



SF Environment

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A Department of the City and County of San Francisco

Guide to San Francisco's Reduced Risk Pesticide List

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Introduction

The City of San Francisco Department of the Environment's (SFE) Reduced-Risk Pesticide List is the result of a multi-step process that involves both environmental scientists and pest managers. The first step is a hazard assessment of both the active ingredients and the formulated product. The second step is a consideration of the potential human and environmental exposure that may result from use of the product in the particular application proposed by San Francisco City staff. This informal exposure assessment is done by SFE staff in conjunction with the Integrated Pest Management Technical Advisory Committee (IPM-TAC). The third and final step combines the results of the hazard and exposure assessments into a decision by staff and the TAC as to whether a product should be added to the List, and if so, whether it requires an "least restricted, (formerly denoted as "Approved (A)"), "more restricted" (formerly "Limited Use (L)"), and "most restricted" categorization (formerly "Limited Use-Special Concern (L*)". Approval for use in the San Francisco IPM program is determined on the basis of the need for the product, the availability of alternatives, the Hazard Tier, and the exposure potential.

Step 1: Hazard Assessment

San Francisco summarizes the hazards associated with pesticide products and places the products into Hazard Tiers (Table 1) based on the toxicity of the active ingredient(s) and the other ingredients (if they are identified) in the product. The specific hazards assessed are described in Table 2 and the ingredients in the product are evaluated for each category and ranked as high, moderate or low hazard, according to the criteria in Table 3.

Step 2: Exposure Assessment

The hazard review and tier ranking process is only the first step toward placing a pesticide on the Reduced-Risk Pesticide List. A critical second step is review by the San Francisco IPM Technical Advisory Committee (IPM TAC), which is composed of IPM Coordinators from the largest City departments (SF Public Utilities Commission, SF Dept. of Recreation and Parks, SF Dept. of Public Works, SF Port, SF MUNI, SF International Airport, SF Dept. of Public Health). The Committee discusses each proposed addition/deletion

Application to Certified Green Buildings

The U.S. Green Building Council's 2009 LEED for Existing Buildings Operations and Maintenance (LEED-EBOM) refers to San Francisco's Hazard Tier System in its reference manual. For LEED-certified buildings, building managers are not required to provide universal notification of pesticide applications if those pesticides would qualify as Tier III (lowest hazard). LEED users should refer to the "Hazard Tier Review Process" section below for guidance on how to categorize their products themselves. Lists of products that San Francisco has categorized are posted on the www.sfenvironment.org/ipm website, but are neither comprehensive nor necessarily up to date. ¹

to the list and reviews:

- *The potential for human exposure or environmental release for each proposed product.* Products such as containerized baits, for example, use very small amounts of active ingredient encased in a protective covering. These would therefore pose less exposure potential than, say, aerosol spray products.
- *The effectiveness of each proposed product.* Does the product work as intended?
- *The need for the product.* Is this kind of pest management action truly necessary? If so, is this the least-hazardous product available for the task?

Step 3: Placement on Reduced-Risk Pesticide List

The IPM TAC makes recommendations for additions/deletions to the list. These recommendations are then reviewed by SFE. If the decision is made to list a product, it is categorized in one of three ways:

Least Restricted (formerly “Approved” or “A”). These products are generally the least hazardous pesticides on the list.

More Restricted (formerly “Limited Use” or “L”). These products include specific restrictions on allowable situations.

Most Restricted (formerly “Limited Use – Special Concern” or “L*”). These are pesticide products that pose the greatest health or environmental concerns, but which are nevertheless considered the least-hazardous chemical alternative for a particular purpose. Use of “Most Restricted” products must be justified at an annual public hearing.

The SFE proposes a new Reduced-Risk Pesticide List annually, and holds a public hearing (generally in January) to obtain public comments and suggestions. The list is then submitted for final approval by the SF Commission on the Environment.

Exemptions

For special, unforeseen, or emergency situations, City Departments must be granted a formal exemption from SFE to use products not found on the Reduced Risk Pesticide List. Most exemptions granted are for pilot testing new, safer products.

Hazard Tier Review Process

Pesticide products are assigned a hazard tier ranking after evaluating the hazard indices listed in the following section. The product is assigned a ranking as High, Moderate, or Low for each characteristic based on the ranges or values shown in Table 3 below. If any of the criteria are in the High category, the product is placed in Tier 1. If the chemical does not have any criteria in the High category, but does have at least one criterion in the Moderate category, the product is placed in Tier 2. Products with criteria only in the Low category are placed in Tier 3. See Table 1 for a summary of rankings, and Table 2 for a summary of data sources.

Table 1: Tier Rankings Derived from Hazard Screening

Tier	Definition
Tier 1	Highest concern. At least one criterion in Table 3 placed in highest hazard category.
Tier 2	Moderate concern. At least one criterion in Table 3 placed in the moderate hazard category.
Tier 3	Lowest concern. No criteria flagged for Tier 1 or Tier 2.

Table 2: Hazards Evaluated and Data Sources Used

Hazard	Source(s) of Information Used
Acute toxicity	Product label: Signal word (Caution, Warning or Danger)
Restricted use	Product label: Use restricted to professional applicators
Cancer	Cancer classification of ingredient by US EPA, State of California (Proposition 65 list) ²⁰ , National Toxicology Program (Report on Carcinogens) ²¹ , or the International Agency for Research on Cancer (IARC Monographs) ²²
Reproductive or Developmental Toxicity	Designation of ingredient by the State of California (Proposition 65 list ²⁰), US EPA on the Toxics Release Inventory list ¹
Endocrine disruption	Designation of ingredient by the European Commission ² or included in the book <i>Environmental Endocrine Disruptors</i> by Lawrence H. Keith ³
Water pollution potential	Ingredient listed under Clean Water Act Section 303(d). ⁴
Hazard to birds	Product label or MSDS: Presence and wording of bird hazard statement or LD ₅₀ or LC ₅₀ of product (if available).
Hazard to aquatic life	Product label or MSDS: Presence and wording of fish hazard statement or LC ₅₀ of product (if available).
Hazard to bees	Product label or MSDS: Presence and wording of bee hazard statement or LD ₅₀ or LC ₅₀ of product (if available).
Hazard to wildlife	Product label or MSDS: Presence and wording of wildlife hazard statement or LD ₅₀ or LC ₅₀ of product (if available).
Soil mobility	Soil mobility score (Groundwater Ubiquity Score or GUS) calculated from physical properties or CA DPR's assessment of groundwater contamination potential using physical properties. Physical property data available in the OSU Pesticide Properties Database, ⁵ CA DPR Pesticide Contamination Prevention Act Status Reports, ⁶ or the EU Footprint Pesticide Properties database. ⁷
Persistent, Bioaccumulative, Toxic substances (PBTs)	US EPA Waste Minimization priority chemical ⁸ or listed by the European Union as fulfilling PBT or Persistent Organic Pollutant (POP) criteria. ⁹

Table 3: Criteria for San Francisco Hazard Tier Ranking

Hazard	High	Moderate	Low
Signal word	Danger	Warning	Caution or none
Restricted use	Yes	—	No
Cancer (see Table 1)	Known or Probable	Possible	Unclassifiable, Not Likely, Not Listed
Reproductive or Developmental Toxicity	Listed	—	Not listed
Endocrine disruption	EC category I or II	—	EC category III or not listed
Water pollution	303(d) listed	—	Not listed
Hazard to birds	“Extremely toxic” or “Highly toxic” according to product label, or high product toxicity based on LC ₅₀ or LD ₅₀ (see above)	“Toxic” according to product label, or moderate product toxicity based on LC ₅₀ or LD ₅₀ (see above)	No warning on product label, or low product toxicity based on LC ₅₀ or LD ₅₀ (see above)
Hazard to aquatic life	“Extremely toxic” or “Highly toxic” according to product label, or high product toxicity based on LC ₅₀ (see above)	“Toxic” according to product label, or moderate product toxicity based on LC ₅₀ (see above)	No warning on product label, or low product toxicity based on LC ₅₀ (see above)
Hazard to bees	“Extremely toxic” or “Highly toxic” according to product label, or high product toxicity based on LD ₅₀ (see above)	“Toxic” according to product label, or moderate product toxicity based on LD ₅₀ (see above)	No warning on product label, or low product toxicity based on LD ₅₀ (see above)
Hazard to wildlife	“Extremely toxic” or “Highly toxic” according to product label, or high product toxicity based on LC ₅₀ or LD ₅₀ (see above)	“Toxic” according to product label, or moderate product toxicity based on LC ₅₀ or LD ₅₀ (see above)	No warning on product label, or low product toxicity based on LC ₅₀ or LD ₅₀ (see above)
Soil mobility	—	GUS ≥2 or DPR classifies AI as exceeding SNVs	GUS <2 and Not listed by DPR as exceeding SNVs.
PBT	Listed	—	Not listed

Below are details on the hazard indices used in the evaluation:

❖ *Acute Toxicity*

EPA assigns every pesticide product to a hazard category based on the results of acute toxicity testing of the full product including inert ingredients. The testing includes the single dose required to cause death in test animals via ingestion, inhalation, and skin absorption. The testing also considers the degree of skin and eye irritation or damage. Based on the results of these tests, EPA assigns the product to a hazard category and requires a signal word such as Caution, Warning, or Danger to be placed on the label. Danger indicates the highest hazard, Warning indicates moderate hazard, and Caution indicates a lower hazard.

❖ *Restricted Use*

Some pesticides are restricted to use only by certified pesticide applicators and are not available to the general public because of high toxicity, particularly hazardous ingredients, or environmental hazards. Pesticides designed as restricted use are so indicated on the product label.

❖ *Cancer (known ingredients only)*

Various state, federal, and international organizations evaluate or list chemicals for carcinogenicity, their potential to cause cancer^{19, 20, 21, 22} Due to the expense and difficulty of such evaluations, not all agencies have reviewed the same chemicals and not all reach the same conclusions on a given chemical. For this reason, we use the ratings of several agencies whenever possible. These ratings indicate the strength of the scientific evidence that a particular chemical can cause cancer in humans, but they do not consider the potency of the chemical, i.e. the number of cancers that will result from a standard level of exposure to a population. The various agencies use different words to describe the strength of evidence, such as possible, probable, likely, known, etc. In order to simplify the rating, we have assigned the various phrases used by the different agencies to a standard phrase used in the Hazard Tier assessment (see Table 4). The tier rating is based on the highest likelihood assigned by any agency that has evaluated the chemical.

Table 4: Standardized Cancer Rankings Used in Hazard Tier Assessment

Organization	Organization Rating	Standardized Rating for SF Hazard Tier
US EPA ¹⁹	Group A: Known Human Carcinogen	Known or Probable
	Known/Likely	Known or Probable
	Likely to be Carcinogenic to Humans	Known or Probable
	Group B: Probable Human Carcinogen	Known or Probable
	B1: Sufficient evidence of carcinogenicity from animal studies with limited evidence of carcinogenicity from epidemiologic studies in humans	
	B2: Sufficient evidence of carcinogenicity from animal studies with inadequate or no data from epidemiologic studies in humans	
	Group C: Possible Human Carcinogen	Possible
	Likely to be Carcinogenic to Humans at High Doses, but Not Likely at Low Doses	Possible
	Suggestive Evidence of Carcinogenicity to Humans	Possible
	Group D: Not classifiable as to human carcinogenicity	Unclassifiable
Data are inadequate for an assessment of human carcinogenic potential	Unclassifiable	
Group E: Not Likely to be Carcinogenic to Humans	Not Likely	
IARC ²²	Group 1: Carcinogenic to Humans	Known or Probable
	Group 2A: Probably Carcinogenic to Humans	Known or Probable
	Group 2B: Possibly Carcinogenic to Humans	Possible
	Group 3: Unclassifiable as to Carcinogenicity to Humans	Unclassifiable
	Group 4: Probably not Carcinogenic to Humans	Not Likely
NIH/NTP ²¹	Known to be a Human Carcinogen	Known or Probable
	Reasonably Anticipated to be a Human Carcinogen	Known or Probable
	Reviewed but not listed	Not Listed
Proposition 65 ²⁰	Known to the State of California to Cause Cancer	Known or Probable

❖ **Reproductive/Developmental Toxicants (known ingredients only)**

Known ingredients in the products are screened against the State of California lists of known reproductive and developmental toxicants,²⁰ the US EPA Toxics Release Inventory (TRI) chemical hazard list,³² or the list from the National Toxicology Program’s Health Assessment and Translation (formerly the Center for Evaluation of Risks to Human Reproduction).³³

❖ **Endocrine Disruptors (known ingredients only)**

Under the Food Quality Protection Act, the EPA is required to screen pesticide ingredients for endocrine system effects. Until that screening is done, a comprehensive list of endocrine disruptors will not be available. For purposes of this screening, we used the list of endocrine disruptors compiled by the European Commission²⁴ and in the book *Environmental Endocrine Disruptors* by Lawrence Keith.²⁵ Chemicals on the EU list are classified for both humans and wildlife as Category I: evidence for endocrine disruption in living organisms, Category II: evidence of potential to cause endocrine disruption, or Category III: low exposure concern, no scientific basis for inclusion, or insufficient information. The list of endocrine disruptors will likely be expanded at a later date, when US EPA publicizes the results of the Endocrine Disruptor Screening Program.

❖ **Water Pollution (known ingredients only)**

Section 303(d) of the federal Clean Water Act requires states to compile a list of water bodies with excessive contamination. The list of impaired water bodies in the area where the product will be used (available from the US EPA 303(d) web site³⁴) is searched for pesticide active ingredients. Based on a site-specific analysis of the water bodies, products are assessed as to whether they contain priority 303(d) pollutants for that area.

❖ **Hazards to Birds, Aquatic Life, Bees, and Other Wildlife**

The US EPA requires particular hazard warning statements on pesticide product labels depending on the toxicity of the active ingredients and the formulated product to particular off-target species, evidence that adverse effects have occurred, and the use for which the product is intended. The hazard assessment is based on whether such warnings appear on the specific product label or the acute toxicity of the product as described in the MSDS. This toxicity is expressed as an LC₅₀ (or LD₅₀) that is the lethal concentration (or dose) to 50% of the test organisms in a laboratory test. The criteria for defining toxicity for different species are shown in Table 5 below.

Table 5: Toxicity Reference Values for Terrestrial and Aquatic Wildlife

Category	Mammal and Bird LD₅₀ (mg/kg)³⁵	Mammal and Bird LC₅₀ (mg/kg of food)³⁶	Aquatic LC₅₀ (mg/L)³⁶	Bee LD₅₀ (g/bee)³⁷
High Toxicity	< 50	< 500	< 1	< 2
Moderate Toxicity	50–500	500–1,000	1–10	2–11
Low Toxicity	> 500	> 1,000	> 10	> 11

❖ **Mobility in Soil (known ingredients only)**

The potential for ground-water or surface-water pollution by pesticides is dependent on many factors, including persistence of the ingredients, water solubility, soil binding, amount of rainfall or irrigation, soil properties, amount and frequency of applications, soil slope, vegetation present, proximity to ground- or surface-water, etc. The hazard assessment only considers the properties that relate strictly to the pesticide itself. The potential for a pesticide moving to surface water or groundwater is thus assessed in one of three ways:

- 1) The Ground-water Ubiquity Score (GUS) is an empirically derived index that relates pesticide persistence and soil binding to mobility. The GUS index is defined mathematically as:

$$\text{GUS} = \log_{10}(\text{half-life}) \times [4 - \log_{10}(\text{K}_{oc})]$$

where K_{oc} is the soil sorption coefficient and half-life is the soil half-life in days. Information on pesticide K_{oc} values can be found in the OSU Pesticide Properties database,²⁷ the California Department of Pesticide Regulation groundwater Status Reports,²⁸ or in the EU Footprint Pesticide Properties database.²⁹

A pesticide movement rating ranging from “extremely low” to “very high” has been assigned to the numerical values by the researchers in the OSU Extension Pesticide Properties Database.²⁷ The values are shown in Table 6.

Table 6: Pesticide Mobility in Soil as a Function of Groundwater Ubiquity Score

GUS Value	Pesticide Movement Rating
<2	Low
>2.0–3.0	Moderate
>3.0	High

- 2) The California Department of Pesticide Regulation (DPR) lists pesticide active ingredients as potential groundwater contaminants when physical properties exceed Specific Numeric Values (SNVs). In order for a chemical to be listed, one of the following must be true:

Water solubility: > 3 ppm (mg/L), or
 Soil adsorption coefficient (K_{oc}): < 1,900 cm³/g

AND one of the following must be true

Hydrolysis half-life: > 14 days, or
 Aerobic soil metabolism half-life: > 610 days, or
 Anaerobic soil metabolism half-life: > 9 days

The list of pesticides that exceed SNVs is available from DPR’s annual Groundwater Status Reports.²⁸

- 3) In addition to the GUS index and DPR’s assessment, information on pesticide water contamination potential is noted from product label warnings. EPA requires two levels of warnings for products with characteristics that have been determined to result in likely contamination of groundwater from use as labeled. A lower level of warning is required if no actual detections have occurred or no field studies have been done. A higher level of warning is required if detections have occurred or field studies have shown that the chemical leaches. For purposes of the initial screening, the presence of either warning is considered an indication that the chemical has high mobility. In rare cases where a label ground-water advisory occurs but the GUS index or DPR assessment did not indicate high mobility, the label advisory is given priority.

Pesticides that have high soil mobility according to the criteria above, but are not otherwise toxic or bioaccumulative are classified as Tier 2.

❖ ***Persistent, Bioaccumulative, Toxic Chemicals (PBTs)***

In recent years much attention has been paid to toxic chemicals that persist in the environment and bioaccumulate. PBTs pose a serious threat because they can build up in ecosystems, wildlife, and humans even when deposited slowly. Many organizations including the United Nations, International Joint Commission on the Great Lakes, U.S. EPA, and Washington State Department of Ecology have proposed strategies to reduce or eliminate them. The list used for this evaluation is EPA's Waste Minimization Priority Chemicals list or listed by the European Union as fulfilling PBT or Persistent Organic Pollutant (POP) criteria. New lists will be added as more information becomes available.

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- ³⁷ US EPA 2012. *Label Review Manual, Chapter 8: Environmental Hazards*. <http://www.epa.gov/oppfead1/labeling/lrm/>.