternative to on-site monitoring, applicators may provide emergency response information directly to neighbors. Each element is discussed in more detail below.

a. First Responder Education

EPA is requiring registrants through their community outreach and education programs see *Community Outreach and Education Programs* section on page 78, to ensure that emergency responders have the training and information that they need to effectively identify and respond to fumigant exposure incidents. EPA believes this will help ensure, in the case of a fumigant accident or incident that first responders recognize the exposure as fumigant related and respond appropriately. The information/training to be provided to first responders will include: how to recognize the early signs and symptoms of fumigant exposure, how to treat fumigant exposures, how fumigant exposure differs from other pesticide exposure, plus the material safety data sheet(s) (MSDS) for the fumigant(s) applied.

The Agency is interested in comments from state and/or local officials about the extent to which first responders are currently receiving information on soil fumigants, for example can they recognize fumigant exposures, and are they aware of the appropriate steps to take to mitigate the exposures and address the source of the exposure. In California, for example, where soil fumigation is common in many areas, the state administers training and education for first responders to help raise awareness and improve skills in responding to incidents. If registrants can document that effective state programs are already in place, additional training may not be required. However, registrants must work with state and local emergency response coordinators to identify needs and opportunities to supplement any information already included in state and local training for first responders about soil fumigants specifically.

b. Site-Specific Response and Management

i. Fumigation Site Monitoring

EPA has determined that monitoring of the buffer zone perimeter would be an effective approach to protect bystanders. Under this approach, if measured concentrations anywhere along the buffer perimeter reach a level of concern specified on product labels, or if the person monitoring the air concentrations experiences eye irritation, an early sign of exposure to concentrations that exceed the Agency's LOC, then the emergency response plan stated in the FMP (see *FMP* section on page 65) must be implemented. If other problems occur, such as a tarp coming loose, then the appropriate control plan must be activated. Because data indicate that peak concentrations sometimes occur on the second day following applications, EPA decided that this monitoring must be done for the full buffer zone period to ensure concentrations do not exceed the action level which will be specified on product labels.

Specific requirements include:

- Monitoring must take place from the beginning of the fumigant application until the buffer zone period expires.

- Monitoring must be conducted by a certified applicator or someone under his/her supervision.
- Monitoring of air concentration levels of the fumigant must take place in the area between the buffer zone and the residences or other occupied areas.
- The person monitoring the air concentration levels must take readings starting approximately 30 minutes from the start of application and at least once each hour during the entire application and buffer zone period.
- A direct reading detection device, such as a Draeger device, with a sensitivity of at least 0.15 ppm for chloropicrin must be used to monitor the air concentration levels of chloropicrin.
- If at any time (1) chloropicrin concentrations are greater than or equal to 0.15 ppm OR (2) the person monitoring the air concentrations experiences sensory irritation, then the emergency response plan stated in the FMP must be immediately implemented by the person monitoring the air concentrations.
- If other problems occur, such as a tarp coming loose, then the appropriate control plan must be activated.
- The results of the air concentration monitoring must be recorded in the FMP.

EPA is interested in comments from fumigant users, researchers, and equipment manufacturers about the extent to which mechanical devices are available or are under development that can both monitor air concentrations and also notify the person responsible for the fumigation when air concentrations approach levels of concern. Such devices are routinely used to monitor environmental conditions in laboratories, and could represent an effective alternative to posting a person on site. EPA also requests input from stakeholders who have experience conducting air monitoring and use of devices on whether more effective, efficient, or practical alternative approaches exist. For example, with specific application methods, fumigants, and/or regional weather conditions, what frequency and duration of sampling would be equally as effective as what is specified in the mitigation?

While protective, this site monitoring might be burdensome for users fumigating in areas with few or no people. Therefore, EPA is allowing users the alternative option of providing emergency response information directly to neighbors.

ii. Response Information for Neighbors

As an alternative to on-site monitoring, the certified applicator supervising the fumigation (or someone under his/her direct supervision) would need to ensure that residences and businesses that meet the criteria outlined below have been provided the information below at least 48 hours prior to fumigant application in a specified field. If after 2 weeks, the fumigation has not yet taken place, the information must be delivered again.

- Information that must be provided includes:
    - Location of the application block
    - Name of fumigant products(s) applied including EPA Registration number
    - Applicator and property owner/operator contact information

- Location of buffer zones
- Time period in which the fumigation is planned to take place and the duration of buffer zone period
- Early signs and symptoms of exposure to the fumigant(s) applied, what to do, and who to call if you believe you are being exposed (911 in most cases).

The method for distributing information to neighbors must be described in the FMP and may be accomplished through mail, telephone, door hangers, or through other methods that can be reasonably expected to effectively inform residences and businesses within the required distance from the edge of the buffer zone.

Who Needs to be Informed?:

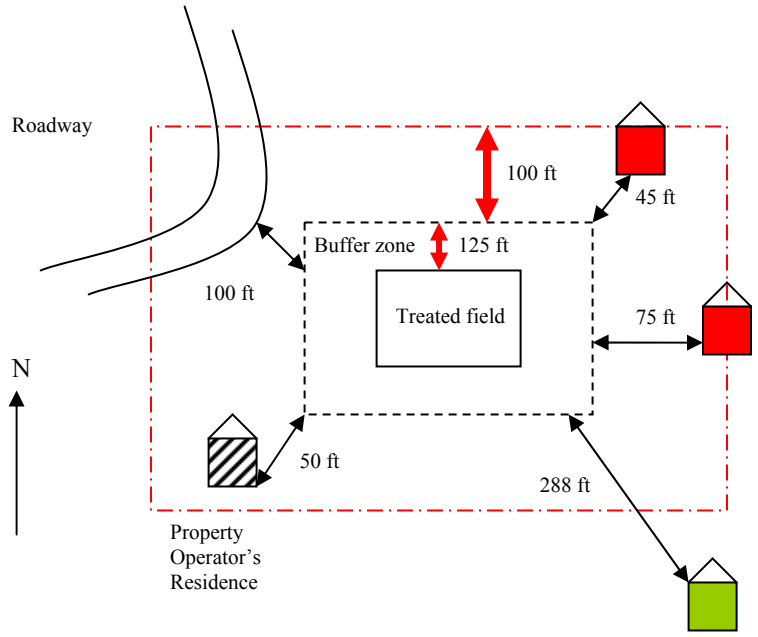
If the buffer zone is less than or equal to:	**People within this distance from the edge of the buffer zone must be informed:**
Buffer ≤ 100 feet	50 feet
100 feet < Buffer ≤ 200 feet	100 feet
200 feet < Buffer ≤ 300 feet	200 feet
Buffer > 300 feet	300 feet

To clarify this option, the following example is provided:

- IF the buffer zone is **125 feet**, people within 100 feet of the buffer zone must be provided emergency response information. So the **red** houses would need to be informed, **but** the **green** house would not.

- This requirement does not impact the roadway or the property operator's residence (striped).

Figure 9. Example Site Map for Informing Neighbors



If there are no residences or other occupied structures within 300 feet of the edge of the buffer zone, no site monitoring or advising of neighbors will be required.

c. Emergency Preparedness and Response Considerations

EPA received comments from many stakeholders about the Agency's Phase 5 proposal for notification. Users have commented that notification is burdensome and that it is unnecessary if buffer zones are also required. However, community groups have commented on the importance of bystanders being informed when fumigations are occurring, since this group of pesticides, compared to other pesticides, has a greater potential to move off site and affect people not involved in the application. State regulators have different views on this requirement. Some support the sharing of information with neighbors, and some states have notification requirements for fumigations with certain products or for certain application methods. In addition, some states require notification to chemically sensitive individuals in proximity to pesticide applications. Others also had concerns about the enforceability of this type of measure and the possible burden on the states to enforce a notification requirement.

California currently requires notification of persons within 300 feet of a methyl bromide buffer zone. California strawberry growers consider the 300 foot notification area for methyl bromide applications to be an extension of the buffer zone. In areas where a large number of people would need to be notified about a planned methyl bromide application, strawberry growers state that they would rather not use methyl bromide because some communities could mobilize to prevent the fumigation from taking place. Some stakeholders also commented that it would be protective and less burdensome if EPA required the user to monitor fumigant air concentrations at the edge of the buffer for 24 hours after the application to ensure the fumigant does not move beyond the buffer at concentrations that exceed EPA's level of concern. If concentrations of concern were detected, the user would be required to implement the emergency response measures specified in the fumigant management plan.

EPA has concluded that bystanders could take steps to protect themselves if they had basic information about fumigations and the appropriate steps to take if they experienced symptoms of exposure. In a number of fumigant incidents that have occurred, the magnitude and severity of the incident could have been significantly reduced if people had such information. Similarly, having on-site monitoring will enable site managers to take remedial action (i.e., activate the control plan in the FMP) to lower emissions sooner, also resulting in fewer and less severe exposures. And, if necessary, site managers would activate the emergency response elements of the FMP.

Providing communities with information about local chemical releases is an important part of emergency preparedness programs and is recognized as an effective means of addressing risk at the local level. Some states, like Florida and Wisconsin, have requirements for providing information to chemically-sensitive individuals about chemicals used nearby so they can take steps to protect themselves from potentially harmful exposures (see http://edis.ifas.ufl.edu/pi004 and http://www.legis.state.wi.us/rsb/code/atcp/atcp029.pdf). Wisconsin also requires fumigators applying metam sodium products through chemigation to provide written notice to the county public health agency and to every individual or household within ¼ miles of the chemigation application site (see http://www.legis.state.wi.us/rsb/code/atcp/atcp030.pdf). EPA agrees that information about how to recognize and address exposures can help citizens reduce potential risk.

EPA understands that difficult challenges exist when agricultural land borders urban or suburban communities. While EPA's decisions for the fumigants will not alleviate challenges that already exist, EPA is allowing options for ensuring emergency preparedness in an effort to lessen potential impact on growers.

If users opt, based on their site conditions, to provide emergency response information to neighbors rather than monitor, EPA believes that scaling the size of the informed area will be protective and helps address concerns expressed by some fumigant users. When the informed area is scaled to the size of the buffer, small buffers which generally result from applications to small areas, at low application rates, and/or using low-emission application techniques, will have small or no areas to inform, while larger applications will have larger areas to inform.

EPA is not requiring a specific method of providing the information to neighbors, but rather that it be done in a way that effectively communicates, in a manner the recipients will understand. Some methods may not result in documentation that would be retained. To address concerns about enforcement, EPA is requiring that information on how and when the emergency response information was delivered and to whom, be included in the FMP.

EPA is interested in input on the importance and usefulness of information specifying the location of the application block and buffer. EPA recognizes that such information may be difficult to convey clearly and concisely, especially if there are no easily recognizable land marks nearby. While such information may be helpful, it may not be critical to ensuring an appropriate response to early signs and symptoms of exposure.

4. Notice to State Lead Agencies

EPA believes that when state, tribal and local enforcement officials have information about when and where applications take place they are better able to plan and execute compliance assistance and assurance activities. Therefore, EPA is requiring notification of the appropriate state or tribal lead agency before an application begins to assist enforcement agencies in compliance monitoring.

The information that must be provided includes the following:

- Applicator contact information (name, telephone number, and applicator license number)
- Property owner/operator contact information
- Location of the application block
- Name of fumigant(s) products(s) applied including EPA Registration number
- Time period in which the fumigation is planned to take place and the duration of buffer zone period

Assuring compliance with new label requirements is an important component of the fumigant risk mitigation package. Notice to enforcement officials allows them to target inspections around periods when fumigations are expected to occur to ensure label requirements designed to mitigate risks of concern for bystanders, handlers, and workers, have been followed and that the conditions for the fumigation have been documented in the FMP. In states such as California, where permitting processes are already in place, additional notice to state and tribal lead agencies will not be required.

5. Soil Fumigation Training for Applicators and Other Handlers

Soil fumigation is an inherently complex activity involving specialized equipment and application techniques. Additionally, the mitigation measures required as part of these decisions will introduce new requirements in the form of more detailed instructions and restrictions on soil fumigations. Failure to adequately manage fumigant applications increases risks to handlers

involved in the fumigation, workers nearby, and other bystanders. Incident data show that a number of fumigant incidents are the result of misapplications, failure to follow label requirements and safe use procedures, and other errors on the part of fumigant applicators. Although states have certification programs, some of which include a specific category for soil fumigation, there currently is not a consistent standard across states and regions where soil fumigation is done, and the federal certification program currently has no category for soil fumigation. Proposed changes in the federal certification program and worker safety regulations to include a soil fumigation category are not, however, anticipated in the near future.

EPA believes that training is an effective way to increase applicators' skill and knowledge so they are better prepared to effectively manage soil fumigation and are able to understand and comply with revised labeling. EPA has determined that training, developed and implemented by registrants to foster product stewardship, will help reduce potential risks associated with failure to adequately manage the complexities of fumigation, and failure to comply with fumigant product labeling. Additionally, EPA believes that providing safety information to other fumigant handlers will help them understand and adhere to practices that will help handlers protect themselves from risks of exposure.

It is important to note that training developed and provided by registrants as required by this RED is separate and distinct from state certification programs. EPA encourages registrants, in developing their training proposals, to work with states where their products are used to identify opportunities to build on and complement state programs. However, the training programs required as part of this decision will be separate from the state certification process and will be developed and administered by registrants. Individual state regulatory agencies have the option of working with registrants on these activities, but are not required to do so. It is important to note that some fumigant registrants have already developed product-specific training that will serve as a good basis for this expanded effort.

a. Training for Applicators Supervising Fumigations

Registrants will be required to develop and implement training programs for applicators in charge of soil fumigations on the proper use and GAPs for soil fumigants. EPA is requiring registrants to submit proposals for these programs as data requirements in the Data Call-In that will accompany this RED. The training programs must address, at minimum, the following elements: how to correctly apply the fumigant; how to protect handlers and bystanders; how to determine buffer zone distances; how to develop a FMP and complete the post fumigation application summary; how to determine when weather and other site-specific factors are not favorable for fumigant application; how to comply with required GAPs and document compliance in the FMP. The training program must be made available to applicators at least annually. The registrant shall provide documentation, such as a card or certificate, to each applicator who successfully completes the training. This documentation shall include the applicator's name, address, license number, and the date of completion.

The registrant must be able to provide to federal, state, or local enforcement personnel, upon request, the names, addresses, and certified applicator license numbers of persons who

successfully completed the training program, as well as the date of completion. Applicators supervising fumigations must have successfully completed the program within the preceding 12 months and must document when and where the training program was completed in the FMP. The registrants will be required to (1) develop a database to track which certified applicators have successfully completed the training and (2) make this database available to state and/or federal enforcement entities upon request. In addition, the applicator must provide to federal, state, or local enforcement personnel, upon request, documentation that verifies completion of the appropriate training program(s).

Product labels will state that before applying the product, the certified applicator supervising the application must have successfully completed, within the preceding 12 months, a chloropicrin training program made available by the registrant, and that the FMP must document when and where the training program was completed.

EPA encourages registrants to include in their proposals additional stewardship elements such as technical support information and resources for certified applicators and/or handlers (e.g., hotlines to answer technical questions from applicators about product use and provide emergency preparedness and response), and equipment verification programs to assist applicators with calibration and testing of soil fumigation equipment. The Agency is soliciting input during the post-RED comment period from states, user groups, registrants, and other stakeholders on content and how best to implement training programs and other stewardship elements.

b. Training Materials for Handlers

EPA has determined that registrants must prepare and disseminate training information and materials for other fumigant handlers, i.e., those working under the supervision of the certified applicator in charge of fumigations. EPA is requiring registrants to submit proposals for these materials as data requirements in the Data Call-Ins that will accompany this RED. The training materials must address, at minimum, the following elements: (1) what fumigants are and how they work, (2) safe application and handling of soil fumigants, (3) air monitoring and respiratory protection requirements for handlers, (4) early signs and symptoms of exposure, (5) appropriate steps to take to mitigate exposures, (6) what to do in case of an emergency, and (7) how to report incidents. Registrants must provide this training information through channels open to the public (e.g., via a website). Pesticide labels will require that applicators supervising fumigations provide this training information to handlers under their supervision before they perform any fumigant handling task, or they must ensure that handlers have been provided the required information within the preceding 12 months. The label will also require that the training information be provided in a manner that the handler can understand. Applicators supervising fumigations must ensure the FMP includes how and when the required training information was provided to the handlers under their supervision. Below is the language that must appear on the label.

"The certified applicator must provide fumigant safe handling information to each handler involved in the application or confirm that each handler participating in the application has received fumigant safe handling information in the past 12 months."

c. Soil Fumigation Training Considerations

In comments on fumigant risk management options, stakeholders were broadly supportive of additional training for applicators and handlers. During the most recent comment period, the vast majority of stakeholders, including growers, community groups, farm workers, states, and registrants expressed strong support for increased training for applicators and other handlers. Several comments noted that fumigant incidents affecting both fumigant workers and bystanders could have been prevented or mitigated if applicators had better training about correct practices and procedures.

The Agency agrees that additional training and technical support for fumigant applicators and handlers will help educate and inform these workers, thus decreasing the likelihood of both incidents and noncompliance. EPA believes fumigant-specific training for applicators and handlers also will help reduce the magnitude and frequency of exposure incidents and, coupled with the other mitigation measures described in this decision, will address risks of unreasonable adverse effects from the use of soil fumigants.

As noted above, several states have high-quality certification programs for fumigators which include exams to test the competency of fumigators. EPA recognized that for applicators to become certified in those states, they must acquire the knowledge and skill necessary to pass the exam. But several stakeholders commented that training opportunities are varied across the country, and the scope and detail of information provided in available training is not consistent. EPA is also concerned that information in existing programs will need to be updated as a result of new requirements associated with this decision and the label changes which will result. Although the federal program will be revised eventually and will establish a consistent standard, EPA believes that registrants must play a central role in developing and delivering training in the interim.

EPA stresses that registrant training programs will be separate from the state certification process and will be developed and administered by registrants in coordination with EPA. EPA will, however, work with state organizations and training experts to explore opportunities for the registrant programs to supplement state programs to provide additional training opportunities for fumigators. EPA will work with registrants in reviewing training program proposals and in developing the content for the programs and materials. EPA will also work with states to identify ways in which registrant training programs can be tailored to complement existing state programs. EPA's goal in requiring registrant training is to add to training resources. EPA is aware of the need to coordinate carefully with states to ensure that new training does not become a burden on state agencies. EPA specifically requests comments from states on the best implementation approaches to meet these goals, and plans to meet with states during and after the public comment period to discuss options.

The Agency also expects that FMPs will serve as tools with which fumigant users can maintain records of their compliance with training requirements in addition to the other measures described in this document. Thus, FMPs would serve as an additional tool for verification state enforcement personnel to verify compliance.

6. Community Outreach and Education Programs

EPA understands from public comments, site visits, and stakeholder meetings, conducted as part of the soil fumigant review, that there is often a fundamental lack of information and communication within communities where soil fumigation occurs, which has raised health and safety concerns among community members. This lack of information and communication has led to inappropriate responses in cases where fumigants have moved off site and into communities. This also has led in some cases to unwarranted concern and anxiety among communities about the risks associated with the use of fumigants. The Agency believes that outreach and education to communities where soil fumigation occurs is an important component of the overall package of measures to address bystander risk. This outreach and education will address the risk of acute bystander exposure by educating community members in high-use areas about buffer zones and their characteristics and purpose; the importance of not entering these zones; how to recognize early signs of fumigant exposure, and how to respond appropriately in case of an incident. The first responder education discussed in the *First Responder Education* section on page 69 is a significant part of this program.

Therefore, the Agency is requiring registrants to develop and implement community outreach and education programs, including programs for first responders, to address these needs. EPA encourages registrants' proposals to work with existing community resources, such as community health networks, for dissemination of information and implementation of their programs. Registrants' proposals must also include criteria and a plan for identifying and selecting the communities that will be receive outreach programs.

Community outreach and education programs must include the following elements, at minimum: (1) what soil fumigants are and how they work, (2) what buffer zones are, (3) early signs and symptoms of exposure, (4) appropriate steps to take to mitigate exposures, (5) what to do in case of an emergency, and (6) how to report an incident.

EPA expects registrants' proposals for the first responder programs described in the *First Responder Education* section on page 69 will also be designed to integrate with existing local first-response and emergency preparedness networks.

The community outreach and education proposal and supporting materials for communities and first responders, as well as a plan for evaluating the effectiveness of the programs, will be included as data requirements in the Data Call-In that will accompany this RED.

As with the training for fumigant applicators and handlers, the community outreach and education program that the Agency is requiring is intended to be part of the registrants' long term product stewardship. State governments are not required to participate in the program, but have the option of working with EPA and registrants to develop and track this and any other stewardship components which the registrants may include in their proposals.

iii. Environmental Risk Mitigation

As mentioned in Section III.C on page 18, the Agency is concerned about both aquatic and terrestrial risks. The Agency believes that mitigation measures detailed in the Human Health Risk Mitigation Section will also reduce ecological risks. Although buffer zones and GAPs do not directly reduce the potential risk to ecological organisms, they do provide an incentive to reduce fumigant application rates and individual treatment areas which in turn will contribute to lower exposure and risks for non-target organisms.

The Agency still has concerns regarding chloropicrin's potential to leach into groundwater and surface water, and therefore is requiring the following language for both tarped and untarped chloropicrin applications, "While chloropicrin has certain properties and characteristics in common with chemicals that have been detected in groundwater (chloropicrin is highly soluble in water and has low adsorption to soil), volatilization is this chemical's most important route of dissipation." The Agency recognizes that managing soil moisture is an important factor that may be used to reduce peak emissions, and the requirements related to soil moisture described in the GAP section will not result in the leaching of chloropicrin into ground or surface water.

In addition to the language above, to reduce the potential for chloropicrin to leach into groundwater when tarps are used in broadcast applications, tarps must be perforated and/or removed before noon and only when rainfall is not expected within 12 hours. Falling temperatures typically found in the late afternoon and evening will not promote dissipation of remaining chloropicrin under the perforated tarp and rainfall may cause remaining chloropicrin under the perforated tarp to leach into ground water. For raised bed applications, rainfall is not a factor since planting occurs with the tarp in place and perforation and/or tarp removal occurs after chloropicrin has dissipated.

When chloropicrin applications are not tarped, the Agency has concerns about chloropicrin's potential to leach into both groundwater and surface water if a rainfall event occurs shortly after application. Chloropicrin may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water. Leaching and runoff of this product will be reduced by avoiding applications when heavy rainfall is forecasted to occur within 24 hours.

The Agency has received a new study which estimates the exposure concentrations of chloropicrin in aquatic environments. In addition EPA is requiring several ecological fate and effect studies to address data gaps identified in the ecological risk assessment. See Section V of this document for details on those studies.

b. Residential Structure Warning Agent Use Mitigation

Details on the chloropicrin's use as a warning agent prior to sulfuryl fluoride applications are included in the Agency's Final Revised Human Health risk assessment as listed in Section III.B of this document.

The Agency reviewed monitoring studies completed by the California Air Resources Board (CARB) of the California Environmental Protection Agency. These studies directly

monitored chloropicrin. The results of these studies are below the Agency's level of concern for bystanders.

i. Occupational Risk Mitigation

1. Respiratory Requirements

The Agency does not have exposure data to assess handler exposures when chloropicrin is used as a warning agent before sulfuryl fluoride residential fumigations. As a result, the Agency is requiring that all handlers wear respiratory protection. The Agency is not requiring monitoring for this chloropicrin use due to the short duration of the expected handler activities. In addition, the Agency does not anticipate that the level of chloropicrin would exceed 1.5 ppm (the estimated upper working level of the respirator based on a 90% protection factor) based on conservative estimates of labeled use rates.

In order to ensure that the respiratory protection EPA is assuming is being achieved for this use, respiratory requirements for chloropicrin will include fit testing, respirator training, and annual medical evaluation. These requirements are the same as detailed in the respiratory protection section for pre-plant soil fumigation on page 54.

c. Chloropicrin Antimicrobial Use Mitigation

For details on the chloropicrin human health risk assessment for antimicrobial uses, please refer to the revised occupational and residential/bystander assessment described in Section III.B of this document.

The antimicrobial uses of chloropicrin are subject only to the mitigation listed below.

i. Bystander Risk Mitigation

The revised risk assessment indicates the potential for acute bystander exposure to chloropicrin when it is used for remedial wood treatment. The Agency believes that requiring the following will reduce this potential below the Agency's level of concern:

- Plug the pre-drilled holes immediately after chloropicrin applications;
- Do not treat structures/beams indoors; and
- Do not drill an application hole through seasoning checks to apply product. If the hole intersects a check, plug the hole and drill another. If more than 2 treatment holes intersect an internal void or rot pocket, redrill the holes farther up the pole into relatively solid wood.

ii. Occupational Risk Mitigation

The Agency's revised risk assessment indicates the potential for handler inhalation during the transfer of chloropicrin into vials and during the pouring/injection of chloropicrin into pre-drilled holes. To mitigate these risks, the Agency is requiring that applicators and handlers wear a full face tight-fitting or loose-fitting helmet or hood style NIOSH/MSHA approved

respirator at all times when handling chloropicrin during the transfer of the product into vials and during the pouring/injecting of chloropicrin into pre-drilled holes. However, use of a respirator is not being proposed for application of the vials once they are filled.

1. Air Concentration

If a spill or leak were to occur, some of the current labels require respiratory protection if air concentrations of chloropicrin exceed 0.3 ppm at any time, while others require respiratory protection if the air concentrations exceed 0.1 ppm. To rectify these differences, the Agency is requiring that unprotected persons not be permitted entry into spill area or clean-up area until the concentration of chloropicrin is determined to be less than 0.1 ppm.

2. Respiratory Requirements

Applicators and handlers that directly pour or inject chloropicrin into timbers or fill vials must wear a full-face tight-fitting, or loose-fitting helmet or hood style NIOSH/MSHA approved respirator when handling chloropicrin. Since the Agency is requiring a full-face respirator and eyes are covered, and not a half-face respirator, all references to wearing goggles and/or full face shields for this application use must be removed from the labels.

Applicators and handlers that are involved in the vial application method are not required to wear a respirator (as the vials are already filled and capped). However, at least one air rescue device (e.g., SCBA) and air-purifying respirators and cartridges for each handler must be immediately available on-site in case of a spill or an emergency.

In order to ensure that the respiratory protection EPA is assuming is being achieved for this use, respiratory requirements for chloropicrin will include fit testing, respirator training, and annual medical evaluation. These requirements are the same as detailed in the respiratory protection section for pre-plant soil fumigation on page 54.

2. Endocrine Disruptor Effects

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) *"may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate."* Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there were scientific bases for including, as part of the program, androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. When the appropriate screening and/or testing protocols being considered under the Agency's Endocrine Disrupter Screening Program (EDSP) have been developed and vetted, chloropicrin may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

3. Endangered Species Considerations

The Endangered Species Act requires federal agencies to ensure that their actions are not likely to jeopardize listed species or adversely modify designated critical habitat. The Agency has developed the Endangered Species Protection Program to identify pesticides whose use may cause adverse impacts on threatened and endangered species, and to implement mitigation measures that address these impacts. To analyze the potential of registered pesticide uses that may affect any particular species, the Agency uses basic toxicity and exposure data developed for the REDs and then considers ecological parameters, pesticide use information, geographic relationship between specific pesticide uses and species locations, and biological requirements and behavioral aspects of the particular species. When conducted, this species-specific analysis will also consider the risk mitigation measures that are being implemented as a result of this RED.

Following this future species-specific analysis, a determination that there is a likelihood of potential effects to a listed species may result in limitations on use of the pesticide, other measures to mitigate any potential effects, or consultations with the Fish and Wildlife Service and/or the National Marine Fisheries as appropriate. If the Agency determines use of chloropicrin "may affect" listed species or their designated critical habitat, the Agency will employ the provisions in the Services' regulations (50 CFR Part 402). Until the species-specific analysis is completed, the risk mitigation measures being implemented through this RED will reduce the likelihood that endangered and threatened species may be exposed to chloropicrin at levels of concern. The Agency is not requiring specific chloropicrin label language at the present time relative to threatened and endangered species. If, in the future, specific measures are necessary for the protection of listed species, the Agency will implement them through the Endangered Species Program.

Chloropicrin has undergone a species-specific analysis for the California Red-Legged Frog case. The Agency determined that chloropicrin is "likely to adversely effect" this species.[24] The Agency's assessment is currently with the Fish and Wildlife Service. After the final determination has been made, the Agency may require other mitigation.

D. Conclusions

In this document, the Agency has described a package of mitigation measures with elements that are designed to work together to reduce risk to human health and the environment. Due to the volatility of chloropicrin, the Agency believes that all of the mitigation measures required by this decision will mitigate risks so that use of chloropicrin will result in no unreasonable adverse effects.

Stakeholder comments and Agency analyses indicate that mitigation may impact the economic benefits of fumigant use. One analysis completed by the Agency quantified the potential impact of buffer zones. For details of that analysis, please see the document titled "Review of Stakeholder Submitted Impact Assessments of Proposed Fumigant Buffers, Comments on Initial Buffer Zone Proposal, and Case Studies of the Impact of a Flexible Buffer System for Managing By-Stander Risks of Fumigants."[19]

[24] http://www.epa.gov/espp/litstatus/effects/redleg-frog/index.html#chloropicrin

The Agency believes that some economic impact will occur in order to protect human health and the environment from unreasonable adverse effects. However, the mitigation package described in this document incorporates flexibility which allows users to make choices that minimize potential impacts. For example, a current application practice might require a large buffer that a user is not able to implement. However, instead of setting a fixed buffer for all applications regardless of application-specific parameters, this decision allows growers the flexibility to modify their practices to achieve smaller buffers; for example treat smaller application blocks, or switch to a lower emission application method. Also, the buffer zone reduction credits allow users to take advantage of site conditions (e.g., soil conditions) or other emission reduction factors such as high barrier tarps to lessen the impact. In addition, the Agency believes that flexibility decreases the impacts associated with respiratory protection mitigation. Instead of requiring respirators for all handling tasks, the monitoring scheme specifies when respiratory protection is needed. This mitigation is protective of handlers while not increasing the burden to users by mandating respirators in such a way as to hinder communication or force users into heat stress situations.

When chloropicrin is used as a warning agent and as an antimicrobial for remedial wood treatments, the Agency believes that the required mitigation is protective and anticipates that it will have minimal impact on the benefits.

Taking into consideration the totality of risk and benefit assessments and stakeholder comments, the Agency believes the mitigation required in this document will be protective while also minimizing impacts on fumigant users and applicators.

V. What Registrants Need to Do

The Agency has determined that the products containing chloropicrin are eligible for reregistration provided that the mitigation measures and label changes identified in this RED are implemented. EPA recognizes that the extent and complexity of the mitigation needed for chloropicrin will require continued coordination among state regulatory agencies, the EPA, registrants, growers and other stakeholders. This is necessary to ensure that all provisions of the RED are understood, that data are developed and evaluated expeditiously, and that bystander and worker protection measures are implemented as soon as practicable. EPA also acknowledges that certain provisions of the RED, such as the worker training program and community outreach and education, will take time to develop in terms of both the content of the program as well as a strategy for implementation.

EPA envisions the following approximate schedule for implementation of the chloropicrin RED:

July 2008	Chloropicrin RED issued
Fall 2008	Comment period closes
Early 2009	EPA responds to comments, amends RED if appropriate
Mid 2009	EPA issues product and generic DCIs
Mid 2009	Registrants submit revised labels to EPA
Late 2009	EPA reviews/approves new labeling
During 2009	Registrants develop worker and community training and education plans and submit to EPA; plans approved and implemented
Early 2010	Products bearing new labels enter the market; training and education programs expand.
2009-2012	Registrants develop data per DCI
2013	EPA begins Registration Review for chloropicrin and other fumigants

The Agency is issuing this decision document for chloropicrin, as announced in a Notice of Availability published in the Federal Register. Due to the broad scope of the decision for the soil fumigant group, there will be a 60-day public comment period for this document to allow stakeholders the opportunity to review and provide comments on issues related to the implementation of the risk mitigation measures. After considering public comment, the Agency will issue a public determination as to whether modifications to this decision are appropriate.

Labeling

Registrants will need to amend their product labeling to incorporate the label statements set forth in the Label Changes Summary Tables 10 and 22. The Agency will consider post-RED comments prior to finalizing labeling. The Agency anticipates that label amendments will need to be submitted approximately 1 year from the issuance of the RED.

A. Manufacturing Use Products

1. Additional Generic Data Requirements

The generic data base supporting the reregistration of chloropicrin has been reviewed and determined to be substantially complete. However, the data listed below are necessary to confirm the reregistration eligibility decision documented in this RED.

a. Data Requirements for Chloropicrin Soil Uses

i. Human Health

1. Toxicity

There are no data requirements.

2. Residue Chemistry

There are no data requirements.

3. Occupational and Residential Exposure

See chart below.

OPPTS Guideline Number	Data Requirement	Study type
835.8100	Field volatility from soil, to determine flux for modeling purposes for applications using water seals	ORE
835.8100	Field volatility from soil, to determine flux for modeling purposes for buried drip irrigation applications.	ORE
835.8100	Field volatility from soils, to determine flux for modeling purposes for deep broadcast untarped applications (> 18" deep).	ORE

835.8100 - Field volatility from soil

Volatility studies are required for chloropicrin's soil uses to determine flux for modeling purposes. These studies will allow the Agency determine appropriate buffer zones when water seals are used and also for drip buried untarp applications. Data for the deep broadcast untarped application will enable a more refined inhalation risk assessment to be completed for buffer zone determinations.

ii. Environmental Fate and Ecological Effects

1. Environmental Fate

There are no data requirements.

2. Ecological Effects

See chart below.

OPPTS Guideline Number	Data Requirement	Study type
Special Study	Avian Acute Inhalation	ECO
870.1300	Acute Inhalation Toxicity Test-Rat	TOX
850.1075	Acute Fish Toxicity-bluegill and rainbow trout	ECO
850.1010	Acute Aquatic Invertebrate Toxicity	ECO
850.1075	Acute Marine/Estuarine Fish	ECO
850.1025	Acute Marine/Estuarine Mollusk	ECO
850.1035	Acute Marine/Estuarine Shrimp	ECO
850.4225	Seed Germination/Seedling Emergence – Tier II.	ECO
850.4250	Vegetative Vigor – Tier II.	ECO
850.4400	Aquatic Plant Growth – Tier II	ECO
850.3020	Honeybee Acute contact.	ECO

Special Study—Avian acute inhalation.

The current estimate of avian risk is based largely on the mammal assessment. This study will enable an inhalation risk assessment specific to birds. Since the risk assessment for terrestrial wildlife is focused on inhalation and this study will provide actual inhalation data rather than an estimation based on acute oral data, it is of even higher priority than the acute oral study.

870.1300—Acute inhalation toxicity test – rat.

The existing study (MRID 45117902) is classified by HED as Acceptable/Non-guideline. The 7/25/00 DER and 1/31/05 Revised HED Human Health Risk Assessment state: "The LC50 calculated for the study should not be considered to be a true LC50 for chloropicrin. Due to the sacrifice of all live animals at day 3 of the study instead of day 14, and too large of exposure particle sizes, the true LC50 could be lower." Thus, a new study will enable an improved wild mammal risk assessment with reduced uncertainty.

850.1075—Acute Fish Toxicity – bluegill and rainbow trout.

The risk assessment is currently relying on supplemental data. Flow-through studies with measured concentrations will greatly reduce uncertainty.

850.1010—Acute aquatic invertebrate toxicity.

The risk assessment is currently relying on supplemental data. Flow-through studies with measured concentrations will greatly reduce uncertainty.

850.1075—Acute Marine/Estuarine Fish.

Given the use patterns of chloropicrin, marine/estuarine species could be exposed. This study will enable a risk assessment specific for marine/estuarine species exposure.

850.1025—Acute Marine/Estuarine Mollusk.

Given the use patterns of chloropicrin, marine/estuarine species could be exposed. This study will enable a risk assessment specific for marine/estuarine species exposure. It will also improve certainty with the endangered species risk assessment, as this test species may be more representative of endangered freshwater mussels than the freshwater *Daphnia*.

850.1035—Acute Marine/Estuarine Shrimp.

Given the use patterns of chloropicrin, marine/estuarine species could be exposed. This study will enable a risk assessment specific for marine/estuarine species exposure. One toxicity value is available from a study published in the scientific literature, but it is from a static study without measured concentrations.

850.4225—Seed Germination/Seedling Emergence – Tier II.

Chloropicrin is used in part due to its phytotoxicity at the application site, and a wide range of open literature and other non-guideline studies indicate the potential for plant damage. This study will enable the assessment of risk to non-target terrestrial plants off-site.

850.4250—Vegetative Vigor – Tier II.

Chloropicrin has at least some phytotoxicity on the treatment site, based on label and open literature information. This study will enable the assessment of risk to non-target terrestrial plants off-site.

850.4400—Aquatic Plant Growth – Tier II.

Chloropicrin has at least some phytotoxicity on the treatment site, based on label and open literature information. This study will enable the assessment of risk to non-target aquatic plants off-site.

850.3020—Honeybee Acute contact.

This basic study is now being requested for virtually all outdoor uses, and will help determine the need for, and specifics of, bee hazard labeling.

iii. Other

OPPTS Guideline Number	Data Requirement	Study type
Special	Community Outreach and Education Programs	Special
Special	Training for Applicators Supervising Fumigations	Special
Special	Training Materials for Handlers	Special

Special Study - Community Outreach and Education Programs

The Agency is requiring registrants to develop and implement community outreach and education programs, including programs for first responders, to address these needs. Community outreach and education programs must include the following elements, at minimum: (1) what soil fumigants are and how they work, (2) what buffer zones are, (3) early signs and symptoms of exposure, (4) appropriate steps to take to mitigate exposures, (5) what to do in case of an emergency, and (6) how to report an incident. EPA expects registrants' proposals for the first responder programs described in Section IV will also be designed to integrate with existing local first-response and emergency preparedness networks.

Special Study - Training for Applicators Supervising Fumigations

EPA has determined that training, developed and implemented by registrants to foster product stewardship, will help reduce potential risks associated with failure to adequately manage the complexities of fumigation, and failure to comply with fumigant product labeling. Additionally, EPA believes that providing safety information to other fumigant handlers will help them understand and adhere to practices that will help handlers protect themselves from risks of exposure.

Registrants are required to develop and implement training programs for applicators in charge of soil fumigations on the proper use of and GAPs for soil fumigants. EPA is requiring registrants to submit proposals for these programs. The training programs must address, at minimum, the following elements: how to correctly apply the fumigant; how to protect handlers and bystanders; how to determine buffer zone distances; how to develop a FMP and complete the

post fumigation application summary; how to determine when weather and other site-specific factors are not favorable for fumigant application; how to comply with required GAPs and document compliance in the FMP. The training program must be made available to applicators at least annually. The registrant shall provide documentation, such as a card or certificate, to each applicator who successfully completes the training. This documentation shall include the applicator's name, address, license number, and the date of completion. The registrant must be able to provide to federal, state, or local enforcement personnel, upon request, the names, addresses, and certified applicator license numbers of persons who successfully completed the training program, as well as the date of completion. Applicators supervising fumigations must have successfully completed the program within the preceding 12 months and must document when and where the training program was completed in the FMP. The registrants will be required to (1) develop a database to track which certified applicators have successfully completed the training and (2) make this database available to state and/or federal enforcement entities upon request. In addition, the applicator must provide to federal, state, or local enforcement personnel, upon request, documentation that verifies completion of the appropriate training program(s).

Special Study - Training Materials for Handlers

EPA has determined that registrants must prepare and disseminate training information and materials for other fumigant handlers, i.e., those working under the supervision of the certified applicator in charge of fumigations. The training materials must address, at minimum, the following elements: (1) what fumigants are and how they work, (2) safe application and handling of soil fumigants, (3) air monitoring and respiratory protection requirements for handlers, (4) early signs and symptoms of exposure, (5) appropriate steps to take to mitigate exposures, (6) what to do in case of an emergency, and (7) how to report incidents. Registrants must provide this training information through channels open to the public (e.g., via a website). Pesticide labels will require that applicators supervising fumigations provide this training information to handlers under their supervision before they perform any fumigant handling task, or they must ensure that handlers have been provided the required information within the preceding 12 months. The label will also require that the training information be provided in a manner that the handler can understand. Applicators supervising fumigations must ensure the FMP includes how and when the required training information was provided to the handlers under their supervision.

b. Chloropicrin Warning Agent Uses

There are no data requirements.

c. Antimicrobial Uses

There are no data requirements.

2. Labeling for Manufacturing-Use Products

To ensure compliance with FIFRA, manufacturing use product (MUP) labeling must be revised to comply with all current EPA regulations, PR Notices, and applicable policies. The MUP labeling must bear the labeling contained in Tables 10 and 22.

B. End-Use Products

1. Additional Product-Specific Data Requirements

Section 4(g)(2)(B) of FIFRA calls for the Agency to obtain any needed product-specific data regarding the pesticide after a determination of eligibility has been made. The Registrant must review previous data submissions to ensure that they meet current EPA acceptance criteria and if not, commit to conduct new studies. If a registrant believes that previously submitted data meet current testing standards, then the study MRID numbers must be cited according to the instructions in the Requirement Status and Registrants Response Form provided for each product. The Agency intends to issue a separate product-specific data call-in (PDCI), outlining specific data requirements.

2. Labeling for End-Use Products

In order to be eligible for reregistration, amend all product labels to incorporate the risk mitigation measures outlined in Section IV. Tables 10 and 22 describe how language on the labels should be amended.

Labeling Changes Summary Table for Chloropicrin

In order to be eligible for reregistration, all product labels muse be amended to incorporate the risk mitigation measures outlined in Section IV. Also, various use and safety information will be included in the labeling of all end-use products containing chloropicrin. The following table describes how language on the labels should be amended.

Table 10: Summary of Labeling Changes for All Chloropicrin Uses (except antimicrobial use)

Description	Amended Labeling Language	Placement on Label
For all Manufacturing Use Products	"Only for formulation into a fumigant for the following uses: pre-plant soil fumigant in agricultural fields and commercial greenhouses, tree replant, warning agent prior to sulfuryl fluoride residential structure fumigations, and remedial wood treatment." Structural greenhouse and/or enclosed space fumigation uses have been cancelled and must be deleted from end-use product labels. On end-use product labels, the directions for use and mitigation use of chloropicrin as a warning agent before sulfuryl fluoride residential structure fumigations must be kept separate from pre-plant soil use. Unless emission data become available to allow EPA to calculate buffer zones for the untarped (buried minimum of 5 inches) drip application method, then untarped drip applications of chloropicrin must be prohibited on end-use product labels. "Chloropicrin cannot be formulated into end-use products labeled for pre-plant or pre-transplant uses unless the registrant makes available to certified applicators who purchase or apply the end-use product a training program approved by EPA that provides information on how to correctly apply the fumigant including how to protect themselves, other handlers and bystanders, how to determine buffer zone distances, how to develop a Fumigant Management Plan, and how to determine when weather and other site-specific factors are not favorable for fumigant application. The training program must be made available to the certified applicators at least annually and the registrant must be able to provide, upon request, the names, addresses, and certified applicator license number of persons who successfully complete the training program." "Chloropicrin cannot be formulated into end-use products labeled for pre-plant or pre-transplant uses unless the registrant assures warning signs suitable for posting buffer zones are available to end-use product users at the point of sale. The buffer zone sign must meet the following standards: o Signs must remain legible during entire posting period. o The size and type of the buffer zone signs must follow the requirements in the Worker Protection Standard for Agricultural Pesticides for treated area posting. . **Contents of Sign**  -- "DO NOT ENTER/NO ENTRE,"	Directions for Use

	-- "[*Name of fumigant*] Fumigant BUFFER ZONE," -- a space for the date and time of fumigation, -- a space for the date and time buffer zone restrictions are lifted (i.e., buffer zone period expires) -- brand name of this product, and -- a space for the name, address, and telephone number of the certified applicator in charge of the fumigation	
One of these statements may be added to a label to allow reformulation of the product for a specific use or all additional uses supported by a formulator or user	"This product may be used to formulate products for specific use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)." "This product may be used to formulate products for any additional use(s) not listed on the MP label if the formulator, user group, or grower has complied with U.S. EPA submission requirements regarding support of such use(s)."	Directions for Use
Environmental Hazards Statements Required by the RED and Agency Label Policies	"This pesticide is toxic to mammals, birds, fish, and aquatic invertebrates. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA."	Precautionary Statements
End Use Products		
Restricted Use Requirement for all products that contain soil use	"Restricted Use Pesticide due to acute inhalation toxicity to humans. For retail sale to and use by certified applicators or persons under their direct supervision and only for those uses covered by the certified applicator's certification."	Top of the front panel
For pre-plant soil use. Certified applicator must complete annual training program.	"The certified applicator supervising that application must successfully complete a chloropicrin training program made available by the registrant within the last 12 months. The Fumigant Management Plan (see details elsewhere on this label) must document when and where the training program was completed."	Directions for Use
For pre-plant soil use. Fumigation Handlers	"Persons engaged in any of the following activities are defined as fumigant handlers: • Persons participating in the application as supervisors, loaders, drivers, co-pilots, shovelers, or as other direct application participants (application starts when the fumigant is first introduced into the soil and ends after the fumigant has stopped being delivered/dispensed to the soil); • Persons taking air samples to monitor fumigant air concentrations; • Persons cleaning up fumigant spills; • Persons handling or disposing of fumigant containers; • Persons cleaning, handling, adjusting, or repairing the parts of fumigation equipment that may contain fumigant residues;	In the Precautionary Use Section

	• Persons installing, repairing, operating irrigation equipment in the fumigant application block or surrounding buffer zone during the buffer zone period; • Persons entering the application site or surrounding buffer zone during the buffer zone period to perform scouting or crop advising tasks; • Persons installing, perforating (cutting, punching, slicing, poking), removing, repairing, or monitoring tarps: ➢ until 14 days after application is complete if tarps are not perforated and removed during those 14 days, or ➢ until tarp removal is complete if tarps are **both** perforated **and** removed less than 14 days after application; or ➢ until 48 hours after tarps perforation is complete if they will not be removed within 14 days after application NOTE: see Tarp Perforation and Removal section on this labeling for requirements about when tarps are allowed to be perforated."	
When chloropicrin is used as a warning prior to sulfuryl fluoride residential structure fumigations. Fumigation Handlers	"All persons participating in the application of chloropicrin when it is used as a warning agent prior to sulfuryl fluoride residential structure fumigations are pesticide handlers."	In the Precautionary Use Section
For pre-plant soil use. Supervision of Handlers	"The certified applicator supervising the application must be at the fumigant application site and able to maintain visual contact with every handler participating in the application starting when the fumigant is first introduced into the soil and ending after the fumigant has stopped being delivered/dispensed to the soil and the soil is sealed. The certified applicator must provide fumigant safe handling information to each handler involved in the application or confirm that each handler participating in the application has received fumigant safe handling information in the past 12 months. For all other fumigant handling tasks (as defined on this label), at least two WPS-trained handlers must be present to monitor one another."	Directions for Use Under the section "protection for handlers"
For pre-plant soil use. Exclusion of Non Handlers from Application Block and Buffer Zone	"The certified applicator supervising the application and the owner/operator of the establishment where the fumigation is taking place must make sure that all persons who are not trained and PPE-equipped and who are not performing one of the handling tasks defined in this labeling are: • excluded from application block during the entry prohibition period, and • excluded from the buffer zone during the buffer zone period."	Directions for Use Under the section "protection for handlers"
For pre-plant soil use Providing, cleaning, and maintaining PPE	"The employer of any fumigant handler (as defined in this label) must make sure that all handlers are provided and correctly wear the required PPE. The PPE must be cleaned and maintained as required by the Worker Protection Standard for Agricultural Pesticides."	Directions for Use Under the section "protection for handlers"
When chloropicrin is used as a warning prior to sulfuryl fluoride residential structure fumigations	"The employer of any handler participating in chloropicrin application prior to sulfuryl fluoride residential structure fumigation must make sure that all handlers are provided and correctly wear the required PPE. The PPE must be cleaned and maintained as required by the Worker Protection Standard for Agricultural Pesticides."	Directions for Use Under the section "protection for handlers"
Respirator Availability for pre-plant soil uses and when chloropicrin is	"In case of emergency or the need for immediate respiratory protection, the fumigation handler employer must make sure that the following PPE are immediately available to all persons performing fumigant handling activities: • at least one air rescue device (e.g., SCBA) must be on-site in case of an	Directions for Use Under the section "protection for handlers"

used as a warning prior to sulfuryl fluoride residential structure fumigations	emergency, and • unless an air-purifying respirator is being worn by each person performing a handling task at the site, enough air-purifying respirators and face-sealing goggles (if the respirator is a half-face style) of the type specified in the PPE section of this labeling must be immediately available at the site for each handler."	
PPE Requirements Established by the RED for all Chloropicrin formulations except those formulated with methyl bromide or methyl iodide and except when chloropicrin is used as a warning prior to sulfuryl fluoride residential structure fumigations (for formulations that contain methyl bromide see methyl bromide RED and for methyl iodide see approved labels)	"Some materials that are chemical-resistant to this product are [registrant inserts correct material(s)]." For more options, follow the instructions for category [insert A, B, C, D, E, F, G or H] on the chemical-resistance category selection chart. **All fumigant handlers must wear:** • Long-sleeved shirt and long pants, • Chemical-resistant footwear and socks, • Chemical-resistant gloves, such as barrier laminate or viton when handling liquid, • Chemical-resistant apron when handling liquid, and • Protective eyewear when handling liquid. In addition, when air monitoring indicates a respirator is required, OR when repairing an unperforated tarp within 14 days after the end of application, fumigant handlers must wear either: • a respirator with an organic-vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or • a respirator with a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G). IMPORTANT; an air-supplying respirator [i.e., a respirator connected directly to a clean air source or a self-contained breathing apparatus (SCBA)] is not permitted for routine fumigant handler tasks. Such respirators are only permitted in emergencies such as a spill or leak or when corrective action is needed to reduce air levels to acceptable levels."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals
PPE Requirements Established by the RED when chloropicrin is used as a warning prior to sulfuryl fluoride residential structure fumigations	"Some materials that are chemical-resistant to this product are [registrant inserts correct material(s)]." For more options, follow the instructions for category [insert A, B, C, D, E, F, G or H] on the chemical-resistance category selection chart. **All fumigant handlers must wear:** • Long-sleeved shirt and long pants, • Chemical-resistant footwear and socks, • Chemical-resistant gloves, such as barrier laminate or viton when handling liquid, • Chemical-resistant apron when handling liquid, and • Protective eyewear when handling liquid. • A half-face, full-face, or helmet/hood style respirator with o an organic-vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or o a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G). IMPORTANT; an air-supplying respirator [i.e., a respirator connected directly to a clean air source or a self-contained breathing apparatus (SCBA)] is not permitted for routine fumigant handler tasks. Such respirators are only permitted in emergencies such as a spill or leak or when corrective action is needed to reduce air levels to acceptable levels."	Immediately following/below Precautionary Statements: Hazards to Humans and Domestic Animals
For pre-plant soil use. Fumigant Air	**"Fumigant Air Monitoring:** The following air monitoring procedures must be followed to determine whether respiratory protection is required for any person performing a fumigant handling task as defined in this labeling. • Air monitoring samples for chloropicrin must be collected in the breathing zone of a	Directions for Use

Monitoring for all Chloropicrin Formulations except methyl bromide or methyl idodide (for formulations with methyl bromide see the RED, or methyl iodide see approved labels.	handler performing a representative handling task starting approximately 30 minutes from the handler's initial exposure and at least once every 2 hours thereafter. • To monitor air concentration levels, a direct reading detection device, such as a Matheson-Kitagawa, Draeger, or Sensidyne device must be used. The devices must have sensitivity of at least 0.15 ppm for chloropicrin. • If at any time (1) chloropicrin concentrations are greater than or equal to 0.15 ppm, or (2) any handler experiences sensory irritation, then an air-purifying respirator as specified in the PPE section of this label must be worn by all handlers. • If two consecutive breathing zone samples taken at least 30 minutes apart, show levels have decreased to less than 0.15 ppm for chloropicrin, then handlers may remove the respirators. • If at any time (1) a handler experiences any sensory irritation when wearing a respirator, or (2) any air sample is greater than or equal to 1.5 ppm for chloropicrin, then all handler activities must cease and handlers must be removed from the application block and surrounding buffer zone until corrective action has been taken. • During the corrective actions if chloropicrin air concentrations are greater than or equal to 1.5 ppm, then a self-contained breathing apparatus (SCBA) must be worn. • In order to resume work activities: ➢ Two consecutive air samples for chloropicrin taken at the handling site at least 30 minutes apart must be less than 1.5 ppm for chloropicrin. ➢ During the collection of air samples an air purifying respirator must be worn by the handler taking air samples. ➢ If chloropicrin concentrations are greater than or equal to 0.15 ppm, then handlers resuming their handler activities must wear air-purifying respirator of the type specified in the PPE section of this labeling."	
User Safety Recommendations	**"User Safety Recommendations** Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet. Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Users should remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing."	Precautionary Statements under: Hazards to Humans and Domestic Animals immediately following Engineering Controls (Must be placed in a box.)
User Safety Requirements	"Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry." "Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them."	Precautionary Statements: Hazards to Humans and Domestic Animals immediately following the PPE requirements
PPE Requirements Established by the RED For all Formulations	**"Respirator fit testing, medical qualification, and training** Employers must ensure that all fumigant handlers are: • Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29CFR Part 1910.134) • Trained using a program that confirms to OSHA's requirements (see 29CFR Part 1910.134) • Examined by a qualified medical practitioner to ensure physical ability to safely wear the style of respirator to be worn. A qualified medical practitioner is a physician or	Directions for Use Under the section "Protection for Handlers"

	other licensed health care professional who will evaluate the ability of a worker to wear a respirator. The initial evaluation consists of a questionnaire that asks about medical conditions (such as a heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. Handlers must be reexamined by a qualified medical practitioner if their health statue or respirator style or use-conditions change."	
For pre-plant soil use. Application Requirements, when tarps are used: Tarp Perforation and/or Removal	**"Tarp Perforation and/or Removal** IMPORTANT: Persons perforating, repairing, removing, and/or monitoring tarps are defined, within certain time limitations, as fumigant handlers (see definition of fumigant handlers in this labeling) and must be provided the PPE and other protections for handlers as required on this labeling and in the Worker Protection Standard for Agricultural Pesticides. Tarps used for fumigations must be perforated (cut, punched, poked, or sliced) only by mechanical methods. Perforation by hand or with hand-held tools is prohibited. Each tarp panel used for broadcast fumigation must be perforated using a lengthwise cut. Tarps cannot be perforated until a minimum of 5 days (120 hours) have elapsed after the fumigant injection into the soil is complete (e.g., after injection of the fumigant product and tarps -- if used -- have been laid or after drip lines have been purged), unless an adverse weather condition exists for broadcast applications. See below. If tarps will be removed after perforation, tarp removal cannot begin until at least 24 hours after tarp perforation is complete. If tarps will NOT be removed after perforation, planting or transplanting cannot begin until at least 48 hours after the tarp perforation is complete. If tarps are left intact for a minimum of 14 days after fumigant injection into the soil is complete, planting or transplanting may take place while the tarps are being perforated. Adverse Weather Conditions Exception for broadcast applications only: Tarps may be removed before the required 5 days (120 hours) if adverse conditions will compromise the integrity of the tarp, provided that: • At least 48 hours have passed after the fumigant injection into the soil is complete, • The buffer zone period is extended until 24 hours after tarp removal is complete, • Subsequent fumigations of untreated areas within the application block do not occur for at least 24-hours after tarp removal is complete, and • Appropriate PPE, respiratory protection, air monitoring and other requirements for the protection of handlers are met."	Direction For Use
For pre-plant soil use. Monitoring Air Concentration Levels	**"Monitoring Air Concentrations in the Buffer Zone Areas:** When air concentration levels must be monitored (i.e., as specified in the general buffer zone requirements section), use a direct reading detection device, such as a Matheson-Kitagawa, Draeger, or Sensidyne device. The devices must have sensitivity of at least 0.15 ppm for chloropicrin."	Directions for Use under the heading "General Buffer Zone Requirements"
Agriculture Use Requirements box	**Agricultural Use Requirements** After the standard paragraphs for the Agricultural Use Requirements box, substituted the following text for the standard restricted-entry interval and double notification	Agricultural Use Requirements box

	requirements: "For entry prohibition and notification requirements, see the "*Application Block Entry Prohibition and Notification*" section of this labeling."	
For pre-plant soil use. Entry Prohibitions	**"Entry Prohibitions** Entry (including early entry that would otherwise be permitted under the WPS) by any person – other than a correctly trained and PPE-equipped handler who is performing a handling task listed on this labeling – is PROHIBITED - from the start of the application until: • 5 days (120 hours) after application has ended for untarped applications. • 5 days (120 hours) after application is complete if tarps are not perforated and removed for at least 14 days following application, or • 48 hours after tarps perforation is complete if they will not be removed for at least 14 days following application, or • until tarp removal is completed if tarps are both perforated **and** removed less than 14 days after application. NOTE: see Tarp Perforation and Removal section on this labeling for requirements about when tarps are allowed to be perforated."	Directions for Use under the heading "heading "Application Block Entry Prohibition and Notification"
For pre-plant soil use. Notification Requirement for the treated area	**"NOTIFICATION:** Notify workers of the application by warning them orally and by posting fumigant warning signs. The signs must bear the skill and crossbones symbol and state: -- "DANGER/PELIGRO," -- "Area under fumigation, DO NOT ENTER/NO ENTRE," -- "[*Name of fumigant*] Fumigant in USE," -- the date and time of fumigation, -- the date and time entry prohibition period is over, -- Name of this product, and -- Name, address, and telephone number of the certified applicator in charge of the fumigation. Post the fumigant warning sign instead of the WPS sign for this application but follow all WPS requirements pertaining to location, legibility, size, and timing of posting and removal. Post the fumigant warning signs at all entrances to the application block (i.e., the greenhouse or field or portion of a field treated with a fumigant in any 24-hour period)"	Direction for Use under the heading "Application Block Entry Prohibition and Notification"
For pre-plant soil use. Mandatory Good Agricultural Practices for all formulations	"**Good Agricultural Practices (GAPs)** The following GAPs must be followed during all fumigant applications. All measurements and other documentation planned to ensure that the mandatory GAPs are achieved must be recorded in the FMP and/or the post-application summary report. **Tarps** (when tarps are used in chloropicrin applications). • A written tarp plan must be developed that includes: o schedule and procedures for checking tarps for damage, tears, and other problems o plans for determining when and how repairs to tarps will be made, and by whom o minimum time following injection that tarp will be repaired o minimum size of tarp damage that will be repaired o other factors used to determine when tarp repair will be conducted:	Directions for Use under "Mandatory Good Agricultural Practices"

- schedule, equipment, and methods used to perforate tarps
- aeration plans and procedures following perforation of tarp, but prior to tarp removal or planting/transplanting
- schedule, equipment, and procedures for tarp removal

The written tarp plan must be included in the site specific fumigant management plan (FMP) as described in the FMP section below.

Weather Conditions

- Prior to fumigation the weather forecast for the day of the application and the 48-hour period following the fumigant application must be checked.
- Do not apply fumigant if ground-level winds are less than 2 mph.
- Applications must not occur during a temperature inversion or when temperature inversions are forecasted to persist for more than 6 consecutive hours for the 36-hour period after application.
  - Visual features that could indicate an inversion is occurring are misty conditions during day or night, and clear night skies.
- Detailed local forecasts for sky conditions, weather conditions, wind speed, and forecasted temperature inversions may be obtained on-line at http://www.nws.noaa.gov.
- For further guidance, contact the local National Weather Service Forecasting Office.

Soil Temperature

- The maximum soil temperature at the depth of injection shall not exceed 90 degrees F at the beginning of the application.
  - If air temperatures have been above 100 degrees F for more than three hours in any of the three days prior to application, then soil temperature shall be measured and recorded in the FMP.

Soil Moisture

- The soil must be moist two to six inches below the surface. The amount of moisture needed in this zone will vary according to soil type and shall be determined using standard feel testing methods (see below). Surface soil generally dries rapidly and must not be considered in this determination.
- If there is insufficient moisture two to six inches below the surface, the soil moisture must be adjusted. If irrigation is not available and there is adequate soil moisture below six inches, soil moisture can be brought to the surface by discing or plowing before injection. To conserve existing soil moisture, pretreatment or treatment tillage should be done as close to the time of application as possible.

Soil Moisture Determination

- The soil shall contain at the time of application enough moisture two to six inches below the surface to meet the following criteria as appropriate for the soil texture.
- For **fine textured soils** (clay loam, silty clay loam, sandy clay, silty clay, sandy clay loam and clay) there must be enough moisture so that the soil is pliable, not crumbly, but does not form a ribbon when squeezed between the thumb and forefinger.
- For **coarse soils** (sand and loamy sand) there must be enough moisture to allow formation of a weak ball when compressed in the hand. Due to soil texture, this ball is easily broken with little disturbance.
- For **medium textured soils** (coarse sandy loam, sandy loam, and fine sandy loam) there must be enough moisture to allow formation of a ball which holds together with moderate disturbance, but does not stick between the thumb and forefinger.
- For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. Whenever possible, the field should be divided into areas of similar soil texture and

the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, local extension service or soil conservation service specialist or pest control advisor (ag consultant) should be consulted for assistance.

Soil Preparation

- Soil shall be properly prepared and at the surface generally be free of clods that are golf ball size or larger. The area to be fumigated shall be tilled to a depth of 5 to 8 inches.
- Field trash must be properly managed. Residue from a previous crop must be worked into the soil to allow for decomposition prior to fumigation. Little or no crop residue shall be present on the soil surface. Crop residue that is present must not interfere with the soil seal.

Soil Sealing

- *For Broadcast Untarped Applications:* Use a disc or similar equipment to uniformly mix the soil to at least a depth of 3 to 4 inches to eliminate the chisel or plow traces. Following elimination of the chisel trace, the soil surface must be compacted with a cultipacker, ring roller, and roller in combination with tillage equipment.
- *For Bedded Applications*: Performed beds shall be sealed by disruption of the chisel trace using press sealers, bed shapers, cultipackers, or by re-shaping (relisting, lifting and replacing, etc.) the beds immediately following injection. Beds formed at the time of application shall be sealed by disrupting the chisel trace using press sealers, or bed shapers.
- *Soil Sealing for Tarped Applications*: The use of a tarp does not eliminate the need to minimize chisel traces prior to application of the tarp, such as by using a nobel plow or other injection shank that disrupts the chisel traces.

Chloropicrin Bedded and Broadcast Shank Applications: Additional GAPs

In addition to the GAPs required for all Chloropicrin soil fumigation applications, the following GAPs apply for injection applications:

Tarps

- Tarps must be installed immediately after the fumigant is applied to the soil.

Soil Preparation

- Trash pulled by the shanks to the ends of the field must be covered with tarp, or soil, depending on the application method before making the turn for the next pass.

Application Depth

- *For Tarped-Broadcast and Tarped-Bedded Applications:* The injection point shall be a minimum of 8 inches from the nearest final soil/air interface.
- *For Untarped-Bedded Applications*: The injection point shall be a minimum of 12 inches from the nearest final soil/air interface.
- *For Untarped-Broadcast Applications*: The injection point shall be a minimum of 10 inches from the nearest final soil/air interface.

Prevention of End Row Spillage

- Do not apply or allow fumigant to drain onto the soil surface. For each injection line either have a check valve located as close as possible to the final injection point, or

drain/purge the line of any remaining fumigant prior to lifting injection shanks from the ground.

- Do not lift injection shanks from the soil until the shut-off valve has been closed and the fumigant has been depressurized (passively drained) or purged (actively forced out via air compressor) from the system.

Calibration, Set-up, Repair, and Maintenance for Application Rigs

- Brass, carbon steel or stainless steel fittings must be used throughout. Polyethylene tubing, polypropylene tubing, Teflon® tubing or Teflon® -lined steel braided tubing must be used for all low pressure lines, drain lines, and compressed gas or air pressure lines. All other tubing must be Teflon® -lined steel braided.
- Galvanized, PVC, nylon or aluminum pipe fittings must not be used.
- All rigs must include a filter to remove any particulates from the fumigant, and a check valve to prevent backflow of the fumigant into the pressurizing cylinder or the compressed air system.
- Rigs must include a flowmeter or a constant pressure system with orifice plates to insure the proper amount of fumigant is applied.
- To prevent the backflow of fumigant into the compressed gas cylinder (e.g. nitrogen, other inert gas or compressed air), if used, applicators must:
    - Ensure that positive pressure is maintained in the cylinder at not less than 200 psi during the entire time it is connected to the application rig, if a compressed gas cylinder is used. (*This is not required for a compressed air system that is part of the application rig because if the compressor system fails the application rig will not be operable*)
    - Ensure that application rigs are equipped with properly functioning check valves between the compressed gas cylinder or compressed air system and the fumigant cylinder. The check valve is best placed on the outlet side of the pressure regulator, and is oriented to only allow compressed gas to flow out of the cylinder or compressed air out of the compressed air system.
    - Always pressurize the system with compressed gas or by use of a compressed air system before opening the fumigant cylinder valve.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator must check the following items carefully:
    - Check the filter, and clean or replace the filter element as required.
    - Check all tubes and chisels to make sure they are free of debris and obstructions.
    - Check and clean the orifice plates and screen checks, if installed.
    - Pressurize the system with compressed gas or compressed air, and check all fittings, valves, and connections for leaks using soap solution.
- Install the fumigant cylinder, and connect and secure all tubing. Slowly open the compressed gas or compressed air valve, and increase the pressure to the desired level. Slowly open the fumigant cylinder valve, always watching for leaks.
- When the application is complete, close the fumigant cylinder valve and blow residual fumigant out of the fumigant lines into the soil using compressed gas or compressed air. At the end of the application, disconnect all fumigant cylinders from the application rig. At the end of the season, seal all tubing openings with tape to prevent the entry of insects and dirt.

Application equipment must be calibrated and all control systems must be working properly. Proper calibration is essential for application equipment to deliver the correct amount of fumigant uniformly to the soil. Refer to the manufacturer's instructions on how to calibrate your equipment, usually the equipment manufacturer, fumigant dealer, or Cooperative Extension Service can provide assistance.

Chloropicrin Drip Applications: Additional GAPs

In addition to the GAPs required for all chloropicrin soil fumigation applications, the following GAPs apply for drip applications:

Soil Preparation

- Till fields with known plowpans because they can lead to puddling of the fumigant due to inadequate soil drainage.

Product and Dosage

- Plan the application by calculating the amount of fumigant required at the appropriate rate for the crop, acreage and target pest. Fumigant must be metered into the water supply line and then passed through a mixing device, such as a centrifugal pump or static mixer, to assure proper agitation.

System Controls and Integrity

- The irrigation system (main lines, headers, drip tape) must be thoroughly checked for leaks before the start of application. Leak detection requires that the irrigation system be at full operating pressure. The amount of time needed at full operating pressure will vary by irrigation system design. Look for puddling along major pipes (holes in pipes or leaky joints), at the top and ends of rows (leaky connection, open drip tape), and on the bed surface (damaged drip tape, malfunctioning emitters). Any leaks discovered during the pre-application check must be repaired prior to fumigant application.
- To inject fumigant, use a metering system (such as a positive pressure system, positive displacement injection pump, diaphragm pump, or a Venturi system) effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls. Do not use containers pumps or other equipment made of aluminum, magnesium or their alloys as chloropicrin can be corrosive to such metals.
- The system must contain:
    - A functional check valve and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination and backflow;
    - A functional, automatic, quick-closing check valve to prevent the flow of fluids back toward the fumigant container;
    - A functional, normally closed valve located on the intake side of the injection point and connected to the system interlock to prevent the fumigant from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down;
    - Functional interlocking controls to automatically shut off the fumigant injection when the irrigation water flow stops or decreases to the point where fumigant distribution is adversely affected.

Site of Injection and Irrigation System Layout

- Site of injection must be as close as practical to the area being treated (such as direct injection of fumigant into the header pipe/manifold or into an aboveground delivery pipe attached to the header). If the fumigant is injected into a main line, make sure the irrigation pipe is able to be cleared of all fumigant as the fumigant may pool in low sections of the pipe. Also make sure that valves on lateral lines of the main line are closed, if these lateral lines lead to areas not being fumigation at the time of the application.

System Flush

	• After application of the fumigant, continue to drip-irrigate the area with water to flush the irrigation system. Do not allow the fumigant to remain in the irrigation system after the application is complete. The total volume of water, including the amount used for flushing the irrigation system, must be adequate to completely remove the fumigant from the lines, but should be less than the amount that could over-saturate the beds (bed collapse can occur from over-saturation). If common lines are used for both the fumigant application and water seal (if a water seal is applied) these lines must be adequately flushed before starting the water seal and/or normal irrigation practices. **Soil Sealing** • Tarps must be put in place before the fumigation begins. • Tarps must be used for drip applications. o Based on the Agency's review of the recently submitted data for untarped drip applications, this GAP may change. • Tarp edges must be buried along the furrow and at the ends of rows. <u>Chloropicrin Tree Replant Application: GAPs</u> This application method is used when chloropicrin is applied to individual tree sites in an existing orchard where shank or drip application are not possible. In addition to the GAPs required for all chloropicrin soil fumigation applications, the following GAPs apply for chloropicrin tree replant applications: **Site Preparation** • Each individual tree-site must remove the tree stump and primary root system with a back-hoe or other similar equipment, for example an auger. • The hole must be backfilled with soil before application. **Application Depth** • The fumigant must be injected at least 18 inches into the soil. **System Flush** • Before removing the application wand from the soil the wand must be cleared using nitrogen or compressed air. **Soil Sealing** • After the wand is cleared and removed from the soil, the injection hole must be either covered with soil and tamp or the soil must be compacted over the injection hole."	
For pre-plant soil use. Site-Specific Fumigation Management Plans for all chloropicrin end-use products.	"**Site-Specific Fumigation Management Plan (FMP)** Prior to the start of fumigation, the certified applicator supervising the application must verify that a site-specific fumigation management plan (FMP) exists for each application block (i.e., a greenhouse or field or portion of a field treated with a fumigant in any 24-hour period). The FMP may be prepared by the certified applicator, the site owner/operator, registrant, or other party. The certified applicator must verify in writing the site-specific FMPs reflects current site conditions before the start of fumigation. • General site information o Site address or description of location o Site operator/owner's name, address, and, phone number o Map, aerial photo, or detailed sketch showing field location, dimensions, buffer zones, property lines, public roads, bus stops, water bodies, wells, rights-of-ways inside buffers, nearby application blocks, surrounding	In the Directions for Use for Pre-plant soil fumigation under the heading, "Site-Specific Fumigation Management Plan (FMP)"

	structures (occupied and non-occupied), locations of posted signs for buffers, and sites requiring ¼ mile buffer zones (e.g., prisons, schools, hospitals, state licensed day care centers) with distances from the application site labeled • Applicator information (license number, address, phone number, contact information for person supervising the fumigation with location and date for completing the registrant's chloropicrin training program) • Authorized on-site personnel (Names of all handlers and the tasks they are authorized and trained to perform) • Application procedures o Fumigation window (target application date, earliest and latest possible date of fumigation) o Product information (brand name, registration number) o Type of fumigation (e.g., shank, broadcast, drip, raised bed, strip, etc.) o Target application rate and application block size • Good Agricultural Practices (GAPs) o Description of applicable mandatory GAPs (registrants may also include optional GAPs) o Measurements and other documentation planned to ensure GAPs are achieved (e.g. measurement of soil and other site conditions, tarp repair/perforation/removal plans, etc.) • Buffer zones o Calculations and rationale for buffer zones distances (e.g. specify table from label that distances are based on, rate and block size, applicable credits applied) o Start and stop times for buffer zones • Respirators and other personal protective equipment (PPE) for handlers (respirator type, respirator cartridge, and other PPE selection; verification that respirator training/fit-testing/medical exams is current; and maintenance/storage procedures) • Air monitoring o Type of samples that will be collected (e.g., occupational, in occupied structures, outside buffer zone area if site monitoring is conducted, etc.) o When and where samples will be collected o Duration of samples o Sampling methods and equipment o Name, address, and, phone number of person taking samples • Posting (names of persons who will post signs, location of posting signs, procedures for posting and sign removal) • Site-Specific response and management o Fumigant site monitoring ▪ Description of who, when, where, and procedures for monitoring buffer zone perimeter o Response information for neighbors ▪ List of residences and businesses informed (neighboring property owners) ▪ Method of sharing information • State and tribal lead agency notification o Include the information that is sent to the lead agency • Plan describing how communication will take place between applicator, land owner/operator, and other on-site handlers (tarp cutters/removers, irrigators, etc.) • Record keeping procedures • Emergency procedures (evacuation routes, locations of telephones, contact information for first responders, local/state/federal contacts, key personnel and emergency procedures/responsibilities in case of an incident, equipment/tarp/seal	

	failure, odor complaints or elevated air concentration levels outside buffer zone suggesting potential problems, or other emergencies). • Hazard communication (product labels, material safety data sheets, etc.) For situations where an initial FMP is developed and certain elements do not change for multiple fumigation sites (e.g. applicator information, authorized on-site personnel, record keeping procedures, emergency procedures, etc.) only elements that have changed need to be updated in the site-specific FMP provided the following: ➢ The certified applicator supervising the application has verified that those elements are current and applicable to the application block before it is fumigated and has documented the verification in the site-specific FMP; and ➢ Recordkeeping requirements are followed for the entire FMP (including elements that do not change) The employer of fumigant handlers must make the FMP available to each of their handler employees involved in the fumigation. The certified applicator and owner/operator of the application block must provide a copy of the FMP to handlers who are involved in the fumigation, workers in adjacent areas to the application block, and federal/state/local enforcement personnel, upon request. Within 30 days of completing the application portion of the fumigation process, the certified applicator supervising the application must complete a post-fumigation application summary that describes any deviations from FMP that have occurred, measurements taken to comply with GAPs as well as any complaints and/or incidents that have been reported to him/her. The summary must include the actual date of the application, application rate, and size of application block fumigated." The certified applicator who supervised the fumigation and the owner/operator of the agricultural establishment where the fumigation took place must keep a signed copy of the site-specific FMPs and the post-application summary record for at least 2 years following the application and must make them available, upon request, to Federal, state, tribal, and/or local enforcement personnel.	
For pre-plant soil use. Information Exchange	"When the certified applicator supervising the application leaves the application site after the application portion of the fumigation process is complete and other persons will be performing handler tasks (see the handling activities listed elsewhere in this labeling), the certified applicator must communicate in writing all of the requirements on this labeling with respect to the fumigation process and protection of handlers to the owner/operator of the agricultural establishment where the fumigation is taking place. IMPORTANT: this requirement does not override the requirements in the Worker Protection Standard for Agricultural Pesticides for information exchange between owners/operators of agricultural establishments and commercial pesticide applicators."	
For pre-plant soil use. General Buffer Zones requirements for all formulations	**"General Buffer Zone Requirements** A "buffer zone" must be established for every fumigant application The following describes the general buffer zone requirements: • "Buffer zone" is an area established around the perimeter of each application block or greenhouse where a soil fumigant is applied. The buffer zone must extend from the edge of the application block perimeter equally in all directions. • All non-handlers including field workers, nearby residents, pedestrians, and other bystanders, must be excluded from the buffer zone during the buffer zone period except for certain persons in transit (see exemptions section).	In the Directions for Use for Pre-plant soil fumigation under the heading "General Buffer Zone Requirements"

- An "application block" is a greenhouse or field or portion of a field treated with a fumigant in any 24-hour period (see Figures 1 and 2 above for further explanation).
- The "buffer zone period" starts at the moment when any fumigant is delivered/dispensed to the soil within the application block and lasts for a minimum of 48 hours after the fumigant has stopped being delivered/dispensed to the soil.

Buffer zone distances

- Buffer zone distances must be based on look-up tables on product labels (25 feet is the smallest distance regardless of site-specific application parameters).
- For selective replant fumigation in an orchard using hand held application methods (e.g., deep injection auger probes), the minimum buffer zone will be 25 feet measured from the center of each injection site (i.e., tree hole).

Authorized entry to buffer zones

- Only authorized handlers who have been properly trained and equipped according to EPA's Worker Protection Standard (WPS) and label requirements may be in the buffer zone during the buffer zone period.

Buffer zone proximity

- To reduce the potential for off-site movement from multiple fumigated fields, buffer zones for products containing chloropicrin from multiple application blocks may not overlap (including blocks fumigated by adjacent property owners; see below for exemptions for areas not under the control of owner/operator of application block).
- No fumigant applications will be permitted within 0.25 miles of schools, state licensed day care centers, nursing homes, assisted living facilities, elder care facilities, hospitals, in-patient clinics and prisons if occupied during the buffer zone period.

Exemptions for transit through buffer zones

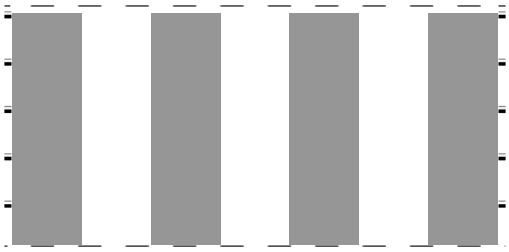
- Vehicular and bicycle traffic on public and private roadways through the buffer zone is permitted. "Roadway" means that portion of a street or highway improved, designed or ordinarily used for vehicular travel, exclusive of the sidewalk or shoulder even though such sidewalk or shoulder is used by persons riding bicycles. In the event a highway includes two or more separated roadways, the term "roadway" shall refer to any such roadway separately.
- Bus stops or other locations where persons wait for public transit are not permitted within the buffer zone.
- See posting section for additional requirements that may apply.

Structures under the control of owner/operator of the application block

- Buffer zones may not include buildings used for storage such as sheds, barns, garages, etc., **UNLESS,**
  1. The storage buildings are not occupied during the buffer zone period, and
  2. The storage buildings do not share a common wall with an occupied structure.
- See posting section for additional requirements that may apply.

Areas not under the control of owner/operator of the application block

- Buffer zones may not include residential areas (including employee housing, private property, buildings, commercial, industrial, and other areas that people may occupy or outdoor residential areas, such as lawns, gardens, or play areas, **UNLESS,**
  1. The occupants provide written agreement that they will voluntarily vacate the buffer zone during the entire buffer zone period, and
  2. Reentry by occupants and other non-handlers must not occur until,
     - The buffer zone period has ended, and
     - Two consecutive air samples for chloropicrin taken in the structure at least 1 hour apart indicate less than less than 0.15 ppm chloropicrin is present.

	• Buffer zones may not include agricultural areas owned/operated by persons other than the owner/operator of the application block, **UNLESS,** 1. The owner/operator of the application block can ensure that the buffer zone will not overlap with a buffer zone from any adjacent property owner, and 2. The owner/operator of the areas that are not under the control of the application provides written agreement to the certified applicator supervising the fumigant application that they, their employees, and other persons will stay out of the buffer zone during the entire buffer zone period. • Buffer zones may not include publicly owned and/or operated areas (e.g., parks, rights of way, side walks, walking paths, playgrounds, athletic fields, etc), **UNLESS,** 1. The area is not occupied during the buffer zone period, 2. Entry by non-handlers is prohibited during the buffer zone period, and Written permission to include the public area in the buffer zone is granted by the appropriate state and/or local authorities responsible for management and operation of the area."	
For pre-plant soil use. Buffer Zone Distances for chloropicrin only formulations, chloropicrin and methyl bromide formulations, chloropicrin and methyl iodide formulations, and chloropicrin and 1,3-D formulations.	"**Buffer Zone Distances** Buffer zone distances must be calculated using the application rate and the size of the application block.  **Figure 1.** Broadcast Application  **Figure 2.** Bedded Application In **Figures 1 and 2,** the dashed line represents the perimeter of the field, the shaded area is the portion of the field that is treated, and the un-shaded area is the area of the field that is untreated. Assuming both fields are 10 acres, and only 50% of field in figure 2 is fumigated, the *rate per treated acre* is 400 lbs ai/A for both Figure 1 and 2. The *broadcast rate* for figure 1 is 400 lb ai/A but the *effective broadcast equivalent rate* for Figure 2 is 200 lbs ai/A. The buffer zone distances must be based on the broadcast or effective broadcast equivalent rates." **Note to registrant:** Labels may express rates as lbs per treated acre under the application instructions but they must identify buffer zone distances based on the broadcast or effective broadcast equivalent rates. "For selective replant fumigation in an orchard using hand-held application methods (e.g., deep injection auger probes), the minimum buffer zone will be 25 feet measured from the center of each injection site.	In the Directions for Use for Pre-plant soil fumigation under the heading " Buffer Zone Distances"

For all other applications, the following tables must be used to determine the buffer distances. Round-up to the nearest rate and block size, where applicable.

Buffer Zone Look-up Table for Shank Bedded with Tarps
[For chloropicrin only see Table 15 below.

See driver table below for formulations of chloropicrin and methyl bromide. If methyl bromide is the driver insert Table 2 from MeBr RED. If chloropicrin is the driver insert Table 15 below.

When chloropicrin is used in combination with methyl iodide, please refer to the Agency for appropriate buffer table.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 15 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 15 below.]

Buffer Zone Look-up Table for Shank Bedded with Tarps if the application occurs 1 hour before sunset and 1 hour after sunrise
[For chloropicrin only see Table 16 below.

See driver table below for formulations of chloropicrin and methyl bromide. If methyl bromide is the driver insert Table 2 from MeBr RED. If chloropicrin is the driver insert Table 16 below.

When chloropicrin is used in combination with methyl iodide, please refer to the Agency for appropriate buffer table.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 16 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 16 below.]

Buffer Zone Look-up Table for Shank Broadcast with Tarps
[For chloropicrin only see Table 15 below.

See driver table below for formulations of chloropicrin and methyl bromide. If methyl bromide is the driver insert Table 3 from MeBr RED. If chloropicrin is the driver insert Table 15 below.

When chloropicrin is used in combination with methyl iodide, please refer to the Agency for appropriate buffer table.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must

meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 15 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 15 below.]

Buffer Zone Look-up Table for Shank Bedded without Tarps
[For chloropicrin only see Table 17 below.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 17 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 17 below.]

Buffer Zone Look-up Table for Shank Broadcast without Tarps
[For chloropicrin only see Table 18 below.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 18 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 18 below.]

Buffer Zone Look-up Table for Shank Deep Broadcast without Tarps
[For chloropicrin only see Table 19 below.

See driver table below for formulations of chloropicrin and methyl bromide. If methyl bromide is the driver insert Table 4 from MeBr RED. If chloropicrin is the driver insert Table 19 below.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 19 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 19 below.]

Buffer Zone Look-up Table for Drip Irrigation with Tarps
[For chloropicrin only see Table 20 in the chloropicrin RED.

When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must

	meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 20 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 20 below.] **Buffer Zone Look-up Table for Pre-Plant Greenhouse Applications with Tarps** [For chloropicrin only see Table 21 below. When chloropicrin is used in combination with 1,3-dichloropropene, the buffer zone must meet all of the generic requirements for chloropicrin. Also to clarify which buffer must be used, 1,3-D labels that contain chloropicrin must delete the current buffer zone language, and replace it with, "The buffer zone for 1,3-D is 100 feet. This buffer zone does not apply to soils that have not been treated with 1,3-D in the previous 3 years." If the chloropicrin buffer as listed in Table 21 is greater than 100 feet, the chloropicrin buffer must be used. If the chloropicrin buffer is less than 100 feet, and 1,3-D has been used on the field in the previous 3 years, the buffer is 100 feet. If 1,3-D has not been used on the field in the previous 3 years, the buffer is determined by Table 21 below.]"	
For pre-plant soil use. Buffer Zone Credits	**"Buffer Zone Credits** The buffer zone distances for chloropicrin applications may be reduced by the percentages listed below. Credits may be added, but credits cannot exceed 50%. Also the minimum buffer zone distance is 25 feet regardless of buffer zone credits available. The maximum buffer zone is 0.5 mile (2,640 feet), with or without credits. • 40% reduction in buffer zone distance, IF using Bromostop® (1.38 mil), IPM Clear VIF (1.38 mil), Eval/Mitsui (1.38 mil) tarps, Hytiblock 7 Black (0.00125"), XL Black Blockade (0.00125"), and Hytibar (1.5 mil). The tarp brand name, manufacturer, lot number, batch number, part number, and thickness must be recorded in the FMP. • 50% reduction in buffer zone distance, IF the Symmetry™ application system is used with one of the approved high barrier tarps AND the application rate is less than 100 lbs ai/A. • 5% reduction in buffer zone distance if potassium thiosulfate (KTS) is applied on top of a tarped chloropicrin application. Apply KTS by sprinkler, and apply 25 gallons of KTS per acre with enough water to wet the soil to a depth of 10 mm. • 10% reduction in buffer zone distance, IF the organic content of soil in the application block is greater than 3%. Record the measurements taken to verify the organic content in the FMP. • 10% reduction in buffer zone distance, IF the clay content of the soil in the application block is greater than 27%. Record the measurements taken to verify the clay content in the FMP. <u>Example of Buffer Calculation if a Credit is Applicable</u> Application Method: **Shank, Tarp, Bed** Application Block size: **20 acres** Application Rate: **122.5 lbs ai/A** Required Buffer Zone from Table 1: **350 feet** Use IPM Clear VIF (1.38 mil) tarp: **40% credit**. New Buffer Zone = **required distance from appropriate table * (1-credit)** New Buffer Zone = **350 * (1-0.40)**	In the Directions for Use for Pre-plant soil fumigation under the heading "Buffer Zone Credits"

<table>
<tr><td></td><td>New Buffer Zone = 210 feet”</td><td></td></tr>
<tr><td>For pre-plant soil use.

Posting</td><td>“Posting Fumigant Buffer Zones
• Posting all entrances to the application block (i.e., the greenhouse or field or portion of a field treated with a fumigant in any 24-hour period) is required for all soil fumigants and use sites. The posting requirements for the application block are listed elsewhere in this labeling.
• Posting of the fumigation buffer zone is required, <u>except</u> when one of the following conditions exist:
(1) if there is a physical barrier that prevents access into the buffer zone, such as a fence or wall, that separates the edge of the buffer zone from workers or bystanders, or
(2) if the area within 300 feet of the edge of the buffer zone is entirely controlled by owner/operator of the application block (i.e., the greenhouse or field or portion of a field treated with a fumigant in any 24-hour period); however this exception does not apply to any area under the control of the owner/operator that may be used as housing for workers or other employees. IMPORTANT: if there is public land or any land under someone else’s control within 300 feet from the edge of the buffer zone, the buffer zone must be posted.
• If the buffer zone must be posted, signs must be placed at all usual points of entry and along likely routes of approach from areas where people not under the control of the application block’s owner/operator may approach the buffer zone.
o Some examples of points of entry include, but are not limited to, roadways, sidewalks, paths, and bike trails.
o When there are no usual points of entry, signs must be posted in the corners of the buffer zone, between the corners of the buffer zone, and along sides so that one sign can be viewed (not read) from the previous one.
o The buffer zone posting signs must remain posted at least until the end of the buffer zone period and must be removed within 3 days after the end of the buffer zone period.
▪ Contiguous Application Blocks Exception: If multiple contiguous application blocks are fumigated within a 14-day period, a buffer zone may be established starting from the outer edge of the contiguous application blocks. This buffer zone is in effect from the beginning of the first application until the buffer zone period for the last application block has expired. The periphery of the buffer zone must be posted during this entire period. Signs may remain posted until 3days after the buffer zone period for the last application block has expired.
• The buffer zone posting should meet the following standards:
o The printed side of the sign must face away from the buffer zone.
o Signs must remain legible during entire posting period.
o The signs at entrances to buffer zones must be removed by the certified applicator in charge of the fumigation (or someone under his/her supervision).
o The general standards for size and type of signs for the buffer zone signs must follow the requirements in the Worker Protection Standard for Agricultural Pesticides for treated area posting.
o The signs must remain visible and legible during the time they are posted.”

Contents of Signs
<table><tr><td>The treated area sign must state the following:
-- Skull and crossbones symbol</td><td>The buffer zone sign must state the following:
-- Do not walk sign</td></tr></table></td><td>In the Directions for Use for Pre-plant soil fumigation under the heading “Posting”</td></tr>
</table>

	 -- "DANGER/PELIGRO," -- "Area under fumigation, DO NOT ENTER/NO ENTRE," -- "[*Name of fumigant*] Fumigant in USE," -- the date and time of fumigation, -- the date and time entry prohibition is lifted -- brand name of this product, and -- name, address, and telephone number of the certified applicator in charge of the fumigation.	 -- "DO NOT ENTER/NO ENTRE," -- "[*Name of fumigant*] Fumigant BUFFER ZONE," -- the date and time of fumigation, -- the date and time buffer zone restrictions are lifted (i.e., buffer zone period expires) -- brand name of this product, and -- name, address, and telephone number of the certified applicator in charge of the fumigation"	
For pre-plant soil use. Site specific response and management	**"Site Specific Response and Management** The certified applicator must either follow the directions under the "fumigant site monitoring" section or follow the directions under the "response information for neighbors" section. **Fumigation Site Monitoring** From the beginning of the fumigant application until the buffer zone period expires, a certified applicator or someone under his/her supervision must monitor the air concentration levels of the fumigant in the area between the buffer zone and any residences or businesses that trigger the 'response information for neighbors' requirement. • The person monitoring the air concentration levels must take readings starting approximately 30 minutes from the start of application and at least once each hour during the entire application and buffer zone period. • A direct reading detection device, such as a Draeger device with a sensitivity of at least 0.15 ppm for chloropicrin must be used to monitor the air concentration levels of chloropicrin. • If at any time (1) chloropicrin concentrations are greater than or equal to 0.15 ppm OR (2) the person monitoring the air concentrations experiences sensory irritation, then the emergency response plan stated in the FMP must be immediately implemented by the person monitoring the air concentrations • If other problems occur, such as a tarp coming loose, then the appropriate control plan must be activated. • The results of the air concentration monitoring must be recorded in the FMP. • Informing the appropriate federal, state or tribal lead agencies is still required. **Response Information for Neighbors** The certified applicator (or someone under his/her supervision) supervising the fumigation must ensure that residences and owners/operators of businesses that meet the criteria below have been provided the emergency response information at least **48 hours** before fumigation occurs. The information provided may include application dates that range for no more than **2 weeks**. After 2 weeks, the information must be delivered again. Criteria for providing response information for neighbors:	In the Directions for Use for Pre-plant soil fumigation under the heading "Site specific response and management"

	• If the buffer zone is less than or equal to **100 feet**, then residences and businesses within **50 feet** from the edge of the buffer zone must be informed. • If the buffer zone is greater than **100 feet** but less than or equal to **200 feet**, then residences and businesses within **100 feet** from the edge of the buffer zone must be informed. • If the buffer zone is greater than **200 feet** but less than or equal to **300 feet**, then residences and businesses within **200 feet** from the edge of the buffer zone must be informed. • If the buffer zone is greater than **300 feet**, then residences and businesses within **300 feet** from the edge of the buffer zone must be informed. Information that must be included: • Location of the application block and surrounding buffer zone • Fumigant(s) applied including EPA Registration # • Applicator and property owner/operator contact information • Time period that fumigation may occur (must not range more than 2 weeks) • Duration of buffer zone • The information must also include: o information on what is being applied, o signs and symptoms of exposure to the fumigant, o what to do and who to call if you believe you are being exposed (911 in most cases). • The method used to share the response information for neighbors must be described in the FMP and may be accomplished through mail, door hangers, or through other methods that will effectively inform people in residences and businesses within the required distance from the edge of the buffer zone."	
Notice to State and Tribal Lead Agencies	**"Notice to State and Tribal Lead Agencies** The state and tribal lead agency information must be provided to the appropriate state or tribal lead agency in a written format prior to the application. The information that must be provided to state and tribal lead agencies includes the following: o Location of the application block and surrounding buffer zone, o Fumigant(s) applied including EPA Registration #, o Applicator and property owner/operator contact information, o Time period that fumigation may occur (must not range more than 2 weeks), o Duration of buffer zone."	Directions for Use under "Notice to State and Tribal Lead Agencies"
For pre-plant soil use. Application Restrictions	"Maximum Application Rates for Pre-Plant Soil Uses • 350 lbs a.i. per treated acre for tarped, shank injection applications; • 175 lbs a.i. per treated acre for untarped, shank injection applications; • 300 lbs a.i. per treated acres for drip irrigation applications (including greenhouses); • 500 lbs a.i. per treated acre, this is equivalent to 1 lb per 100 square feet, for tree hole replant applications (small area)."	In the Directions for Use for Pre-plant soil fumigation under the heading "Maximum Application Rates for Pre-Plant Soil Fumigation" within its own box
For pre-plant soil use.	"The maximum area that can be treated is 50,000 square feet.	In the Directions for Use for Pre-

Requirements for greenhouses.	All greenhouse pre-plant soil fumigations must be tarped."	plant soil fumigation under the heading "Requirements for Pre-Plant Greenhouse Soil Fumigations"
Environmental Hazards	"This pesticide is toxic to mammals and birds. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate."	Precautionary Statements immediately following the User Safety Recommendations
General Application Restrictions	"Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. While chloropicrin has certain properties and characteristics in common with chemicals that have been detected in groundwater (chloropicrin is highly soluble in water and has low adsorption to soil), volatilization is this chemical's most important route of dissipation. To reduce the potential for leaching to groundwater, especially in soils with shallow groundwater, for broadcast, **tarped** applications, the tarps must be perforated (cut, punched, etc.) before noon and only when rainfall is not expected within 12 hours. For raised-bed, **tarped** applications rainfall is not a factor since planting occurs with the tarp in place. For untarped applications of chloropicrin, potential leaching into groundwater and runoff into surface water can be reduced by avoiding applications when heavy rainfall is forecasted to occur within 24 hours."	Place in the Direction for Use directly above the Agricultural Use Box.

DRIVER TABLES

Table 11

Standard Tarp (no credits)								
	Formulation							
Application Method	**98:2**	**80:20**	**75:25**	**67:33**	**57:43**	**50:50**	**45:55**	**33:67**
Broadcast[1]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin	Chloropicrin
Bedded[2]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin
Bedded*[3]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin

Table 12

High Barrier Films: Bromostop® (1.38 mil), IPM Clear VIF (1.38 mil), and Eval/Mitsui (1.38 mil) with 25% credit for methyl bromide and 40% credit for chloropicrin								
	Formulation							
Application Method	**98:2**	**80:20**	**75:25**	**67:33**	**57:43**	**50:50**	**45:55**	**33:67**
Broadcast[1]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin
Bedded[2]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin
Bedded*[3]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin

Table 13

High Barrier Films: Hytiblock 7 black (0.00125"), XL Black Blockade (0.00125") and Hytibar (1.5 mil) with a 40% credit for chloropicrin and no credit for methyl bromide								
	Formulation							
Application Method	**98:2**	**80:20**	**75:25**	**67:33**	**57:43**	**50:50**	**45:55**	**33:67**
Broadcast[1]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin
Bedded[2]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin
Bedded*[3]	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin

Table 14

Deep (≥ 18 inches) Untarp								
	Formulation							
Application Method	**98:2**	**80:20**	**75:25**	**67:33**	**57:43**	**50:50**	**45:55**	**33:67**
Broadcast[4]	Methyl Bromide	Methyl Bromide	Chloropicrin	Chloropicrin	Chloropicrin	Chloropicrin	Chloropicrin	Chloropicrin

*When applications occur between 1 hour before sunset and 1 hour after sunrise.

[1] Where methyl bromide is listed, for the appropriate buffer zone, see Table 3 in the methyl bromide RED. Where chloropicrin is listed, see Table 15 below.

[2] Where methyl bromide is listed, for the appropriate buffer zone, see Table 2 in the methyl bromide RED. Where chloropicrin is listed, see Table 15 below.

[3] Where methyl bromide is listed, for the appropriate buffer zone, see Table 2 in the methyl bromide RED. Where chloropicrin is listed, see Table 16 below.

[4] Where methyl bromide is listed, for the appropriate buffer zone, see Table 4 in the methyl bromide RED. Where chloropicrin is listed, see Table 19 below.

Table 15

Tarp Bedded and Broadcast Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	25	25	25	25	25	50	75	100	125	135	150	175	225	250	275	325
5	25	25	25	25	50	75	125	175	225	275	300	375	450	475	550	625
10	25	25	50	75	100	175	250	350	400	450	550	650	700	750	900	1000
20	25	35	50	125	250	350	450	550	650	750	850	1025	1150	1225	1375	1575
30	25	35	70	200	350	475	600	750	900	1000	1100	1400	1500	1575	1825	2075
40	25	50	100	275	425	600	750	900	1050	1200	1400	1675	1775	1975	2250	2500
50	35	50	150	350	500	700	900	1100	1250	1425	1575	1975	2175	2375	2675	2950
60	50	75	200	400	600	800	1050	1225	1450	1625	1825	2275	2375	2575	2950	3350
80	50	100	275	500	750	1000	1250	1475	1775	2175	2325	2775	2950	3150	3750	4150
120	75	175	400	700	1050	1375	1675	2050	2375	2775	3150	3725	4000	4350	P	P

Table 16

Tarp Bedded Buffer Zone Distances (feet) with 25% Increase																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	31	31	31	31	31	63	94	125	157	169	188	219	281	313	344	406
5	31	31	31	31	63	94	156	219	281	344	375	469	562.5	594	388	781
10	31	31	63	94	125	219	313	438	500	563	688	813	875	938	1125	1250
20	31	44	63	156	313	438	563	688	813	938	1063	1281	1438	1531	1719	1969
30	31	44	88	250	438	594	750	938	1125	1250	1375	1750	1875	1969	2281	2594
40	31	63	125	344	531	750	938	1125	1313	1500	1750	2094	2219	2469	2813	3125
50	44	63	188	438	625	875	1125	1375	1563	1781	1969	2469	2719	2969	3344	3688
60	63	94	250	500	750	1000	1313	1531	1813	2031	2281	2844	2969	3219	3688	4188
80	63	125	344	625	938	1250	1563	1844	2219	2719	2906	3469	3688	3938	4688	5188
120	94	219	500	875	1313	1718	2094	2563	2968	3469	3938	4656	5000	P	P	P

Table 17

Untarp Bedded Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	17.5	**26.25**	**35**	**43.75**	**52.5**	**61.25**	**70**	**78.72**	**87.5**	**96.25**	**105**	**122.5**	**131.3**	**140**	**157.5**	**175**
1	25	25	25	25	50	100	125	150	175	175	200	250	275	300	325	350
5	25	25	25	50	100	175	225	275	325	375	400	500	525	575	625	700
10	25	25	50	150	200	300	375	450	550	600	650	750	825	875	1000	1100
20	25	35	125	275	375	500	600	725	825	925	1000	1175	1225	1350	1475	1650
30	25	50	200	350	550	675	800	925	1050	1175	1300	1475	1625	1700	1925	2175
40	25	75	300	450	650	800	975	1100	1275	1425	1575	1775	1975	2175	2350	2550
50	25	125	350	550	725	925	1100	1275	1475	1625	1775	2075	2225	2375	2750	3000
60	35	175	400	650	825	1025	1250	1475	1675	1875	2000	2375	2575	2775	3075	3550
80	50	250	500	775	1000	1225	1475	1775	2025	2475	2550	2800	2900	3200	3750	4350
120	50	350	650	1025	1400	1650	2000	2375	2575	2950	3200	3750	3975	4350	4725	P

Table 18

Untarp Broadcast Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	17.5	**26.25**	**35**	**43.75**	**52.5**	**61.25**	**70**	**78.75**	**87.5**	**96.25**	**105**	**122.5**	**131.3**	**140**	**157.5**	**175**
1	25	25	25	50	100	150	175	200	225	275	300	350	375	400	450	500
5	25	25	50	75	175	275	350	400	475	550	600	700	750	800	900	1000
10	25	25	75	250	350	450	600	700	800	900	950	1125	1200	1300	1450	1575
20	25	50	250	450	625	800	975	1125	1250	1375	1500	1775	1875	1975	2225	2575
30	25	125	400	625	850	1100	1250	1475	1625	1825	1975	2375	2550	2600	2950	3400
40	35	250	500	800	1025	1275	1575	1775	1975	2250	2400	2850	3050	3225	3750	4325
50	50	275	600	900	1225	1575	1825	2100	2375	2575	2850	3300	3550	3950	4350	P
60	50	350	700	1050	1400	1775	2075	2375	2550	2950	3200	3800	4175	4350	P	P
80	75	450	900	1275	1775	2150	2600	2950	3275	3575	3950	P	P	P	P	P
120	125	600	1200	1775	2375	2950	3350	3950	4350	P	P	P	P	P	P	P

Table 19

Untarp Broadcast Deep Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	35	**52.5**	**70**	**87.5**	**105**	**122.5**	**140**	**157.5**	**175**	**192.5**	**210**	**245**	**262.5**	**280**	**315**	**350**
1	25	90	175	225	300	350	400	450	500	525	600	700	750	800	878	975
5	50	175	350	475	600	700	800	900	1000	1050	1200	1400	1475	1575	1775	1975
10	75	350	600	800	950	1125	1300	1450	1575	1675	1875	2200	2350	2550	2800	3150
20	250	625	975	1250	1500	1775	1975	2225	2575	2775	2950	3550	3750	4000	P	P
30	400	850	1250	1625	1975	2375	2600	2950	3400	3650	3800	4350	4575	4725	P	P
40	500	1025	1575	1975	2400	2850	3225	3750	4325	4500	P	P	P	P	P	P
50	600	1225	1825	2375	2850	3300	3950	4350	P	P	P	P	P	P	P	P
60	700	1400	2075	2550	3200	3800	4350	P	P	P	P	P	P	P	P	P
80	900	1775	2600	3275	3950	P	P	P	P	P	P	P	P	P	P	P
120	1200	2375	3350	4350	P	P	P	P	P	P	P	P	P	P	P	P

Table 20

Drip Irrigation Tarped Buffer Zone Distances (feet)																
Block Size (acres)	Broadcast Equivalent Application Rate (lb ai/acre)															
	30	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**	**210**	**225**	**240**	**270**	**300**
1	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
10	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	50
20	25	25	25	25	25	25	25	25	25	25	25	35	35	50	65	75
30	25	25	25	25	25	25	25	25	25	25	25	35	50	65	85	125
40	25	25	25	25	25	25	25	25	25	25	35	35	50	75	125	150
50	25	25	25	25	25	25	25	25	35	35	50	50	75	125	145	175
60	25	25	25	25	25	25	25	25	35	50	50	50	100	125	175	225
80	25	25	25	25	25	25	25	50	50	50	50	75	125	150	225	275
120	25	25	25	25	25	25	25	50	75	100	100	175	225	275	325	400

Table 21
Greenhouse Tarped Drip Applications

Structure Size	Buffer Zone
≤ 25,000 square feet	25 feet
> 25,000 square feet and ≤ 30,000 square feet	50 feet
> 30,000 square feet and ≤ 35,000 square feet	75 feet
> 35,000 square feet and ≤ 40,000 square feet	100 feet
> 40,000 square feet and ≤ 45,000 square feet	115 feet
> 45,000 square feet and up to 50,000 square feet	130 feet

Table 22: Summary of Labeling Changes for Chloropicrin Antimicrobial Uses (Remedial Wood Treatment)

Description	Amended Label Language	Placement
Add language clarifying application methods	"For remedial treatment of wooden poles/timbers: 1. Plug the pre-drilled holes immediately after applications; 2. Do not treat structures/beams indoors; 3. Do not drill an application hole through seasoning checks to apply product. If the hole intersects a check, plug the hole and drill another. If more than 2 treatment holes intersect an internal void or rot pocket, re-drill the holes farther up the pole into relatively solid wood."	Directions for Use
For end-use products containing directions for use for the pour or injection method of application (not including the vial application method)	"Applicators and other handlers must wear a full-face tight-fitting or loose-fitting helmet or hood style NIOSH/MSHA approved respirator • with an organic-vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or • with a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G)." All references to wearing goggles or a full face shield for eye protection must be removed.	Personal Protective Equipment
For end-use products containing directions for use for the vial method of application	"For handling activities in enclosed areas, applicators and other handlers participating in filling the vials or otherwise exposed to non-encapsulated product must wear: • a supplied-air respirator with MSHA/NIOSH approval number prefix TC-19C, or • a self-contained breathing apparatus (SCBA) with MSHA/NIOSH approval number TC-13F. For handling activities outdoors, applicators and other handlers participating in filling the vials or otherwise exposed to non-encapsulated product must wear a full-face tight-fitting or loose-fitting helmet or hood style NIOSH/MSHA approved respirator: • with an organic-vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or • with a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G)."	Personal Protective Equipment
For all antimicrobial end-use registrations of chloropicrin	"Do not permit entry into spill area or clean-up area by unprotected persons until concentration of chloropicrin is determined to be less than 0.1 ppm." This language updates some labels which currently state 0.3 ppm.	Storage and Disposal and Personal Protective Equipment
The following language must appear on the label if respirator use is required (for liquid pour application and when filling vials):	<u>"Employers must also ensure that all handlers are:</u> • Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29CFR Part 1910.134) • Trained using a program that confirms to OSHA's requirements (see 29CFR Part 1910.134) • Examined by a qualified medical practitioner to ensure physical ability to safely wear the style of respirator to be worn. A qualified medical practitioner is a physician or other licensed health care professional who will evaluate the ability of a worker to wear a respirator. The initial	Directions for Use Under the section "Protection for Handlers"

	evaluation consists of a questionnaire that asks about medical conditions (such as a heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. The initial evaluation must be done before respirator use begins. Handlers must be reexamined by a qualified medical practitioner if their health statue or respirator style or use-conditions change."	
The following language must appear on the label if the use of a respirator is not required (application via vial method) but needs to be available in case of spill or emergency:	"In case of emergency or the need for immediate respiratory protection, the fumigation handler employer must make sure that the following PPE are immediately available to all persons performing fumigant handling activities: • at least one air rescue device (e.g., SCBA) must be on-site in case of an emergency, and • unless an air-purifying respirator is being worn by each person performing a handling task at the site, enough full-face air-purifying respirators of the type specified in the PPE section of this labeling must be immediately available at the site for each handler."	Directions for Use Under the section "Protection for Handlers"
For registration 75340-1, use directions for the vial method of application must be incorporated into the main label and the reference to the pour method of chloropicrin removed (the pour method is no longer used for this registration).	Vial method of application language to be provided by registrant when revised label submitted for review.	Directions for Use

Appendix A

Chloropicrin PC Code 081501 Uses Eligible for Reregistration

Use Site	Formulation	Application Method	Maximum Application Rate/Number of Applications	Use Limitations
Pre-Plant Soil				
Agricultural Crops Berries: caneberries, blackberries, boysenberries, dewberries, loganberries, raspberries, youngberries, blueberries, cranberries, gooseberries, huckleberries. Small fruits: strawberries, currants, grapes, kumquat, bananas, figs, persimmons, pineapple, pomegranates, tree fruits (all), vine fruits (all). Citrus fruits: Grapefruit, lemon, limes, oranges, tangelos, tangerines. Nut crops: almonds, cashews, chestnuts, filberts, hickory nuts, pecans, walnuts, pistachios. Pome and stone fruits: apples, pears, quinces, apricots, cherries, nectarines, peaches, plums, prunes, dates. Cucurbits:	soluble concentrate/liquid, pressurized gas, pressurized liquid, emulsifiable concentrate, and a ready-to-use product	1. Shank injection tarped** 2. Shank injection untarped 3. Shank injection deep (at least 18 inches) untarped 4. Drip Irrigation Tarp 5. Tree hole replant	1. 350 lbs ai/A 2. 175 lbs ai/A 3. 350 lbs ai/A 4. 300 lbs ai/A 5. 500 lbs ai/A (1 lb/100 ft^2)	See applicable GAPS from Table 10 in the RED.

Use Site	Formulation	Application Method	Maximum Application Rate/Number of Applications	Use Limitations
Melons (all), cantaloupes, casaba melons, crenshaw melons, honeydew, muskmelons, persian melons, watermelon, cucumbers, pumpkins, squash (summer and winter), mango melons. Vegetables: asparagus, eggplant, peppers, pimentos, tomatoes, cole crops, broccoli, brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, endive, lettuce (all), mustard, spinach, Swiss chard, carrots, garlic, leeks, okra, onions, parsnips, potatoes, radishes, rutabagas, salsify, shallots, sweet potato, yams, popcorn, garden beets, celery, turnips, vegetables (all). Field crops: beans (all), peas (all), kenaf, forage-fodder grasses (all), pastures, alfalfa, clover, lespedeza, vetch, birdsfoot trefoil, barley, corn, oats, rye, sorghum, wheat, sugarcane, buckwheat, tobacco, safflower, cotton, flax, peanuts, soybeans, millet.				

Use Site	Formulation	Application Method	Maximum Application Rate/Number of Applications	Use Limitations
Ornamentals: golf course turf, ornamental turf, forest trees (all), herbaceous plants (all), woody plants (all), flowering plants (all). Miscellaneous: hops, horseradish, mint, olives, greenhouse soils, mushroom house soils.				
Warning Agent Prior to Sulfuryl Fluoride Residential Fumigations				
Residential Structures	Ready-to-Use	Chloropicrin is then placed in the center of the structure in either a shallow pan or onto absorbent material. A fan is then placed to direct the air stream over the pan or absorbent material to accelerate the chloropicrin's evaporation.	1 fluid ounce ai of chloropicrin is used per 10,000-15,000 cubic feet.	
Remedial Wood Treatment				
Wood poles, timbers, pilings, and glue-laminated beams.	Ready to use	There are two methods for application of chloropicrin for remedial wood treatment. One method involves using encapsulated vials. Applicators pour liquid chloropicrin into vials and cap them. After the applicator	Pole Circumference in inches and amount of solution to be applied : 22-29in, use ¼ pint 30-38in, use ½ pint 39-56in, use 1.0 pint 57-65in, use 1 ¼ pint	Do not treat structures/beams indoors. Do not drill an application hole through seasoning checks to apply product. If the hole intersects a check, plug the hole and drill another. If more than 2

Use Site	Formulation	Application Method	Maximum Application Rate/Number of Applications	Use Limitations
		has reached the area to be treated, the cap is removed and the vial inserted into the holes that have been pre-drilled into the timber. The hole is then capped. The other method involves pouring/injecting liquid chloropicrin into holes that have been pre-drilled. The hole is then capped.		treatment holes intersect an internal void or rot pocket, re-drill the holes farther up the pole into relatively solid wood.

**The application method matches up with the same number for the maximum application rate. For example, the maximum application rate for shank bedded tarped applications is 350 lbs ai/A.

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

This section is currently not available.

Appendix C.

Technical Support Documents

Additional support of this RED is maintained in the OPP docket EPA-HQ-OPP-2007-0350. This docket may be accessed in the OPP docket room located at S-4900, One Potomac Yard 2777 S. Crystal Drive, Arlington, VA. It is open Monday through Friday, excluding federal holidays, from 8:30-4:00 pm. All documents may be view in the OPP docket room or downloaded or viewed via the internet at http://www.regulations.gov.

Health Effects Support Documents

- Chloropicrin Final Revised HED Human Health Risk Assessment June 18, 2008. (DP Barcode 348674)
- MOA Mode of Action, Eye Irritation, and the Intra-Species Factor: Comparison of Chloropicrin and MITC. June 25, 2008. DP Barcode 293356.
- RESPONSE TO PUBLIC COMMENTS. The Health Effects Division's Response to Comments on the Agency's April 12, 2007 document, Chloropicrin: Revised HED Human Health Risk Assessment for Phase 5 (Docket EPA-HQ-OPP-2007-0350). DP Barcode 348676.

Environmental Fate and Ecological Effects Support Documents

- Revised Screening Ecological Risk Assessment for the Reregistration of Chloropicrin. DP Barcode 348669. April 16, 2008.
- Response to Phase 5 Public Comments on the Phase 4 Chloropicrin Reregistration Risk Assessment. April 16, 2008. DP Barcode 348669.

Biological and Economical Analysis Support Documents

- Review of Stakeholder Submitted Impact Assessments of Proposed Fumigant Buffers, Comments on Initial Buffer Zone Proposal, and Case Studies of the Impact of a Flexible Buffer System for Managing By-Stander Risks of Fumigants. June 25, 2008. DP Barcode 353940.
- Response to Phase 5 BEAD Related Public Comments Received on the Reregistration of Chloropicrin, Dazomet, Metam Potassium, Metam Sodium, and Methyl Bromide. June 25, 2008. DP Barcode 353940.
- EPA-HQ-OPP-2007-0350-0017, Summary of the Benefits of Soil Fumigation with Chloropicrin in Crop Production.
- EPA-HQ-OPP-2007-0350-0018, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Cucurbit Production.
- EPA-HQ-OPP-2007-0350-0019, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Eggplant Production
- EPA-HQ-OPP-2007-0350-0020, Assessment of the Benefits Soil Fumigants (Methyl Bromide, Chloropicrin, Metam-Sodium, Dazomet) Used by Forest Tree Seedling Nurseries.
- EPA-HQ-OPP-2007-0350-0021, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, Dazomet, and Metam Sodium for Use in Raspberry

Nurseries, Fruit and Nut Deciduous Tree Nurseries, and Rose Bush Nurseries in California.

- EPA-HQ-OPP-2007-0350-0022, Assessment of the Benefits of Soil Fumigation with Chloropicrin and Metam-sodium in Onion Production.
- EPA-HQ-OPP-2007-0350-0023, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, and Metam Sodium in Grape Production.
- EPA-HQ-OPP-2007-0350-0024, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin and Metam Sodium in Tree Nut Production.
- EPA-HQ-OPP-2007-0350-0025, Assessment of the Benefits of Soil Fumigation with Chloropicrin and Metam Sodium in Pome Fruits Production.
- EPA-HQ-OPP-2007-0350-0026, Assessment of the Benefits of Soil Fumigation with Methyl Bromide, Chloropicrin, and Metam Sodium in Stone Fruit Production.
- EPA-HQ-OPP-2007-0350-0027, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Bell Pepper Production.
- EPA-HQ-OPP-2007-0350-0028, Assessment of the Benefits of Soil Fumigation with Metam Sodium in Potato Production.
- EPA-HQ-OPP-2007-0350-0029, Assessment of Soil Fumigation with Chloropicrin, Methyl Bromide and Metam-sodium in Strawberry Production.
- EPA-HQ-OPP-2007-0350-0030, Assessment of the Benefits of Chloropicrin, Methyl Bromide, Metam-sodium and Dazomet Use In Strawberry Nursery Runner Production.
- EPA-HQ-OPP-2007-0350-0031, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam-sodium on Sweet Potato Production.
- EPA-HQ-OPP-2007-0350-0032, Assessment of the Benefits of Soil Fumigation with Chloropicrin in Tobacco Production.
- EPA-HQ-OPP-2007-0350-0033, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, and Metam Sodium in Tomato Production.
- EPA-HQ-OPP-2007-0350-0034, Assessment of the Benefits of Soil Fumigation with Metam-Sodium in Carrot Production.
- EPA-HQ-OPP-2007-0350-0035, Assessment of the Benefits of Soil Fumigation with Metam Sodium in Peanut Production.
- EPA-HQ-OPP-2007-0350-0036, Assessment of the Benefits of Soil Fumigation with Chloropicrin, Methyl Bromide, Metam Sodium and Dazomet in Ornamental Production.
- EPA-HQ-OPP-2007-0350-0037, BEAD's Planned Impact Assessments on Agricultural Sites with Significant Use of Soil Fumigants (Chloropicrin, Dazomet, Methyl Bromide, Metam Potassium, and Metam Sodium.

Antimicrobial Assessment Support Documents

- Revised Occupation and Residential/Bystander Assessment of the Antimicrobial Use (Remedial Wood Treatment) of Chloropicrin for the Reregistration Eligibility Decision (RED) Document. (Phase 3 Comment). PC Code 081501, DP Barcode 314399.
- Phase 6 Response to Substantive Public Comments on Antimicrobials Division's Occupational and Residential Assessments for the Reregistration Eligibility Decision

(RED) Documents for the following chemicals: Methylisothiocyanate (MITC), Metam Sodium, Dazomet, and Chloropicrin.
- Updated Label Language for the Antimicrobial Uses of Chloropicrin (PC Code 081501) for the Reregistration Eligibility Decision Document.

Buffer Zone Credits Support Document
- Factors Which Impact Soil Fumigant Emissions - Evaluation for Use in Soil Fumigant Buffer Zone Credit Factor Approach. Dawson, J. and Smith, C.; D306857; June 9, 2008.
- Health Effects Division Recommendations for Fumigant Data Requirements. DP Barcode 353724.

Risk Management Support Documents
- SRRD's Response to Phase 5 Public Comments for the Soil Fumigants. Rice, M. and McNally, R.; July 2008.
- Risk Mitigation Options to Address Bystander and Occupational Exposures from Soil Fumigant Applications. EPA-HQ-OPP-2007-0350-0003.