



OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

WASHINGTON, D.C. 20460

MEMORANDUM

DATE: July 11, 2024

SUBJECT: **Thiamethoxam.** Updated Occupational Exposure Assessment for Seed Treatment Uses in Support of Registration Review.

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The conclusions conveyed in this assessment were developed in full compliance with *EPA Scientific Integrity Policy for Transparent and Objective Science*, and EPA Scientific Integrity Program's *Approaches for Expressing and Resolving Differing Scientific Opinions*. The full text of *EPA Scientific Integrity Policy for Transparent and Objective Science*, as updated and approved by the Scientific Integrity Committee and EPA Science Advisor can be found here: https://www.epa.gov/system/files/documents/2023-12/scientific_integrity_policy_2012_accessible.pdf. The full text of the EPA Scientific Integrity Program's *Approaches for Expressing and Resolving Differing Scientific Opinions* can be found here: <https://www.epa.gov/scientific-integrity/approaches-expressing-and-resolving-differing-scientific-opinions>.

Introduction

The Pesticide Re-evaluation Division (PRD) of the Office of Pesticide Programs (OPP) has requested the Health Effects Division (HED) evaluate the hazard and exposure data and conduct an updated assessment to estimate the risk to human health that will result from the currently registered seed treatment uses of thiamethoxam.

A revised occupational and residential exposure assessment for thiamethoxam was completed in 2021 to incorporate updates to exposure data and assumptions, as well as to address comments received on the 2017 Human Health Draft Risk Assessment (K. Lowe, D460670, 01/15/2021). In that revision, changes to the ORE memo included: (1) adding in seed treatment scenarios for product labels that include specific label use restrictions (i.e., volumetric restrictions on the amount of product workers may handle), (2) deleting open loading scenarios (without label restrictions) for corn seed treatment based on notification of cancelled labels, (3) updating the calculations for onion seed treatment to reflect a value of 3,000 lb seed treated/day, (4) updating the calculations for onion seed planting to reflect a value of 320 lb seed planted/day, (5) updating the calculations for rice seed planting to reflect a label restriction of 120 lb seed per acre, and (6) updating the poultry house scenario to reflect updated assumptions for area treated based on input from the Biological and Economic Analysis Division (BEAD).

This memorandum further revises the seed treatment assessment to incorporate updated exposure data and policies for seed treatment scenarios (Science Advisory Council for Exposure (ExpoSAC) Policies 14 and 15, January 2022). A summary of human health risk resulting from the registered seed treatment uses of thiamethoxam is provided herein. All other elements and conclusions of the revised 2021 ORE assessment remain unchanged.

It is HED policy to use the best available data to assess exposure. Several sources of generic data were used in this assessment as surrogate data in the absence of chemical-specific data, including Pesticide Handlers Exposure Database Version 1.1 (PHED 1.1); the Agricultural Handler Exposure Task Force (AHETF) database; and ExpoSAC Policy 14 and 15 (SOPs for Seed Treatment). Some of these data are proprietary, and subject to the data protection provisions of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Note: This memorandum was reviewed by the Exposure Science Advisory Committee (ExpoSAC) on August 24th, 2023.

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1.0 Executive Summary

HED has conducted an updated occupational exposure assessment for the registered conventional seed treatment uses of the active ingredient (ai), thiamethoxam, in support of Registration Review, to incorporate new exposure monitoring data and science policies related to evaluating seed treatment uses of pesticides.

Thiamethoxam {3-[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-*N*-nitro-4*H*-1,3,5-oxadiazin-4-imine} is a broad-spectrum nitroguanidine insecticide which belongs to the pesticidal class of compounds known as the neonicotinoids (Insecticide Resistance Action Committee Group 4A). It is registered for use on a wide variety of agricultural crops, residential use sites, ornamental plants, domestic and industrial areas, and food-handling establishments. This memorandum, which supports the ongoing thiamethoxam registration review, incorporates new and updated exposure data and policies for seed treatment scenarios (ExpoSAC Policies 14 and 15, January 2022). Therefore, the updated seed treatment assessment included herein supersedes the seed treatment assessment included in the 2021 revised ORE in support of registration review (K. Lowe, D460670, 01/15/2021). For details regarding all other occupational and residential assessments completed for thiamethoxam, including the full hazard characterization and dose-response assessment, non-occupational spray drift, residential handler and post-application risk assessments, occupational handler (non-seed treatment), and occupational post-application risk assessment, refer to the 2021 revised ORE memo (K. Lowe, D460670, 01/15/2021).

There are multiple thiamethoxam seed treatment end-use products which are formulated either as a liquid, wettable powder (WP), water soluble bag (WSB) formulations, or dust (commercial seed treatment only) formulation. The personal protective equipment (PPE) statements on the registered agricultural seed treatment labels require handlers to wear baseline attire (i.e., long-sleeve shirt, long pants, shoes, and socks), with several labels requiring additional PPE such as gloves, coveralls, and respirators. Several seed treatment labels were identified as restricted use pesticides (RUPs); however, the relevant end-use product labels are multiple active ingredient products, and the RUP status is based on other pesticides included in the labels. A summary of the registered seed treatment uses is provided in Appendix A, Table A.1

For a complete summary of all registered thiamethoxam uses, refer to the 2021 revised ORE memo in support of registration review (K. Lowe, D460670, 01/15/2021).

Exposure Profile

Based on the registered seed treatment uses of thiamethoxam, it is expected that short- (1 to 30 days) and intermediate-term (1 to 6 months) dermal and inhalation occupational handler exposures will occur. Chronic exposure is not expected for the registered use patterns.

Hazard Characterization

The toxicological database for thiamethoxam is complete and acceptable for selecting toxicity endpoints and points of departure (PODs) for risk assessment. An inhalation toxicity study is not available for thiamethoxam; however, the Hazard and Science Policy Council (HASPOC) recommended, based on a weight-of-evidence (WOE) approach, that the study not be required (TXR 0057630, M.

Lewis, 09/22/2017). In acute lethality studies, technical thiamethoxam is slightly toxic to rats and moderately toxic to mice via the oral route of exposure (Toxicity Category III); it is of low toxicity to rats via the dermal (Toxicity Category III) and inhalation routes (Toxicity Category IV). It is not irritating to the skin and minimally irritating to the eye and is not a dermal sensitizer.

The point of departure (POD) used for assessing dermal and inhalation exposure for adults was selected from two co-critical 2-generation reproduction studies in the rats, where the offspring No Observed Adverse Effects Level (NOAEL) is 1.2 mg/kg/day (MRID 46402904; 2004 study), and the level of concern (LOC) is 100 (based on uncertainty factors consisting of 10x for inter-species extrapolation and 10x for intra-species variability). Thiamethoxam is classified as “not likely to be carcinogenic to humans.”

Since the toxicological effects are the same for the dermal and inhalation routes, exposures to adults via the dermal and inhalation routes may be combined. Since the LOCs for dermal and inhalation risks are the same, a total margin of exposure (MOE) is calculated, and the LOC for the combined exposure is an MOE of 100.

Occupational Exposure and Risk Estimates

The occupational handler dermal and inhalation exposure and risk estimates were re-assessed for seed treatment uses based on updated exposure data and policies. For on-farm seed treatment, several crops resulted in risk estimates of concern assuming baseline attire (i.e., SL) and PPE (gloves). With one crop still having a risk of concern even when maximum PPE is considered. For commercial seed treatment, there are numerous combined (dermal and inhalation) risk estimates of concern (i.e., MOEs < LOC of 100) assuming baseline attire (i.e., single layer, SL) and various PPE (i.e., gloves, G). For scenarios with combined risk estimates of concern, the dermal risks are more often of concern than inhalation risks (i.e., contribute more towards the total risk). Additionally, there are several commercial seed treatment scenarios that remain of concern with maximum PPE (i.e., double layer (DL) or coveralls/G + PF10 Respirator, R). When considering volumetric restrictions for commercial seed treatments, all scenarios resulted in risk estimates of concern assuming closed loading restrictions and SL/G. Additionally, some scenarios resulted in risks of concern when considering open loading restrictions and SL/G. Several scenarios resulted in risks of concern (MOEs < LOC of 100) with maximum PPE (i.e., DL/G + PF10 R).

Human Studies Review

This risk assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide or other chemical. These data, which include studies from the AHETF database and ExpoSAC Policy 14 (SOPs for Seed Treatment); are (1) subject to ethics review pursuant to 40 CFR 26, (2) have received that review, and (3) are compliant with applicable ethics requirements. For certain studies, the ethics review may have included review by the Human Studies Review Board. Descriptions of data sources, as well as guidance on their use, can be found at the Agency website.

2.0 Risk Assessment Conclusions and Recommendations

2.1 Summary of Risk Estimates

Occupational Handler – Seed Treatments: Numerous occupational handler scenarios are of concern (i.e., MOEs < the LOC) when assuming baseline attire and gloves are worn. Additionally, several scenarios remain of concern when maximum PPE (i.e., DL/G + PF10 respirators) is considered.

- For on-farm seed treatments, combined (dermal and inhalation) short-term MOEs ranged from 28 to 4,800 (LOC = 100), assuming SL/G attire is worn. With the addition of a PF 10 respirator (i.e., SL/G and PF 10R), only Other Legume (6A and 6C) and field peas have combined risk estimates of concern with MOEs ranging from 68 to 90. If the maximum PPE protections are used (i.e., double layer clothing, gloves, and PF10 R) then Other Legume (6C) and field peas are no longer of concern, however, Other Legume (6A) remain of concern with an MOE of 68. The complete summary of on-farm risk estimates may be found in Appendix B, Table B.1.
- When considering volumetric restrictions, as listed on some end-use product seed treatment labels (e.g., EPA Reg. No. 100-941) for commercial seed treatments, closed loading restrictions resulted in MOEs ranging from 17 to 20 (LOC of 100) and open loading restrictions resulted in MOEs ranging from 98 to 120, assuming SL/G. Several scenarios resulted in risks of concern (MOEs < LOC of 100) with maximum PPE (i.e., DL/G + PF10 R). See Table B.2 in Appendix B for a summary of these risks.
- For commercial seed treatments, combined (dermal and inhalation) short-term MOEs range from 0.0086 to 200,000 (LOC = 100), assuming baseline attire (single layer, SL) and gloves (G). Multiple scenarios resulted in risk estimates of concern (MOEs < LOC of 100) with maximum additional PPE (i.e., DL/G + PF10 R). See Tables 5.1.1-4 in Section 5.1 for a summary of these risks. See Appendix B, Tables B.3-A to D for a detailed summary of the commercial seed treatment risk estimates.
 - Worker exposure from cleanout tasks for commercial seed treatments (i.e., CST – Cleaning) resulted in the lowest MOEs, with risk estimates ranging from 0.0086 to 410 when assuming SL/G and 0.0099 to 490 when assuming DL/G + PF 10 R.
 - Worker exposure from treating, packing, and loading/planting for commercial seed treatments had some risks of concern that would require additional PPE to mitigate. Assuming SL/G, MOEs ranged from 1.9 to 200,000. When assuming DL/G + PF10 R, MOEs ranged from 3.7 to 710,000.

2.2 Label Recommendations

No specific recommendations are being made; however, HED has identified some risk estimates of concern for occupational handlers. Some of these risk estimates are not of concern with the addition of PPE beyond what is currently on labels, such as coveralls and/or respirators. Additionally, HED recommends that the seed treatment equipment and any additional seed treatment processes (i.e., pelleting, encrusting, film coating, etc.) be specified on the end-use product labels.

2.3 Data Deficiencies and Requirements

None.

3.0 Hazard Characterization

Acute Toxicity

In acute lethality studies, technical thiamethoxam is slightly toxic to rats and moderately toxic to mice via the oral route of exposure (Toxicity Category III); it is of low toxicity to rats via the dermal (Toxicity Category III) and inhalation routes (Toxicity Category IV). It is not irritating to the skin and minimally irritating to the eye and is not a dermal sensitizer. A summary of the acute toxicity profile is provided in Table 3.1 below.

Guideline No.	Study Type	MRID(s)	Results	Toxicity Category
870.1100	Acute Oral (rat)	44703314	LD ₅₀ = 1563 mg/kg (M & F)	III
	Acute Oral (mouse)	44703315	LD ₅₀ = 783 mg/kg (M) LD ₅₀ = 964 mg/kg (F) LD ₅₀ = 871 mg/kg (C)	III
870.1200	Acute Dermal (rat)	44703316	LD ₅₀ ≥ 2000 mg/kg (M & F)	III
870.1300	Acute Inhalation (rat)	44703317	LC ₅₀ ≥ 3.72 mg/L (M & F)	IV
870.2400	Primary Eye Irritation (rabbit)	44703318	Minimally irritating	IV
870.2500	Primary Skin Irritation (rabbit)	44703319	Not irritating	IV
870.2600	Dermal Sensitization (guinea pig)	44710401	Not a sensitizer (Magnusson and Kligman)	N/A

Toxicological PODs Used for Risk Assessment

The toxicological database for thiamethoxam is complete and acceptable for selecting toxicity endpoints and PODs for risk assessment. An inhalation toxicity study is not available for thiamethoxam; however, the HASPOC recommended, based on a WOE approach, that the study not be required (TXR 0057630, M. Lewis, 09/22/2017).

No new toxicity data have been received for thiamethoxam since the previous risk assessment (K. Lowe, D460670, 01/15/2021).

Dermal – Adults (short- and intermediate-term): While there were adverse effects observed in the route-specific 28-day dermal toxicity study at 1000 (males) and 250 (females) mg/kg/day, increased susceptibility was observed in the database. Therefore, an oral point of departure was selected for dermal risk assessment because the dermal toxicity study did not evaluate developmental or reproductive endpoints.

The endpoint used for establishing the dermal exposure for adults was selected from two co-critical 2-generation reproduction studies in the rats. The offspring NOAEL is 1.2 mg/kg/day (MRID 46402904; 2004 study), and the LOC is 100 (10x for inter-species extrapolation and 10x for intra-species variability). The offspring LOAEL of 1.8 mg/kg/day (MRID 44718707; 1998 study) was based on testicular effects in the F₁ males. The NOAEL from this study was 0.6 mg/kg/day; however, the dose of 1.2 mg/kg/day from the second 2-generation reproduction study was used as the NOAEL based on no effect on the testes at this dose (testes effects in this study were seen at 156 mg/kg/day). The NOAEL of 1.2 mg/kg/day from the 2004 study is considered protective of the effects observed at the LOAEL of

1.8 mg/kg/day in the 1998 study because the testes effects observed in the 1998 study were considered conservative based on the marginal nature of the effect at the LOAEL and the effects were not corroborated in the other studies in the database. However, the Agency concluded that the LOAEL for testes effect in the 2004 study could be used over the 1998 study, primarily because the two studies used different terminology, criteria, and scoring for the histopathological evaluation leading to uncertainty in comparing the results across studies.

Inhalation – Adults (short- and intermediate-term): The endpoint used for assessing inhalation exposure to adults was selected from two co-critical 2-generation reproduction studies in the rats. The NOAEL is 1.2 mg/kg/day, and the LOC is 100 (10x for inter-species extrapolation and 10x for intra-species variability). The effects observed and the LOAELs have been described above (see dermal - adults). These studies were selected because of the exposure duration, and because the endpoint (testicular effects) is protective of all other effects in the database. No route-specific repeat dose study is available to assess for potential inhalation toxicity resulting from thiamethoxam exposure. In the absence of a route-specific study, the NOAEL and LOAEL from an oral study have been used for risk assessment.

A summary of the toxicological doses and endpoints is provided in Table 3.2.

Table 3.2. Summary of Toxicological Doses and Endpoints for Thiamethoxam for Use in Human Health Risk Assessments.				
Exposure/ Scenario	Point of Departure	Uncertainty/ FQPA Safety Factors	Level of Concern for Risk Assessment	Study and Toxicological Effects
Dermal (Short- and intermediate-term) (Adults)	Oral study NOAEL= 1.2 mg/kg/day (MRID 46402904) (DAF = 5%)	UF _A = 10x UF _H = 10x FQPA SF = 1X (Where applicable)	LOC = 100 (residential and occupational)	2-Generation reproduction study; 1998. (MRID 44718707) LOAEL = 1.8 mg/kg/day based on increased incidence and severity of tubular atrophy in testes of F ₁ generation males. 2-Generation reproduction study; 2004. (MRID 46402904) LOAEL = 156 mg/kg/day (males), not determined (females) based on sperm abnormalities and germ cell loss in F ₁ males.
Inhalation (Short- and intermediate-term) (Adults)	Oral study NOAEL= 1.2 mg/kg/day (MRID 46402904) (inhalation toxicity = oral toxicity)	UF _A = 10x UF _H = 10x FQPA SF = 1x (Where applicable)	LOC = 100 (residential and occupational)	2-Generation reproduction study (MRID 44718707) LOAEL = 1.8 mg/kg/day based on increased incidence and severity of tubular atrophy in testes of F ₁ generation males. 2-Generation reproduction study (MRID 46402904) LOAEL = 156 mg/kg/day (males), not determined (females) based on sperm abnormalities and germ cell loss in F ₁ males.

Table 3.2. Summary of Toxicological Doses and Endpoints for Thiamethoxam for Use in Human Health Risk Assessments.

Exposure/ Scenario	Point of Departure	Uncertainty/ FQPA Safety Factors	Level of Concern for Risk Assessment	Study and Toxicological Effects
Cancer (oral, dermal, inhalation)	"Not Likely to be Carcinogenic to Humans" based on convincing evidence that a non-genotoxic mode of action for liver tumors was established in the mouse. Quantification of cancer risk is <u>not</u> required.			

Point of Departure (POD) = A data point or an estimated point that is derived from observed dose-response data and used to mark the beginning of extrapolation to determine risk associated with lower environmentally relevant human exposures. NOAEL = no observed adverse effect level. LOAEL = lowest observed adverse effect level. UF = uncertainty factor. UF_A = extrapolation from animal to human (interspecies). UF_H = potential variation in sensitivity among members of the human population (intraspecies). FQPA SF = FQPA Safety Factor. MOE = margin of exposure. LOC = level of concern. N/A = not applicable. DAF = dermal absorption factor.

Cancer Classification: The Cancer Assessment Review Committee (CARC) determined, based on a weight-of-evidence approach, that thiamethoxam should have a cancer classification of "not likely to be carcinogenic to humans" (TXR 0053465, J. Kidwell, 06/13/2005).

Absorption: A dermal absorption factor (DAF) of 5% was applied to adult occupational and residential dermal exposures. HED recommends use of a 5% DAF for risk assessment based on a WOE approach considering the following: 1) both *in vivo* dermal absorption studies support that the dose remaining at the skin site is not available for continued absorption over time, 2) the highest percentage of dermal absorption across both *in vivo* rat studies was 4.22%, which is likely a conservative estimate due to the potential for oral exposure in that study, 3) the physical chemical properties (Log Kow <1) support a low dermal absorption, and 4) the NIOSH finite dose skin permeation calculator supports that dermal absorption is negligible in humans. Since no inhalation absorption data are available, toxicity by the inhalation route is considered to be equivalent to the estimated toxicity by the oral route of exposure.

Body Weight: Since the dermal and inhalation PODs are based on developmental and/or fetal effects, the body weight used for dermal and inhalation assessment is 69 kg.

4.0 Use Profile

Thiamethoxam is currently registered for use on a variety of agricultural crops for seed treatment. Seed treatment uses include several liquid, WP, WSB, and one dust (commercial seed treatment only) formulations. These end-use products can be applied at rates ranging from 0.000063 to 0.3 lb ai/lb seed. The PPE statement on the registered agricultural seed treatment labels requires handlers to wear baseline attire (i.e., long-sleeve shirt, long pants, shoes, and socks) with several labels requiring additional PPE such as gloves, coveralls, and respirators.

A summary of the representative registered commercial end-use products and use sites with the highest application rates or percent ai is provided in Appendix A, Table A.1, for the seed treatment uses of thiamethoxam. This summary was provided in the revised 2021 ORE and is based on the BEAD's HED Master Label Report (05/12/2016). The Master Label Report is a summary of all use patterns and originates from subset of EPA registered and accepted labels.

5.0 Occupational Exposure and Risk Estimates

5.1 Updated Occupational Handler Exposure/Risk Estimates – Seed Treatments

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

Based on the anticipated use patterns and current labeling, types of equipment and techniques that can potentially be used, occupational handler exposures are expected from the registered uses. All registered occupational handler uses of thiamethoxam were most recently re-evaluated in the 2021 revised ORE in support of registration review (K. Lowe, D460670, 01/15/2021). However, since the 2021 revised ORE assessment, ExpoSAC's seed treatment policies and unit exposures have been updated. To account for the updated seed treatment exposure policies (ExpoSAC Policies 14 and 15), the thiamethoxam seed treatment assessment has been revised again in this memorandum. Except as noted below, all other elements and conclusions of the 2021 revised ORE assessment remain unchanged.

The revisions based on public comments received on the DRA have been accounted for in this assessment in the following ways:

- (1) A specific volumetric restriction assessment has been completed that provides risk estimates for both closed loading and open loading restrictions.
- (2) The use pattern has been adjusted to take into account canceled seed treatment labels (e.g., 100-1184) that allowed for open loading for corn seed treatments with no label restrictions on amount of product handled. However, using the updated ExpoSAC Policy 14, all seed treatment exposure data used in this assessment are based on closed loading systems. Any risks identified assume that closed loading systems were used.
- (3) Seed treatment values for onion seed *treated* in a day and onion seed *planted* in a day are based on the updated Policy 15 and are equivalent to the values used in the 2021 revised ORE.
- (4) It is current standard procedure to calculate exposure to workers loading/planting treated seed using the number of seeds planted per day (Policy 15) rather than the lb of seed planted per day. Exposure and risk for planting rice was calculated using the label restriction for planting rice, 120 lb seed/acre, and both the low-end and high-end seed counts.

The following commercial and on-farm seed treatment worker activities are anticipated and have been assessed:

Commercial Seed Treatment (CST) – Treating: The CST-Treating scenario represents worker exposure while performing any combination of packaging, treating, or cleanout tasks, but not exclusively packaging or exclusively cleanout. This scenario includes several tasks, such as mixing and loading chemical, calibrating the seed treater equipment, treating/coating the seed and sampling “wet”

treated seed, which are very critical to the CST process but generally involve just a few specially trained workers at each facility. Worker exposure associated with these scenario-specific tasks is predicted from the amount of ai handled (AaiH).

The CST-Treating dataset represents use of closed loading systems. HED does not have data to quantify exposure from the use of an open loading system. Exposure may be higher with use of an open loading system; however, it should be noted that workers did other activities beyond just loading chemical, as described above. If open loading systems are used for commercial seed treatment, HED anticipates that the risk estimates will be higher than what is presented here.

CST - Packaging: The CST-Packaging scenario represents exposure while workers are performing one or more packaging tasks, but none of the treating or cleanout tasks. The packaging-related tasks identified include bagging, closing/sewing, tagging, stacking, and moving packaged seed via forklift. Worker exposure associated with these scenario-specific tasks is predicted from the amount of AaiH.

CST - Cleaning: The CST-Cleaning scenario represents worker exposure while performing cleanout-related tasks. Cleanout of seed-treating equipment is a task that can involve intensive contact with residue on equipment surfaces. Cleanout tasks might occupy a worker anywhere from a few minutes up to a large portion of the workday. The cleanout activity frequently involves intermittent cleanout tasks that occur for short durations periodically during a workday. If such workdays involve packaging and/or treating tasks as well, then total workday exposure would be described by the CST-Treating scenario. The CST-Cleaning scenario represents only those workers whose workday is exclusively devoted to cleanout activity. Worker exposure associated with these scenario-specific tasks is predicted from the active ingredient's seed treatment application rate (AR) and the cleanout activity duration (AD) ($AR \times AD$).

Note: Unlike other occupational handler unit exposures, the CST-Cleaning unit exposure is not predicted from the amount of ai handled by a worker. Instead, exposure from the CST-Cleaning scenario is predicted using both the application rate and activity duration. Therefore, mitigations such as volumetric restriction, which aim to restrict the amount of ai handled by a given worker, do not impact the exposure and risk to a worker performing the CST-Cleaning scenario.

CST-Loader/Planter: The CST-Loader/Planter scenario consists of handling purchased bags of commercially treated seed, loading the treated seed to a hopper or similar planting equipment, and planting seed in fields. During planting, the planter typically performs other tasks in addition to operating the equipment by driving the tractor through the field, such as making sure that the seed is properly planted (e.g., by checking seed depth and making adjustments or repairs as needed) or leveling the seed in the hopper as needed. It would also include any 'background' exposure such as contact with contaminated surfaces or equipment in the workday environment. Even though this scenario is identified as involving enclosed cab tractors only, the assumption is that there would be no meaningful difference in planter exposure between open versus closed cabs, and therefore, the same dataset is used for both. This assumption is based on the likelihood that most worker exposure while planting treated seeds is coming from activities occurring outside the planter/tractor cab (i.e., maintenance activities). Worker exposure associated with these scenario-specific tasks is predicted from the amount of ai handled.

On-Farm Seed Treatment and Planting with Liquids (OFST/P-L): The OFST/P-L scenario involves workers that operate any on-farm seed treating equipment, including mixing, loading and application of liquid pesticides to untreated seed, and any associated tasks such as maintaining the treating equipment, and then planting the treated seed. The OFST/P-L scenario represents treatment of seed at or immediately before planting using manual-style treating/planting equipment such as hopper-box, planter-box, and slurry-boxes as well as using commercial-style treatment equipment. The workers often perform tasks other than treating and planting during the monitoring period, including cleaning auger (mixing) systems or planters after treatment was finished, shoveling treated seed into augers or directly into a planter, checking augers or spray nozzle operation, fixing auger problems, spreading untreated seed in seed hoppers, checking seed depth during planting, adjusting seed equipment, and removing dirt build-up on the planter. Worker exposure associated with these scenario-specific tasks is predicted from the amount of active ingredient handled.

The on-farm seed treatment datasets represent use of open loading systems. HED does not have data to quantify exposure from the use of a closed loading system. Exposure may be lower with use of a closed loading system; however, it should be noted that workers did other activities beyond just loading chemical (e.g., loading treated seed into planters and planting). If closed loading systems are used for on-farm seed treatment, HED anticipates that the risk estimates may be lower than what is presented here.

The quantitative exposure/risk assessment developed for occupational handlers are based on the scenarios presented in Appendix C, Tables C.1 and C.2.

Occupational Handler Exposure Data and Assumptions

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

Application Rate: The maximum use rate for each seed crop was used in a screening-level for the assessment of occupational exposures for all possible occupational handler seed treatment exposure scenarios of thiamethoxam. A summary of the registered seed treatment uses is provided in Appendix A, Table A.1.

Unit Exposures: It is the policy of HED to use the best available data to assess handler exposure. Sources of generic handler data, used as surrogate data in the absence of chemical-specific data, include the AHETF database and ExpoSAC Policy 14, or other registrant-submitted occupational exposure studies. Some of these data are proprietary (e.g., AHETF data), and subject to the data protection provisions of FIFRA. The standard values recommended for use in predicting handler exposure that are used in this assessment, known as “unit exposures”, are outlined in HED’s Exposure Science Advisory Council Policy 14: Standard Operating Procedures for Seed Treatment¹, which, along with additional information on seed treatment exposure assessment, can be found at the Agency website².

¹ Available online: [US EPA - Standard Operating Procedures for Seed Treatment](#)

² Available online: [Occupational Pesticide Exposure - Seed Treatment | US EPA](#)

Amount Treated and Amount Planted: The inputs for amount of seed treated and planted are found in ExpoSAC Policy 15 for many crops assessed in this memo. See Appendix D, details all additional data and information, including seed treatment information for crops not currently covered by the current version of that Policy (version 15.2).

In addition, the end-use product label, Cruiser® 5FS (EPA Reg.#100-941) include a specific use restriction, a volumetric restriction. Volumetric restrictions are end-use product specific, based on the formulation (i.e., % ai) and amount of the product used. For that product label, specific risk estimates were calculated using the listed restrictions, 215 gallons per 8-hour day for closed-loading seed treatment systems and 38 gallons per 8-hour day for open-loading systems, and the amount of ai per gallon of end-use product, 5 lbs ai per gallon.

Finally, end-use products for rice seed treatments include a planting restriction of no more than 120 lbs of rice seed planted per acre. However, using the current policy for estimating exposure for loading/planting activities, the “number of seeds planted per day” for rice was used instead of “pounds of seed planted per day”. In order to convert the planting restriction into “number of seeds”, the low and high-end seed count values for rice (15,600 to 28,100 seeds per lb) were used. To account for the low and high-seed count values, separate rice CST-loading/planting scenarios were created for rice considering each value (i.e., “High-end” and “Low-end”).

Exposure Duration: HED classifies exposures from 1 to 30 days as short-term and exposures 30 days to six months as intermediate-term. Exposure duration is determined by many things, including the exposed population, the use site, the pest pressure triggering the use of the pesticide, and the cultural practices surrounding that use site. For most agricultural uses, it is reasonable to believe that occupational handlers will not apply the same chemical every day for more than a one-month time frame; however, there may be a large agribusiness and/or commercial applicators who may apply a product over a period of weeks (e.g., completing multiple applications for multiple clients within a region). For thiamethoxam, based on the existing registered commercial seed treatment uses, both short- and intermediate-term exposures are expected for occupational handlers because a product could be applied multiple times per season. On-farm seed treatment exposures are anticipated to be short-term only in duration. Since short- and intermediate-term PODs are the same, the results of the short-term risk assessment are protective of any intermediate-term exposures.

Personal Protective Equipment: Estimates of dermal and inhalation exposure were calculated considering the PPE listed on product labels, and any additional PPE necessary to identify risk estimates not of concern. The attire and/or PPE that was considered and assessed include: (1) baseline, defined as a single layer of clothing consisting of a long-sleeved shirt, long pants, shoes plus socks, no protective gloves, (2) baseline with gloves, (3) double layer with gloves, (4) no respirator, and (5) PF10 respirator. The thiamethoxam product labels for seed treatments direct mixers, loaders, applicators and other handlers to wear baseline attire with PPE. It should be noted that some labels used to establish the seed treatment use pattern included requirements for treaters and/or multiple activity workers to wear coveralls (considered a double layer of clothing) and in some cases a respirator, but not all did.

Additionally, the inhalation exposure and risk estimates for the occupational handler assessments consider the reduction in exposure afforded by respirators. Typically, results are presented for

“baseline,” defined as no respirator, and then, because they are the occupational standard in the pesticide industry, for half-face filtering facepiece or elastomeric respirators, quantified via application of their corresponding assigned protection factor (APF) of 10 (90% exposure reduction). This format, in some cases along with risk estimates for engineering controls, provides a variety of options for risk management decisions. This risk assessment presents potential inhalation risk estimates of concern when using a half-face filtering facepiece or elastomeric respirator (i.e., a PF10 respirator) for all scenarios.

Occupational Handler Non-Cancer Exposure and Risk Estimate Equations

The algorithms used to estimate non-cancer exposure and dose for occupational handlers can be found in Appendix B.

Combining Exposures/Risk Estimates

Occupational handler dermal and inhalation exposure is anticipated from the registered thiamethoxam use. Dermal and inhalation risk estimates were combined in this assessment since the toxicological effects for these exposure routes were similar. Dermal and inhalation risk estimates were combined using the following formula:

$$\text{Combined MOE} = \text{Point of Departure (mg/kg/day)} \div \text{Combined dermal + inhalation dose (mg/kg/day)}$$

Summary of Occupational Handler Non-Cancer Exposure and Risk Estimates

There are numerous combined (dermal and inhalation) risk estimates of concern (MOEs < LOC of 100) for commercial and on-farm seed treatment assuming baseline attire (i.e., SL) and various PPE (i.e., gloves, G). For scenarios with a combined risk estimate of concern, dermal exposure contributes more of the exposure, but frequently both routes of exposure are independently of concern. Additionally, there are several instances where dermal and inhalation risk estimates are not of concern but the combined exposure results in a risk of concern.

Note: There are several thiamethoxam seed treatment labels that include use directions for crop groups and subgroups in addition to directions for specific crops. Since the seed treatment exposure calculations require seed-specific inputs for individual crops (e.g., “seed count” or “planting density”), in order to complete a seed treatment assessment for a crop group/subgroup, every crop belonging to that group or subgroup would need to be individually assessed using crop-specific seed treatment information. However, there are a number of crops in every group/subgroup for which HED does not have specific seed treatment information. In lieu of specific seed treatment information for those individual crops, a hypothetical “worst-case” screening level crop scenario, referred to as the “Other” crop, was created for each subgroup. This worst-case “Other” crop scenario is intended to serve as a screening level scenario for those crops that HED lacks seed-specific information on and is intended to provide a health protective estimate of risk. If risks of concern are identified for an “Other” crop scenario, then the missing crop specific seed treatment information for the crops in that subgroup would be needed to refine the risks. For the detailed information on the “Other” crops and how surrogate seed treatment information was selected for this scenario, please refer to Appendix D.

On-farm seed treatments: There are multiple crops with combined risk estimates of concern, when assuming at least single layer clothing (i.e., baseline attire) and gloves the MOEs range from 28 to 4,800. With the addition of a PF 10 respirator (i.e., SL/G and PF 10R), only Other Legume (6A and 6C)

and field peas have combined risk estimates of concern with MOEs ranging from 68 to 90. If the maximum PPE protections are used (i.e., double layer clothing, gloves, and PF10 R) then Other Legume (6C) and field peas are no longer of concern, however, Other Legume (6A) remain of concern with an MOE of 78. See Table B.1 in Appendix B a detailed summary of the on-farm exposure and risk estimates.

Commercial Seed Treatment Volumetric Restrictions: Volumetric restrictions are listed on at least one thiamethoxam seed treatment end-use product label (e.g., 100-941). However, volumetric restrictions only limit the amount of ai a worker may handle. This restriction does not impact the CST-Cleaning scenario, that scenario is not normalized by the amount of ai a work handles but instead by the activity duration and application rate. Only CST-Treating and CST-Packaging scenarios have been assessed for this label restriction. For closed loading systems, a restriction of 215 gallons per day results in combined MOEs of concern for treating and packaging activities (MOEs range 17 to 20, LOC = 100) assuming SL/G attire is worn. Even with the addition of DL/G and a PF 10 R, the combined MOEs remain of concern for both activities (MOEs range 34 to 76).

For open loading systems, a restriction of 38 gallons per day results in an MOE of concern for packaging activities (MOE is 98, LOC = 100) assuming SL/G attire is worn. However, wearing either DL/G (MOE is 100) or SL/G and PF10 R (MOE is 360) the packaging activities are no longer of concern. Treating activities does not have an MOE of concern (MOE is 120) when SL/G attire is worn. However, HED does not have data to quantify exposure from the use of an open loading system. If open loading systems are used for commercial seed treatment, HED anticipates that the risk estimates will be higher than what is presented here.

See Table B.2 for the detailed summary of exposure and risk estimates when volumetric restrictions are used.

Commercial seed treatments: Combined (dermal and inhalation) MOEs range from 0.0086 to 200,000 (LOC = 100) assuming baseline attire and gloves. Additional PPE (e.g., double layer clothing and respirators) may be used to mitigate some of the risk estimates of concern. However, several scenarios still result in risks of concern (MOEs < LOC of 100) with additional PPE (i.e., DL/G + PF10 R). See Tables 5.1.1-4 for a summary of the seed treatment scenarios and any mitigation that may be needed to reduce risks of concerns identified in the assessment. See Appendix B, Tables B.3-A to D for a detailed look at the commercial seed treatment risk estimates.

Table 5.1.1 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOE ≥ 100) Assuming Single Layer Clothing and Gloves (SL/G)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning (Crop—Specialized Treat.)	CST-Loader/Planter (Crop—Specialized Treat.)
<ul style="list-style-type: none"> Alfalfa--N/A Barley--N/A Bean, Broad (Faba)--N/A Bean, dry--N/A Bean, lima--N/A Bean, navy--N/A Bean, snap--N/A Bean, Yardlong--N/A 	<ul style="list-style-type: none"> Bean, Broad (Faba)--N/A Bean, dry--N/A Bean, lima--N/A Bean, navy--N/A Bean, snap--N/A Bean, Yardlong--N/A Beet, sugar--Film-coated Broccoli--Encrusted/Pelleted 	<ul style="list-style-type: none"> Potato--N/A 	<ul style="list-style-type: none"> Alfalfa--N/A Balsam pear (Bittermelon)--N/A Bean, Broad (Faba)--N/A Bean, Yardlong--N/A Beet, sugar--Film-coated Broccoli--Encrusted/Pelleted

Table 5.1.1 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOE ≥ 100) Assuming Single Layer Clothing and Gloves (SL/G)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning (Crop—Specialized Treat.)	CST-Loader/Planter (Crop—Specialized Treat.)
<ul style="list-style-type: none"> • Beet, sugar--Film-coated • Broccoli--Encrusted/Pelleted • Broccoli--Film-coated • Broccoli, Chinese--Encrusted/Pelleted • Broccoli, Chinese--Film-coated • Broccoli, Chinese--N/A • Brussels sprout--Encrusted/Pelleted • Brussels sprout--Film-coated • Buckwheat--N/A • Cabbage--Encrusted/Pelleted • Cabbage--Film-coated • Cabbage, Chinese--Encrusted/Pelleted • Cabbage, Chinese--Film-coated • Cantaloupe--Encrusted/Pelleted • Cantaloupe--Film-coated • Carrot--Encrusted/Pelleted • Carrot--Film-coated • Cauliflower--Encrusted/Pelleted • Cauliflower--Film-coated • Celery--Encrusted/Pelleted • Collards--Encrusted/Pelleted • Collards--Film-coated • Cowpea--N/A • Cucumber--Encrusted/Pelleted • Cucumber--Film-coated • Endive--Encrusted/Pelleted • Endive--Film-coated • Guar--N/A • Honeydew--Encrusted/Pelleted • Honeydew--Film-coated • Kale--Encrusted/Pelleted • Kale--Film-coated • Kohlrabi--Encrusted/Pelleted • Kohlrabi--Film-coated • Lentil--Encrusted/Pelleted • Lentil--Film-coated • Lettuce, head--Encrusted/Pelleted • Lettuce, leaf--Encrusted/Pelleted 	<ul style="list-style-type: none"> • Broccoli--Film-coated • Broccoli, Chinese--Encrusted/Pelleted • Broccoli, Chinese--Film-coated • Brussels sprout--Encrusted/Pelleted • Brussels sprout--Film-coated • Cabbage--Encrusted/Pelleted • Cabbage--Film-coated • Cabbage, Chinese--Encrusted/Pelleted • Cabbage, Chinese--Film-coated • Cantaloupe--Encrusted/Pelleted • Cantaloupe--Film-coated • Carrot--Encrusted/Pelleted • Carrot--Film-coated • Cauliflower--Encrusted/Pelleted • Cauliflower--Film-coated • Celery--Encrusted/Pelleted • Collards--Encrusted/Pelleted • Collards--Film-coated • Cowpea--N/A • Cucumber--Encrusted/Pelleted • Cucumber--Film-coated • Endive--Encrusted/Pelleted • Endive--Film-coated • Guar--N/A • Honeydew--Encrusted/Pelleted • Honeydew--Film-coated • Kale--Encrusted/Pelleted • Kale--Film-coated • Kohlrabi--Encrusted/Pelleted • Kohlrabi--Film-coated • Lentil--Encrusted/Pelleted • Lentil--Film-coated • Lettuce, head--Encrusted/Pelleted • Lettuce, leaf--Encrusted/Pelleted • Lupin, White--N/A • Muskmelon--Encrusted/Pelleted • Muskmelon--Film-coated • Mustard greens--Encrusted/Pelleted • Mustard seed--Encrusted/Pelleted • Mustard seed--Film-coated • Mustard, Chinese--Encrusted/Pelleted • Mustard, Chinese--Film-coated • Onion, dry, bulb--Encrusted/Pelleted • Onion, dry, bulb--Film-coated 		<ul style="list-style-type: none"> • Broccoli--Film-coated • Broccoli, Chinese--Encrusted/Pelleted • Broccoli, Chinese--Film-coated • Broccoli, Chinese--N/A • Brussels sprout--Encrusted/Pelleted • Brussels sprout--Film-coated • Buckwheat--N/A • Cabbage--Encrusted/Pelleted • Cabbage--Film-coated • Cabbage, Chinese--Encrusted/Pelleted • Cabbage, Chinese--Film-coated • Canola--N/A • Cantaloupe--Encrusted/Pelleted • Cantaloupe--Film-coated • Cauliflower--Encrusted/Pelleted • Cauliflower--Film-coated • Celery--Encrusted/Pelleted • Celery--Film-coated • Chayote--N/A • Collards--Encrusted/Pelleted • Collards--Film-coated • Cowpea--N/A • Endive--Encrusted/Pelleted • Endive--Film-coated • Guar--N/A • Honeydew--Encrusted/Pelleted • Honeydew--Film-coated • Kohlrabi--Encrusted/Pelleted • Kohlrabi--Film-coated • Lentil--Encrusted/Pelleted • Lentil--Film-coated • Lettuce, head--Encrusted/Pelleted • Lettuce, head--Film-coated • Lettuce, leaf--Encrusted/Pelleted • Lettuce, leaf--Film-coated

Table 5.1.1 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOE ≥ 100) Assuming Single Layer Clothing and Gloves (SL/G)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning (Crop—Specialized Treat.)	CST-Loader/Planter (Crop—Specialized Treat.)
<ul style="list-style-type: none"> • Lupin, White--N/A • Millet, pearl--N/A • Millet, proso--N/A • Muskmelon--Encrusted/Pelleted • Muskmelon--Film-coated • Mustard greens--Encrusted/Pelleted • Mustard seed--Encrusted/Pelleted • Mustard seed--Film-coated • Mustard, Chinese--Encrusted/Pelleted • Mustard, Chinese--Film-coated • Oat--N/A • Onion, dry, bulb--Encrusted/Pelleted • Onion, dry, bulb--Film-coated • Onion, green--Encrusted/Pelleted • Onion, green--Film-coated • Other, Brassica (5A)--Encrusted/Pelleted • Other, Brassica (5A)--Film-coated • Other, Brassica (5B)--Encrusted/Pelleted • Other, Cereal Grains (15)--N/A • Other, Cucurbits (9A)--Encrusted/Pelleted • Other, Cucurbits (9A)--Film-coated • Other, Legume (6A)--N/A • Other, Legume (6B)--N/A • Other, Legume (6C)--N/A • Parsley--Encrusted/Pelleted • Pea, Edible-podded--N/A • Pea, Field--N/A • Pea, garden--N/A • Pea, Pigeon--N/A • Pea, Southern--N/A • Peanut--N/A • Potato--N/A • Rape Greens--Encrusted/Pelleted • Rape Greens--Film-coated • Rye--N/A • Soybean--N/A • Spinach--Encrusted/Pelleted 	<ul style="list-style-type: none"> • Onion, green--Encrusted/Pelleted • Onion, green--Film-coated • Other, Brassica (5A)--Encrusted/Pelleted • Other, Brassica (5A)--Film-coated • Other, Brassica (5B)--Encrusted/Pelleted • Other, Cucurbits (9A)--Encrusted/Pelleted • Other, Cucurbits (9A)--Film-coated • Other, Legume (6A)--N/A • Other, Legume (6B)--N/A • Other, Legume (6C)--N/A • Parsley--Encrusted/Pelleted • Pea, Edible-podded--N/A • Pea, Field--N/A • Pea, garden--N/A • Pea, Pigeon--N/A • Pea, Southern--N/A • Peanut--N/A • Potato--N/A • Rape Greens--Encrusted/Pelleted • Rape Greens--Film-coated • Spinach--Encrusted/Pelleted • Spinach--Film-coated • Swiss Chard--Encrusted/Pelleted • Swiss Chard--Film-coated 		<ul style="list-style-type: none"> • Lupin, White--N/A • Millet, pearl--N/A • Millet, proso--N/A • Muskmelon--Encrusted/Pelleted • Muskmelon--Film-coated • Mustard greens--Encrusted/Pelleted • Mustard greens--Film-coated • Mustard seed--Encrusted/Pelleted • Mustard seed--Film-coated • Mustard, Chinese--Encrusted/Pelleted • Mustard, Chinese--Film-coated • Onion, dry, bulb--Encrusted/Pelleted • Onion, dry, bulb--Film-coated • Other, Brassica (5A)--Encrusted/Pelleted • Other, Brassica (5A)--Film-coated • Other, Cereal Grains (15)--N/A • Other, Cucurbits (9A)--Encrusted/Pelleted • Other, Cucurbits (9A)--Film-coated • Other, Oil Seed (20A)--N/A • Pea, Pigeon--N/A • Pea, Southern--N/A • Peanut--N/A • Pumpkin--N/A • Rhubarb--Encrusted/Pelleted • Rhubarb--Film-coated • Sorghum, grain--N/A • Squash, Chinese--N/A • Squash, summer--N/A • Squash, winter--N/A • Sunflower--N/A • Swiss Chard--Encrusted/Pelleted • Swiss Chard--Film-coated • Watermelon--N/A

Table 5.1.1 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOE \geq 100) Assuming Single Layer Clothing and Gloves (SL/G)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning (Crop—Specialized Treat.)	CST-Loader/Planter (Crop—Specialized Treat.)
<ul style="list-style-type: none"> Spinach--Film-coated Swiss Chard-- Encrusted/Pelleted Swiss Chard--Film-coated Triticale--N/A Wheat--N/A 			

Table 5.1.2 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOEs \geq 100) Assuming Double Layer Clothing and Gloves (DL/G)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	CST-Loading/Planting (Crop—Specialized Treat.)
<ul style="list-style-type: none"> Parsley--Film-coated 	<ul style="list-style-type: none"> Alfalfa--N/A Barley--N/A Broccoli, Chinese--N/A Buckwheat--N/A Millet, pearl--N/A Millet, proso--N/A Oat--N/A Other, Cereal Grains (15)-- N/A Rye--N/A Triticale--N/A Triticale--N/A Wheat--N/A 		<ul style="list-style-type: none"> Bean, snap (130) Corn, filed (120) Potato (110) Rice, Low-end restriction (120) Soybean (110) Spinach (130)

Table 5.1.3 Summary of Combined (Dermal and Inhalation) Scenarios with No Risks of Concern (MOEs \geq 100) Assuming Double Layer Clothing, Gloves, and Respirator (DL/G + PF10 R)

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	CST-Loading/Planting (Crop—Specialized Treat.)
<ul style="list-style-type: none"> Amaranth, Chinese (Spinach, Chinese)-- Encrusted/Pelleted Mustard greens--Film-coated Other, Brassica (5B)-- Film-coated Other, Leafy (4A)-- Encrusted/Pelleted 	<ul style="list-style-type: none"> Amaranth, Chinese (Spinach, Chinese)-- Encrusted/Pelleted Canola--N/A Cotton--N/A Fennel-- Encrusted/Pelleted Flax--N/A Lettuce, head--Film-coated Lettuce, leaf--Film-coated Mustard greens--Film-coated Other, Brassica (5B)-- Film-coated Other, Leafy (4A)-- 		<ul style="list-style-type: none"> Barley--N/A Bean, dry--N/A Bean, lima--N/A Bean, snap--N/A Carrot-- Encrusted/Pelleted Carrot--Film-coated Corn, field--N/A Corn, pop--N/A Corn, sweet--N/A Cotton--N/A Cucumber-- Encrusted/Pelleted Cucumber--Film-coated Fennel-- Encrusted/Pelleted

Table 5.1.3 Summary of <u>Combined</u> (Dermal and Inhalation) Scenarios with <u>No Risks of Concern</u> (MOEs \geq 100) Assuming Double Layer Clothing, Gloves, and Respirator (DL/G + PF10 R)			
CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	CST-Loading/Planting (Crop—Specialized Treat.)
	Encrusted/Pelleted <ul style="list-style-type: none"> • Other, Leafy (4B)--Encrusted/Pelleted • Other, Oil Seed (20A)--N/A • Parsley--Film-coated • Rhubarb--Encrusted/Pelleted • Rice--N/A • Soybean--N/A • Sunflower--N/A 		<ul style="list-style-type: none"> • Fennel--Film-coated • Flax--N/A • Kale--Encrusted/Pelleted • Kale--Film-coated • Oat--N/A • Other, Brassica (5B)--Encrusted/Pelleted • Other, Brassica (5B)--Film-coated • Other, Cucurbits (9B)--N/A • Other, Legume (6B)--N/A • Other, Oil Seed (20B)--N/A • Pea, garden--N/A • Rape Greens--Encrusted/Pelleted • Rape Greens--Film-coated • Rice (Planting Restriction/Low-end)--N/A • Rye--N/A • Safflower--N/A • Spinach--Encrusted/Pelleted • Spinach--Film-coated • Triticale--N/A • Triticale--N/A • Wheat--N/A

Table 5.1.4. Summary of Combined (Dermal and Inhalation) Scenarios that Remain Risks of Concern (MOEs < 100) with Maximum Additional PPE (i.e., DL/G + PF10 R).

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	Loading/Planting (Crop—Specialized Treat.)
<ul style="list-style-type: none"> • Amaranth, Chinese (Spinach, Chinese)--Film-coated • Balsam pear (Bittermelon)--N/A • Canola--N/A • Celery--Film-coated • Chayote--N/A • Corn, field--N/A • Corn, pop--N/A • Corn, sweet--N/A • Cotton--N/A • Fennel--Encrusted/Pelleted • Fennel--Film-coated • Flax--N/A • Lettuce, head--Film-coated 	<ul style="list-style-type: none"> • Amaranth, Chinese (Spinach, Chinese)--Film-coated • Balsam pear (Bittermelon)--N/A • Celery--Film-coated • Chayote--N/A • Corn, field--N/A • Corn, pop--N/A • Corn, sweet--N/A • Fennel--Film-coated • Other, Cucurbits (9B)--N/A • Other, Leafy (4A)--Film-coated • Other, Leafy (4B)--Film- 	<ul style="list-style-type: none"> • Alfalfa--N/A • Amaranth, Chinese (Spinach, Chinese)--Encrusted/Pelleted • Amaranth, Chinese (Spinach, Chinese)--Film-coated • Balsam pear (Bittermelon)--N/A • Barley--N/A • Bean, Broad (Faba)--N/A • Bean, dry--N/A • Bean, lima--N/A • Bean, navy--N/A • Bean, snap--N/A • Bean, Yardlong--N/A 	<ul style="list-style-type: none"> • Amaranth, Chinese (Spinach, Chinese)--Encrusted/Pelleted • Amaranth, Chinese (Spinach, Chinese)--Film-coated • Bean, navy--N/A • Onion, green--Encrusted/Pelleted • Onion, green--Film-coated • Other, Leafy (4A)--Encrusted/Pelleted

Table 5.1.4. Summary of Combined (Dermal and Inhalation) Scenarios that Remain Risks of Concern (MOEs < 100) with Maximum Additional PPE (i.e., DL/G + PF10 R).

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	Loading/Planting (Crop—Specialized Treat.)
<ul style="list-style-type: none"> • Lettuce, leaf--Film-coated • Other, Cucurbits (9B)--N/A • Other, Leafy (4A)--Film-coated • Other, Leafy (4B)--Encrusted/Pelleted • Other, Leafy (4B)--Film-coated • Other, Oil Seed (20A)--N/A • Other, Oil Seed (20B)--N/A • Pumpkin--N/A • Rhubarb--Encrusted/Pelleted • Rhubarb--Film-coated • Rice--N/A • Safflower--N/A • Sorghum, grain--N/A • Squash, Chinese--N/A • Squash, summer--N/A • Squash, winter--N/A • Sunflower--N/A • Watermelon--N/A 	<ul style="list-style-type: none"> • coated • Other, Oil Seed (20B)--N/A • Pumpkin--N/A • Rhubarb--Film-coated • Safflower--N/A • Sorghum, grain--N/A • Squash, Chinese--N/A • Squash, summer--N/A • Squash, winter--N/A • Watermelon--N/A 	<ul style="list-style-type: none"> • Beet, sugar--Film-coated • Broccoli--Encrusted/Pelleted • Broccoli--Film-coated • Broccoli, Chinese--Encrusted/Pelleted • Broccoli, Chinese--Film-coated • Broccoli, Chinese--N/A • Brussels sprout--Encrusted/Pelleted • Brussels sprout--Film-coated • Buckwheat--N/A • Cabbage--Encrusted/Pelleted • Cabbage--Film-coated • Cabbage, Chinese--Encrusted/Pelleted • Cabbage, Chinese--Film-coated • Canola--N/A • Cantaloupe--Encrusted/Pelleted • Cantaloupe--Film-coated • Carrot--Encrusted/Pelleted • Carrot--Film-coated • Cauliflower--Encrusted/Pelleted • Cauliflower--Film-coated • Celery--Encrusted/Pelleted • Celery--Film-coated • Chayote--N/A • Collards--Encrusted/Pelleted • Collards--Film-coated • Corn, field--N/A • Corn, pop--N/A • Corn, sweet--N/A • Cotton--N/A • Cowpea--N/A • Cucumber--Encrusted/Pelleted • Cucumber--Film-coated • Endive--Encrusted/Pelleted • Endive--Film-coated • Fennel--Encrusted/Pelleted • Fennel--Film-coated • Flax--N/A • Guar--N/A • Honeydew--Encrusted/Pelleted 	<ul style="list-style-type: none"> • Other, Leafy (4A)--Film-coated • Other, Leafy (4B)--Encrusted/Pelleted • Other, Leafy (4B)--Film-coated • Other, Legume (6A)--N/A • Other, Legume (6C)--N/A • Parsley--Encrusted/Pelleted • Parsley--Film-coated • Pea, Edible-podded--N/A • Pea, Field--N/A • Potato--N/A • Rice--N/A • Rice (Planting Restriction/High-end)--N/A • Soybean--N/A

Table 5.1.4. Summary of Combined (Dermal and Inhalation) Scenarios that Remain Risks of Concern (MOEs < 100) with Maximum Additional PPE (i.e., DL/G + PF10 R).

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	Loading/Planting (Crop—Specialized Treat.)
		<ul style="list-style-type: none"> • Honeydew--Film-coated • Kale--Encrusted/Pelleted • Kale--Film-coated • Kohlrabi--Encrusted/Pelleted • Kohlrabi--Film-coated • Lentil--Encrusted/Pelleted • Lentil--Film-coated • Lettuce, head-- Encrusted/Pelleted • Lettuce, head--Film-coated • Lettuce, leaf-- Encrusted/Pelleted • Lettuce, leaf--Film-coated • Lupin, White--N/A • Millet, pearl--N/A • Millet, proso--N/A • Muskmelon-- Encrusted/Pelleted • Muskmelon--Film-coated • Mustard greens-- Encrusted/Pelleted • Mustard greens--Film-coated • Mustard seed-- Encrusted/Pelleted • Mustard seed--Film-coated • Mustard, Chinese-- Encrusted/Pelleted • Mustard, Chinese--Film-coated • Oat--N/A • Onion, dry, bulb-- Encrusted/Pelleted • Onion, dry, bulb--Film-coated • Onion, green-- Encrusted/Pelleted • Onion, green--Film-coated • Other, Brassica (5A)-- Encrusted/Pelleted • Other, Brassica (5A)--Film-coated • Other, Brassica (5B)-- Encrusted/Pelleted • Other, Brassica (5B)--Film-coated • Other, Cereal Grains (15)-- N/A • Other, Cucurbits (9A)-- Encrusted/Pelleted 	

Table 5.1.4. Summary of Combined (Dermal and Inhalation) Scenarios that Remain Risks of Concern (MOEs < 100) with Maximum Additional PPE (i.e., DL/G + PF10 R).

CST-Treating (Crop—Specialized Treat.)	CST-Packaging (Crop—Specialized Treat.)	CST-Cleaning Equipment (Crop—Specialized Treat.)	Loading/Planting (Crop—Specialized Treat.)
		<ul style="list-style-type: none"> • Other, Cucurbits (9A)--Film-coated • Other, Cucurbits (9B)--N/A • Other, Leafy (4A)--Encrusted/Pelleted • Other, Leafy (4A)--Film-coated • Other, Leafy (4B)--Encrusted/Pelleted • Other, Leafy (4B)--Film-coated • Other, Legume (6A)--N/A • Other, Legume (6B)--N/A • Other, Legume (6C)--N/A • Other, Oil Seed (20A)--N/A • Other, Oil Seed (20B)--N/A • Parsley--Encrusted/Pelleted • Parsley--Film-coated • Pea, Edible-podded--N/A • Pea, Field--N/A • Pea, garden--N/A • Pea, Pigeon--N/A • Pea, Southern--N/A • Peanut--N/A • Pumpkin--N/A • Rape Greens--Encrusted/Pelleted • Rape Greens--Film-coated • Rhubarb--Encrusted/Pelleted • Rhubarb--Film-coated • Rice--N/A • Rye--N/A • Safflower--N/A • Sorghum, grain--N/A • Soybean--N/A • Spinach--Encrusted/Pelleted • Spinach--Film-coated • Squash, Chinese--N/A • Squash, summer--N/A • Squash, winter--N/A • Sunflower--N/A • Swiss Chard--Encrusted/Pelleted • Swiss Chard--Film-coated • Triticale--N/A • Triticale--N/A • Watermelon--N/A • Wheat--N/A 	

Appendix A. Summary for Registered Seed Treatment Uses

The use pattern summary for seed treatments, below in Table A.1, was provided in the revised 2021 ORE (K. Lowe, D460670, 01/15/2021) and is based on the BEAD's HED Master Label Report (05/12/2016). The Master Label Report is a summary of all use patterns and originates from subset of EPA registered and accepted labels. Minor changes for clarity have been made to the today provided in 2021 ORE; however, the use pattern remains the same.

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Alfalfa	Liquid	Commercial seed treatment	Mechanical, slurry-type	0.001 mg ai/seed	100-941 ^c	Label rate based on 210,000 seeds. May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only.
Brassica Head and Stem Vegetables: Broccoli, Brussels sprouts, Cabbage, Cauliflower, Cavalo broccolo, Chinese broccoli (gailan), Chinese cabbage (napa), Chinese mustard cabbage (gai choy), and kohlrabi Brassica Leafy Vegetables: Broccoli raab (rapini), Chinese cabbage (bok choy), Collards, Kale, Mizuna, Mustard greens, Mustard spinach, and Rape greens	Wettable powder in Water Soluble Bags	Commercial seed treatment	Mechanical, pelleting film coating system	0.1 mg ai/seed	100-1294	Open or closed systems
Canola	Liquid	Commercial seed treatment	Mechanical, slurry-type	23 fl oz/100 lb seed 0.40 lb ai/100 lb seed	100-935	For use with closed transfer systems only

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Carrot	Wettable powder in Water Soluble Bags	Commercial seed treatment	Mechanical, pelleting film coating system	0.05 mg ai/seed	100-1294	Open or closed systems
Cereal Grains: Barley, Buckwheat, Pearl Millet, Proso Millet, Oats, Rye, Teosinte, Triticale, Wheat, and Wild Rice	Liquid	Commercial or On-farm	Mechanical, slurry-type	1.33 fl oz/100 lb seed 0.052 lb ai/100 lb seed	100-1527 ^a ; 100-941 ^c	Open or closed systems
Corn, Field	Liquid	Commercial seed treatment	Mechanical, slurry-type	1.25 mg ai/seed or 11.61 fl oz/100 lb seed	100-1321 ^b ; 100-1405 ^b ; 100-941 ^c	EPA Reg. # 100-1321 and 100-1405: May be applied by closed system seed treatment application processes. EPA Reg.# 100-941 includes the following restrictions: "DO NOT apply more than 215 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing a closed system. DO NOT apply more than 38 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing an open system." Apply in commercial seed treatment facilities only.
Corn, Pop	Liquid	Commercial seed treatment	Mechanical, slurry-type	1.25 mg ai/seed or 25.8 fl oz/100 lb seed	100-1321 ^b ; 100-1405 ^b ; 100-941 ^c	EPA Reg. # 100-1321 and 100-1405: May be applied by closed system seed treatment application processes. EPA Reg.# 100-941 includes the following restriction: "DO NOT apply more than 215 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing a closed system. DO NOT apply more than 38 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing an open system." Apply in commercial seed treatment facilities only
Corn, Sweet	Liquid	Commercial seed treatment	Mechanical, slurry-type	1.25 mg ai/seed or 20.65 fl oz/100 lb seed	100-1321 ^b ; 100-1405 ^b ; 100-941 ^c	EPA Reg. # 100-1321 and 100-1405: May be applied by closed system seed treatment application processes. EPA Reg.# 100-941 includes the following restriction: "DO NOT apply more than 215 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing a closed system. DO NOT apply more than 38 gallons of Cruiser 5FS Alfalfa per 8-hour day for seed treatments utilizing an open system." Apply in commercial seed treatment facilities only
Cotton	Liquid	Commercial or On-farm	Mechanical, slurry-type	0.375 mg ai/seed	100-1321 ^b ; 100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Oil seed: black mustard seed, borage seed, crambe seed, field mustard seed, flax seed, Indian mustard seed, Indian rapeseed seed, rapeseed seed, and safflower seed	Liquid	Commercial or On-farm	Mechanical, slurry-type	10.24 fl oz/100 lb seed 0.40 lb ai/100 lb seed	100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Cucurbits: Chayote, Chinese Waxgourd, Citron Melon, Cucumber, Gherkin, Edible Gourd (includes hyotan, cucuzza, Chinese Okra, and hechima), Momordica spp. (includes balsam apple, balsam pear, bitter melon, Chinese cucumber), Muskmelon (includes true cantaloupe, cantaloupe, casaba, Crenshaw melon, golden pershaw melon, honeydew melon, honey balls, mango melon, Persian melon, pineapple melon, Santa Claus melon, and snake melon), Pumpkin,	Liquid	Commercial or On-farm	Mechanical, slurry-type	0.75 mg ai/seed	100-941 ^c	Label rate based on an average range of 4,000 to 27,000 cucurbit seeds per pound. May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Summer Squash (includes crookneck squash, scallop squash, straightneck squash, vegetable marrow, and zucchini), Winter squash (includes butternut squash, calabaza, hubbard squash, acorn squash, and spaghetti squash), Watermelon						
Leafy Vegetables (Except Brassica): Amaranth (leafy amaranth, Chinese spinach, tampala); Arugula (roquette); Cardoon; Celery; Celtuce; Chervil; Chinese celery; Edible-leaved chrysanthemum; Garland chrysanthemum; Corn salad; Cress (garden and upland); Dandelion; Dock (sorrel); Endive (escarole); Fennel, Florence (finochio); Head lettuce; Leaf lettuce; Orach; Parsley; Purslane (garden and winter); Radicchio (red chicory); Rhubarb; Spinach; New Zealand spinach; Vine spinach (Malabar spinach,	Wettable powder in Water Soluble Bags	Commercial seed treatment	Mechanical, pelleting film coating system	1.2 mg ai/seed	100-1294	Open or closed systems

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Indian spinach); Swiss chard						
<p>Legume Vegetables:</p> <p>Bean (Lupinus species) (includes grain, sweet, white, white sweet lupin),</p> <p>Bean (Phaseolus species) (includes field bean, kidney bean, lima bean, navy bean, runner bean, snap bean, tepary bean, wax bean),</p> <p>Bean (Vigna species) (includes adzuki bean, asparagus bean, blackeyed pea, catjang, Chinese longbean, cowpea, Crowderpea, moth bean, mung bean, rice bean, southern pea, urd bean, yardlong bean),</p> <p>Broad bean (fava bean), Chickpea (garbanzo bean), Guar, Jackbean, Lablab bean (hyacinth bean), Lentil,</p> <p>Pea (Pisum species) (includes dwarf pea, edible-pod pea, English pea, field pea, garden pea, green pea, snow pea, sugar snap pea),</p> <p>Pigeon pea, Sword bean</p>	Liquid	Commercial or On-farm	Mechanical, slurry-type	<p>1.28 fl oz/100 lb seed</p> <p>0.05 lb ai/100 lb seed</p>	100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Onion	Wettable powder in Water Soluble Bags	Commercial seed treatment	Mechanical, pelleting film coating system	0.2 mg ai/seed	100-1294	Open or closed systems
Peanuts	Wettable powder	Commercial seed treatment	Mechanical	0.29 mg ai/seed	100-1365	Applied as a dry treatment; Open or closed systems
	Dust			4 oz/100 lb seed 0.045 lb ai/ 100 lb seed	100-1438 ^a	Open or closed systems
	Liquid		Mechanical, slurry-type	0.29 mg ai/seed	100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Potato	Liquid	Commercial seed treatment	Liquid seed treater	0.16 fl oz/100 lb potato 0.0063 lb ai/100 lb potato	100-1248 ^a ; 100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Rice	Liquid	Commercial or On-farm	Mechanical, slurry-type	0.03 mg ai/seed	100-941c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only. Label restriction of 120 lb seed/A.
Sorghum	Liquid	Commercial or On-farm	Mechanical, slurry-type	7.6 fl oz/100 lb seed 0.30 lb ai/100 lb seed	100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Soybeans	Liquid	Commercial or On-farm	Mechanical, slurry-type	4.23 fl oz/100 lb seed 0.075 lb ai/100 lb seed	100-1247 ^a ; 100-1283 ^a ; 100-1426 ^a ; 100-1427 ^a ; 100-1450 ^a ; 100-1457 ^b ; 100-1559 ^a ; 100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Spinach	Wettable powder in Water Soluble Bags	Commercial seed treatment	Mechanical, pelleting film coating system	0.12 mg ai/seed	100-1294	Open or closed systems

Table A.1. Summary of Directions for <u>Seed Treatment</u> Uses of Thiamethoxam						
Use Site	Formulation	Application Type	Application Equipment	Maximum Application Rate	Registered Labels	Notes
Sugar Beet	Liquid	Commercial or On-farm	Mechanical, slurry-type	3.95 fl oz/unit sugar beet seed 0.062 lb ai/100 lb seed	100-941 ^c	A unit of sugar beet seed is 100,000 seeds. May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only
Sunflower	Liquid	Commercial or On-farm	Mechanical, slurry-type	0.25 mg ai/seed	100-941 ^c	May be applied by closed or open system seed treatment application processes. Apply in commercial seed treatment facilities only

Appendix B. Seed Treatment Risk Estimate Tables

Formulation	Crop / Seed	App. Rate ²	Seed Treated ⁴ (lb seed/day)	Planted Daily (# seeds planted/day)	Dermal MOE ^{3,5,6} (LOC = 100)			Inhalation MOE ^{3,7,8} (LOC = 100)		Combined MOE ⁹ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No- R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Liquid	Balsam pear (Bittermelon)	0.75 mg ai/seed	323	774,400	1200	5700	7000	1700	17000	700	1300	1400	1100	4300	5000
Liquid	Barley	0.00052 lb ai/lb seed	19,600	184,240,000	150	720	870	220	2200	89	170	180	140	540	620
Liquid	Bean, Broad (Faba)	0.0005 lb ai/lb seed	4,611	4,181,760	660	3200	3900	970	9700	390	740	780	620	2400	2800
Liquid	Bean, dry	0.0005 lb ai/lb seed	32,700	26,136,000	92	450	550	140	1400	56	110	110	86	340	390
Liquid	Bean, lima	0.0005 lb ai/lb seed	21,000	19,008,000	140	700	850	210	2100	84	160	170	130	530	610
Liquid	Bean, navy	0.0005 lb ai/lb seed	105,000	83,635,200	29	140	170	43	430	17	33	34	27	110	120
Liquid	Bean, snap	0.0005 lb ai/lb seed	41,800	33,454,080	72	350	430	110	1100	44	84	88	68	270	310
Liquid	Bean, Yardlong	0.0005 lb ai/lb seed	11,201	8,960,880	270	1300	1600	400	4000	160	310	320	250	980	1100
Liquid	Beet, sugar	0.00062 lb ai/lb seed	3,960	87,120,000	620	3000	3600	910	9100	370	700	730	580	2300	2600
Liquid	Buckwheat	0.00052 lb ai/lb seed	14,400	288,000,000	200	980	1200	300	3000	120	230	240	190	740	860
Liquid	Cantaloupe	0.75 mg ai/seed	67	1,072,240	850	4100	5000	1300	13000	510	990	1000	800	3100	3600
Liquid	Chayote	0.75 mg ai/seed	19	232,320	3900	19000	23000	5800	58000	2300	4400	4600	3700	14000	16000
Liquid	Cotton	0.375 mg ai/seed	3,780	17,000,000	110	520	630	160	1600	65	120	130	100	390	450
Liquid	Cowpea	0.0005 lb ai/lb seed	3,480	11,151,360	870	4200	5100	1300	13000	520	990	1000	820	3200	3700
Liquid	Cucumber	0.75 mg ai/seed	929	11,151,360	82	400	480	120	1200	49	92	96	77	300	340
Liquid	Flax	0.004 lb ai/lb seed	4,000	243,936,000	94	460	560	140	1400	56	110	110	88	350	400

Table B.1. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Treating/Planting On-farm Seed Treatments. ¹

Formulation	Crop / Seed	App. Rate ²	Seed Treated ⁴ (lb seed/day)	Planted Daily (# seeds planted/day)	Dermal MOE ^{3,5,6} (LOC = 100)			Inhalation MOE ^{3,7,8} (LOC = 100)		Combined MOE ⁹ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Liquid	Guar	0.0005 lb ai/lb seed	2,178	3,484,800	1400	6700	8200	2000	20000	820	1500	1600	1300	5000	5800
Liquid	Honeydew	0.75 mg ai/seed	67	1,072,240	850	4100	5000	1300	13000	510	990	1000	800	3100	3600
Liquid	Lentil	0.0005 lb ai/lb seed	5,600	41,817,600	540	2600	3200	790	7900	320	610	630	510	2000	2300
Liquid	Lupin, White	0.0005 lb ai/lb seed	12,800	40,640,000	240	1100	1400	350	3500	140	270	280	220	840	1000
Liquid	Millet, pearl	0.00052 lb ai/lb seed	1,600	136,000,000	1800	8800	11000	2700	27000	1100	2100	2200	1700	6600	7800
Liquid	Millet, proso	0.00052 lb ai/lb seed	2,400	112,000,000	1200	5900	7100	1800	18000	720	1400	1400	1100	4400	5100
Liquid	Muskmelon	0.75 mg ai/seed	174	2,787,840	330	1600	1900	480	4800	200	370	380	310	1200	1400
Liquid	Mustard seed	0.004 lb ai/lb seed	560	101,360,000	670	3300	4000	1000	10000	400	770	800	630	2500	2900
Liquid	Oat	0.00052 lb ai/lb seed	18,000	234,000,000	160	780	950	240	2400	96	180	190	150	590	680
Liquid	Other, Cereal Grains (15)	0.00052 lb ai/lb seed	5,737	487,672,000	510	2500	3000	750	7500	300	580	600	480	1900	2100
Liquid	Other, Cucurbits (9A)	0.75 mg ai/seed	218	3,484,800	260	1300	1500	390	3900	160	300	310	240	980	1100
Liquid	Other, Cucurbits (9B)	0.75 mg ai/seed	929	11,151,360	82	400	480	120	1200	49	92	96	77	300	340
Liquid	Other, Legume (6A)	0.0005 lb ai/lb seed	163,350	130,680,000	19	90	110	27	270	11	21	22	18	68	78
Liquid	Other, Legume (6B)	0.0005 lb ai/lb seed	20,957	19,008,000	140	700	850	210	2100	84	160	170	130	530	610
Liquid	Other, Legume (6C)	0.0005 lb ai/lb seed	125,000	200,000,000	24	120	140	36	360	14	28	29	23	90	100

Table B.1. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Treating/Planting On-farm Seed Treatments. ¹

Formulation	Crop / Seed	App. Rate ²	Seed Treated ⁴ (lb seed/day)	Planted Daily (# seeds planted/day)	Dermal MOE ^{3,5,6} (LOC = 100)			Inhalation MOE ^{3,7,8} (LOC = 100)		Combined MOE ⁹ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Liquid	Other, Oil Seed (20A)	0.004 lb ai/lb seed	1,348	243,936,000	280	1400	1700	410	4100	170	320	330	260	1000	1200
Liquid	Other, Oil Seed (20B)	0.004 lb ai/lb seed	2,800	38,102,400	130	660	790	200	2000	79	150	160	120	500	570
Liquid	Pea, Edible-podded	0.0005 lb ai/lb seed	65,340	52,272,000	46	220	270	69	690	28	53	55	43	170	190
Liquid	Pea, Field	0.0005 lb ai/lb seed	125,000	200,000,000	24	120	140	36	360	14	28	29	23	90	100
Liquid	Pea, garden	0.0005 lb ai/lb seed	32,900	44,804,560	92	440	540	140	1400	56	110	110	86	330	390
Liquid	Pea, Pigeon	0.0005 lb ai/lb seed	5,227	4,181,760	580	2800	3400	850	8500	340	650	680	540	2100	2400
Liquid	Pea, Southern	0.0005 lb ai/lb seed	2,614	8,363,520	1200	5600	6800	1700	17000	700	1300	1400	1100	4200	4900
Liquid	Peanut	0.29 mg ai/seed	18,300	8,400,000	280	1400	1700	420	4200	170	320	340	260	1100	1200
Liquid	Potato	0.000063 lb ai/lb seed	425,000	2,125,728	57	270	330	83	830	34	63	66	53	200	240
Liquid	Pumpkin	0.75 mg ai/seed	363	580,800	1600	7600	9300	2300	23000	940	1800	1800	1500	5700	6600
Liquid	Rice	0.03 mg ai/seed	31,300	487,672,000	47	230	280	69	690	28	53	55	44	170	200
Liquid	Rice (Planting Restriction/High-end)	0.03 mg ai/seed	24,000	674,400,000	34	160	200	50	500	20	38	40	32	120	140
Liquid	Rice (Planting Restriction/Low-end)	0.03 mg ai/seed	24,000	374,400,000	61	300	360	90	900	36	69	72	57	230	260
Liquid	Rye	0.00052 lb ai/lb seed	18,000	324,000,000	160	780	950	240	2400	96	180	190	150	590	680
Liquid	Safflower	0.004 lb ai/lb seed	2,800	38,102,400	130	660	790	200	2000	79	150	160	120	500	570
Liquid	Sorghum, grain	0.003 lb ai/lb seed	960	8,000,000	530	2500	3100	770	7700	310	590	620	500	1900	2200

Table B.1. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Treating/Planting On-farm Seed Treatments. ¹

Formulation	Crop / Seed	App. Rate ²	Seed Treated ⁴ (lb seed/day)	Planted Daily (# seeds planted/day)	Dermal MOE ^{3,5,6} (LOC = 100)			Inhalation MOE ^{3,7,8} (LOC = 100)		Combined MOE ⁹ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Liquid	Soybean	0.00075 lb ai/lb seed	33,300	50,000,000	60	290	360	90	900	36	69	72	56	220	260
Liquid	Squash, Chinese	0.75 mg ai/seed	19	232,320	3900	19000	23000	5800	58000	2300	4400	4600	3700	14000	16000
Liquid	Squash, summer	0.75 mg ai/seed	484	929,280	980	4800	5800	1500	15000	590	1100	1200	920	3600	4200
Liquid	Squash, winter	0.75 mg ai/seed	303	580,800	1600	7600	9300	2300	23000	940	1800	1800	1500	5700	6600
Liquid	Sunflower	0.25 mg ai/seed	320	640,000	4300	21000	25000	6300	63000	2600	4800	5000	4000	16000	18000
Liquid	Triticale	0.00052 lb ai/lb seed	21,800	327,000,000	130	650	780	200	2000	79	150	160	120	490	560
Liquid	Watermelon	0.75 mg ai/seed	726	3,484,800	260	1300	1500	390	3900	160	300	310	240	980	1100
Liquid	Wheat	0.00052 lb ai/lb seed	31,400	300,000,000	92	450	550	140	1400	56	110	110	86	340	390

1. OFST/P = on-farm seed treatment/planting.
2. Maximum Application Rate: Based on registered labels (see Table A.1).
3. Unit Exposures: Based on the ExpoSAC Policy 14 ([US EPA - Standard Operating Procedures for Seed Treatment](#)); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10 = respirator assumed to reduce inhalation exposure by 90.
4. Area Treated or Amount Handled: ExpoSAC Policy 15 and 2011 BEAD memo, "Acres Planted Per Day and Seeding Rates of Crops Grown in the United States" (J. Becker, March 2011).
5. On-Farm Seed Treating and Planting Dermal Dose = Dermal Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Amount of Seed Treated ($\text{lb seed}/\text{day}$) \times DAF (5 %) \div BW (69 kg).
6. Dermal MOE = Dermal POD ($1.2 \text{ mg}/\text{kg}/\text{day}$) \div Dermal Dose ($\text{mg}/\text{kg}/\text{day}$). LOC = 100.
7. On-Farm Seed Treating and Planting Inhalation Dose = Inhalation Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Amount of Seed Treated ($\text{lb seed}/\text{day}$) \div BW (69 kg).
8. Inhalation MOE = Inhalation POD ($1.2 \text{ mg}/\text{kg}/\text{day}$) \div Inhalation Dose ($\text{mg}/\text{kg}/\text{day}$). LOC = 100.
9. Combined MOE = $1 \div [(1 \div \text{Dermal MOE}) + (1 \div \text{Inhalation MOE})]$.

Table B.2. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Volumetric Restrictions											
Formulation	Activity	Crop / Seed	Amount Treated ^{2,3} (lb ai/day)	Dermal MOE ^{1, 4, 5} (LOC = 100)		Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)			
				SL/G	DL/G	No-R	PF10 R	SL/G + No-R	DL/G + No-R	SL/G + PF10 R	DL/G + PF10 R
Closed Loading Restrictions - 215 Gallons											
All formulations	Treating	All	1075	30	36	64	640	20	23	29	34
All formulations	Packaging	All	1075	91	120	21	210	17	18	63	76
Open Loading Restrictions - 38 Gallons											
All formulations	Treating	All	190	170	210	360	3600	120	130	160	200
All formulations	Packaging	All	190	520	670	120	1200	98	100	360	430

- Unit Exposures: Based on the ExpoSAC Policy 14 (US EPA - Standard Operating Procedures for Seed Treatment); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10 = respirator assumed to reduce inhalation exposure by 90%.
- Maximum Application Rate: Based on registered labels (see Table A.1).
- Based on volumetric restrictions listed on end-use product labels (EPA Reg No. 100-941). To estimate amount handled = restricted volume (215 or 38 gallons) * ai concentration (5 lb ai/gallon; EPA Reg No 100-941). To estimate seed treated = restricted volume (215 or 38 gallons) * ai concentration (5 lb ai/gallon; EPA Reg No. 100-941) ÷ application rate.
- Commercial Seed Treaters and Packagers Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Volumetric Restriction-Daily Amount Handled (lb ai/day) × DAF (5 %) ÷ BW (69 kg). Or, Commercial Seed Treatment Cleaners Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) × DAF (5 %) ÷ BW (69 kg).
- Dermal MOE = Dermal POD (1.2 mg/kg/day) ÷ Dermal Dose (mg/kg/day). LOC = 100.
- Commercial Seed Treaters and Packagers Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Amount of Seed Treated (lb seed/day) ÷ BW (69 kg). Or, Commercial Seed Treatment Cleaners Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) ÷ BW (69 kg).
- Inhalation MOE = Inhalation POD (1.2 mg/kg/day) ÷ Inhalation Dose (mg/kg/day). LOC = 100.
- Combined MOE = 1 ÷ [(1 ÷ Dermal MOE) + (1 ÷ Inhalation MOE)].

Table B.3-A. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Treating Commercial Seed Treatments. *															
Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ₃	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Treating															
Alfalfa	18	N/A	0.001 mg ai/seed	380,000	25	170	210	360	3600	23	120	130	25	160	200
Amaranth, Chinese (Spinach, Chinese)	4A	Encrusted/ Pelleted	1.2 mg ai/seed	225	16	110	130	230	2300	15	74	83	16	100	120
Amaranth, Chinese (Spinach, Chinese)	4A	Film-coated	1.2 mg ai/seed	3,000	1.2	8.2	9.9	17	170	1.1	5.5	6.3	1.2	7.8	9.4
Balsam pear (Bittermelon)	9B	N/A	0.75 mg ai/seed	339,500	2.6	18	22	38	380	2.4	12	14	2.6	17	21
Barley	15	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Bean, Broad (Faba)	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Bean, dry	6C	N/A	0.0005 lb ai/lb seed	281,250	34	230	280	490	4900	32	160	180	34	220	260
Bean, lima	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Bean, navy	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Bean, snap	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Bean, Yardlong	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Beet, sugar	1A	Film-coated	0.00062 lb ai/lb seed	3,000	2600	17000	21000	37000	370000	2400	12000	13000	2600	16000	20000
Broccoli	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	640	4300	5300	9300	93000	600	2900	3400	640	4100	5000
Broccoli	5A	Film-coated	0.1 mg ai/seed	3,000	48	330	400	700	7000	45	220	250	48	320	380

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Broccoli, Chinese	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	500	3400	4100	7300	73000	470	2300	2600	500	3200	3900
Broccoli, Chinese	5A	Film-coated	0.1 mg ai/seed	3,000	37	250	310	550	5500	35	170	200	37	240	290
Brussels sprout	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	500	3400	4100	7300	73000	470	2300	2600	500	3200	3900
Brussels sprout	5A	Film-coated	0.1 mg ai/seed	3,000	37	250	310	550	5500	35	170	200	37	240	290
Buckwheat	NA	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Cabbage	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	580	3900	4800	8500	85000	540	2700	3100	580	3700	4500
Cabbage	5A	Film-coated	0.1 mg ai/seed	3,000	43	300	360	630	6300	40	200	230	43	290	340
Cabbage, Chinese	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	580	3900	4800	8500	85000	540	2700	3100	580	3700	4500
Cabbage, Chinese	5B	Film-coated	0.1 mg ai/seed	3,000	43	300	360	630	6300	40	200	230	43	290	340
Canola	20A	N/A	0.004 lb ai/lb seed	125,000	9.4	65	78	140	1400	8.8	44	50	9.3	62	74
Cantaloupe	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	610	4200	5100	9000	90000	570	2900	3300	610	4000	4800
Cantaloupe	9A	Film-coated	0.75 mg ai/seed	3,000	46	310	380	670	6700	43	210	240	46	300	360
Carrot	1A and 1B	Encrusted/ Pelleted	0.05 mg ai/seed	225	480	3300	4000	7000	70000	450	2200	2500	480	3200	3800
Carrot	1A and 1B	Film-coated	0.05 mg ai/seed	3,000	36	240	300	520	5200	34	160	190	36	230	280
Cauliflower	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	640	4300	5300	9300	93000	600	2900	3400	640	4100	5000
Cauliflower	5A	Film-coated	0.1 mg ai/seed	3,000	48	330	400	700	7000	45	220	250	48	320	380
Celery	4B	Encrusted/ Pelleted	0.12 mg ai/seed	225	69	470	570	1000	10000	65	320	360	69	450	540

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Celery	4B	Film-coated	0.12 mg ai/seed	3,000	5.2	35	43	75	750	4.9	24	27	5.2	33	41
Chayote	9B	N/A	0.75 mg ai/seed	339,500	0.47	3.2	3.9	6.8	68	0.44	2.2	2.5	0.47	3.1	3.7
Collards	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	2900	20000	24000	43000	430000	2700	14000	15000	2900	19000	23000
Collards	5B	Film-coated	0.1 mg ai/seed	3,000	220	1500	1800	3200	32000	210	1000	1200	220	1400	1700
Corn, field	NA	N/A	1.25 mg ai/seed	339,500	2.5	17	21	37	370	2.3	12	13	2.5	16	20
Corn, pop	NA	N/A	1.25 mg ai/seed	339,500	1.1	7.3	8.8	16	160	1	5	5.7	1.1	7	8.3
Corn, sweet	NA	N/A	1.25 mg ai/seed	339,500	1.1	7.7	9.3	16	160	1	5.2	5.9	1.1	7.3	8.8
Cotton	20C	N/A	0.375 mg ai/seed	125,000	9.2	63	76	130	1300	8.6	42	48	9.1	60	72
Cowpea	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Cucumber	9B	Encrusted/ Pelleted	0.75 mg ai/seed	225	710	4800	5800	10000	100000	660	3200	3700	700	4600	5500
Cucumber	9B	Film-coated	0.75 mg ai/seed	3,000	53	360	440	760	7600	50	240	280	53	340	420
Endive	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	1500	10000	13000	22000	220000	1400	6900	8200	1500	9600	12000
Endive	4A	Film-coated	0.12 mg ai/seed	3,000	110	780	940	1700	17000	100	530	610	110	750	890
Fennel	4B	Encrusted/ Pelleted	1.2 mg ai/seed	225	6.9	47	57	100	1000	6.5	32	36	6.9	45	54
Fennel	4B	Film-coated	1.2 mg ai/seed	3,000	0.52	3.5	4.3	7.5	75	0.49	2.4	2.7	0.52	3.3	4.1
Flax	20A	N/A	0.004 lb ai/lb seed	125,000	9.4	65	78	140	1400	8.8	44	50	9.3	62	74
Guar	6C	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Honeydew	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	610	4200	5100	9000	90000	570	2900	3300	610	4000	4800
Honeydew	9A	Film-coated	0.75 mg ai/seed	3,000	46	310	380	670	6700	43	210	240	46	300	360
Kale	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	670	4500	5500	9700	97000	630	3100	3500	670	4300	5200
Kale	5B	Film-coated	0.1 mg ai/seed	3,000	50	340	410	730	7300	47	230	260	50	320	390
Kohlrabi	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	640	4300	5300	9300	93000	600	2900	3400	640	4100	5000
Kohlrabi	5A	Film-coated	0.1 mg ai/seed	3,000	48	330	400	700	7000	45	220	250	48	320	380
Lentil	6C	Encrusted/ Pelleted	0.0005 lb ai/lb seed	225	42000	290000	350000	610000	6100000	39000	200000	220000	42000	280000	330000
Lentil	6C	Film-coated	0.0005 lb ai/lb seed	3,000	3200	22000	26000	46000	460000	3000	15000	17000	3200	21000	25000
Lettuce, head	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	160	1100	1300	2300	23000	150	740	830	160	1000	1200
Lettuce, head	4A	Film-coated	0.12 mg ai/seed	3,000	12	82	99	170	1700	11	55	63	12	78	94
Lettuce, leaf	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	160	1100	1300	2300	23000	150	740	830	160	1000	1200
Lettuce, leaf	4A	Film-coated	0.12 mg ai/seed	3,000	12	82	99	170	1700	11	55	63	12	78	94
Lupin, White	6C	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Millet, pearl	NA	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Millet, proso	NA	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Muskmelon	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	610	4200	5100	9000	90000	570	2900	3300	610	4000	4800
Muskmelon	9A	Film-coated	0.75 mg ai/seed	3,000	46	310	380	670	6700	43	210	240	46	300	360

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Mustard greens	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	230	1500	1900	3300	33000	220	1000	1200	230	1400	1800
Mustard greens	5B	Film-coated	0.1 mg ai/seed	3,000	17	120	140	250	2500	16	81	90	17	110	130
Mustard seed	20A	Encrusted/ Pelleted	0.004 lb ai/lb seed	225	5300	36000	44000	76000	760000	5000	24000	28000	5300	34000	42000
Mustard seed	20A	Film-coated	0.004 lb ai/lb seed	3,000	390	2700	3300	5700	57000	370	1800	2100	390	2600	3100
Mustard, Chinese	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	500	3400	4100	7300	73000	470	2300	2600	500	3200	3900
Mustard, Chinese	5A	Film-coated	0.1 mg ai/seed	3,000	37	250	310	550	5500	35	170	200	37	240	290
Oat	NA	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Onion, dry, bulb	3-07A	Encrusted/ Pelleted	0.2 mg ai/seed	225	370	2500	3000	5300	53000	350	1700	1900	370	2400	2800
Onion, dry, bulb	3-07A	Film-coated	0.2 mg ai/seed	3,000	28	190	230	400	4000	26	130	150	28	180	220
Onion, green	3-07B	Encrusted/ Pelleted	0.2 mg ai/seed	225	370	2500	3000	5300	53000	350	1700	1900	370	2400	2800
Onion, green	3-07B	Film-coated	0.2 mg ai/seed	3,000	28	190	230	400	4000	26	130	150	28	180	220
Other, Brassica (5A)	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	500	3400	4100	7300	73000	470	2300	2600	500	3200	3900
Other, Brassica (5A)	5A	Film-coated	0.1 mg ai/seed	3,000	37	250	310	550	5500	35	170	200	37	240	290
Other, Brassica (5B)	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	230	1500	1900	3300	33000	220	1000	1200	230	1400	1800
Other, Brassica (5B)	5B	Film-coated	0.1 mg ai/seed	3,000	17	120	140	250	2500	16	81	90	17	110	130

Table B.3-A. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Treating Commercial Seed Treatments. *

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Other, Cereal Grains (15)	NA	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Other, Cucurbits (9A)	9A	Encrusted/Pelleted	0.75 mg ai/seed	225	610	4200	5100	9000	90000	570	2900	3300	610	4000	4800
Other, Cucurbits (9A)	9A	Film-coated	0.75 mg ai/seed	3,000	46	310	380	670	6700	43	210	240	46	300	360
Other, Cucurbits (9B)	9B	N/A	0.75 mg ai/seed	339,500	0.47	3.2	3.9	6.8	68	0.44	2.2	2.5	0.47	3.1	3.7
Other, Leafy (4A)	4A	Encrusted/Pelleted	1.2 mg ai/seed	225	16	110	130	230	2300	15	74	83	16	100	120
Other, Leafy (4A)	4A	Film-coated	1.2 mg ai/seed	3,000	1.2	8.2	9.9	17	170	1.1	5.5	6.3	1.2	7.8	9.4
Other, Leafy (4B)	4B	Encrusted/Pelleted	1.2 mg ai/seed	225	6.9	47	57	100	1000	6.5	32	36	6.9	45	54
Other, Leafy (4B)	4B	Film-coated	1.2 mg ai/seed	3,000	0.52	3.5	4.3	7.5	75	0.49	2.4	2.7	0.52	3.3	4.1
Other, Legume (6A)	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Other, Legume (6B)	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Other, Legume (6C)	6C	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Other, Oil Seed (20A)	20A	N/A	0.004 lb ai/lb seed	125,000	9.4	65	78	140	1400	8.8	44	50	9.3	62	74
Other, Oil Seed (20B)	20B	N/A	0.004 lb ai/lb seed	360,000	3.3	22	27	48	480	3.1	15	17	3.3	21	26
Parsley	4A	Encrusted/Pelleted	0.12 mg ai/seed	225	270	1800	2200	3900	39000	250	1200	1400	270	1700	2100
Parsley	4A	Film-coated	0.12 mg ai/seed	3,000	20	140	170	290	2900	19	94	110	20	130	160

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Pea, Edible-podded	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Pea, Field	6C	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Pea, garden	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Pea, Pigeon	6A	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Pea, Southern	6B	N/A	0.0005 lb ai/lb seed	339,500	28	190	230	410	4100	26	130	150	28	180	220
Peanut	99	N/A	0.29 mg ai/seed	126,000	65	440	540	940	9400	61	300	340	65	420	510
Potato	1C	N/A	0.000063 lb ai/lb seed	800,000	94	640	780	1400	14000	88	440	500	93	610	740
Pumpkin	9B	N/A	0.75 mg ai/seed	339,500	1.3	9	11	19	190	1.2	6.1	7	1.3	8.6	10
Rape Greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	225	830	5700	6900	12000	120000	780	3900	4400	820	5400	6500
Rape Greens	5B	Film-coated	0.1 mg ai/seed	3,000	63	430	520	910	9100	59	290	330	63	410	490
Rhubarb	4B	Encrusted/Pelleted	1.2 mg ai/seed	225	6.9	47	57	100	1000	6.5	32	36	6.9	45	54
Rhubarb	4B	Film-coated	1.2 mg ai/seed	3,000	0.52	3.5	4.3	7.5	75	0.49	2.4	2.7	0.52	3.3	4.1
Rice	15	N/A	0.03 mg ai/seed	302,500	8.5	57	70	120	1200	7.9	39	44	8.4	54	66
Rye	15	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Safflower	20B	N/A	0.004 lb ai/lb seed	360,000	3.3	22	27	48	480	3.1	15	17	3.3	21	26
Sorghum, grain	15	N/A	0.003 lb ai/lb seed	360,000	4.4	30	36	64	640	4.1	20	23	4.4	29	34
Soybean	6	N/A	0.00075 lb ai/lb seed	281,250	23	150	190	330	3300	22	100	120	23	140	180

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Spinach	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	1800	12000	15000	26000	260000	1700	8200	9500	1800	11000	14000
Spinach	4A	Film-coated	0.12 mg ai/seed	3,000	130	900	1100	1900	19000	120	610	700	130	860	1000
Squash, Chinese	9B	N/A	0.75 mg ai/seed	339,500	0.47	3.2	3.9	6.8	68	0.44	2.2	2.5	0.47	3.1	3.7
Squash, summer	9B	N/A	0.75 mg ai/seed	339,500	1.3	9	11	19	190	1.2	6.1	7	1.3	8.6	10
Squash, winter	9B	N/A	0.75 mg ai/seed	339,500	1.3	9	11	19	190	1.2	6.1	7	1.3	8.6	10
Sunflower	20B	N/A	0.25 mg ai/seed	80,000	12	82	99	170	1700	11	55	63	12	78	94
Swiss Chard	4B	Encrusted/ Pelleted	0.12 mg ai/seed	225	2300	16000	19000	34000	340000	2200	11000	12000	2300	15000	18000
Swiss Chard	4B	Film-coated	0.12 mg ai/seed	3,000	180	1200	1500	2500	25000	170	810	940	180	1100	1400
Triticale	15	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200
Watermelon	9A	N/A	0.75 mg ai/seed	339,500	0.88	6	7.3	13	130	0.82	4.1	4.7	0.87	5.7	6.9
Wheat	15	N/A	0.00052 lb ai/lb seed	360,000	25	170	210	370	3700	23	120	130	25	160	200

* There several different end-use product formulations for thiamethoxam seed treatment labels. For commercial seed treatment unit exposures are applicable to all formulations types, and exposure and risk estimates are not categorized by type.

1. Unit Exposures: Based on the ExpoSAC Policy 14 ([US EPA – Standard Operating Procedures for Seed Treatment](#)); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10 = respirator assumed to reduce inhalation exposure by 90%.
2. Maximum Application Rate: Based on registered labels (see Table A.1).
3. Area Treated or Amount Handled: ExpoSAC Policy 15 and 2011 BEAD memo, “Acres Planted Per Day and Seeding Rates of Crops Grown in the United States” (J. Becker, March 2011).
4. Commercial Seed Treaters and Packagers Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Amount of Seed Treated (lb seed/day) × DAF (5 %) ÷ BW (69 kg). Or, commercial Seed Treatment Cleaners Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) × DAF (5 %) ÷ BW (69 kg).
5. Dermal MOE = Dermal POD (1.2 mg/kg/day) ÷ Dermal Dose (mg/kg/day). LOC = 100.
6. Commercial Seed Treaters and Packagers Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Amount of Seed Treated (lb seed/day) ÷ BW (69 kg). Or, commercial Seed Treatment Cleaners Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) ÷ BW (69 kg).
7. Inhalation MOE = Inhalation POD (1.2 mg/kg/day) ÷ Inhalation Dose (mg/kg/day). LOC = 100.
8. Combined MOE = 1 ÷ [(1 ÷ Dermal MOE) + (1 ÷ Inhalation MOE)].

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ₂	Seed Treated (lb seed/day) ₃	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Packaging															
Alfalfa	18	N/A	0.001 mg ai/seed	380,000	130	520	670	120	1200	62	98	100	120	360	430
Amaranth, Chinese (Spinach, Chinese)	4A	Encrusted/ Pelleted	1.2 mg ai/seed	225	82	330	420	77	770	40	62	65	74	230	270
Amaranth, Chinese (Spinach, Chinese)	4A	Film-coated	1.2 mg ai/seed	3,000	6.1	25	32	5.8	58	3	4.7	4.9	5.5	17	21
Balsam pear (Bittermelon)	9B	N/A	0.75 mg ai/seed	339,500	14	55	71	13	130	6.7	11	11	13	39	46
Barley	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Bean, Broad (Faba)	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Bean, dry	6C	N/A	0.0005 lb ai/lb seed	281,250	170	700	900	160	1600	82	130	140	150	490	580
Bean, lima	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Bean, navy	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Bean, snap	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Bean, Yardlong	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Beet, sugar	1A	Film-coated	0.00062 lb ai/lb seed	3,000	13000	53000	68000	12000	120000	6200	9800	10000	12000	37000	43000
Broccoli	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	3300	13000	17000	3100	31000	1600	2500	2600	3000	9200	11000
Broccoli	5A	Film-coated	0.1 mg ai/seed	3,000	250	980	1300	230	2300	120	190	200	230	690	830

Table B.3-B. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Packaging Commercial Seed Treatments. *															
Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Broccoli, Chinese	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	2600	10000	13000	2400	24000	1200	1900	2000	2300	7100	8400
Broccoli, Chinese	5A	Film-coated	0.1 mg ai/seed	3,000	190	770	1000	180	1800	92	150	150	170	540	640
Broccoli, Chinese	5A	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Brussels sprout	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	2600	10000	13000	2400	24000	1200	1900	2000	2300	7100	8400
Brussels sprout	5A	Film-coated	0.1 mg ai/seed	3,000	190	770	1000	180	1800	92	150	150	170	540	640
Buckwheat	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Cabbage	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	3000	12000	15000	2800	28000	1400	2300	2400	2700	8400	9800
Cabbage	5A	Film-coated	0.1 mg ai/seed	3,000	220	900	1200	210	2100	110	170	180	200	630	760
Cabbage, Chinese	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	3000	12000	15000	2800	28000	1400	2300	2400	2700	8400	9800
Cabbage, Chinese	5B	Film-coated	0.1 mg ai/seed	3,000	220	900	1200	210	2100	110	170	180	200	630	760
Canola	20A	N/A	0.004 lb ai/lb seed	125,000	49	200	250	46	460	24	37	39	44	140	160
Cantaloupe	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	3100	13000	16000	3000	30000	1500	2400	2500	2800	9100	10000
Cantaloupe	9A	Film-coated	0.75 mg ai/seed	3,000	240	950	1200	220	2200	110	180	190	220	660	780
Carrot	1A and 1B	Encrusted/ Pelleted	0.05 mg ai/seed	225	2500	9800	13000	2300	23000	1200	1900	2000	2300	6900	8300
Carrot	1A and 1B	Film-coated	0.05 mg ai/seed	3,000	180	740	960	170	1700	87	140	140	160	520	610
Cauliflower	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	3300	13000	17000	3100	31000	1600	2500	2600	3000	9200	11000
Cauliflower	5A	Film-coated	0.1 mg ai/seed	3,000	250	980	1300	230	2300	120	190	200	230	690	830

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Celery	4B	Encrusted/ Pelleted	0.12 mg ai/seed	225	360	1400	1800	340	3400	170	270	290	330	990	1200
Celery	4B	Film-coated	0.12 mg ai/seed	3,000	27	110	140	25	250	13	20	21	24	76	90
Chayote	9B	N/A	0.75 mg ai/seed	339,500	2.4	9.6	12	2.3	23	1.2	1.9	1.9	2.2	6.8	7.9
Collards	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	15000	60000	78000	14000	140000	7200	11000	12000	14000	42000	50000
Collards	5B	Film-coated	0.1 mg ai/seed	3,000	1100	4500	5900	1100	11000	550	880	930	1000	3200	3800
Corn, field	15	N/A	1.25 mg ai/seed	339,500	13	52	67	12	120	6.2	9.8	10	12	36	43
Corn, pop	15	N/A	1.25 mg ai/seed	339,500	5.5	22	28	5.2	52	2.7	4.2	4.4	5	15	18
Corn, sweet	NA	N/A	1.25 mg ai/seed	339,500	5.8	23	30	5.5	55	2.8	4.4	4.6	5.2	16	19
Cotton	20C	N/A	0.375 mg ai/seed	125,000	47	190	240	44	440	23	36	37	42	130	160
Cowpea	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Cucumber	9B	Encrusted/ Pelleted	0.75 mg ai/seed	225	3600	15000	19000	3400	34000	1700	2800	2900	3300	10000	12000
Cucumber	9B	Film-coated	0.75 mg ai/seed	3,000	270	1100	1400	260	2600	130	210	220	240	770	910
Endive	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	7800	32000	41000	7400	74000	3800	6000	6300	7100	22000	26000
Endive	4A	Film-coated	0.12 mg ai/seed	3,000	590	2400	3100	560	5600	290	450	470	530	1700	2000
Fennel	4B	Encrusted/ Pelleted	1.2 mg ai/seed	225	36	140	180	34	340	17	27	29	33	99	120
Fennel	4B	Film-coated	1.2 mg ai/seed	3,000	2.7	11	14	2.5	25	1.3	2	2.1	2.4	7.6	9
Flax	20A	N/A	0.004 lb ai/lb seed	125,000	49	200	250	46	460	24	37	39	44	140	160

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Guar	6C	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Honeydew	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	3100	13000	16000	3000	30000	1500	2400	2500	2800	9100	10000
Honeydew	9A	Film-coated	0.75 mg ai/seed	3,000	240	950	1200	220	2200	110	180	190	220	660	780
Kale	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	3400	14000	18000	3200	32000	1600	2600	2700	3100	9700	12000
Kale	5B	Film-coated	0.1 mg ai/seed	3,000	260	1000	1300	240	2400	120	190	200	230	710	840
Kohlrabi	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	3300	13000	17000	3100	31000	1600	2500	2600	3000	9200	11000
Kohlrabi	5A	Film-coated	0.1 mg ai/seed	3,000	250	980	1300	230	2300	120	190	200	230	690	830
Lentil	6C	Encrusted/ Pelleted	0.0005 lb ai/lb seed	225	220000	870000	1100000	200000	2000000	100000	160000	170000	200000	610000	710000
Lentil	6C	Film-coated	0.0005 lb ai/lb seed	3,000	16000	65000	84000	15000	150000	7700	12000	13000	14000	45000	54000
Lettuce, head	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	820	3300	4200	770	7700	400	620	650	740	2300	2700
Lettuce, head	4A	Film-coated	0.12 mg ai/seed	3,000	61	250	320	58	580	30	47	49	55	170	210
Lettuce, leaf	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	820	3300	4200	770	7700	400	620	650	740	2300	2700
Lettuce, leaf	4A	Film-coated	0.12 mg ai/seed	3,000	61	250	320	58	580	30	47	49	55	170	210
Lupin, White	6C	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Millet, pearl	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Millet, proso	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Muskmelon	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	3100	13000	16000	3000	30000	1500	2400	2500	2800	9100	10000

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Muskmelon	9A	Film-coated	0.75 mg ai/seed	3,000	240	950	1200	220	2200	110	180	190	220	660	780
Mustard greens	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	1200	4700	6000	1100	11000	570	890	930	1100	3300	3900
Mustard greens	5B	Film-coated	0.1 mg ai/seed	3,000	87	350	450	83	830	42	67	70	79	250	290
Mustard seed	20A	Encrusted/ Pelleted	0.004 lb ai/lb seed	225	27000	110000	140000	26000	260000	13000	21000	22000	24000	77000	91000
Mustard seed	20A	Film-coated	0.004 lb ai/lb seed	3,000	2000	8200	11000	1900	19000	970	1500	1600	1800	5700	7000
Mustard seed	20A	N/A	0.004 lb ai/lb seed	125,000	49	200	250	2400	24000	1200	1900	2000	2300	7100	8400
Mustard, Chinese	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	2600	10000	13000	180	1800	92	150	150	170	540	640
Mustard, Chinese	5A	Film-coated	0.1 mg ai/seed	3,000	190	770	1000	120	1200	62	98	100	120	360	430
Oat	NA	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	1800	18000	920	1500	1500	1700	5300	6300
Onion, dry, bulb	3-07A	Encrusted/ Pelleted	0.2 mg ai/seed	225	1900	7600	9800	130	1300	67	110	110	130	400	470
Onion, dry, bulb	3-07A	Film-coated	0.2 mg ai/seed	3,000	140	570	740	1800	18000	920	1500	1500	1700	5300	6300
Onion, green	3-07B	Encrusted/ Pelleted	0.2 mg ai/seed	225	1900	7600	9800	130	1300	67	110	110	130	400	470
Onion, green	3-07B	Film-coated	0.2 mg ai/seed	3,000	140	570	740	2400	24000	1200	1900	2000	2300	7100	8400
Other, Brassica (5A)	5A	Encrusted/ Pelleted	0.1 mg ai/seed	225	2600	10000	13000	180	1800	92	150	150	170	540	640
Other, Brassica (5A)	5A	Film-coated	0.1 mg ai/seed	3,000	190	770	1000	1100	11000	570	890	930	1100	3300	3900
Other, Brassica (5B)	5B	Encrusted/ Pelleted	0.1 mg ai/seed	225	1200	4700	6000	83	830	42	67	70	79	250	290

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Other, Brassica (5B)	5B	Film-coated	0.1 mg ai/seed	3,000	87	350	450	120	1200	62	98	100	120	360	430
Other, Cereal Grains (15)	NA	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	3000	30000	1500	2400	2500	2800	9100	10000
Other, Cucurbits (9A)	9A	Encrusted/ Pelleted	0.75 mg ai/seed	225	3100	13000	16000	220	2200	110	180	190	220	660	780
Other, Cucurbits (9A)	9A	Film-coated	0.75 mg ai/seed	3,000	240	950	1200	2.3	23	1.2	1.9	1.9	2.2	6.8	7.9
Other, Cucurbits (9B)	9B	N/A	0.75 mg ai/seed	339,500	2.4	9.6	12	77	770	40	62	65	74	230	270
Other, Leafy (4A)	4A	Encrusted/ Pelleted	1.2 mg ai/seed	225	82	330	420	5.8	58	3	4.7	4.9	5.5	17	21
Other, Leafy (4A)	4A	Film-coated	1.2 mg ai/seed	3,000	6.1	25	32	34	340	17	27	29	33	99	120
Other, Leafy (4B)	4B	Encrusted/ Pelleted	1.2 mg ai/seed	225	36	140	180	2.5	25	1.3	2	2.1	2.4	7.6	9
Other, Leafy (4B)	4B	Film-coated	1.2 mg ai/seed	3,000	2.7	11	14	140	1400	70	110	120	130	410	490
Other, Legume (6A)	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Other, Legume (6B)	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Other, Legume (6C)	6C	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	46	460	24	37	39	44	140	160
Other, Oil Seed (20A)	20A	N/A	0.004 lb ai/lb seed	125,000	49	200	250	16	160	8.2	13	14	15	48	57
Other, Oil Seed (20B)	20B	N/A	0.004 lb ai/lb seed	360,000	17	68	88	1300	13000	670	1100	1100	1300	3900	4600
Parsley	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	1400	5600	7200	98	980	49	79	83	91	290	350

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Parsley	4A	Film-coated	0.12 mg ai/seed	3,000	100	420	540	140	1400	70	110	120	130	410	490
Pea, Edible-podded	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Pea, Field	6C	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Pea, garden	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Pea, Pigeon	6A	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	140	1400	70	110	120	130	410	490
Pea, Southern	6B	N/A	0.0005 lb ai/lb seed	339,500	140	580	750	310	3100	160	250	260	300	920	1100
Peanut	99	N/A	0.29 mg ai/seed	126,000	330	1300	1700	460	4600	230	370	390	430	1300	1600
Potato	1C	N/A	0.000063 lb ai/lb seed	800,000	480	1900	2500	6.4	64	3.3	5.2	5.4	6.1	19	23
Pumpkin	9B	N/A	0.75 mg ai/seed	339,500	6.8	27	35	4000	40000	2100	3200	3400	3900	12000	14000
Rape Greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	225	4300	17000	22000	300	3000	150	240	260	290	910	1100
Rape Greens	5B	Film-coated	0.1 mg ai/seed	3,000	320	1300	1700	34	340	17	27	29	33	99	120
Rhubarb	4B	Encrusted/Pelleted	1.2 mg ai/seed	225	36	140	180	2.5	25	1.3	2	2.1	2.4	7.6	9
Rhubarb	4B	Film-coated	1.2 mg ai/seed	3,000	2.7	11	14	41	410	21	33	35	39	120	150
Rice	15	N/A	0.03 mg ai/seed	302,500	43	170	230	120	1200	62	98	100	120	360	430
Rye	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	16	160	8.2	13	14	15	48	57
Safflower	20B	N/A	0.004 lb ai/lb seed	360,000	17	68	88	21	210	11	17	18	21	63	76
Sorghum, grain	15	N/A	0.003 lb ai/lb seed	360,000	23	90	120	110	1100	57	89	93	110	330	390

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Seed Treated (lb seed/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Soybean	6	N/A	0.00075 lb ai/lb seed	281,250	120	470	600	8500	85000	4400	6900	7200	8100	25000	30000
Spinach	4A	Encrusted/ Pelleted	0.12 mg ai/seed	225	9000	36000	47000	640	6400	330	520	540	610	1900	2300
Spinach	4A	Film-coated	0.12 mg ai/seed	3,000	670	2700	3500	2.3	23	1.2	1.9	1.9	2.2	6.8	7.9
Squash, Chinese	9B	N/A	0.75 mg ai/seed	339,500	2.4	9.6	12	6.4	64	3.3	5.2	5.4	6.1	19	23
Squash, summer	9B	N/A	0.75 mg ai/seed	339,500	6.8	27	35	6.4	64	3.3	5.2	5.4	6.1	19	23
Squash, winter	9B	N/A	0.75 mg ai/seed	339,500	6.8	27	35	58	580	30	47	49	55	170	210
Sunflower	20B	N/A	0.25 mg ai/seed	80,000	61	250	320	11000	110000	5700	8900	9300	11000	33000	40000
Swiss Chard	4B	Encrusted/ Pelleted	0.12 mg ai/seed	225	12000	48000	62000	850	8500	440	690	720	810	2500	3000
Swiss Chard	4B	Film-coated	0.12 mg ai/seed	3,000	900	3600	4700	120	1200	62	98	100	120	360	430
Triticale	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430
Watermelon	9A	N/A	0.75 mg ai/seed	339,500	4.5	18	23	4.3	43	2.2	3.5	3.6	4.1	13	15
Wheat	15	N/A	0.00052 lb ai/lb seed	360,000	130	520	670	120	1200	62	98	100	120	360	430

* There several different end-use product formulations for thiamethoxam seed treatment labels. For commercial seed treatment unit exposures are applicable to all formulations types, and exposure and risk estimates are not categorized by type.

- Unit Exposures: Based on the ExpoSAC Policy 14 ([US EPA - Standard Operating Procedures for Seed Treatment](#)); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10 = respirator assumed to reduce inhalation exposure by 90%.
- Maximum Application Rate: Based on registered labels (see Table A.1).
- Area Treated or Amount Handled: ExpoSAC Policy 15 and 2011 BEAD memo, "Acres Planted Per Day and Seeding Rates of Crops Grown in the United States" (J. Becker, March 2011).
- Commercial Seed Treaters and Packagers Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Amount of Seed Treated (lb seed/day) × DAF (5 %) ÷ BW (69 kg). Or, commercial Seed Treatment Cleaners Dermal Dose = Dermal Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) × DAF (5 %) ÷ BW (69 kg).
- Dermal MOE = Dermal POD (1.2 mg/kg/day) ÷ Dermal Dose (mg/kg/day). LOC = 100.
- Commercial Seed Treaters and Packagers Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Amount of Seed Treated (lb seed/day) ÷ BW (69 kg). Or, commercial Seed Treatment Cleaners Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ai/lb seed) × Activity Duration (2.5 hr) ÷ BW (69 kg).
- Inhalation MOE = Inhalation POD (1.2 mg/kg/day) ÷ Inhalation Dose (mg/kg/day). LOC = 100.

8. Combined MOE = $1 \div [(1 \div \text{Dermal MOE}) + (1 \div \text{Inhalation MOE})]$.

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ₃	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Loading/Planting															
Alfalfa	18	N/A	0.001 mg ai/seed	681,000,000	280	1400	2100	840	8400	210	530	600	270	1200	1700
Amaranth, Chinese (Spinach, Chinese)	4A	Encrusted/Pelleted	1.2 mg ai/seed	13,939,200	11	56	85	34	340	8.3	21	24	11	48	68
Amaranth, Chinese (Spinach, Chinese)	4A	Film-coated	1.2 mg ai/seed	13,939,200	11	56	85	34	340	8.3	21	24	11	48	68
Balsam pear (Bittermelon)	9B	N/A	0.75 mg ai/seed	774,400	320	1600	2400	980	9800	240	610	700	310	1400	1900
Barley	NA	N/A	0.00052 lb ai/lb seed	184,240,000	41	200	310	120	1200	31	75	87	40	170	250
Bean, Broad (Faba)	6B	N/A	0.0005 lb ai/lb seed	4,181,760	180	900	1400	550	5500	140	340	390	170	770	1100
Bean, dry	6C	N/A	0.0005 lb ai/lb seed	26,136,000	25	130	190	76	760	19	48	54	24	110	150
Bean, lima	6B	N/A	0.0005 lb ai/lb seed	19,008,000	39	200	300	120	1200	29	75	86	38	170	240
Bean, navy	6A	N/A	0.0005 lb ai/lb seed	83,635,200	7.9	40	60	24	240	5.9	15	17	7.6	34	48
Bean, snap	6A	N/A	0.0005 lb ai/lb seed	33,454,080	20	99	150	60	600	15	37	43	19	85	120
Bean, Yardlong	6A	N/A	0.0005 lb ai/lb seed	8,960,880	74	370	560	220	2200	55	140	160	72	320	450
Beet, sugar	1A	Film-coated	0.00062 lb ai/lb seed	87,120,000	170	850	1300	510	5100	130	320	370	160	730	1000
Broccoli	5A	Encrusted/Pelleted	0.1 mg ai/seed	16,867,600	110	560	840	340	3400	83	210	240	110	480	670

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Broccoli	5A	Film-coated	0.1 mg ai/seed	16,867,600	110	560	840	340	3400	83	210	240	110	480	670
Broccoli, Chinese	5A	Encrusted/Pelleted	0.1 mg ai/seed	15,206,400	120	620	930	380	3800	91	240	270	120	530	750
Broccoli, Chinese	5A	Film-coated	0.1 mg ai/seed	15,206,400	120	620	930	380	3800	91	240	270	120	530	750
Brussels sprout	5A	Encrusted/Pelleted	0.1 mg ai/seed	2,230,240	850	4200	6400	2600	26000	640	1600	1800	820	3600	5100
Brussels sprout	5A	Film-coated	0.1 mg ai/seed	2,230,240	850	4200	6400	2600	26000	640	1600	1800	820	3600	5100
Buckwheat	NA	N/A	0.00052 lb ai/lb seed	288,000,000	55	280	420	170	1700	42	110	120	53	240	340
Cabbage	5A	Encrusted/Pelleted	0.1 mg ai/seed	7,840,800	240	1200	1800	730	7300	180	450	520	230	1000	1400
Cabbage	5A	Film-coated	0.1 mg ai/seed	7,840,800	240	1200	1800	730	7300	180	450	520	230	1000	1400
Cabbage, Chinese	5B	Encrusted/Pelleted	0.1 mg ai/seed	4,181,760	450	2300	3400	1400	14000	340	870	990	440	2000	2700
Cabbage, Chinese	5B	Film-coated	0.1 mg ai/seed	4,181,760	450	2300	3400	1400	14000	340	870	990	440	2000	2700
Canola	20A	N/A	0.004 lb ai/lb seed	148,104,000	63	320	470	190	1900	47	120	140	61	270	380
Cantaloupe	9A	Encrusted/Pelleted	0.75 mg ai/seed	1,072,240	230	1200	1800	710	7100	170	450	510	220	1000	1400
Cantaloupe	9A	Film-coated	0.75 mg ai/seed	1,072,240	230	1200	1800	710	7100	170	450	510	220	1000	1400
Carrot	1A and 1B	Encrusted/Pelleted	0.05 mg ai/seed	167,270,400	23	110	170	68	680	17	42	49	22	95	140
Carrot	1A and 1B	Film-coated	0.05 mg ai/seed	167,270,400	23	110	170	68	680	17	42	49	22	95	140
Cauliflower	5A	Encrusted/Pelleted	0.1 mg ai/seed	1,858,560	1000	5100	7600	3100	31000	760	1900	2200	970	4400	6100

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Cauliflower	5A	Film-coated	0.1 mg ai/seed	1,858,560	1000	5100	7600	3100	31000	760	1900	2200	970	4400	6100
Celery	4B	Encrusted/Pelleted	0.12 mg ai/seed	5,575,680	280	1400	2100	850	8500	210	530	610	270	1200	1700
Celery	4B	Film-coated	0.12 mg ai/seed	5,575,680	280	1400	2100	850	8500	210	530	610	270	1200	1700
Chayote	9B	N/A	0.75 mg ai/seed	232,320	1100	5400	8200	3300	33000	830	2000	2400	1100	4600	6600
Collards	5B	Encrusted/Pelleted	0.1 mg ai/seed	5,227,200	360	1800	2700	1100	11000	270	680	780	350	1500	2200
Collards	5B	Film-coated	0.1 mg ai/seed	5,227,200	360	1800	2700	1100	11000	270	680	780	350	1500	2200
Corn, field	15	N/A	1.25 mg ai/seed	8,050,000	19	94	140	57	570	14	35	41	18	81	110
Corn, pop	15	N/A	1.25 mg ai/seed	6,000,000	25	130	190	76	760	19	48	54	24	110	150
Corn, sweet	15	N/A	1.25 mg ai/seed	4,779,120	31	160	240	95	950	23	60	68	30	140	190
Cotton	20C	N/A	0.375 mg ai/seed	17,000,000	29	150	220	90	900	22	56	64	28	130	180
Cowpea	6B	N/A	0.0005 lb ai/lb seed	11,151,360	240	1200	1800	720	7200	180	450	510	230	1000	1400
Cucumber	9B	Encrusted/Pelleted	0.75 mg ai/seed	11,151,360	23	110	170	68	680	17	42	49	22	95	140
Cucumber	9B	Film-coated	0.75 mg ai/seed	11,151,360	23	110	170	68	680	17	42	49	22	95	140
Endive	4A	Encrusted/Pelleted	0.12 mg ai/seed	4,181,760	380	1900	2800	1100	11000	280	700	790	370	1600	2200
Endive	4A	Film-coated	0.12 mg ai/seed	4,181,760	380	1900	2800	1100	11000	280	700	790	370	1600	2200
Fennel	4B	Encrusted/Pelleted	1.2 mg ai/seed	4,646,400	34	170	250	100	1000	25	63	71	33	150	200
Fennel	4B	Film-coated	1.2 mg ai/seed	4,646,400	34	170	250	100	1000	25	63	71	33	150	200

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Flax	20A	N/A	0.004 lb ai/lb seed	243,936,000	26	130	200	78	780	20	49	56	25	110	160
Guar	6C	N/A	0.0005 lb ai/lb seed	3,484,800	380	1900	2900	1200	12000	290	740	850	370	1600	2300
Honeydew	9A	Encrusted/Pelleted	0.75 mg ai/seed	1,072,240	230	1200	1800	710	7100	170	450	510	220	1000	1400
Honeydew	9A	Film-coated	0.75 mg ai/seed	1,072,240	230	1200	1800	710	7100	170	450	510	220	1000	1400
Kale	5B	Encrusted/Pelleted	0.1 mg ai/seed	46,080,000	41	200	310	120	1200	31	75	87	40	170	250
Kale	5B	Film-coated	0.1 mg ai/seed	46,080,000	41	200	310	120	1200	31	75	87	40	170	250
Kohlrabi	5A	Encrusted/Pelleted	0.1 mg ai/seed	4,646,400	410	2000	3100	1200	12000	310	750	870	400	1700	2500
Kohlrabi	5A	Film-coated	0.1 mg ai/seed	4,646,400	410	2000	3100	1200	12000	310	750	870	400	1700	2500
Lentil	6C	Encrusted/Pelleted	0.0005 lb ai/lb seed	41,817,600	150	740	1100	450	4500	110	280	320	150	640	880
Lentil	6C	Film-coated	0.0005 lb ai/lb seed	41,817,600	150	740	1100	450	4500	110	280	320	150	640	880
Lettuce, head	4A	Encrusted/Pelleted	0.12 mg ai/seed	25,090,560	63	310	470	190	1900	47	120	140	61	270	380
Lettuce, head	4A	Film-coated	0.12 mg ai/seed	25,090,560	63	310	470	190	1900	47	120	140	61	270	380
Lettuce, leaf	4A	Encrusted/Pelleted	0.12 mg ai/seed	12,560,000	120	630	940	380	3800	91	240	270	120	540	750
Lettuce, leaf	4A	Film-coated	0.12 mg ai/seed	12,560,000	120	630	940	380	3800	91	240	270	120	540	750
Lupin, White	6C	N/A	0.0005 lb ai/lb seed	40,640,000	65	320	490	200	2000	49	120	140	63	280	390
Millet, pearl	NA	N/A	0.00052 lb ai/lb seed	136,000,000	500	2500	3800	1500	15000	380	940	1100	480	2100	3000
Millet, proso	NA	N/A	0.00052 lb ai/lb seed	112,000,000	330	1700	2500	1000	10000	250	630	710	320	1500	2000

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Muskmelon	9A	Encrusted/Pelleted	0.75 mg ai/seed	2,787,840	90	450	680	270	2700	68	170	190	87	390	540
Muskmelon	9A	Film-coated	0.75 mg ai/seed	2,787,840	90	450	680	270	2700	68	170	190	87	390	540
Mustard greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	10,454,400	180	900	1400	550	5500	140	340	390	170	770	1100
Mustard greens	5B	Film-coated	0.1 mg ai/seed	10,454,400	180	900	1400	550	5500	140	340	390	170	770	1100
Mustard seed	20A	Encrusted/Pelleted	0.004 lb ai/lb seed	101,360,000	180	920	1400	560	5600	140	350	400	170	790	1100
Mustard seed	20A	Film-coated	0.004 lb ai/lb seed	101,360,000	180	920	1400	560	5600	140	350	400	170	790	1100
Mustard, Chinese	5A	Encrusted/Pelleted	0.1 mg ai/seed	22,809,600	82	410	620	250	2500	62	160	180	79	350	500
Mustard, Chinese	5A	Film-coated	0.1 mg ai/seed	22,809,600	82	410	620	250	2500	62	160	180	79	350	500
Oat	NA	N/A	0.00052 lb ai/lb seed	234,000,000	44	220	330	130	1300	33	82	93	43	190	260
Onion, dry, bulb	3-07A	Encrusted/Pelleted	0.2 mg ai/seed	16,083,680	59	290	440	180	1800	44	110	130	57	250	350
Onion, dry, bulb	3-07A	Film-coated	0.2 mg ai/seed	16,083,680	59	290	440	180	1800	44	110	130	57	250	350
Onion, green	3-07B	Encrusted/Pelleted	0.2 mg ai/seed	100,362,240	9.4	47	71	28	280	7	18	20	9.1	40	57
Onion, green	3-07B	Film-coated	0.2 mg ai/seed	100,362,240	9.4	47	71	28	280	7	18	20	9.1	40	57
Other, Brassica (5A)	5A	Encrusted/Pelleted	0.1 mg ai/seed	22,809,600	82	410	620	250	2500	62	160	180	79	350	500
Other, Brassica (5A)	5A	Film-coated	0.1 mg ai/seed	22,809,600	82	410	620	250	2500	62	160	180	79	350	500
Other, Brassica (5B)	5B	Encrusted/Pelleted	0.1 mg ai/seed	59,241,600	32	160	240	96	960	24	60	69	31	140	190
Other, Brassica (5B)	5B	Film-coated	0.1 mg ai/seed	59,241,600	32	160	240	96	960	24	60	69	31	140	190

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Other, Cereal Grains (15)	15	N/A	0.00052 lb ai/lb seed	487,672,000	140	700	1100	420	4200	110	260	300	140	600	870
Other, Cucurbits (9A)	9A	Encrusted/Pelleted	0.75 mg ai/seed	3,484,800	72	360	540	220	2200	54	140	160	70	310	430
Other, Cucurbits (9A)	9A	Film-coated	0.75 mg ai/seed	3,484,800	72	360	540	220	2200	54	140	160	70	310	430
Other, Cucurbits (9B)	9B	N/A	0.75 mg ai/seed	11,151,360	23	110	170	68	680	17	42	49	22	95	140
Other, Leafy (4A)	4A	Encrusted/Pelleted	1.2 mg ai/seed	125,452,800	1.3	6.3	9.4	3.8	38	0.97	2.4	2.7	1.3	5.4	7.5
Other, Leafy (4A)	4A	Film-coated	1.2 mg ai/seed	125,452,800	1.3	6.3	9.4	3.8	38	0.97	2.4	2.7	1.3	5.4	7.5
Other, Leafy (4B)	4B	Encrusted/Pelleted	1.2 mg ai/seed	16,384,000	9.6	48	72	29	290	7.2	18	21	9.3	41	58
Other, Leafy (4B)	4B	Film-coated	1.2 mg ai/seed	16,384,000	9.6	48	72	29	290	7.2	18	21	9.3	41	58
Other, Legume (6A)	6A	N/A	0.0005 lb ai/lb seed	130,680,000	5.1	25	38	15	150	3.8	9.4	11	4.9	21	30
Other, Legume (6B)	6B	N/A	0.0005 lb ai/lb seed	19,008,000	39	200	300	120	1200	29	75	86	38	170	240
Other, Legume (6C)	6C	N/A	0.0005 lb ai/lb seed	200,000,000	6.6	33	50	20	200	5	12	14	6.4	28	40
Other, Oil Seed (20A)	20A	N/A	0.004 lb ai/lb seed	243,936,000	77	380	580	230	2300	58	140	160	75	330	460
Other, Oil Seed (20B)	20B	N/A	0.004 lb ai/lb seed	38,102,400	37	190	280	110	1100	28	70	79	36	160	220
Parsley	4A	Encrusted/Pelleted	0.12 mg ai/seed	125,452,800	13	63	94	38	380	9.7	24	27	13	54	75
Parsley	4A	Film-coated	0.12 mg ai/seed	125,452,800	13	63	94	38	380	9.7	24	27	13	54	75
Pea, Edible-podded	6A	N/A	0.0005 lb ai/lb seed	52,272,000	13	64	96	38	380	9.7	24	27	13	55	77

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Pea, Field	6C	N/A	0.0005 lb ai/lb seed	200,000,000	6.6	33	50	20	200	5	12	14	6.4	28	40
Pea, garden	6B	N/A	0.0005 lb ai/lb seed	44,804,560	25	130	190	76	760	19	48	54	24	110	150
Pea, Pigeon	6A	N/A	0.0005 lb ai/lb seed	4,181,760	160	790	1200	480	4800	120	300	340	150	680	960
Pea, Southern	6B	N/A	0.0005 lb ai/lb seed	8,363,520	320	1600	2400	960	9600	240	600	690	310	1400	1900
Peanut	99	N/A	0.29 mg ai/seed	8,400,000	77	390	580	230	2300	58	140	160	75	330	460
Potato	1C	N/A	0.000063 lb ai/lb seed	2,125,728	15	78	120	47	470	11	29	34	15	67	96
Pumpkin	9B	N/A	0.75 mg ai/seed	580,800	430	2200	3300	1300	13000	320	820	930	420	1900	2600
Rape Greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	59,241,600	32	160	240	96	960	24	60	69	31	140	190
Rape Greens	5B	Film-coated	0.1 mg ai/seed	59,241,600	32	160	240	96	960	24	60	69	31	140	190
Rhubarb	4B	Encrusted/Pelleted	1.2 mg ai/seed	580,800	270	1400	2000	820	8200	200	520	580	260	1200	1600
Rhubarb	4B	Film-coated	1.2 mg ai/seed	580,800	270	1400	2000	820	8200	200	520	580	260	1200	1600
Rice	15	N/A	0.03 mg ai/seed	487,672,000	13	65	97	39	390	9.8	24	28	13	56	78
Rice (Planting Restriction/High-end)	15	N/A	0.03 mg ai/seed	674,400,000	9.3	47	70	28	280	7	18	20	9	40	56
Rice (Planting Restriction/Low-end)	15	N/A	0.03 mg ai/seed	374,400,000	17	84	130	51	510	13	32	37	16	72	100
Rye	15	N/A	0.00052 lb ai/lb seed	324,000,000	44	220	330	130	1300	33	82	93	43	190	260

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Planted Daily (# seeds planted/day) ³	Dermal MOE ^{1, 4, 5} (LOC = 100)			Inhalation MOE ^{1, 6, 7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Safflower	20B	N/A	0.004 lb ai/lb seed	38,102,400	37	190	280	110	1100	28	70	79	36	160	220
Sorghum, grain	15	N/A	0.003 lb ai/lb seed	8,000,000	140	720	1100	440	4400	110	270	310	140	620	880
Soybean	6	N/A	0.00075 lb ai/lb seed	50,000,000	17	83	120	50	500	13	31	35	16	71	97
Spinach	4A	Encrusted/Pelleted	0.12 mg ai/seed	80,000,000	20	98	150	59	590	15	37	42	19	84	120
Spinach	4A	Film-coated	0.12 mg ai/seed	80,000,000	20	98	150	59	590	15	37	42	19	84	120
Squash, Chinese	9B	N/A	0.75 mg ai/seed	232,320	1100	5400	8200	3300	33000	830	2000	2400	1100	4600	6600
Squash, summer	9B	N/A	0.75 mg ai/seed	929,280	270	1400	2000	820	8200	200	520	580	260	1200	1600
Squash, winter	9B	N/A	0.75 mg ai/seed	580,800	430	2200	3300	1300	13000	320	820	930	420	1900	2600
Sunflower	20B	N/A	0.25 mg ai/seed	640,000	1200	5900	8800	3600	36000	900	2200	2600	1200	5100	7100
Swiss Chard	4B	Encrusted/Pelleted	0.12 mg ai/seed	16,384,000	96	480	720	290	2900	72	180	210	93	410	580
Swiss Chard	4B	Film-coated	0.12 mg ai/seed	16,384,000	96	480	720	290	2900	72	180	210	93	410	580
Triticale	15	N/A	0.00052 lb ai/lb seed	327,000,000	37	180	280	110	1100	28	68	79	36	150	220
Triticale	15	N/A	0.00052 lb ai/lb seed	327,000,000	37	180	280	110	1100	28	68	79	36	150	220
Watermelon	9A	N/A	0.75 mg ai/seed	3,484,800	72	360	540	220	2200	54	140	160	70	310	430
Wheat	15	N/A	0.00052 lb ai/lb seed	300,000,000	25	130	190	76	760	19	48	54	24	110	150

* There several different end-use product formulations for thiamethoxam seed treatment labels. For commercial seed treatment unit exposures are applicable to all formulations types, and exposure and risk estimates are not categorized by type.

1. Unit Exposures: Based on the ExpoSAC Policy 14 ([US EPA - Standard Operating Procedures for Seed Treatment](#)); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10

= respirator assumed to reduce inhalation exposure by 90%.

2. Maximum Application Rate: Based on registered labels (see Table A.1).

3. Area Treated or Amount Handled: ExpoSAC Policy 15 and 2011 BEAD memo, "Acres Planted Per Day and Seeding Rates of Crops Grown in the United States" (J. Becker, March 2011).

4. Commercial Seed Treaters and Packagers Dermal Dose = Dermal Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Amount of Seed Treated ($\text{lb seed}/\text{day}$) \times DAF (5 %) \div BW (69 kg). Or, commercial Seed Treatment Cleaners Dermal Dose = Dermal Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Activity Duration (2.5 hr) \times DAF (5 %) \div BW (69 kg).

5. Dermal MOE = Dermal POD ($1.2 \text{ mg}/\text{kg}/\text{day}$) \div Dermal Dose ($\text{mg}/\text{kg}/\text{day}$). LOC = 100.

6. Commercial Seed Treaters and Packagers Inhalation Dose = Inhalation Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Amount of Seed Treated ($\text{lb seed}/\text{day}$) \div BW (69 kg). Or, commercial Seed Treatment Cleaners Inhalation Dose = Inhalation Unit Exposure ($\mu\text{g}/\text{lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate ($\text{lb ai}/\text{lb seed}$) \times Activity Duration (2.5 hr) \div BW (69 kg).

7. Inhalation MOE = Inhalation POD ($1.2 \text{ mg}/\text{kg}/\text{day}$) \div Inhalation Dose ($\text{mg}/\text{kg}/\text{day}$). LOC = 100.

8. Combined MOE = $1 \div [(1 \div \text{Dermal MOE}) + (1 \div \text{Inhalation MOE})]$.

Table B.3-D. Updated Occupational Handler Non-Cancer Exposure and Risk Estimates for Thiamethoxam – Cleaning Commercial Seed Treatments. *															
Crop / Seed	Sub-group	Specialized Treatment	App. Rate ₂	Activity Duration (activity hours/day) ₃	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Cleaning															
Alfalfa	18	N/A	0.001 mg ai/seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Amaranth, Chinese (Spinach, Chinese)	4A	Encrusted/Pelleted	1.2 mg ai/seed	2.5	0.0036	0.022	0.024	0.24	2.4	0.0035	0.02	0.022	0.0036	0.022	0.024
Amaranth, Chinese (Spinach, Chinese)	4A	Film-coated	1.2 mg ai/seed	2.5	0.0036	0.022	0.024	0.24	2.4	0.0035	0.02	0.022	0.0036	0.022	0.024
Balsam pear (Bittermelon)	9B	N/A	0.75 mg ai/seed	2.5	0.9	5.4	5.9	59	590	0.89	4.9	5.4	0.9	5.4	5.8
Barley	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59
Bean, Broad (Faba)	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Bean, dry	6C	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Bean, lima	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Bean, navy	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Bean, snap	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Bean, Yardlong	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Beet, sugar	1A	Film-coated	0.00062 lb ai/lb seed	2.5	7.7	46	50	500	5000	7.6	42	45	7.7	46	50
Broccoli	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.15	0.86	0.94	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Broccoli	5A	Film-coated	0.1 mg ai/seed	2.5	0.15	0.86	0.94	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Broccoli, Chinese	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Broccoli, Chinese	5A	Film-coated	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Brussels sprout	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.11	0.67	0.74	600	6000	9.1	50	55	9.2	55	59
Brussels sprout	5A	Film-coated	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Buckwheat	NA	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Cabbage	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.13	0.78	0.86	600	6000	9.1	50	55	9.2	55	59
Cabbage	5A	Film-coated	0.1 mg ai/seed	2.5	0.13	0.78	0.86	8.6	86	0.13	0.72	0.78	0.13	0.77	0.85
Cabbage, Chinese	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.13	0.78	0.86	8.6	86	0.13	0.72	0.78	0.13	0.77	0.85
Cabbage, Chinese	5B	Film-coated	0.1 mg ai/seed	2.5	0.13	0.78	0.86	8.6	86	0.13	0.72	0.78	0.13	0.77	0.85
Canola	20A	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	8.6	86	0.13	0.72	0.78	0.13	0.77	0.85
Cantaloupe	9A	Encrusted/Pelleted	0.75 mg ai/seed	2.5	0.14	0.83	0.91	78	780	1.2	6.5	7.1	1.2	7	7.7
Cantaloupe	9A	Film-coated	0.75 mg ai/seed	2.5	0.14	0.83	0.91	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Carrot	1A and 1B	Encrusted/Pelleted	0.05 mg ai/seed	2.5	0.11	0.65	0.71	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Carrot	1A and 1B	Film-coated	0.05 mg ai/seed	2.5	0.11	0.65	0.71	7.1	71	0.11	0.6	0.65	0.11	0.64	0.7

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Cauliflower	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.15	0.86	0.94	7.1	71	0.11	0.6	0.65	0.11	0.64	0.7
Cauliflower	5A	Film-coated	0.1 mg ai/seed	2.5	0.15	0.86	0.94	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Celery	4B	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.016	0.094	0.1	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Celery	4B	Film-coated	0.12 mg ai/seed	2.5	0.016	0.094	0.1	1	10	0.016	0.086	0.091	0.016	0.093	0.099
Chayote	9B	N/A	0.75 mg ai/seed	2.5	0.16	0.95	1	1	10	0.016	0.086	0.091	0.016	0.093	0.099
Collards	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.67	4	4.3	10	100	0.16	0.87	0.91	0.16	0.94	0.99
Collards	5B	Film-coated	0.1 mg ai/seed	2.5	0.67	4	4.3	43	430	0.66	3.7	3.9	0.67	4	4.3
Corn, field	15	N/A	1.25 mg ai/seed	2.5	0.87	5.2	5.7	43	430	0.66	3.7	3.9	0.67	4	4.3
Corn, pop	15	N/A	1.25 mg ai/seed	2.5	0.37	2.2	2.4	57	570	0.86	4.8	5.2	0.87	5.2	5.6
Corn, sweet	15	N/A	1.25 mg ai/seed	2.5	0.39	2.3	2.5	24	240	0.36	2	2.2	0.37	2.2	2.4
Cotton	20C	N/A	0.375 mg ai/seed	2.5	1.2	6.9	7.5	25	250	0.38	2.1	2.3	0.39	2.3	2.5
Cowpea	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	75	750	1.2	6.3	6.8	1.2	6.8	7.4
Cucumber	9B	Encrusted/Pelleted	0.75 mg ai/seed	2.5	0.16	0.95	1	620	6200	9.5	52	57	9.6	56	62
Cucumber	9B	Film-coated	0.75 mg ai/seed	2.5	0.16	0.95	1	10	100	0.16	0.87	0.91	0.16	0.94	0.99
Endive	4A	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.35	2.1	2.3	10	100	0.16	0.87	0.91	0.16	0.94	0.99
Endive	4A	Film-coated	0.12 mg ai/seed	2.5	0.35	2.1	2.3	23	230	0.34	1.9	2.1	0.35	2.1	2.3
Fennel	4B	Encrusted/Pelleted	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	23	230	0.34	1.9	2.1	0.35	2.1	2.3
Fennel	4B	Film-coated	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Flax	20A	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099
Guar	6C	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	78	780	1.2	6.5	7.1	1.2	7	7.7
Honeydew	9A	Encrusted/Pelleted	0.75 mg ai/seed	2.5	0.14	0.83	0.91	620	6200	9.5	52	57	9.6	56	62
Honeydew	9A	Film-coated	0.75 mg ai/seed	2.5	0.14	0.83	0.91	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Kale	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.15	0.9	0.98	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Kale	5B	Film-coated	0.1 mg ai/seed	2.5	0.15	0.9	0.98	9.8	98	0.15	0.82	0.89	0.15	0.89	0.97
Kohlrabi	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.15	0.86	0.94	9.8	98	0.15	0.82	0.89	0.15	0.89	0.97
Kohlrabi	5A	Film-coated	0.1 mg ai/seed	2.5	0.15	0.86	0.94	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Lentil	6C	Encrusted/Pelleted	0.0005 lb ai/lb seed	2.5	9.6	57	63	9.4	94	0.15	0.79	0.85	0.15	0.85	0.93
Lentil	6C	Film-coated	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Lettuce, head	4A	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.036	0.22	0.24	620	6200	9.5	52	57	9.6	56	62
Lettuce, head	4A	Film-coated	0.12 mg ai/seed	2.5	0.036	0.22	0.24	2.4	24	0.035	0.2	0.22	0.036	0.22	0.24
Lettuce, leaf	4A	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.036	0.22	0.24	2.4	24	0.035	0.2	0.22	0.036	0.22	0.24
Lettuce, leaf	4A	Film-coated	0.12 mg ai/seed	2.5	0.036	0.22	0.24	2.4	24	0.035	0.2	0.22	0.036	0.22	0.24
Lupin, White	6C	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	2.4	24	0.035	0.2	0.22	0.036	0.22	0.24
Millet, pearl	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	620	6200	9.5	52	57	9.6	56	62
Millet, proso	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59
Muskmelon	9A	Encrusted/Pelleted	0.75 mg ai/seed	2.5	0.14	0.83	0.91	600	6000	9.1	50	55	9.2	55	59

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Muskmelon	9A	Film-coated	0.75 mg ai/seed	2.5	0.14	0.83	0.91	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Mustard greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.052	0.31	0.34	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Mustard greens	5B	Film-coated	0.1 mg ai/seed	2.5	0.052	0.31	0.34	3.4	34	0.051	0.28	0.31	0.052	0.31	0.34
Mustard seed	20A	Encrusted/Pelleted	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	3.4	34	0.051	0.28	0.31	0.052	0.31	0.34
Mustard seed	20A	Film-coated	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	78	780	1.2	6.5	7.1	1.2	7	7.7
Mustard seed	20A	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	78	780	1.2	6.5	7.1	1.2	7	7.7
Mustard, Chinese	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Mustard, Chinese	5A	Film-coated	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Oat	NA	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59
Onion, dry, bulb	3-07A	Encrusted/Pelleted	0.2 mg ai/seed	2.5	0.084	0.5	0.55	5.5	55	0.083	0.46	0.5	0.084	0.5	0.54
Onion, dry, bulb	3-07A	Film-coated	0.2 mg ai/seed	2.5	0.084	0.5	0.55	5.5	55	0.083	0.46	0.5	0.084	0.5	0.54
Onion, green	3-07B	Encrusted/Pelleted	0.2 mg ai/seed	2.5	0.084	0.5	0.55	5.5	55	0.083	0.46	0.5	0.084	0.5	0.54
Onion, green	3-07B	Film-coated	0.2 mg ai/seed	2.5	0.084	0.5	0.55	5.5	55	0.083	0.46	0.5	0.084	0.5	0.54
Other, Brassica (5A)	5A	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Other, Brassica (5A)	5A	Film-coated	0.1 mg ai/seed	2.5	0.11	0.67	0.74	7.4	74	0.11	0.61	0.67	0.11	0.66	0.73
Other, Brassica (5B)	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.052	0.31	0.34	3.4	34	0.051	0.28	0.31	0.052	0.31	0.34
Other, Brassica (5B)	5B	Film-coated	0.1 mg ai/seed	2.5	0.052	0.31	0.34	3.4	34	0.051	0.28	0.31	0.052	0.31	0.34
Other, Cereal Grains (15)	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Other, Cucurbits (9A)	9A	Encrusted/Pelleted	0.75 mg ai/seed	2.5	0.14	0.83	0.91	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Other, Cucurbits (9A)	9A	Film-coated	0.75 mg ai/seed	2.5	0.14	0.83	0.91	9.1	91	0.14	0.76	0.83	0.14	0.82	0.9
Other, Cucurbits (9B)	9B	N/A	0.75 mg ai/seed	2.5	0.16	0.95	1	10	100	0.16	0.87	0.91	0.16	0.94	0.99
Other, Leafy (4A)	4A	Encrusted/Pelleted	1.2 mg ai/seed	2.5	0.0036	0.022	0.024	0.24	2.4	0.0035	0.02	0.022	0.0036	0.022	0.024
Other, Leafy (4A)	4A	Film-coated	1.2 mg ai/seed	2.5	0.0036	0.022	0.024	0.24	2.4	0.0035	0.02	0.022	0.0036	0.022	0.024
Other, Leafy (4B)	4B	Encrusted/Pelleted	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099
Other, Leafy (4B)	4B	Film-coated	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099
Other, Legume (6A)	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Other, Legume (6B)	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Other, Legume (6C)	6C	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Other, Oil Seed (20A)	20A	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	78	780	1.2	6.5	7.1	1.2	7	7.7
Other, Oil Seed (20B)	20B	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	78	780	1.2	6.5	7.1	1.2	7	7.7
Parsley	4A	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.061	0.36	0.4	4	40	0.06	0.33	0.36	0.061	0.36	0.4
Parsley	4A	Film-coated	0.12 mg ai/seed	2.5	0.061	0.36	0.4	4	40	0.06	0.33	0.36	0.061	0.36	0.4
Pea, Edible-podded	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Pea, Field	6C	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Pea, garden	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Pea, Pigeon	6A	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Pea, Southern	6B	N/A	0.0005 lb ai/lb seed	2.5	9.6	57	63	620	6200	9.5	52	57	9.6	56	62
Peanut	99	N/A	0.29 mg ai/seed	2.5	8.3	49	54	540	5400	8.2	45	49	8.3	49	53
Potato	1C	N/A	0.000063 lb ai/lb seed	2.5	76	450	490	5000	50000	75	410	450	76	450	490
Pumpkin	9B	N/A	0.75 mg ai/seed	2.5	0.45	2.7	2.9	30	300	0.44	2.5	2.6	0.45	2.7	2.9
Rape Greens	5B	Encrusted/Pelleted	0.1 mg ai/seed	2.5	0.19	1.1	1.2	12	120	0.19	1	1.1	0.19	1.1	1.2
Rape Greens	5B	Film-coated	0.1 mg ai/seed	2.5	0.19	1.1	1.2	12	120	0.19	1	1.1	0.19	1.1	1.2
Rhubarb	4B	Encrusted/Pelleted	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099
Rhubarb	4B	Film-coated	1.2 mg ai/seed	2.5	0.0016	0.0094	0.01	0.1	1	0.0016	0.0086	0.0091	0.0016	0.0093	0.0099
Rice	15	N/A	0.03 mg ai/seed	2.5	2.6	15	17	170	1700	2.6	14	15	2.6	15	17
Rye	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59
Safflower	20B	N/A	0.004 lb ai/lb seed	2.5	1.2	7.1	7.8	78	780	1.2	6.5	7.1	1.2	7	7.7
Sorghum, grain	15	N/A	0.003 lb ai/lb seed	2.5	1.6	9.5	10	100	1000	1.6	8.7	9.1	1.6	9.4	9.9
Soybean	6	N/A	0.00075 lb ai/lb seed	2.5	6.4	38	42	420	4200	6.3	35	38	6.4	38	42
Spinach	4A	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.4	2.4	2.6	26	260	0.39	2.2	2.4	0.4	2.4	2.6
Spinach	4A	Film-coated	0.12 mg ai/seed	2.5	0.4	2.4	2.6	26	260	0.39	2.2	2.4	0.4	2.4	2.6
Squash, Chinese	9B	N/A	0.75 mg ai/seed	2.5	0.16	0.95	1	10	100	0.16	0.87	0.91	0.16	0.94	0.99
Squash, summer	9B	N/A	0.75 mg ai/seed	2.5	0.45	2.7	2.9	30	300	0.44	2.5	2.6	0.45	2.7	2.9

Crop / Seed	Sub-group	Specialized Treatment	App. Rate ²	Activity Duration (activity hours/day) ³	Dermal MOE ^{1,4,5} (LOC = 100)			Inhalation MOE ^{1,6,7} (LOC = 100)		Combined MOE ⁸ (LOC = 100)					
					SL/No G	SL/G	DL/G	No-R	PF10 R	SL/No G + No-R	SL/G + No-R	DL/G + No-R	SL/No G + PF10 R	SL/G + PF10 R	DL/G + PF10 R
Squash, winter	9B	N/A	0.75 mg ai/seed	2.5	0.45	2.7	2.9	30	300	0.44	2.5	2.6	0.45	2.7	2.9
Sunflower	20B	N/A	0.25 mg ai/seed	2.5	0.97	5.7	6.3	63	630	0.96	5.2	5.7	0.97	5.6	6.2
Swiss Chard	4B	Encrusted/Pelleted	0.12 mg ai/seed	2.5	0.53	3.2	3.5	35	350	0.52	2.9	3.2	0.53	3.2	3.5
Swiss Chard	4B	Film-coated	0.12 mg ai/seed	2.5	0.53	3.2	3.5	35	350	0.52	2.9	3.2	0.53	3.2	3.5
Triticale	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59
Watermelon	9A	N/A	0.75 mg ai/seed	2.5	0.3	1.8	2	20	200	0.3	1.7	1.8	0.3	1.8	2
Wheat	15	N/A	0.00052 lb ai/lb seed	2.5	9.2	55	60	600	6000	9.1	50	55	9.2	55	59

* There several different end-use product formulations for thiamethoxam seed treatment labels. For commercial seed treatment unit exposures are applicable to all formulations types, and exposure and risk estimates are not categorized by type.

1. Unit Exposures: Based on the ExpoSAC Policy 14 ([US EPA - Standard Operating Procedures for Seed Treatment](#)); Level of PPE: SL/G = single layer, gloves; DL/G = double layer, gloves; No-R = no respirator; PF10 = respirator assumed to reduce inhalation exposure by 90%.
2. Maximum Application Rate: Based on registered labels (see Table A.1).
3. Area Treated or Amount Handled: ExpoSAC Policy 15 and 2011 BEAD memo, "Acres Planted Per Day and Seeding Rates of Crops Grown in the United States" (J. Becker, March 2011).
4. Commercial Seed Treaters and Packagers Dermal Dose = Dermal Unit Exposure ($\mu\text{g/lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate (lb ai/lb seed) \times Amount of Seed Treated (lb seed/day) \times DAF (5 %) \div BW (69 kg). Or, commercial Seed Treatment Cleaners Dermal Dose = Dermal Unit Exposure ($\mu\text{g/lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate (lb ai/lb seed) \times Activity Duration (2.5 hr) \times DAF (5 %) \div BW (69 kg).
5. Dermal MOE = Dermal POD (1.2 mg/kg/day) \div Dermal Dose (mg/kg/day). LOC = 100.
6. Commercial Seed Treaters and Packagers Inhalation Dose = Inhalation Unit Exposure ($\mu\text{g/lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate (lb ai/lb seed) \times Amount of Seed Treated (lb seed/day) \div BW (69 kg). Or, commercial Seed Treatment Cleaners Inhalation Dose = Inhalation Unit Exposure ($\mu\text{g/lb ai}$) \times Conversion Factor ($0.001 \text{ mg}/\mu\text{g}$) \times Application Rate (lb ai/lb seed) \times Activity Duration (2.5 hr) \div BW (69 kg).
7. Inhalation MOE = Inhalation POD (1.2 mg/kg/day) \div Inhalation Dose (mg/kg/day). LOC = 100.
8. Combined MOE = $1 \div [(1 \div \text{Dermal MOE}) + (1 \div \text{Inhalation MOE})]$.

Appendix C. Summary of Occupational Non-cancer Algorithms

Occupational Non-cancer Algorithms for Commercial Seed Treaters and Packagers

Potential daily exposures for occupational seed treaters and packagers are calculated using the following formulas:

$$E = UE * AR * AST * 0.001 \text{ mg/ug}$$

where:

E	=	exposure (mg ai/day),
UE	=	unit exposure (µg ai/lb ai),
AR	=	maximum application rate according to proposed label (lb ai/lb seed), and
AST	=	amount of seed treated (lb seed/day).

The daily doses are calculated using the following formula:

$$ADD = \frac{E * AF}{BW}$$

where:

ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day),
E	=	exposure (mg ai/day),
AF	=	absorption factor (dermal and/or inhalation), and
BW	=	body weight (kg).

Margin of Exposure: Non-cancer risk estimates for each application handler scenario are calculated using a Margin of Exposure (MOE), which is a ratio of the toxicological endpoint to the daily dose of concern. The daily dermal and inhalation dose received by occupational handlers are compared to the appropriate POD (i.e., NOAEL) to assess the risk to occupational handlers for each exposure route. All MOE values are calculated using the following formula:

$$MOE = \frac{POD}{ADD}$$

where:

MOE	=	margin of exposure: value used by HED to represent risk estimates (unitless),
POD	=	point of departure (mg/kg/day), and
ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day).

Occupational Non-cancer Algorithms for Commercial Seed Treatment Cleaners

Potential daily exposures for occupational seed treatment cleaners are calculated using the following formulas:

$$E = UE * AR * AD * 0.001 \text{ mg/ug}$$

where:

E	=	exposure (mg ai/day),
UE	=	unit exposure [(µg ai/hr)/(lb ai/lb seed)],
AR	=	maximum application rate according to proposed label (lb ai/lb seed), and
AD	=	activity duration (2.5 hr).

The daily doses are calculated using the following formula:

$$ADD = \frac{E * AF}{BW}$$

where:

ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day),
E	=	exposure (mg ai/day),
AF	=	absorption factor (dermal and/or inhalation), and
BW	=	body weight (kg).

Margin of Exposure: Non-cancer risk estimates for each application handler scenario are calculated using a Margin of Exposure (MOE), which is a ratio of the toxicological endpoint to the daily dose of concern. The daily dermal and inhalation dose received by occupational handlers are compared to the appropriate POD (i.e., NOAEL) to assess the risk to occupational handlers for each exposure route. All MOE values are calculated using the following formula:

$$MOE = \frac{POD}{ADD}$$

where:

MOE	=	margin of exposure: value used by HED to represent risk estimates (unitless),
POD	=	point of departure (mg/kg/day), and
ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day).

Occupational Non-cancer Algorithms for Loaders/Planters of Commercially Treated Seed and for On-farm Seed Treatment/Planting

Potential daily exposures for occupational loaders/planters of commercially treated seed and for on-farm seed treatment/planting are calculated using the following formulas:

$$E = UE * AR * 2.2 \times 10^{-6} \text{ lb/mg} * ASP * 0.001 \text{ mg/ug}$$

where:

E	=	exposure (mg ai/day),
UE	=	unit exposure (µg ai/lb ai),
AR	=	maximum application rate according to proposed label (mg ai/seed), and
ASP	=	amount of seed planted or, for on-farm, amount of seed treated and then planted (# seeds/day).

The daily doses are calculated using the following formula:

$$ADD = \frac{E * AF}{BW}$$

where:

ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day),
E	=	exposure (mg ai/day),
AF	=	absorption factor (dermal and/or inhalation), and
BW	=	body weight (kg).

Margin of Exposure: Non-cancer risk estimates for each application handler scenario are calculated using a Margin of Exposure (MOE), which is a ratio of the toxicological endpoint to the daily dose of concern. The daily dermal and inhalation dose received by occupational handlers are compared to the appropriate POD (i.e., NOAEL) to assess the risk to occupational handlers for each exposure route. All MOE values are calculated using the following formula:

$$MOE = \frac{POD}{ADD}$$

where:

MOE	=	margin of exposure: value used by HED to represent risk estimates (unitless),
POD	=	point of departure (mg/kg/day), and
ADD	=	average daily dose absorbed in a given scenario (mg ai/kg/day).

Appendix D. Addendum to ExpoSAC Policy 15 (v15.2)

Thiamethoxam is currently registered on a number of seed crops that do not have crop-specific individual seed values presented within ExpoSAC Policy 15, including crops belonging to the following crop groups: Crop Group 4 Leafy Vegetables (Except Brassica Vegetables), Crop Group 5 Brassica (Cole) Leafy Vegetables, Crop Group 6 Legume Vegetables, Crop Group 9 Cucurbit Vegetables, Crop Group 15 Cereal Grains, and Crop Group 20 Oilseed Group. While those crops/crop groups are not presented within ExpoSAC Policy 15, there are additional seed treatment data for some of those crops in the 2011 BEAD memo titled “Acres Planted per Day and Seeding Rates of Crops Grown in the United States”. Following the same framework as used in Policy 15, that additional data was used to generate a thiamethoxam-specific addendum to the Policy. For additional background on this framework, refer to ExpoSAC policy 15, see the “Amount of Seed Treated Per Day” (Section 2.0) for commercial and on-farm treatments, as well as the “Amount of Seed Planted” (Section 3.0).

However, after inputting additional data from the 2011 BEAD memo, there are still crops from multiple crop groups that do not have crop specific seed treatment data. While some data was found from other sources to help supplement the BEAD memo, see “Notes” in Table D.1, the following interim approaches were used to estimate exposure from crops without specific data.

Crops with Missing Seed Count Data: There are a number of crops which have data on seeding rates but no seed count (i.e., # of seeds per pound) in the 2011 BEAD memo. A “surrogate seed count” was selected based on a worst-case exposure approach, determined by the crop in each crop subgroup with the greatest high-end seed count. The highest seed count was selected as the basis for worse-case scenario for the following reasons, 1) for specific crops with application rates based on “mg ai/seed”, the amount of ai applied increases as the number of seeds per pound (i.e. seed count) increases; and 2) for application rates based on “lb ai/lb seed”, the seed count data is not needed for calculating exposure, and a surrogate seed count isn’t necessary. See Table D.1 below to see the selected surrogate crops and seed count data.

Crops with Missing Seed Count and Seeding Rate Data: For crops with no data found in the 2011 BEAD memo, a screening crop for the crop group, referred to as “Other”, was created using the worse-case crop for treating (treating/packing/cleaning) and the worse-case crop for loading/planting for each crop subgroup. As stated above for crops with missing seed count data, the worse-case crop for treating (including packaging/cleaning) activities is based on the crop with highest seed count in a subgroup. For loading/planting activities, the worse-case crop is based on the crop with the greatest number of seeds planted per day. The greatest number of seeds planted per day was selected as the basis for worse-case scenario for planting activities for the following reasons, 1) the current method for estimating exposure from planting treated seed is based on the “number of seeds” rather than the “number of pounds of seed”; and 2) the amount of ai workers involved in planting activities are exposed to increases as the number of seeds planted increase. See Table D.1 below for more information on the “Other” crops.

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Alfalfa	199,000	227,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Alfalfa	3,405,000	Calculated	TBD	15.00	Entered as is from BEAD, 2011 (Table 9)	200	681,000,000	3,000
Amaranth, Chinese (Spinach, Chinese)	400,000	500,000	Lettuce, leaf/head seed count used as surrogate, based on highest seed count for a 4A crop.	Small-seeded Vegetables	174,240	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	0.44	Calculated	80	13,939,200	35
Balsam pear (Bittermelon)	2,400	3,200	https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=3153&dt=3&g=12	Large-seeded Vegetables	9,680	Max value for direct seeding from BEAD, 2011 (Table 10)	TBD	4.03	Calculated	80	774,400	323
Barley	9,400	14,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Wheat	921,200	Entered as is from Policy 15.2	TBD	98.00	Max value from BEAD, 2011 (Table 9). Table provides range - low end would be 30 lb/A	200	184,240,000	19,600
Bean, Broad (Faba)	907	4,752	Lima bean seed count used as surrogate, based on highest seed count for a 6B crop.	Large-seeded Vegetables	52,272	Max value from BEAD, 2011 (Table 10).	TBD	57.63	Calculated	80	4,181,760	4,611

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Bean, dry	800	1,814	Seed count entered as-is from BEAD, 2011 (Table B-1)	Soybean	130,680	Max value from BEAD, 2011 (Table 10).	TBD	163.35	Calculated	200	26,136,000	32,700
Bean, lima	907	4,752	Low-end seed count from BEAD, 2011 reference (Table B-1). High-end count calculated.	Large-seeded Vegetables	95,040	Max value from BEAD, 2011 (Table 10).	20.00	104.79	Low-end from: https://edis.ifas.ufl.edu/pdf%5CCCV%5CCV125%5CCV125-Dp3ijgffey.pdf (Table 1). High end calculated.	200	19,008,000	21,000
Bean, navy	800	1,814	Seed count for beans, dry	Large-seeded Vegetables	418,176	Max value for beans, succulent common from BEAD, 2011 (Table 10).	TBD	522.72	Calculated	200	83,635,200	105,000
Bean, snap	800	1,814	Seed count for beans, dry	Large-seeded Vegetables	418,176	Max value for beans, succulent common from BEAD, 2011 (Table 10).	TBD	522.72	Calculated	80	33,454,080	41,800

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Bean, Yardlong	800	1,814	Seed count for beans, dry. Highest seed count for a 6A crop.	Large-seeded Vegetables	112,011	Max value from BEAD, 2011 (Table 10).	TBD	140.01	Calculated	80	8,960,880	11,201
Beet, garden	25,344	79,200	Calculated	Small-seeded Vegetables	633,600	Max value from BEAD, 2011 (Table 10).	8.00	25.00	Entered as-is from BEAD, 2011 (Table 10).	80	50,688,000	2,000
Beet, sugar	22,000	40,000	From BEAD, 2011 (Table B-1)	Small-seeded Vegetables	435,600	Max value from BEAD, 2011 (Table 10)	TBD	19.80	Calculated	200	87,120,000	3,960
Broccoli	80,000	150,000	From BEAD, 2011 (Table B-1)	Small-seeded Vegetables	210,845	Max value from BEAD, 2011 (Table 10)	TBD	2.64	Calculated	80	16,867,600	211
Broccoli, Chinese	64,000	192,000	Brussels sprouts seed count used as surrogate, based on highest seed count for 5A crop.	Small-seeded Vegetables	190,080	Max value from BEAD, 2011 (Table 10)	TBD	2.97	Calculated	80	15,206,400	238
Brussels sprout	64,000	192,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	27,878	Max value from BEAD, 2011 (Table 10)	TBD	0.44	Calculated	80	2,230,240	35

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/ acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Buckwheat	20,000	20,000	https://plants.sc.egov.usda.gov/DocumentLibrary/plantguide/pdf/pg_faes2.pdf	Wheat	1,440,000	Calculated	TBD	72.00	Max value from BEAD, 2011 (Table 10). Table provides range - low end would be 36 lb/A.	200	288,000,000	14,400
Cabbage	45,000	165,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	98,010	Max value from BEAD, 2011 (Table 10)	TBD	2.18	Calculated	80	7,840,800	174
Cabbage, Chinese	45,000	165,000	Cabbage seed count from BEAD,2011 (Table B-1)	Small-seeded Vegetables	52,272	Max value from BEAD, 2011 (Table 10)	TBD	1.16	Calculated	80	4,181,760	93
Canola	90,000	115,000	Rape seed count from BEAD, 2011 (Table B-1)	Canola	740,520	Max value for rape from BEAD, 2011 (Table 10)	TBD	8.23	Calculated	200	148,104,000	1,650
Cantaloupe	16,000	20,800	Muskmelon (cantaloupe) seed count from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	13,403	Max value for Muskmelon (cantaloupe) from BEAD, 2011 (Table 10)	TBD	0.84	Calculated	80	1,072,240	67

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Carrot	175,000	400,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	2,090,880	Max value from BEAD, 2011 (Table 10)	TBD	11.95	Calculated	80	167,270,400	956
Cauliflower	80,000	150,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	23,232	Max value for cauliflower seeds from BEAD, 2011 (Table 10)	TBD	0.29	Calculated	80	1,858,560	23
Celery	1,000,000	1,152,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	69,696	Max value from BEAD, 2011 (Table 10)	TBD	0.07	Calculated	80	5,575,680	6
Chayote	12,000	18,144	Cucumber seed count used as surrogate, based on highest seed count for a 9B crop.	Large-seeded Vegetables	2,904	Max value from BEAD, 2011 (Table 10)	TBD	0.24	Calculated	80	232,320	19

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Chicory (radicchio)	400,000	426,667	Low end: https://horticulture.oregonstate.edu/oregon-vegetables/radicchio-0#:~:text=SEED%20AND%20SEED%20TREATMENT&text=About%200.75%2D%200.8%20lb%20of,acre%20if%20transplants%20are%20used. High end seed count calculated	Small-seeded Vegetables	320,000	This is calculated but also in BEAD memo: BEAD, 2011 (Table 10) gives range of 29,040 - 52,272	0.75	0.80	https://horticulture.oregonstate.edu/oregon-vegetables/radicchio-0#:~:text=SEED%20AND%20SEED%20TREATMENT&text=About%200.75%2D%200.8%20lb%20of,acre%20if%20transplants%20are%20used	80	25,600,000	64
Collards	16,335	32,670	Calculated	Small-seeded Vegetables	65,340	max value from BEAD, 2011 (Table 10)	2.00	4.00	Range of values from BEAD, 2011 (Table 10)	80	5,227,200	320
Corn, field	1,361	2,000	Entered as-is from BEAD, 2011 (Table B-1)	Corn (Field)	40,250	Max value from BEAD, 2011 (Table 4)	TBD	29.57	calculated	200	8,050,000	5,910
Corn, pop	1,361	4,760	Entered as-is from BEAD, 2011 (Table B-1)	Corn (Field)	30,000	Max value from BEAD, 2011 (Table 10)	TBD	22.04	calculated	200	6,000,000	4,410
Corn, sweet	1,800	4,500	Entered as-is from BEAD, 2011 (Table B-1)	Corn (Field)	59,739	Max value from BEAD, 2011 (Table 10)	TBD	33.19	calculated	80	4,779,120	2,660

Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Cotton	4,500	5,000	Low-end seed count from BEAD, 2011 (Table B-1). High-end seed count from https://cals.arizona.edu/crop/cotton/croprmt/population_evaluation.html#:~:text=Commonly%20for%20example%2C%20there%20are,39%2C200%20ppa%20might%20be%20expected.	Cotton	85,000	Max value from BEAD, 2011 (Table 6)	TBD	18.89	calculated	200	17,000,000	3,780
Cowpea	3,200	4,000	Entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	139,392	Max value from BEAD, 2011 (Table 10)	TBD	43.56	calculated	80	11,151,360	3,480
Cucumber	12,000	18,144	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	139,392	Max value from BEAD, 2011 (Table 10)	TBD	11.62	calculated	80	11,151,360	929
Endive	13,068	52,272	Seed counts calculated using Planting density and seed rate range. http://ufdcimages.uflib.ufl.edu/IR/00/00/34/79/00001/CV12600.pdf	Small-seeded Vegetables	52,272	Max value from BEAD, 2011 (Table 10)	1.00	4.00	http://ufdcimages.uflib.ufl.edu/IR/00/00/34/79/00001/CV12600.pdf	80	4,181,760	320

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Fennel	1,000,000	1,152,000	Celery seed count used as surrogate, based on highest seed count for a 4B crop.	Small-seeded Vegetables	58,080	Max value from BEAD, 2011 (Table 10)	0.05	0.06	Calculated	80	4,646,400	5
Flax	60,984	121,968	High-end seed count estimated from low-end Seeding Rate (from reference https://www.ndsu.edu/agriculture/ag-hub/ag-topics/crop-production/crops/flax/flax-production-north-dakota#section-4) and Planting Density	Canola	3,049,200	Max value from BEAD, 2011 (Table 10)	25.00	50.00	Policy 15.2 for max seeding rate and range found at (https://www.ndsu.edu/agriculture/sites/default/files/2022-07/a1038.pdf)	80	243,936,000	4,000
Guar	1,600	5,000	Field pea seed count used as surrogate, based on highest seed count for a 6C crop. BEAD, 2011 (Table B-1)	Large-seeded Vegetables	43,560	Max value from BEAD, 2011 (Table 10)	8.71	27.23	Calculated	80	3,484,800	2,178
Honeydew	16,000	20,800	Muskmelon seed count used as surrogate, based on highest seed count for a 9A crop. BEAD, 2011 (Table B-1).	Small-seeded Vegetables	13,403	Max value from BEAD, 2011 (Table 10)	0.64	0.84	Calculated	80	1,072,240	67

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/ acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Kale	100,000	144,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	576,000	Max value from BEAD, 2011 (Table 10)	4.00	5.76	Calculated	80	46,080,000	461
Kohlrabi	100,000	150,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	58,080	Only have transplanted values in BEAD 2011 Table 10)	0.39	0.58	Calculated	80	4,646,400	47
Lentil	7,467	13,068	High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density (BEAD, 2011 Table 10)	Small-seeded Vegetables	522,720	Max value from BEAD, 2011 (Table 10)	40.00	70.00	Range provided in BEAD, 2011 (Table 10)	80	41,817,600	5,600
Lettuce, head	400,000	500,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	313,632	Max value from BEAD, 2011 (Table 10)	0.63	0.78	Calculated	80	25,090,560	63
Lettuce, leaf	400,000	500,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	157,000	Max value from BEAD, 2011 (Table 10)	0.31	0.39	Calculated	80	12,560,000	31

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Lupin, White	3,175	4,082	Seed count (Lupin) entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	508,000	Calculated as high-end seedting rate mulitplied by low-end seed count	50.00	160.00	Range provided in BEAD, 2011 (Table 10)	80	40,640,000	12,800
Millet, Japanese	155,000	193,750	Low-end is in Policy 15.2 Table 3.1. High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density	Wheat	3,875,000	Policy 15.2 Table 3.1	20.00	25.00	Range provided in BEAD, 2011 (Table 10)	80	310,000,000	2,000
Millet, pearl	85,000	340,000	Low end from BEAD 2011 (Table 9). High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density	Wheat	1,700,000	Calculated by multiplying high-end seeding rate by low-end seed count, Policy 15.2 Table 3.1	5.00	20.00	Range provided in BEAD, 2011 (Tables 9 and 10)	80	136,000,000	1,600
Millet, proso	46,667	70,000	Low-end is in Policy 15.2 Table 3.1. High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density	Wheat	1,400,000	Max value from BEAD, 2011 (Table 10)	20.00	30.00	Range provided in BEAD, 2011 (Table 10)	80	112,000,000	2,400
Muskmelon	16,000	20,800	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	34,848	Max value from BEAD, 2011 (Table 10)	1.68	2.18	Calculated	80	2,787,840	174

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Mustard greens	181,000	422,333	Mustard seed count used as surrogate, based on highest seed count for a 5B crop. Can't find source	Small-seeded Vegetables	130,680	Max value from BEAD, 2011 (Table 10)	TBD	0.72	3 to 6 lb/A in BEAD 2011, Table 10.	80	10,454,400	58
Mustard seed	181,000	422,333	Low-end in Policy 15.2 Table 3.1, high-end calculated using low-end seeding rate	Canola	1,267,000	Policy 15.2 Table 3.1	3.00	7.00	5 to 7 lb/A in BEAD 2011, Table 10	80	101,360,000	560
Mustard, Chinese	64,000	192,000	Brussels sprouts seed count used as surrogate, based on highest seed count for 5A crop. BEAD, 2011 (Table B-1)	Small-seeded Vegetables	285,120	Max value from BEAD, 2011 (Table 10)	1.49	4.46	Calculated	80	22,809,600	356
Oat	13,000	18,144	Seed count entered as-is from BEAD, 2011 (Table B-1)	Wheat	1,170,000	Policy 15.2 Table 3.1, Calculated by multiplying high-end seeding rate by low-end seed count	60.00	90.00	BEAD 2011 (Table 10) lists range as 60 to 90 lbs/A	200	234,000,000	18,000
Onion, dry, bulb	100,000	130,000	Seed count entered as-is from BEAD, 2011 (Table B-1)		201,046	Max value from BEAD, 2011 (Table 10), Policy 15 Table 3.1 lists 400,000	1.55	2.01	Calculated, Range listed as 3 to 4 lb seed/acre from BEAD Table 10	80	16,083,680	161

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Onion, green	100,000	130,000	Seed count entered as-is from BEAD, 2011 (Table B-1)		1,254,528	Max value from BEAD, 2011 (Table 10), Policy 15 Table 3.1 lists 2,500,000	9.65	12.55	Very large range from 2 to 110 in BEAD Table 10, just calculated based on seed count and planting density	80	100,362,240	1,000
Other, Brassica (5A)	64,000	192,000	Brussels Sprouts seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 5A crops.	Small-seeded Vegetables	285,120	Chinese mustard used as surrogate for planting scenarios, based on greatest planting density for 5A crops.	1.49	4.46	Calculated	80	22,809,600	356
Other, Brassica (5B)	181,000	422,333	Mustard Greens seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 5B crops.	Small-seeded Vegetables	740,520	Rape greens used as surrogate for planting scenarios, based on greatest planting density for 5B crops.	1.75	4.09	Calculated	80	59,241,600	327

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Other, Cereal Grains (15)	85,000	340,000	Pearl millet seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 15 crop	Wheat	2,438,360	Rice used as surrogate for planting scenarios, based on greatest planting density for 15 crops.	7.17	28.69	Calculated	200	487,672,000	5,737
Other, Cucurbits (9A)	16,000	20,800	Muskmelon seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 9A crop	Small-seeded Vegetables	43,560	Watermelon used as surrogate for planting scenarios, based on greatest planting density for 9A crops.	2.09	2.72	Calculated	80	3,484,800	218
Other, Cucurbits (9B)	12,000	18,144	Cucumber seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 9B crop	Large-seeded Vegetables	139,392	Cucumber used as surrogate for planting scenarios, based on greatest planting density for 9B crops.	7.68	11.62	Calculated	80	11,151,360	929

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)- from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Other, Leafy (4A)	400,000	500,000	Lettuce Leaf seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 4A crop	Small-seeded Vegetables	1,568,160	Parsley used as surrogate for planting scenarios, based on greatest planting density for 4A crops.	3.14	3.92	Calculated	80	125,452,800	314
Other, Leafy (4B)	1,000,000	1,152,000	Celery seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 4B crop	Small-seeded Vegetables	204,800	Swiss Chard used as surrogate for planting scenarios, based on greatest planting density for 4B crops.	0.18	0.20	Calculated	80	16,384,000	16
Other, Legume (6A)	800	1,814	Edible-pod pea seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 6A crop	Large-seeded Vegetables	653,400	Edible-pod Pea used as surrogate for planting scenarios, based on greatest planting density for 6A crops.	360.20	816.75	Calculated	200	130,680,000	163,350

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Other, Legume (6B)	907	4,752	Lima Bean seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 6B crop	Large-seeded Vegetables	95,040	Lima Bean used as surrogate for planting scenarios, based on greatest planting density for 6B crops.	20.00	104.79	Calculated	200	19,008,000	20,957
Other, Legume (6C)	1,600	5,000	Field Pea seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 6C crop	Large-seeded Vegetables	1,000,000	Field Pea used as surrogate for planting scenarios, based on greatest planting density for 6C crops.	200.00	625.00	Calculated	200	200,000,000	125,000
Other, Oil Seed (20A)	181,000	422,333	Mustard Seed seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 20A crops.	Canola	3,049,200	Flax used as surrogate for planting scenarios, based on greatest planting density for 20A crops.	7.22	16.85	Calculated	80	243,936,000	1,348

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Other, Oil Seed (20B)	13,608	31,752	Safflower seed count range used as surrogate for treating scenarios, based on greatest high-end seed count for 20B crops.	Wheat	476,280	Safflower used as surrogate for planting scenarios, based on greatest planting density for 20B crops.	15.00	35.00	Calculated	80	38,102,400	2,800
Parsley	150,000	296,500	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	1,568,160	Max value from BEAD, 2011 (Table 10), Polciy 15.2 Table 3.1 lists 6,000,000	5.29	10.45	Calculated, range from BEAD Table 10 is 14 to 40 lb seed/acre	80	125,452,800	836
Pea, Edible-podded	800	1,814	Navy Bean seed count used as surrogate, based on highest seed count for a 6A crop.	Large-seeded Vegetables	653,400	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	816.75	Calculated	80	52,272,000	65,340

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Pea, Field	1,600	5,000	Seed count and planting density entered as-is from BEAD, 2011 (Table 10, B-1).	Large-seeded Vegetables	1,000,000	Seed count and planting density entered as-is from BEAD, 2011 (Table 10, B-1).	TBD	625.00	Calculated	200	200,000,000	125,000
Pea, garden	1,361	2,800	Seed count entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	560,057	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	411.50	Calculated	80	44,804,560	32,900
Pea, Pigeon	800	1,814	Navy bean seed count used as surrogate, based on highest seed count for a 6A crop.	Large-seeded Vegetables	52,272	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	65.34	Calculated	80	4,181,760	5,227
Pea, Southern	3,200	4,000	Cowpea seed count used as surrogate, based on highest seed count for a 6B crop.	Large-seeded Vegetables	104,544	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	32.67	Calculated	80	8,363,520	2,614

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Peanut	460	907	Seed count entered as-is from BEAD, 2011 (Table B-1)		105,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	228.26	Calculated	80	8,400,000	18,300
Potato	5	11	Seed count entered as-is from BEAD, 2011 (Table B-1)		34,848	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	6969.60	Calculated	61	2,125,728	425,000
Pumpkin	1,600	6,400	Seed count entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	7,260	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	4.54	Calculated	80	580,800	363
Rape Greens	90,000	115,000	Canola/Rape seed (20A) used as surrogate.	Small-seeded Vegetables	740,520	Canola/Rape seed (20A) used as surrogate.	TBD	8.23	Canola/Rape seed (20A) used as surrogate.	80	59,241,600	658
Rhubarb	1,000,000	1,152,000	Celery seed count used as surrogate, based on highest seed count for a 4B crop.	Small-seeded Vegetables	7,260	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	0.01	Calculated	80	580,800	1

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Rice	15,600	28,100	Seed count entered as-is from BEAD, 2011 (Table B-1)	Rice	2,438,360	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	156.31	Calculated	200	487,672,000	31,300
Rice (Planting Restriction/High-end)	15,600	28,100	Seed count entered as-is from BEAD, 2011 (Table B-1)	Rice	2,438,360	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	120.00	Calculated	200	674,400,000	24,000
Rice (Planting Restriction/Low-end)	15,600	28,100	Seed count entered as-is from BEAD, 2011 (Table B-1)	Rice	2,438,360	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	120.00	Calculated	200	374,400,000	24,000
Rye	18,000	27,000	High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density	Wheat	1,620,000	Planting density entered as-is from BEAD, 2011 (Table 10).	60.00	90.00	Calculated	200	324,000,000	18,000
Safflower	13,608	31,752	High-end seed count estimated from low-end Seeding Rate (BEAD, 2011 Table 10) and Planting Density	Wheat	476,280	Planting density entered as-is from BEAD, 2011 (Table 10).	15.00	35.00	Calculated	80	38,102,400	2,800

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Sorghum, grain	8,333	22,000	High-end seed count from reference: https://www.pioneer.com/us/agronomy/planting_rate.html#:~:text=Grain%20sorghum%20seed%20size%20is,to%2022%2C000%20seeds%20per%20pound.	Wheat	100,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	12.00	Calculated	80	8,000,000	960
Soybean	1,500	3,600	Seed count entered as-is from BEAD, 2011 (Table B-1)		250,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	166.67	Calculated	200	50,000,000	33,300
Spinach	40,000	45,360	Seed count entered as-is from BEAD, 2011 (Table B-1)	Small-seeded Vegetables	1,000,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	25.00	Calculated	80	80,000,000	2,000
Squash, Chinese	12,000	18,144	Cucumber seed count used as surrogate, based on highest seed count for a 9B crop.	Large-seeded Vegetables	2,904	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	0.24	Calculated	80	232,320	19

Table D1. Addendum to ExpoSAC Seed Treatment Policy 15.												
Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Squash, summer	1,920	6,400	Seed count entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	11,616	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	6.05	Calculated	80	929,280	484
Squash, winter	1,920	6,400	Seed count entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	7,260	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	3.78	Calculated	80	580,800	303
Sunflower	2,000	9,000	Seed count entered as-is from BEAD, 2011 (Table B-1)		8,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	4.00	Calculated	80	640,000	320
Swiss Chard	25,600	34,133	High-end seed count estimated from low-end Seeding Rate (from reference http://aggie-horticulture.tamu.edu/vegetable/files/2011/10/swisschard.pdf) and Planting Density	Small-seeded Vegetables	204,800	Planting density entered as-is from BEAD, 2011 (Table 10).	6.00	8.00	Calculated	80	16,384,000	640
Triticale	15,000	22,680	Seed count entered as-is from BEAD, 2011 (Table B-1)	Wheat	1,635,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	109.00	Calculated	200	327,000,000	21,800

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Crop / Seed Type	Seed Count (# seeds/lb seed)			Seed Treatment Category for Pounds of Seed Treated Per Day	Amount Seed Planted							
	Low-end	High-end	Notes on values provided		Planting Density		Seeding Rate (lb seed/acre)			Area Planted (acre)-from ExpoSAC Policy 9.2	# Seeds Planted (calculated)	lb Seed Planted (calculated)
					(# seeds/acre)	Notes on values provided	Low-end	High-end	Notes on values provided			
Watermelon	4,800	9,600	Seed count entered as-is from BEAD, 2011 (Table B-1)	Large-seeded Vegetables	43,560	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	9.08	Calculated	80	3,484,800	726
Wheat	9,550	18,000	Seed count entered as-is from BEAD, 2011 (Table B-1)	Wheat	1,500,000	Planting density entered as-is from BEAD, 2011 (Table 10).	TBD	157.07	Calculated	200	300,000,000	31,400