CHAPTER 2

PESTICIDE REGULATIONS AND USAGE

A. INTRODUCTION

This chapter provides an overview of the pesticide registration and enforcement processes. New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency (USEPA) each have pesticide registration requirements that are applicable in New York State. This chapter also provides a description of the State's reporting requirements for pesticide users and the latest available estimates of overall pesticide usage in New York City and New York State.

A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pesticides can include insecticides that target insects, fungicides that target fungi, herbicides that target weeds and other unwanted plants, and rodenticides that target rodents, among others.[1] Insecticides include adulticides that target adult mosquitoes and larvicides that target mosquito larvae and pupae. Under the Proposed Action, the New York City Department of Health (NYCDOH) could select an adulticide product from among several registered adulticides for its *Adult Mosquito Control Programs.* The Material Safety Data Sheet (MSDS) and product label for each adulticide considered for use by NYCDOH in the *Adult Mosquito Control Programs* is included in Appendix 2.

NYSDEC pesticide registration information discussed below was largely excerpted from the "Agenda for NYSDEC Division of Solid & Hazardous Materials, Bureau of Pesticides & Radiation, Pesticide Product Registration Workshop, December 12, 1995," and NYSDEC's website (www.dec.state.ny.us). Code of Federal Regulations (CFR), which codifies the rules established by Federal agencies, and USEPA's website, are the primary sources of information for the discussion on USEPA's pesticide registration process. The CFR provisions referred to in this chapter (e.g., 40 CFR Part 152, may be found on the Internet at www.access.gpo.gov/nara/cfr/waisidx_00/40cfrv11_00. html).

B. DESCRIPTIONS OF NYSDEC AND USEPA REGISTRATION PROCESSES

In order for a pesticide to be distributed, sold, or used in the United States, it must first undergo rigorous registration processes at the Federal and State levels. Products must first be registered with USEPA before NYSDEC conducts its registration process. At each level throughout the process, the potential adverse impacts from pesticides are examined, and in the end, a series of restrictions are applied to the products to make sure that potential adverse effects are minimized.

This section provides an overview of NYSDEC and USEPA pesticide registration processes. It is important to note that NYSDEC has one additional pesticide registration procedure that USEPA does

[1] U.S. Environmental Protection Agency. Office of Pesticide Programs. http://www.epa.gov/opp00001/whatis.htm 1/26/01.

not have: the "Registration to Meet Special Local Needs." Furthermore, the New York State legislature requires NYSDEC Commissioner to register pesticides independently of the Federal registration process and adopt rules and regulations that, among other things, prevent damage or injury to wildlife. USEPA weighs the risks of using a particular pesticide against possible advantages in a cost-benefit analysis. The parameters that result in a favorable cost-benefit on a national scale might be unfavorable on a local scale. Therefore, it is necessary for New York State to reexamine USEPA decisions on products that successfully pass the Federal registration process in order to protect human health, the environment, and the fish and wildlife resources of the State, as required by State law. Products that are not registered for use as pesticides by USEPA may not be registered for use as pesticides by NYSDEC. The following sections describe USEPA and NYSDEC registration processes in more detail.

USEPA PESTICIDE REGISTRATION PROCESS

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. ?? 136 et seq. (1947), provides Federal control of pesticide distribution, sale, and use. USEPA was given authority under FIFRA not only to study the consequences of pesticide usage but also to require users (farmers, utility companies, and others) to register when purchasing pesticides. Through later amendments to the law, users also must take exams for certification as applicators of pesticides. The New York State certification process is conducted by NYSDEC.

As discussed above, all pesticides used in the United States must be registered (licensed) by USEPA. Registration assures that pesticides will be properly labeled and, if used in accordance with USEPA specifications, will not have any unreasonable adverse effects on humans, the environment and non-target species. To prevent such effects, USEPA can limit the distribution, sale, or use of any pesticide that is not registered in accordance with FIFRA.

Registration of a pesticide is a scientific, legal, and administrative process through which USEPA examines the composition of the pesticide; the particular site or crop on which it is to be used; the amount, frequency and timing of its use; and storage and disposal practices. A pesticide product is composed of "active" and "inert" ingredients. As discussed in Chapter 1, "Description of the Proposed Action," a product's active ingredient is the chemical component intended to target and eradicate the pest. Inert ingredients are generally added to pesticides as solvents and/or dispersion aids. Unlike active ingredients, inert ingredients are not required to be identified on the product label. However, they may need to be listed individually if they pose a hazard to public health or the environment. In most cases, only the total percentage of all inert ingredients must be publicly disclosed. In general, detailed information on inert ingredients is considered confidential business information for proprietary purposes and is not available to the public, nor to local health departments.

In evaluating a pesticide registration application USEPA assesses a wide variety of potential human health and environmental effects associated with use of the product. The producer of the pesticide must provide data from tests done according to USEPA guidelines. These tests must determine whether a pesticide has the potential to cause adverse effects on humans, wildlife, fish, and plants, including endangered species and non-target organisms, as well as possible contamination of surface water or groundwater from leaching (soaking into the ground), runoff (surface drainage following rain event) and spray drift. Testing for the pesticide's environmental effects enables USEPA to understand its "environmental fate," or persistence within the environment. Potential human risks evaluated include short-term toxicity and long-term effects such as cancer and reproductive system disorders. USEPA must also approve the language that appears on each pesticide label. Some of the

language that appears on the label, such as "warning" or "caution," is required based on the product's toxicity (see Tables 2-1 through 2-3, below). A pesticide product can only be stored, handled, used, and disposed of according to the directions on the label accompanying it at the time of sale. During the registration process, USEPA classifies pesticide products for restricted-use or for general use. USEPA does not normally classify products for general use; products that are not restricted remain unclassified (40 CFR Part 152.160). General use pesticides may be applied by anyone, but restricted-use pesticides may only be applied by certified applicators or persons working under the supervision of a certified applicator. Unclassified pesticides are not limited in any manner, except in cases where a product bears labeling limiting the use to a specific user group such as veterinarians.

Types Of Registration

There are several types of registrations under which pesticides may be used in the United States Under Federal Registration Actions, USEPA is authorized to register pesticides for use throughout the United States. However, some pesticides are registered for use only in certain states. In addition, states, tribes, and territories can further restrict the use or sale of USEPA-registered pesticide products within their own jurisdictions.

The second type of registration action involves USEPA's approval of Experimental Use Permits (EUPs), which allow manufacturers to field-test pesticides under development. Manufacturers of conventional pesticides are required to obtain EUPs before testing new pesticides or new uses of previously registered pesticides if they conduct experiments on 10 acres or more of land or 1 acre or more of water. Biopesticides also require EUPs when used in experimental settings.

Registration can also involve emergency exemptions, through which USEPA allows State and Federal agencies to permit the unregistered use of a pesticide in a specific geographic area for a limited time if emergency pest conditions exist. This registration action typically arises when growers and others encounter a pest problem on a site for which there is either no registered pesticide available, or for which there is a registered pesticide that would be effective, but is not yet approved for use on that particular site. Also, exemptions can be approved for public health and quarantine reasons. In order to approve an emergency exemption, USEPA must find that the pesticide use poses no "unreasonable adverse effects" and that there is a "reasonable certainty of no harm" to human health and the environment.

Lastly, states can register a new pesticide product for any use, or for an additional use of an USEPA-registered product. To obtain USEPA's approval, the states must demonstrate that: (1) there is a "special local need" for such a product, and (2) a tolerance, exemption from a tolerance, or another clearance under the Federal Food, Drug & Cosmetic Act (FFDCA), 21 USC 9 ? 346a, has been established. The FFDCA, first enacted in 1938, was amended in 1954 to limit the quantity of any poisonous or deleterious substance added to food by establishing pesticide "tolerances." A tolerance is the maximum permissible level for pesticide residues allowed in or on commodities used for human food and animal feed.

Registration Priorities

USEPA's registration process places high priority on registering pesticides that are safer than pesticides currently on the market, those pesticides with public health benefits, and pesticides that are of particular economic importance to producers. For more information on this priority system, the Pesticide Registration Notices 97-2 and 98-7 may be found on the Internet at www.USEPA.gov/ oppuisdi/ PR_Notices/pr97-2.html and www.epa.gov/oppuisdi/PR_Notices/pr98-7.html.

Reregistration and the Food Quality Protection Act (FQPA)

USEPA's current reregistration process, established by the 1988 FIFRA amendments, is designed to ensure that older pesticides (those initially registered before November 1, 1984) meet contemporary health and safety standards and product labeling requirements, and that their risks are mitigated. The process enables USEPA to reevaluate the product's active ingredient, data supporting the active ingredient, and its uses. To be "eligible" for reregistration, a pesticide must have a substantially complete scientific database and must not cause unreasonable risks to human health or the environment when used according to its label.

From when FIFRA was first enacted in 1947, it was intended that all registered pesticides be reregistered every five years. Standards for pesticide registration have not remained the same since 1947, but have evolved in tandem with science and public policy. Many factors impeded USEPA's progress in carrying out the reregistration mandate, including the sheer number of active ingredients to be reviewed (approximately 1,150), the lengthy review procedures, and inadequate resources. Therefore, the 1988 FIFRA amendments were designed to accelerate the reregistration process and authorize the collection of fees to support reregistration efforts.

There are five phases in the reregistration process. USEPA first asks registrants of these pesticides whether they intend to seek reregistration. In Phase 2, registrants are required to notify USEPA whether or not they intended to reregister their products; to identify and commit to providing necessary new studies; and to pay the first installment of the reregistration fee. During this phase, USEPA issues guidance to registrants for preparing their Phase 2 and Phase 3 responses. During Phase 3, following USEPA guidance, registrants are required to submit summaries and reformat acceptable studies, "flag" studies indicating adverse effects, re-commit to satisfying all applicable data requirements, and pay the final installment of the reregistration fee. During Phase 4, USEPA reviews all Phase 2 and 3 submissions and requires registrants to meet any unfulfilled data requirements within four years.

In the final phase, USEPA reviews all the studies that have been submitted for a "case" or group of related pesticide active ingredients, and decides whether or not pesticide products containing the active ingredient(s) are eligible for reregistration. As noted above, to be eligible, a pesticide must have a substantially complete scientific database and must not cause unreasonable risks to human health or the environment when used according to its label. USEPA also considers whether the pesticide meets the new safety standard of the 1996 Food Quality Protection Act (FQPA), which amended FIFRA and the FFDCA. Under FQPA, USEPA must make a determination that pesticide residues remaining in or on food are safe, and that there is a "reasonable certainty of no harm." This process, known as "tolerance reassessment," is combined with the registration process.

The results of the Agency's review are then presented in a Reregistration Eligibility Decision (RED) document, which summarizes the risk assessment conclusions and outlines any risk reduction measures necessary for the pesticide to continue to be registered in the United States. Products containing the pesticide are reregistered after certain product-specific data and revised labeling are submitted and approved. Also, all the active ingredients in a pesticide product must be eligible before the product may be reregistered. For large groups of pesticides that require cumulative assessment, like the organophosphates, USEPA is completing individual Interim REDs (IREDs) and Tolerance Reassessment Progress Reports (TREDs). Once the Agency completes a cumulative risk assessment and risk management decision encompassing the *entire group* of related pesticides, the individual decisions may be issued as REDs. Further risk mitigation may be required at that time.

USEPA has prioritized pesticides for both reregistration review and tolerance reassessment based on their potential risks. USEPA has given top priority to pesticides intended for use on human food and animal feed. Three priority groups have been established. The first group, exhibiting the highest potential risk, includes: (1) organophosphate, carbamate, and organochlorine pesticides; (2) probable and possible human carcinogens; (3) "high-hazard" inert ingredients; and (4) any pesticides that exceed their reference dose (i.e., the amount believed not to cause adverse effects if consumed daily over a 70-year lifetime). The first group also includes pesticides for which REDs were substantially complete prior to the enactment of FQPA, even though they are not among those pesticides that appear to pose the greatest risks.[2] The second group includes possible human carcinogens not included in the first group, and all remaining pesticides subject to reregistration (post-1984). The third group includes biological pesticides and inert ingredients that have not been identified in 40 CFR Part 180[3] as being "high-hazard." Pesticides initially registered after 1984 are also included in group three.[4]

USEPA has also prioritized pesticides for reregistration into four lists, A through D. List A contains most food use pesticides. Pesticides on Lists B, C, and D are classified on the basis of their potential for human exposure and other factors, with List B containing pesticides of greater concern and List D, of less concern.[5]

Special Review[6]

In addition to reregistration and tolerance reasssessment, USEPA is required to conduct "special reviews" when there is reason to believe that the use of a pesticide may result in unreasonable adverse effects on humans or the environment. As set forth in 40 CFR Part 154.7, special reviews are initiated when the following criteria are met:

- Acute toxicity to humans or domestic animals;
- Potential chronic or delayed toxic effects in humans;
- Potential hazards to non-target organisms;
- Risk to the continued existence of any threatened or endangered species;
- Risk of destruction or other adverse modification of a critical habitat of any threatened or endangered species; and
- Any other adverse effect on humans or the environment which may outweigh the benefits that justify initial or continued registration.

During the special review, USEPA prepares "position documents," which are reviewed by the Scientific Advisory Board (established by FIFRA), the U.S. Department of Agriculture (USDA), and the public. Depending on the level of risk determined by the review, USEPA will modify the pesticide's registration to reduce the risk to an acceptable level by canceling the product's registration altogether (thereby removing it from the market), changing its use pattern, changing application methods and/or rates, and/or imposing protective measures.

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[2] Federal Register: October 7, 1998 (Volume 63, Number 194). Pages 53895-53902.
[3] 40 CFR 180 is entitled "Tolerances and Exemptions from Tolerances for Pesticide Chemicals in or on Raw Agricultural Commodities."
[4] Federal Register: August 4, 1997 (Volume 62, Number 149)] Pages 42019-42030.
[5] U.S. Environmental Protection Agency. Office of Pesticide Programs. "Status of Pesticides in Registration, Reregistration, and Special Review (Rainbow Report)." Spring 1998.
[6] U.S. Environmental Protection Agency. Office of Prevention, Pesticides, and Toxic Substances. "Status of Chemicals in Special Review." EPA-738-R-00-001. March 2000.

Data Requirements and Testing

The data requirements for product registration, as set forth in 40 CFR Part 158, specify the type of information USEPA needs in order to make regulatory judgments about the risks of pesticide products. The data requirements are intended to generate data and information necessary to address concerns pertaining to the identity, composition, potential adverse effects, and environmental fate of each pesticide. A registrant may develop and submit the required data, cite all previously submitted data, or cite selected data. The following discussion describes each data requirement in detail.

Chemical Composition or Formulation

Information on the product's complete chemical composition—including active ingredients, inert ingredients, and any impurities—must be submitted in a Confidential Statement of Formula (CSF). As discussed above, inert ingredients are not required to be identified on the product label unless they pose a hazard to public health or the environment. In most cases, only the total percentage of all inert ingredients must be publicly disclosed. In general, detailed information on inert ingredients is considered confidential business information for proprietary purposes.

For each component of the formulation, the following information must be provided to USEPA as part of the product's CSF:

- Chemical name and number according to the Chemical Abstracts Society ("CAS number") nomenclature, any commonly accepted name, and trade name;
- USEPA Registration number, if any;
- Supplier name and address;
- Amount, in units expressed as used in the formulation;
- Percentage by weight;
- Upper and lower certified limits, expressed as a percentage by weight;
- Purpose in the formulation; and
- Supplier name and address.

Residue Chemistry

Residue chemistry data are used by USEPA to estimate the exposure of the general population to pesticide residues in food, and for setting and enforcing tolerances for pesticide residues in food or feed. Residue chemistry data include chemical identity and composition of the pesticide, and the amounts, frequency, and time of pesticide application. In setting the appropriate tolerance, USEPA applies FQPA's standard of "reasonable certainty of no harm."

Environmental Fate

Environmental fate studies generate data to assess the exposure of humans to pesticide residues through either reentry of the treated area or from food products. These studies also look at persistent pesticides' ability to remain in the environment (which may result in the loss of usable land, surface water, ground water, and wildlife resources), as well as assessing the potential exposure to non-target organisms, especially threatened or endangered species. Environmental fate studies include a variety of testing methods, including:

- Degradation studies using both hydrolysis and photolysis studies to determine the rate of pesticide degradation or the amount of time it takes for the pesticide to break down in the environment. The results are specifically used to identify persistence pesticides that could remain in the environment affecting non-target organisms.
- Metabolism studies generating data from aerobic and anaerobic metabolisms in both soil and aquatic organisms. These data determine the nature of persistent pesticides and their availability to rotational crops.
- Mobility studies using leaching, adsorption/desorption, and volatility testing to determine the transport and destination of pesticides. These data can then be used to assess potential environmental hazards, such as loss of land and water for human use due to contamination and habitat loss to wildlife resulting from pesticide residue transport in the environment.
- Dissipation studies generating information used to assess environmental hazards related to reentry into treated areas, and hazards from residues in rotational crop and other food sources.
- Accumulation studies determining the amount of pesticide residues left in the environment after multiple applications. Rotational and irrigated crop studies test how much of the pesticide product may remain in soil or be absorbed by crops. This type of analysis allows the Agency to establish label restrictions for the pesticides as well as crop rotation restrictions. Pesticide accumulation studies are also conducted in aquatic organisms so that label restrictions can prevent application in areas where edible fish and/or shellfish are apparent.

Hazard to Humans and Domestic Animals

Data required to assess hazards to humans and domestic animals include acute, sub-chronic, and chronic toxicity tests, as well as tests addressing mutagenicity and pesticide metabolism. These tests usually involve the administering of pesticide product doses to a test species, usually of the rat or mouse genus.

- Acute studies determine the acute oral, dermal, and inhalation toxicity of a pesticide for short periods of exposure (e.g., 4-hour exposure for inhalation toxicity). These are hazards that would arise soon after short-term exposure to the pesticide product. Acute studies then serve as a classification system for precautionary labeling. These studies also provide the base dose levels used in subchronic and other studies.
- Subchronic toxicity studies assess hazards arriving from repeated exposure over a limited period of time (e.g., 90 days). They provide information on target organs and accumulation potential. The resulting data are used to select dose levels for chronic testing and to establish safety criteria for human exposure. These tests are not capable of detecting those effects that may take a long time to arise (e.g., cancer).
- Chronic studies determine the effects of a substance in mammalian species following prolonged and repeated exposure, including cumulative and latency effects. Test animals are observed over most of their life span.
- Teratogenicity and reproduction studies examine the potential effects of a pesticide on fetuses or mothers during pregnancy.
- Mutagenicity studies assess the potential to affect the mammalian cell genetic components, and determine the relevance of these changes to mammals, and when these changes are demonstrated to incorporate these in the assessment of health effects.

- Metabolism studies examine the absorption, distribution, excretion, and metabolism of a pesticide and aid in the evaluation of a pesticide's behavior in relation to human exposure and intended pesticide use.
- Reentry protection studies assess the hazard to farm employees resulting from reentry into treated areas. These data are derived from toxicity, residue dissipation, and human exposure studies. Monitoring data generated during exposure studies are used to determine the quantity of pesticide to which people may be exposed after application and to develop reentry intervals.

Pesticide Spray Drift

Data required to evaluate pesticide spray drift are based on droplet size and field testing of the pesticide. These data assist in the development of overall exposure estimates along with toxicity data for humans and wildlife to assess the overall potential hazard of the pesticide. Spray drift studies also serve the purpose common to all data requirement tests, which is to provide data to determine the need for precautionary labeling to minimize the potential adverse effect on non-target organisms.

Hazard to Non-Target Organisms

Information addressing the effects of a pesticide on non-target organisms, such as birds, mammals, fish, terrestrial and aquatic invertebrates, and plants is required. The tests include short-term acute, sub-acute, reproduction, simulated field, and full field studies, which are arranged in a tiered system progressing from the laboratory to the field. Potential adverse effects found in each tier will then require further testing. As common with all data requirements, these studies determine the need for precautionary label statements in relation to the pesticide product in order to minimize potential effects on non-target organisms.

- Short-term studies are the basic laboratory tests which must be provided for acute and subchronic toxicity assessments. The data establish acute toxicity levels of the active ingredient to the test organism, compare toxicity information with measured or estimated pesticide residues in the environment, assess potential impacts to non-target organisms, and indicate whether further testing is needed.
- Long-term and field studies are other tests that may be required when basic data and environmental conditions suggest possible adverse effects from the pesticide. Data from these studies estimate chronic effects, measure residues in the environment, and determine if further testing is necessary. Simulated or field data examine acute and chronic effects on captive or monitored fish and wildlife populations under natural or near natural environments. These types of studies are only conducted when possible effects cannot be determined from less extensive studies or if there is a significant potential for adverse effects.

Product Performance

These data are required to show the pesticide product performance and ensure control of the pests listed on the label.

Labeling Requirements

All label language must be approved by USEPA before a pesticide can be sold or distributed in the United States. The overall intent of the label is to provide clear directions for effective product performance while minimizing risks to human health and the environment. It is a violation of Federal law to use a pesticide in a manner inconsistent with its labeling. The courts have deemed that a label imposes legally enforceable obligations on the user.

Every pesticide product must bear a label containing the information specified in FIFRA and the regulations in 40 CFR 156.10. The general contents of the label, as described in this part, must show clearly and prominently the following:

- Name, brand, and trademark under which the product is sold;
- Name and address of the producer, registrant, or person for whom the product was produced;
- Net contents, as prescribed below:
  - The net weight or measure of content shall be exclusive of wrappers or other materials and shall be the average content unless explicitly stated as a minimum quantity.
  - If the pesticide is a liquid, the net content statement shall be in terms of liquid measure at 68 degrees Fahrenheit (20 degrees Celsius) and shall be expressed in conventional American units such as fluid ounces, pints, quarts, or gallons.
  - If the pesticide is solid or semisolid, viscous or pressurized, or is a mixture of liquid and solid, the net content statement shall be in terms of weight expressed as pounds and ounces.
  - In all cases, net content shall be stated in terms of the largest suitable units, i.e., "1 pound 10 ounces" rather than "26 ounces."
  - In addition to the required units specified, net content may be expressed in metric units.
  - Variation above minimum content or around an average is permissible only to the extent that it represents deviation unavoidable in good manufacturing practice. Variation below a stated minimum is not permitted. In no case shall the average content of the packages in a shipment fall below the stated average content.
- Product registration number, which is assigned to the product during registration.
- Producing establishment number, which refers to the final establishment at which the product was produced or finished.
- An ingredient statement, which must contain the name and percentage by weight of each active ingredient, the total percentage by weight of all inert ingredients, and, if the pesticide contains arsenic in any form, a statement of the percentages of total and water-soluble arsenic calculated as elemental arsenic. Accepted common name is to be used followed by chemical name unless the common name is widely known. In cases where the pesticide formulation changes considerably over time (i.e., degradation), the following statement must be written on the label: "Not for sale or use after [date]." The product must meet all requirements on the label through that date. Inert ingredients may need to be listed if they pose a hazard to public health or the environment.
- Warning or precautionary statements. Every pesticide product label must bear on the front panel the statement "keep out of reach of children." However, human hazard signals and precautionary statements vary according to the product's toxicity to humans, as discussed below under "Toxicity Categories."
- Directions for use, which must be easily read and understandable by the average person who will use them. They may appear anywhere on the label as long as they can be easily read. Directions may be omitted if:
  - The product is only to be used in manufacturing;
  - It will not come into the hands of the public;

?? It has data sheets available specifying products involved;

?? It is determined that directions are not necessary to prevent unreasonable adverse effects on humans and the environment;

?? It is only to be used by a physician;

?? It is a drug and regulated under FFDCA;

?? It will be used only by formulators of pesticides.

✍The use classification, indicating whether the product is for general use, restricted use, or both. If it is a restricted use product, specific directions must follow. Other information may be required if its use is restricted to certain applicators.

Toxicity Categories and Precautionary Labeling

Pesticide products are classified into four categories, based on their relative "acute toxicity" or the health effects that would arise soon after short-term exposure. As described above, under "Data Requirements and Testing," acute studies are one of several studies that are conducted to assess a product's potential hazard to humans and domestic animals. By administering doses of a particular pesticide to a test species, the acute study determines the product's acute oral, dermal, and inhalation toxicity. (In general, a substance is more toxic when it requires a smaller dose to produce an adverse effect.) The product is then classified into one of four toxicity categories based on a comparison of its toxicity to specific regulatory thresholds (see Table 2-1, below). The toxicity category then serves as the basis of the required precautionary labeling.

Table 2-1
Toxicity Categories and Required Warnings

Hazard Indicators	Category I	Category II	Category III	Category IV
Mandatory Warnings	"Danger" and possibly "Poison"	"Warning"	"Caution"	"Caution"
Acute Oral* (milligrams per kilogram)	Up to and including 50	> 50 thru 500	> 500 thru 5,000	> 5,000
Acute Inhalation (milligrams per liter)	Up to and including 0.2	> 0.2 thru 2	> 2 thru 20	> 20
Acute Dermal (Skin)* (milligrams per kilogram)	Up to and including 200	> 200 thru 2,000	> 2,000 thru 20,000	> 20,000
Eye Effects	Corrosive; corneal opacity not reversible within 7 days.	Corneal opacity reversible within 7 days; irritation persisting for 7 days.	No corneal opacity; irritation reversible within 7 days.	No irritation.
Skin Irritation**	Corrosive (tissue destruction into the dermis and/or scarring)	Severe irritation at 72 hours (severe erythema or edema)	Moderate irritation at 72 hours (moderate erythema)	Mild or slight irritation at 72 hours (no irritation or slight erythema)

Source: 0 CFR Part 156.10.
Notes:
* 4-hour exposure
** Erythema = abnormal redness of the skin due to capillary congestion (as in inflammation).
Edema = abnormal excess accumulation of serous fluid in connective tissue or in a serous cavity.

Warnings

Pesticide products meeting the criteria for any of the four toxicity categories must bear on their labels human hazard warnings. Products that meet the Category I criteria (the most toxic) must bear the word "Danger," and possibly "Poison." The word "Poison" must appear when a product is assigned to Category I based on oral, inhalation or dermal (skin) toxicity. Such products must also include on their labels a statement of practical first-aid treatment. Pesticide products in Category II must bear the word "Warning," whereas products meeting Category III or Category IV criteria (least toxic) must bear the word "Caution."

Precautionary Statements for Humans and Domestic Animals

When a product is deemed potentially hazardous to humans and domestic animals, a precautionary statement must be provided on the label indicating the particular hazard, the route(s) of exposure, and the precautions to be taken to avoid accident, injury, or damage. Table 2-2, below, depicts typical precautionary statements by toxicity category. Theses statements must be modified or expanded to reflect specific hazards.

Table 2-2
Typical Precautionary Statements

Toxicity Category	Oral, Inhalation, or Dermal Toxicity	Skin and Eye Effects
I	Fatal (poisonous) if swallowed [inhaled or absorbed through skin]. Do not breathe vapor [dust or spray mist]. Do not get in eyes, on skin, or on clothing. [Front panel statement of practical treatment required.]	Corrosive, causes eye and skin damage [or skin irritation]. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful or fatal if swallowed. [Appropriate first aid statement required.]
II	May be fatal if swallowed [inhaled or absorbed through skin]. Do not breathe vapor [dust or spray mist]. Do not get in eyes, on skin, or on clothing. [Appropriate first aid statements required.]	Causes eye [and skin] irritation. Do not get in eyes, on skin, or on clothing. Harmful if swallowed. [Appropriate first aid statement required.]
III	Harmful if swallowed [inhaled or absorbed through skin]. Avoid breathing vapors [dust or spray mist]. Avoid contact with skin, eyes, or clothing. [Appropriate first aid statement required.]	Avoid contact with skin, eyes, or clothing. In case of contact immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists.
IV	[No precautionary statements required.]	[No precautionary statements required.]

Source: 40 CFR Part 156.10.

Environmental Hazard Statements

When a product is deemed potentially hazardous to the environment, excluding humans and domestic animals, environmental hazard statements are required on the label, as outlined in Table 2-3, below. As described above, under "Data Requirements and Testing," many studies are conducted to assess a product's potential hazard to the environment, or more specifically, to "non-target" organisms. These studies include evaluations of spray drift, short-term laboratory tests, long-term and field studies, and a variety of environmental fate studies. Results of these studies determine whether a product's label needs to contain one or several of the environmental hazard statements listed in Table 2-3, below.

Table 2-3
Environmental Hazard Statements

Toxicity	Required Statement
Active ingredient with: (1) a mammalian acute oral LD_{50} of 100 or less; and/or (2) avian acute oral LD_{50} of 100 mg/kg or less, or subacute dietary LC_{50} of 500 ppm or less.	This pesticide is toxic to wildlife.
Active ingredient with a fish acute LC_{50} of 1 ppm or less.	This pesticide is toxic to fish.
Accident history or field studies demonstrate that use of the pesticide may result in fatality to birds, fish or mammals.	This pesticide is extremely toxic to wildlife (fish).
For pesticides involving foliar application to agricultural crops, forests, or shade trees, or for mosquito abatement treatments, those toxic to pollinating insects.	An appropriate label.
For all outdoor uses other than aquatic applications.	Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposal of wastes.

Source: 40 CFR Part 156.10.

Exemptions

There are several exemptions to FIFRA, including: (1) natural or "minimum risk" pesticides, such as citronella oil and cedar, (2) foods that attract pests, (3) vitamin hormone products, (4) preservatives for biological specimens, such as embalming fluids, (5) "pheromones" or compounds that are produced by insects to modify their behavior, and (6) treated articles or substances, such as wood products that are treated to prevent insect or fungus infestation (40 CFR Part 152.25).

NYSDEC PESTICIDE REGISTRATION PROCESS

New York State's Environmental Conservation Law (ECL) §33-0701 requires every pesticide product used, distributed, sold, or offered for sale in New York State to be registered with NYSDEC. Starting in 1993, products must be registered every two years. Pesticide products generally include any pesticide product registered or required to be registered by USEPA. More specifically, NYSDEC registration is required for:

- Products with basic USEPA registrations;
- Supplemental (distributor) registrations (each must be registered as a separate product);
- Additional brand names (each must be registered as a separate product);
- Products for which there is a Special Local Need (SLN), whether it is a new product or an additional use for an existing USEPA registered product; and
- Experimental use products used pursuant to a Federal EUP, regardless of whether the product is sold or given free to cooperators. NYSDEC does not require a State EUP or registration for other proposals for testing of experimental use products. However, notification requirements apply.
- Any amendment to an existing registration that entails:
  - ?? A major change in labeling;

- A major change in use pattern;
- Addition of a major crop in New York State that will significantly increase acreage;
- Significant increase in application rate;
- Any change that increases the exposure and, thereby, the potential risk to nontarget organisms;
- Changes in formulation except:
  - Changes in formulation allowed by notification to USEPA, such as a change in the source of an active ingredient;
  - Minor changes in either active ingredient percentages, or inert ingredient percentages; modification of fertilizer percentages in pesticide-fertilizer mixtures;
  - Adjustments to percentages of ingredients resulting from changes in methods of analysis;

- Changes in ownership of the product. A change in the company name of the registrant without a change in the ownership does not require a new registration, providing product names do not change. If there is no change of ownership, label changes may be made under amended registration procedures.

Products not registered for use as pesticides by USEPA may not be registered for use as pesticides by NYSDEC. Products not requiring registration by NYSDEC include:

- Products specifically exempted from the Federal pesticide registration process (FIFRA); and
- Plant strains developed from USEPA-registered transgenic (i.e., genetically modified) plant pesticide material.

Data Requirements

The following information and forms must be provided when product applications are submitted:

- A completed "Pesticide Registration Application" (NYSDEC Form 44-19-9) listing the names and USEPA registration numbers of each product proposed for registration. More than one product may be entered on one form.
- A completed "Product Data Sheet for Registration of a Pesticide" (NYSDEC Form 44-14-5), one for each pesticide product to be registered. All required information can be obtained from the product label.
- One copy of the most current USEPA "accepted" labeling for each product to be registered. Approved labeling consists of a label stamped "Accepted" by USEPA, plus any comment letter from USEPA, letter of amendment via "notification," or USEPA policy notice. If label wording varies on different container sizes, e.g., disposal instructions, labels for different sizes must be submitted.
- If the label is a supplemental distributor label, USEPA stamped "Accepted" label must be submitted for the basic registration upon which the distributor label is based. This label may be submitted by the distributor or the basic registrant. If the label has been requested from the basic manufacturer, a copy of the request must accompany the application.
- Three copies of the final printed labeling for each product to be registered. Accurate facsimiles are acceptable where it is impractical to submit an actual label.

- A copy of the CSF on USEPA Form 8570-4, or its predecessor, for each product. Substitute forms are not acceptable. This form may be submitted by the basic registrant directly. If the form has been requested from the basic manufacturer, a copy of the request must accompany the application. If the CSF is already on file with NYSDEC for the subject product, a letter so stating may be substituted.

Review Procedures

The New York State Department of Health (NYSDOH) assists NYSDEC in making decisions on pesticide registrations in the State. The departments conduct joint reviews of applications that would potentially increase the exposure of humans and the environment to a particular pesticide. The departments assume responsibilities according to their area of expertise; NYSDOH evaluates the pesticide product's human health risks while NYSDEC evaluates the risks to the environment and non-target organisms. The joint reviews are conducted for products that contain new active ingredients and products with a major change in labeling or a major change in use pattern.

Products Containing New Active Ingredients or Major Changes in Use Pattern

Products containing new active ingredients are those with an active ingredient not contained in any pesticide product currently registered with NYSDEC.

Products constituting a "major change in use pattern" are those that represent either:

- A change in the general use pattern involving a category or site previously not registered for the active ingredient (40 CFR Part 158.100). Examples include, but are not limited to, addition of terrestrial food or nonfood use, aquatic food and nonfood use, domestic outdoor use, indoor use, forestry use, or greenhouse food or nonfood use; or
- A change that is likely to increase the exposure of any nontarget organism or that increases the potential for significant impact to humans, property, or the environment. Examples include, but are not limited to: addition of aerial application, addition of direct soil application, or addition of a major crop.

Registration to Meet Special Local Needs

SLN registrations for product uses not on the Federally registered label will be considered according to the following conditions:

- There is a demonstrated SLN within the State;
  - If a food use is covered by the necessary tolerances or exemptions under the FFDCA;
  - Registration use for the same product has not been previously denied, disapproved, suspended, or cancelled by USEPA or registrant; and
  - The registrant is in accord with the purposes of FIFRA.

SLN registrations will be considered only if the applicant demonstrates that there is an existing or imminent pest problem in New York State that cannot be met by an existing Federally registered product.

Experimental Use Products

As discussed above, under "USEPA Pesticide Registration Process," an EUP allows manufacturers to field-test pesticides under development. It is the intention of NYSDEC to obtain all information necessary to ensure the safe use of new pesticide chemicals without inhibiting research in New York State. All experimental products for which a Federal EUP has been issued or is required, or for which

a State EUP is required, must be registered in New York State, regardless of whether the product is sold or given free to cooperators.

New York State Department of Health

The Bureau of Toxic Substance Assessment of NYSDOH, Center for Environmental Health, evaluates human health risks posed by pesticide products and assists NYSDEC in making decisions on pesticide registrations in the State. NYSDOH also assists NYSDEC in other pesticide-related activities, such as the development of regulations, support during litigation, and assistance in developing best management plans and groundwater/drinking water monitoring programs.

The review of pesticide products occurs in two phases: (1) data completeness and (2) product review. The first phase—data completeness—consists of the determination of the completeness of the registration package. The second phase begins when the registration package has been deemed complete by NYSDEC. Thereafter, NYSDOH staff reviews pertinent parts of the registration package to assess potential human exposure and health risks, based on a product's toxicity and human exposure estimates. Important product review procedures are discussed below.

NYSDOH is typically not consulted when a registration application is submitted for a product that contains a currently registered active ingredient. As noted above, the joint NYSDEC/NYSDOH review is limited to products that contain new active ingredients, or new products with a major change in use pattern or major change in labeling.

Product Label, CSF, and USEPA Notice of Pesticide Registration

The product label, CSF, and USEPA Notice of Pesticide Registration contain a large amount of information relevant to the overall review of a pesticide product. Included in these materials is information on the active and inert ingredients, the product's uses and use rates, applicator requirements, use restrictions, and conditions of Federal registration. These materials help to identify issues that are most likely to be significant during the package review and provide the background necessary for conducting the remainder of the review. Examples of the information from these materials relevant to the public health review of pesticide products are included below:

- Application rates, application sites, and target species. A product may be of greater or lesser concern in New York State, as compared to other areas of the nation, depending on the target species and use sites.
- Conditions of Federal registration. These may be relevant to evaluating risks from use of the product in the State.
- Restrictions on the product label. The product's use in the State may be limited or not allowed in certain areas or by certain individuals, which may influence the evaluation of exposures and risks.
- Ingredients and use patterns. Some may require special attention during the registration review due to toxicity and potential for exposure, respectively.
- Personal protective equipment required on the label. In some cases, Federal label statements do not adequately protect all workers. For example, the health risks to nonprotected users of a turf-use product reviewed in the past were significant, but there were no requirements for personal protective equipment for nonagricultural workers on the label. Requiring such equipment may have reduced these health risks.

Chemical and Physical Properties of the Active Ingredient(s)

The chemical structure, molecular weight, vapor pressure, water solubility, octanol/water partition coefficient, organic carbon partition coefficient, and mode of pesticidal action for the active ingredient, along with the product's proposed use, are useful in identifying potential issues that require special consideration during the review. For example, termiticide active ingredients (or components of the solvent system thereof) with high vapor pressures indicate that indoor air impacts may be an issue. An active ingredient for turf use that has a high water solubility and low organic carbon partition coefficient suggests that leaching or runoff to drinking water sources may be a concern.

Exposure Evaluation

Risk is the product of toxicity and potential exposure. Therefore, evaluating the potential for human exposure to a pesticide is a key element in determining public health risks. The magnitude of concern for public health risks is related not just to toxicity, but is also highly dependent on magnitude of exposure. For example, an insignificant level of exposure to a pesticide of high toxicity may be of less concern than high level exposure to a lower toxicity pesticide.

Potential exposure to a pesticide may vary depending on regional use practices, an area's vulnerability to contamination, and regulations applicable to that area. USEPA's task is to evaluate risks and benefits of pesticides to the nation as a whole; however, New York State has special circumstances that are not necessarily reflected in USEPA decisions and requirements. As noted above, evaluating pesticide exposure at the State level is very important to ensure that factors unique to an area are considered during the registration review.

USEPA does not require exposure studies for the Federal registration of most pesticides and relatively few registration packages are submitted with exposure data from the labeled use. In these cases, it is necessary for the State to estimate exposures based on exposure studies available in the literature or by developing an exposure scenario anew based on what is generally known about the pesticide's use and specific properties. In those few cases where compound-specific exposure studies are available (usually for agricultural-use products), the studies are often conducted using products or application methods that are no longer directly comparable to the pesticide product being submitted for registration and, therefore, these estimates need to be modified.

The submission of the following types of data could expedite the review of a pesticide product.

- Data on exposure to workers who mix, load, and apply the pesticide, particularly for those products whose labels do not require the use of personal protective equipment. Product uses that do not fall under the Federal Worker Protection Standard (e.g., nonagricultural uses) often do not require use of such equipment.
- Data relevant to evaluating potential exposure from biological pesticides, such as natural history and occurrence of an organism, temperature range for growth, and habitat/substrate preference.
- Data on indoor air and surface impacts of active ingredients and solvent systems from the use of termiticides (in particular) and indoor use pesticides (in general). It appears that USEPA does not typically require these studies. However, NYSDOH's review of indoor air studies for termiticides indicates that significant air impacts can occur from proper use of products, indicating their potential to pose health risks. For example, indoor air study results submitted for one termiticide product indicated that air levels of volatile aromatic solvents exceeded State criteria that triggers relocation of occupants following a petroleum spill.

- Data on exposure to so-called inert ingredients from the labeled use of pesticide products. Inert ingredients may have the potential to pose health risks.
- Data on exposures to residents or users of turf areas treated with pesticides.
- Data on spray drift and its potential to affect non-target areas and cause exposure to nearby occupants and their property. Many products labeled for aerial spraying, for example, contain very limited instructions on how to reduce spray drift, thereby creating a potential for exposure.

Other types of data relevant to determining exposure potential are routinely required by USEPA and are submitted in registration packages. Data, such as the nature and magnitude of residues in food commodities and food tolerance values, are evaluated to determine if registration of a product in the State is likely to significantly increase the public's current exposure to a pesticide. Environmental fate data allow estimation of exposure potential by providing information on persistence in various environmental media, how the pesticide breaks down in the environment and the likelihood that it will leach (soak into the ground) or run off into drinking water sources.

Toxicity Review

Toxicity is equally important as exposure in determining risk; and without properly characterizing toxic potential, risks cannot be estimated. For evaluating toxicity, reports or reviews from USEPA Data Evaluation Record are the primary source of information. Also important are any special reviews conducted by USEPA, such as Toxicology Branch Peer Review reports, or registrant summaries of reports that were not submitted to USEPA as part of Federal registration. Full study reports are rarely reviewed unless specific scientific issues remain unresolved after review of USEPA documents. Characteristics examined during the review of the toxicological data include:

- Acute toxicity of the active ingredient and formulated product;
- Whether the active ingredient has the potential to cause tumors (“oncogenic” potential) and, if so, how strong is the weight of evidence for oncogenicity;
- Whether the active ingredient causes reproductive or developmental effects;
- Whether the active ingredient causes any significant long-term or “chronic” toxic effects at relatively low doses; and
- Whether the product causes any specific toxicity, such as toxicity to the neurological system (“neurotoxicity”) or to the immune system (“immunotoxicity”) at relatively low doses.

Part of the review summary provided to NYSDEC contains qualitative (e.g., oncogenic potential, eye irritation) and quantitative (e.g., estimated cancer risk) assessments of a pesticide's toxicity. This information is necessary for NYSDEC to make a decision on State registration of a pesticide. For some pesticides, USEPA has developed quantitative risk values, such as cancer slope factors and risk reference doses that can be used to estimate health risks. However, for a number of pesticides (especially new active ingredients), USEPA values are not available and must be developed by NYSDOH.

Enforcement

When states adopt their own pesticide programs, in addition to the Federal pesticide registration process, the primary enforcement of FIFRA is delegated by USEPA to the appointed State agency, e.g., NYSDEC in the case of New York State. As discussed above, enforcement provisions under FIFRA include: (1) the suspension or cancellation of a product’s registration; (2) an order halting the

sale or use of the product and, if necessary, its seizure; and (3) penalties. Under §71-2907 of the State's Environmental Conservation Law (ECL), NYSDEC can seek to impose three types of sanctions on alleged violators of Article 33 of the ECL: administrative, civil, and criminal. The Department may also seek an injunction to restrain such violators from continuing the violation or from carrying out the threat of violation (ECL §71-2911). During the preparation of the EIS, NYCDOH requested from NYSDEC available information linking adulticide applications (as part of the City's 1999 operations) to reported fishkills. No detailed information from NYSDEC was supplied to NYCDOH.

C. PESTICIDE USAGE IN NEW YORK STATE

NYSDEC REPORTING REQUIREMENTS

The New York State Pesticide Reporting Law (PRL), (ECL §33-1201(2)), enacted on July 8, 1996, requires certified commercial applicators of restricted use pesticides and commercial permit holders (i.e., anyone involved in the distribution, sale, or re-sale of restricted use pesticides) to submit annual reports to NYSDEC detailing their pesticide activities for the prior year. Certified pesticide applicators are required to report the name of the product applied, the product's USEPA registration number, the quantity applied, the date of application, and the location of the application by address (including zip code). Commercial permittees must report for each sale the name of the product purchased, its USEPA registration number, the quantity purchased, and the location of intended application by address (including zip code). If the address is unavailable by town or city (including zip code), the permittee must indicate whether the location of intended application differs from the billing address that appears on the record.

NYSDEC is responsible for collecting data in compliance with this law. Cornell University assists NYSDEC in organizing the data in a computer database and summarizing the data in annual reports, which are known as the "Annual Reports on New York State Pesticide Sales and Applications."

To enforce the PRL, NYSDEC imposes penalties on commercial applicators and commercial permit holders that either fail to report, or fail to meet the statutory deadline of February 1st (the date on which data from the prior calendar year must be submitted to NYSDEC). In addition, NYSDEC can revoke their certification, business registration, or commercial permit.

Commercial permittees are not required to report sales of pesticides classified for "general use" (e.g., "over-the-counter" household products), with the exception of general use agricultural pesticides. General use pesticides are available for purchase and use by the general public. Therefore, they may be applied by anyone—unlike restricted use pesticides, which must be applied by commercial applicators meeting specific NYSDEC requirements. Commercial applicators are required to report their use of both restricted and general use pesticides.

REPORTED PESTICIDE USAGE

To present the best available estimates on background pesticide usage in New York State, data were extracted from NYSDEC's "Preliminary Report on New York State 1999 Pesticide Sales and Applications" (the "1999 Preliminary Report"), dated July 1, 2000. The 1999 Preliminary Report provides preliminary estimates of the total amount of pesticides applied; amount of pesticides sold to private applicators; and amount of pesticides sold to distributors. In 1999, a total of 14,159 commercial applicators (94 percent) and 404 commercial permittees (96 percent) reported their activities.

The Final Report for 1999 will not be available from NYSDEC until mid-2002. The data included in the 1999 report and herewith represent preliminary numbers that are subject to change once the data are reviewed; the numbers reported in the final document may be different.

New York State

A summary of the preliminary amount of pesticides applied by commercial applicators and sold by commercial permittees in New York State during 1999 is shown below in Table 2-4. Commercial permittees are required to report the following:

- Sales of restricted use pesticides to other commercial permit holders for resale;
- Sales of restricted use pesticides to commercial applicators for end use; and
- Sales of restricted pesticides and general use agricultural pesticides to private applicators.

Table 2-4
1999 Preliminary Summary of Total Quantities Statewide

Category	Number of Pesticide Products	Amount*	
		(Gallons)	(Pounds)
Applied by Commercial Applicators	3,022	13,083,714	20,530,744
Sold for Resale**	358	359,023	3,528,008
Sold for End Use**	491	99,418	1,164,866
Sold to Private Applicators***	920	752,499	4,104,565

Source: NYSDEC, Division of Solid and Hazardous Materials: "Preliminary Report on New York State 1999 Pesticide Sales and Applications." July 1, 2000.
NYSDEC, 2000: Table 1, "Preliminary Summary of Total Quantities Statewide, Calendar Year 1999."
* The quantity of pesticides commercially applied is the sum of the gallons and pounds reported. In other words, the gallons and pounds in the table do not reflect two ways of presenting the same amount of pesticides.
** Restricted use pesticides only
*** Sales of general use pesticides used in agricultural crop production.

As noted in the 1999 Preliminary Report, quantities for some pesticides were reported using both weight- and volume-based units of measure (pounds and gallons, respectively). The validation data to determine which type of measurement unit should be used to report each particular pesticide are not currently available in a form applicable to the reported pesticide data. Therefore, the 1999 Preliminary Report lists both measurements as they were reported to NYSDEC. NYSDEC is working to consolidate this information into a common unit of measurement. Therefore, in Table 2-4, the gallons and pounds do not reflect two ways of presenting the same amount of pesticides. The total amount of pesticides is the sum of the gallons and pounds reported.

The 1999 Preliminary Report includes the following caveats with respect to the accuracy of data.[7] While these caveats recognize uncertainties and data gaps in the 1999 Preliminary Report, the report should provide reasonable order of magnitude estimates of reported pesticide usage in New York State, including New York City.

The caveats of the 1999 Preliminary Report are as follows:

"The reporting community, NYSDEC, its computer consultants, and Cornell University work together to provide the best information possible for the health researchers. However, the data are neither perfect nor complete. Users of the data are cautioned about limitations of the data, including the following:

[7] See NYSDEC website for the full report: www.dec.state.ny.us/website/dshm/prl/1999prl.htm

1. The information as reported by the applicators and distributors is accepted. Neither NYSDEC nor Cornell can attest to the accuracy of the data provided. However, obvious or likely errors are reviewed and corrected where possible.
2. NYSDEC is aware that duplicate data were introduced into the database. However, an improved process for tracking pesticide reports has reduced the problem since last year. Any pesticide reports identified by the reporting entities as duplicates were removed. However, duplicate reports that were submitted, without notifying NYSDEC that it was a duplicate report, could enter the database undetected. The incidence of this is probably quite low. This is because NYSDEC has improved its report tracking system and is better able to target its requests to resubmit reports to entities that have had their reports returned for clarification or completion. Duplicates would lead to an overestimate of pesticide use or sales.
3. The Pesticide Reporting Law requires NYSDEC to accept data from the regulated community on handwritten forms. Some of the data on these forms were difficult for the data entry operators to decipher. The quality of these data are not as reliable as data submitted on typed or computer-generated forms. Data that are unreadable go into the database as a blank field.
4. Use of zip code to define application and sales locations created a number of problems. Zip codes are postal delivery locations. Large wilderness areas or farmland may have few if any delivery points. Since mail is not delivered to these locations, they are technically not located in a zip code. Determination of what zip code to report for an application or intended application in one of these locations was problematic for the businesses and applicators.
5. Some zip codes contain more than one contiguous location. Without more accurate address data than are currently collected, there is no way to divide application or intended application quantities between the separate locations included in these zip codes.
6. In some cases, data reported for selected zip codes have not been reported under that zip code. These selected zip codes are unique to a location and could be used to identify where an application or intended application occurred. Identification of the specific location of a pesticide application is not allowed by the Pesticide Reporting Law. In these instances, these data have either been reported under the “private” zip code or, by county; however, if the zip code was located entirely within a single enclosing zip code, the data were reported under that enclosing zip code.
7. Quantities for some pesticides were reported using both weight- and volume-based units of measure. The information to determine which type of measurement unit should be used to report that particular pesticide are not currently available. Therefore, the reports list both measurements, as it was reported to NYSDEC. NYSDEC is working to consolidate this information into a common unit of measurement.
8. Products with a quantity of zero reflect that applications or intended applications of the product were made, but that the quantity was indecipherable on the report form. Efforts will be made to obtain this information as NYSDEC and Cornell University continue with data quality assurance methods.
9. The database may contain an overestimate of the volume of pesticides actually used or sold. Several factors contribute to this potential overestimate. Data are not available to indicate the quantity of pesticides that may be involved in the factors identified below:

(a) It is fairly common for private applicators to return unused pesticides. They may even do so in a different year than the one in which they made the initial purchase. The current reporting system does not account for returns. Only the original sale is reported.

(b) Commercial permittees report sales of restricted pesticides to other distributors. These distributors sell the same pesticide a second time, possibly to another distributor, who may sell it yet a third time. Each sale is reported. There is no way of identifying reports of multiple sales of a single volume of pesticide.

(c) Many products are routinely diluted with an inert material prior to application. Some applicators report the diluted amount of material applied, not the undiluted amount as required by NYSDEC. This error can inflate the estimates of total pesticides applied in a given year.

10. Data are not reported by active ingredient. This makes the database different from most other pesticide use tracking data bases, which may cause difficulties in comparing these data with data from other states. NYSDEC is working toward reporting by active ingredient.

11. Commercial Permit Holders (sellers of restricted pesticides), under the Pesticide Reporting Law, must record and report sales of general use agricultural pesticides to certified private applicators. However, certified private applicators can purchase general use agricultural pesticides from non-commercial permit holders. Those sales and the associated use information would not be captured by the Pesticide Reporting Law in those situations.

12. The 1999 reporting year data cannot be used for statistically valid comparisons with the 1997 or 1998 reporting year data. The primary reason is the volume of acceptable data (correctly formatted, legible, all fields completed) was much greater for 1999. This is a function of the reporting community's increasing understanding of what and how to report and NYSDEC's quality control procedures. Cross-year comparisons should be possible in the future as the learning curve tapers off and report processing is further refined.

The 1999 Preliminary Report does not contain information on the individual products or classes of products that were applied in 1999 (e.g., insecticides, herbicides, etc.). However, a review of the final annual reports for 1997 and 1998 indicates that in both years insecticides were the most common type of pesticides applied in the State, followed by: termiticides (by volume, in both years); wood preservatives (by weight, in 1997); and herbicides (by weight, in both years). Table 2-5 provides a summary of the top five pesticides used in each year (those applied the most, by volume and weight).

It is important to note that year-to-year comparisons are not entirely accurate because NYSDEC and Cornell University are still improving the reporting system, and the reporting community is still developing an understanding of the reporting requirements, their correct format, etc.

New York City

As reported in the 1999 NYSDEC Preliminary Report, Table 2-6 lists the approximate total amounts of pesticides applied by commercial applicators in the five boroughs of New York City. Almost 6.7 million gallons plus 3.4 million pounds of pesticides were used by commercial applicators within New York City. To date, there are no comprehensive studies that show actual background use of all pesticides (including those used by the general public), specifically in New York City. As discussed above, general use or "over the counter" pesticide products used by the general public are not required to be reported. NYSDEC's 1999 Preliminary Report contains only reported usage of restricted use pesticides, with the exception of general use pesticides used for agricultural purposes.

Table 2-5
Top Five Pesticides Applied in New York State, 1997 and 1998

Type of Pesticide*	Product Name	Amount (Percentage)	
		1997	1998
By Volume			
Insecticide	Dursban Pro	60.30	36.07
Insecticide	Damoil Insecticide/Miticide	11.30	?
Termiticide	Dragnet FT & SFR Termiticide/Insecticide	10.60	8.57
Insecticide	Optashield CS Premise Insecticide	5.50	?
Insecticide	Prentox Diazinon 4E Insecticide	3.70	?
Termiticide	Demon TC Insecticide	?	21.47
Insecticide	Baygon 70 WP Insecticide	?	6.74
Termiticide	Equity	?	5.61
By Weight			
Insecticide	Dursban Pro	45.10	?
Wood Preservative	CCA Type C Wood Preservative 60%	12.20	?
Herbicide	Fertilizer/Pendimethalin Herbicide Combinations	11.30	14.35
Insecticide	Prentox Diazinon 4E Insecticide	6.40	11.49
Insecticide	Lesco Merit Insecticide with various fertilizer combinations	6.30	7.52
Insecticide	Cynoff EC Insecticide	?	43.52
Disinfectant	Liquid Chlorine Biocide	?	6.22

Sources: NYSDEC, Division of Solid and Hazardous Materials. "Annual Report: New York State 1997 Pesticide Sales and Applications." July 1, 1998; "Final Annual Report on 1998 New York State Pesticide Sales and Applications." July 1, 2000.
* As classified in the New York State Pesticide Product Ingredient and Manufacturer System (PIMS) database http://pmep.cce.cornell.edu/pims/index.html

Table 2-6
Pesticides Applied in New York City in 1999

Borough	# Pesticides	Amount*	
		Gallons	Pounds
Bronx	444	499,346	171,415
Brooklyn	445	4,387,367	2,350,618
Manhattan	549	97,120	465,441
Staten Island	316	427,624	17,477
Queens	499	1,257,329	395,186
Total (Citywide)	?	**6,668,786**	**3,400,137**

Source: NYSDEC, Division of Solid and Hazardous Materials: "Preliminary Report on New York State 1999 Pesticide Sales and Applications." July 1, 2000.
NYSDEC, 2000: Table 1, "Preliminary Summary of Total Quantities Statewide, Calendar Year 1999."
* The quantity of pesticides commercially applied is the sum of the gallons and pounds reported. In other words, the gallons and pounds in the table do not reflect two ways of presenting the same amount of pesticides.

INSECTICIDES USED BY NEW YORK CITY TO COMBAT WEST NILE VIRUS IN 1999 AND 2000

As discussed in Chapter 1, "Description of the Proposed Action," the City of New York proposes to apply adulticides as part of its *Adult Mosquito Control Programs*, which will be implemented by NYCDOH. Larvicide products, used in the City's *Routine Surveillance and Control Program* (the "*Routine Program*"), control mosquito larvae or pupae, whereas adulticide products are used to control adult mosquitoes. Below is a summary of the larvicides and adulticides that have been used to control the outbreaks of West Nile virus in 1999 and 2000. In addition to the amounts shown below, private communities, such as the Breezy Point Cooperative in the Rockaways neighborhood of Queens, use insecticides to control mosquitoes in their communities.

Larvicides

As part of NYCDOH's *Routine Program*, larvicides can be applied to known and potential mosquito breeding sites throughout the City, including catch basins, storm drains, the borders of stagnant freshwater ponds, wetlands, and salt marshes. The larvidicing activity, which is based on the results of active surveillance of potential breeding sites, is started at the beginning of the breeding season in order to reduce the number of adult mosquitoes, thereby decreasing the potential need for adulticides. The *Routine Program* which includes the application of larvicide, was subject to a separate environmental review that was completed in 2000.

Table 2-7, below, summarizes the larvicide products that have been used, their active ingredients, and the amounts applied during the year 2000—the year in which larvicides were first used by the City on a large-scale basis to control mosquito-borne viruses. The products fall into two categories based on their active ingredients: methoprene-based larvicides and biological larvicides. Methoprene, a chemical compound, inhibits the growth of mosquito larvae by mimicking the insect's growth regulation hormone. The biological larvicides rely on toxins released by microorganisms (bacteria) to destroy mosquito larvae (i.e., *Bacillus Sphaericus* or *Bacillus Thuringiensis* var. *Israelensis*).

Table 2-7
Total Larvicides Applied by New York City in 2000

Active Ingredient/Product/USEPA Registration Number	Amount
METHOPRENE-BASED LARVICIDES	
Methoprene/Altosid XR Briquets/2724-421	85,396 briquets*
BIOLOGICAL LARVICIDES	
Bacillus Sphaericus/Vectolex CG Biological Larvicide/ 275-77	Approximately 4,700 pounds
Bacillus Thuringiensis var *Israelensis*/Bactimos Briquets/6218-47	27 briquets*

Source: New York City Department of Health
* A briquet is a block that is placed in the water where mosquitoes breed. It releases larvicide slowly over weeks to months.

As shown in the table, in 2000 New York City applied approximately 85,400 briquets of the methoprene-based larvicide called Altosid XR Briquets. (A briquet is a block that is placed in the water where mosquitoes breed. It releases concentrated larvicide slowly over a period lasting weeks to months.) Of the biological larvicides, approximately 4,700 pounds of Vectolex CG Biological

Larvicide (*Bacillus Sphaericus*) was applied and 27 briquets of Bactimos Briquets (*Bacillus Thuringiensis* var. *Israelensis*) was applied.

Adulticides

In 1999, approximately 5,349 gallons of four adulticide products were applied by New York City during its public health mosquito spraying program (see Table 2-8). Of this amount, the product called Fyfanon ULV[8] Ultra Low Volume Concentrate Insecticide containing malathion as the active ingredient constituted 85 percent or 4,561 gallons. In the following year, 2000, New York City applied approximately 2,120 gallons of just one adulticide product called Anvil 10+10 ULV containing sumithrin as the active ingredient. Of this amount, nearly 56 percent (1,174 gallons) was applied in Staten Island. In 2000, Staten Island was the epicenter (i.e., location of the first human infection and most of the human cases) of the West Nile virus outbreak. In 1999, however, Queens was considered to be the epicenter and therefore received the bulk of the adulticide applications.

As shown in Table 2-8, in 1999 over 1,200 times more restricted-use pesticides were applied throughout the City (for the purposes of home roach control, rat and mouse control, etc.) than the 5,349 gallons of adulticides applied for the public health mosquito spraying program. The adulticides represented a mere 0.08 percent of all restricted use pesticides applied throughout the City during the same year (almost 6.7 million gallons). Data on applications of restricted-use pesticides for the year 2000 are not available at this time. Again, there are no studies of actual background use of all pesticides in New York City (including those applied by the general public). The amounts reported to NYSDEC do not include use of pesticides by the general public (e.g., household products).

Table 2-8
Total Adulticides Applied by NYC for West Nile Virus Programs
Vs.
Total Pesticides Applied Citywide

Active Ingredient/Product	Amount (Gallons)	
	1999	2000
Resmethrin/Scourge Insecticide with SPB-1382/PBO 18%+14% MF Formula II	271	N/A
Resmethrin/Scourge Insecticide with SPB-1382/PBO 4%+12% MF Formula II	357	N/A
Malathion/Fyfanon ULV Ultra Low Volume Concentrate Insecticide	4,561	N/A
Sumithrin/Anvil 10+10 ULV	160	2,120
Total Adulticides (West Nile Virus Programs)	5,349	2,120
Total Pesticides (Citywide)	**6,668,786**	?

Sources: Mayor's Office of Emergency Management, New York City Department of Health
N/A Not applicable. Only sumithrin (Anvil 10+10 ULV) was applied in 2000. PBO = Piperonyl Butoxide, which is neither an active ingredient nor an inert ingredient but a synergist.

[8] ULV = Ultra low volume.

D. ADULTICIDES THAT WOULD LIKELY BE USED FOR COMMUNITY-SCALE APPLICATIONS

Table 2-9 below lists 17 adulticide products registered for use in New York State that are indicative of products that could be applied on a community-scale basis. While the State's pesticide laws do not make a distinction between pesticides applied on a community-scale basis and those applied to small areas, these 17 products are generally considered more likely for community-scale use. All 17 products were considered for evaluation in the EIS because the Proposed Action is a long term plan. While NYCDOH applied a pyrethroid product (i.e., Anvil) in 2000, and intends to continue to use pyrethroid products in 2001 (if necessary), there may be a need to choose an organophosphate product at some time in the future. Reasons for possible changes in the selection of a product would include the potential effectiveness of the adulticide on the mosquito specie(s) of concern (either for amplification of the virus in the wildlife hosts or transmission to humans), and the potential for or indication of resistance in species to continued use of the same active ingredient (or product). Therefore, the EIS addresses the potential impacts from all registered adulticides which would likely be used on a community-scale in the foreseeable future. The adulticides are classified into two major categories based on their active ingredients: organophosphates and pyrethroids. The organophosphate products listed below contain one of the following active ingredients: malathion or naled, which represent 2 of almost 40 different types of organophosphate compounds. Not included in Table 2-9 are three pyrethrin products. As compared to organophosphates and pyrethroids, pyrethrins are less likely to be used for community-scale applications because they are expensive and difficult to produce in large quantities. Pyrethrin is a naturally occurring insecticide derived from the flowers of chrysanthemum plants. The pyrethroid products are based on pyrethrin's synthetic equivalent. These products contain PBO in addition to the pyrethroid ingredient. (A synergist is a chemical that enhances the effectiveness of another chemical.) There are three types of pyrethroid ingredients found in the products listed below: sumithrin, permethrin, and resmethrin.

The 17 adulticide products also contain inert ingredients. As discussed above, active ingredients are those intended to target and eradicate the pest whereas inert ingredients, comprising the remainder of the product, are used as solvents or to facilitate dispersion of the product. Tables 2-10 and 2-11 identify the percentage breakdown of active ingredients and inert ingredients for each product. In addition to the constituency of these adulticides, it is important to understand the mechanisms by which such adulticides could be applied, and the amounts of each constituent that can be applied based on label recommendations. Therefore, Tables 2-10 and 2-11 also provide the maximum allowable application rates (in pounds per acre) for the product as whole, the active ingredients (including the synergist PBO), and the inert ingredients. Table 2-10 presents the maximum recommended ground application rates, and Table 2-11 presents the maximum recommended aerial application rates. Product labels generally give application rates for the active ingredients. Where application rates for the product as a whole were given on the label, the application rate for the active ingredient was calculated. All inert ingredient application rates were calculated from the product application rates.

Based on human hazard warnings and environmental hazard statements, a review of the labels for the products, and the requirements listed in Tables 2-1, 2-2, and 2-3, the relative toxicity categories of the products can be determined. Table 2-12 identifies: (1) the product's toxicity classification, which is based on the product's acute toxicity to humans and domestic animals; (2) the required human hazard

Table 2-9
Adulticides Currently Registered in New York State that could be Applied on a Community-Scale Basis

Product	Active Ingredients and Synergists*	USEPA Registration Number
ORGANOPHOSPHATES		
Atrapa Insecticide VCP	Malathion	1812-407
Atrapa Insecticide ULV	Malathion	1812-407
Dibrom Concentrate Insecticide	Naled	59639-19
Formula MU-17	Naled	5011-71
Fyfanon ULV Ultra Low Volume Concentrate Insecticide	Malathion	4787-8
Trumpet EC Insecticide	Naled	59639-90
PYRETHROIDS		
Anvil 2+2 ULV	Sumithrin, PBO	1021-1687-8329
Anvil 10+10 ULV	Sumithrin, PBO	1021-1688-8329
Aqua-Reslin	Permethrin, PBO	432-796
Biomist 1.5+7.5 ULV	Permethrin, PBO	8329-40
Biomist 3+15 ULV	Permethrin, PBO	8329-33
Mosquito Beater 2-2	Permethrin, PBO	4-389
Flit 10 EC	Permethrin	4816-688-8329
Mosquito Beater 4-4	Permethrin, PBO	4-390
Permethrin 57% OS	Permethrin	8329-44
Scourge Insecticide with SBP-1382/PBO 4%+12% MF Formula II	Resmethrin, PBO	432-716
Scourge Insecticide with SBP-1382/PBO 18%+54% MF Formula II	Resmethrin, PBO	432-667

* New York State Pesticide Product Ingredient and Manufacturer System (PIMS) database http://pmep.cce.cornell.edu/pims/index.html
PBO=Piperonyl Butoxide, which is neither an active ingredient nor an inert ingredient but a synergist.

warning, which is based on the toxicity classification and is shown on the label; and (3) the environmental hazard statement that is shown on the label. The regulatory thresholds or criteria for each precautionary statement are discussed in more detail above under "Toxicity Categories and Precautionary Labeling."

ADULTICIDE COMPOSITION

Active Ingredients[9]

Under FIFRA, an active ingredient is defined as one that prevents, destroys, repels or mitigates a pest, or is a plant regulator, defoliant, desiccant or nitrogen stabilizer.

As shown in Table 2-9, the 17 New York State registered products that could be applied on a community-scale basis each contain one of the following active ingredients: naled or malathion (organophosphates); or permethrin, resmethrin, or sumithrin (pyrethroids). While the products and their specific formulations may be relatively new, the active ingredients have been used as pesticides for many years.

[9] http://pmep.cce.cornell.edu/profiles/insect-mite/index.html , March 23,2001.

Organophosphates

Malathion (CAS # 121-75-5)

Malathion, introduced in 1950, is one of the earliest organophosphate insecticides developed. It is suited for the control of sucking and chewing insects on fruits and vegetables, and is also used to control mosquitoes, flies, household insects, animal parasites, and head and body lice. Malathion is available in emulsifiable concentrate, wettable powder, dustable powder, and ULV liquid formulations, and may be found in formulations with many other pesticides. Malathion is also used for adult mosquito control in public health programs like NYCDOH's proposed *Adult Mosquito Control Programs*.

Naled (CAS # 300-76-5)

Naled, initially registered by USEPA in 1959, is a fast acting organophosphate insecticide used to control aphids, mites, mosquitoes, and flies on crops and in greenhouses, mushroom houses, animal and poultry houses, kennels, food processing plants, and aquaria. Liquid formulations can be applied to greenhouse heating pipes to kill insects by vapor action. It has been used by veterinarians to kill parasitic worms (other than tapeworms) in dogs. Naled is available in dust, emulsion concentrate, liquid, and ULV formulations.

Pyrethroids

Permethrin (CAS # 52645-53-1)

Permethrin was developed in 1973 as the first synthetic pyrethroid[10] that is relatively stable in sunlight. It is a broad-spectrum synthetic pyrethroid insecticide, used against a variety of pests on nut, fruit, vegetable, cotton, ornamental, mushroom, potato, and cereal crops. It is used in greenhouses, home gardens, and for termite control. Permethrin is also used as a household pesticide to control cockroaches and flying insects, and for the treatment of ectoparasites (parasites on the surface of the body) such as lice living on humans. It may cause a mite buildup by reducing mite predator populations. Permethrin is available in dusts, emulsifiable concentrates, smokes, ULV, and wettable powder formulations. For adult mosquito control, ULV applications are typically used.

Resmethrin (CAS # 10453-86-8)

Resmethrin, first developed in 1968, is a synthetic prethroid and is used for control of flying and crawling insects in homes, greenhouses, indoor landscapes, mushroom houses, and industrial sites.[11] It is also used for fabric protection, pet sprays and shampoos, and it is applied to horses or in horse stables.

Sumithrin (CAS # 026002-80-2)

Sumithrin (d-phenothrin), is a synthetic pyrethroid and a general-use insecticide that has been in use for 30 years. Sumithrin is used against many adult mosquito species and is used as an insecticide and miticide in commercial, industrial and institutional non-food areas. Sumithrin is also used in homes, gardens, greenhouses, and in pet quarters and on pets.

[10] http://www.pestmanagement.co.uk/culture/history.html and http:/home.donga.ac.kr/~pesticides/history.html, March 23, 2001.
[11] http:/home.donga.ac.kr/~pesticides/history.html, March 23, 2001.

Table 2-10
Composition and Label Application Rates of Adulticide Products – Ground

Product Name	USEPA Reg. #	% Active Ingredients/ % Inert Ingredients*	Ground Application Rate (lbs/acre)		
			Product	Active Ingredient/PBO*	Inert Ingredient**
ORGANOPHOSPHATES					
Atrapa Insecticide VCP	1812-407	96.5% Malathion/3.5% Inerts	0.0570	0.0550	0.0020
Atrapa Insecticide ULV	1812-407	95.0% Malathion/5.0% Inerts	0.0570	0.0542	0.0029
Dibrom Concentrate Insecticide	59639-19	87.4% Naled/12.6% Inerts	0.0200	0.0175	0.0025
Formula MU-17	5011-71	20.0% Naled/80.0% Inerts	0.4000	0.0800	0.3200
Fyfanon ULV	4787-8	95.0% Malathion/5.0% Inerts	0.0570	0.0542	0.0029
Trumpet EC Insecticide	59639-90	78.0% Naled/ 22.0% Inerts	0.030	0.0200	0.0056
PYRETHROIDS					
Anvil 2+2 ULV	1021-1687-8329	2.0% Sumithrin and 2.0% PBO, Technical/96.0% Inerts	0.1800	0.0036/0.0036	0.1728
Anvil 10+10 ULV	1021-1688-8329	10% Sumithrin and 10% PBO, Technical/ 80% Inerts (white mineral oil, aromatic hydrocarbons)	0.0360	0.0036/0.0036	0.0288
Aqua-Reslin	432-796	20.0% Permethrin and 20.0% PBO, Technical/ 60.0% Inerts (including odorless mineral spirits)	0.0350	0.0070/0.0070	0.0210
Biomist 1.5+7.5 ULV	8329-40	1.5% Permethrin and 7.5% PBO, Technical/ 91.0% Inerts	0.4700	0.0070/0.0350	0.4247
Biomist 3+15 ULV	8329-33	3.0% Permethrin and 15.0% PBO, Technical/ 82% Inerts	0.1700	0.0050/0.0264	0.1367
Mosquito Beater 2-2	4-389	2.0% Permethrin and 2.0% PBO, Technical / 96.0% Inerts (petroleum distillates)	0.3500	0.0070/0.0070	0.3360
Flit 10 EC	4816-688-8329	10% Permethrin/ 90.0% Other ingredients (petroleum distillates)	0.0700	0.0070	0.0630
Mosquito Beater 4-4	4-390	4.0% Permethrin and 4.0% PBO Technical /92.0% Inerts (petroleum distillate)	0.1750	0.0070/0.0070	0.1610
Permethrin 57% OS	8329-44	57.0% Permethrin/ 43.0% Inerts	0.0400	0.0210	0.0158
Scourge Insecticide with SBP-1382/PBO 4%+12% MF Formula II	432-716	4.14% Resmethrin and 12.42% PBO Technical/83.44 Inerts	0.1700	0.0070/0.0210	0.1411
Scourge Insecticide with SBP-1382/PBO 18%+54% MF Formula II	432-667	18.0% Resmethrin and 54.0% PBO Technical/28.0% Inerts (including aromatic petroleum solvent)	0.0400	0.0070/0.0210	0.0109

* PBO=Piperonyl Butoxide, which is neither an active ingredient nor an inert ingredient but a synergist, only appears in pyrethroid products

** Inert Ingredient application rates are calculated from product application rates.

Source: New York State Pesticide Registration Labels

Table 2-11
Composition and Label Application Rates of Adulticide Products – Aerial

Product Name	USEPA Reg. #	% Active Ingredients/ % Inert Ingredients*	Aerial Application Rate (lbs/acre)		
			Product	Active Ingredient/PBO*	Inert Ingredient**
ORGANOPHOSPHATES					
Atrapa Insecticide VCP	1812-407	96.5% Malathion/3.5% Inerts	0.2400	0.2316	0.0084
Atrapa Insecticide ULV	1812-407	95.0% Malathion/5.0% Inerts	0.2400	0.2280	0.0120
Dibrom Concentrate Insecticide	59639-19	87.4% Naled/12.6% Inerts	0.1190	0.1044	0.0150
Formula MU-17	5011-71	20.0% Naled/80.0% Inerts	0.4000	0.0800	0.3200
Fyfanon ULV Ultra Low Volume Concentrate Insecticide	4787-8	95.0% Malathion/5.0% Inerts	0.2400	0.2280	0.0120
Trumpet EC Insecticide	59639-90	78.0% Naled/22.0% Inerts	0.1280	0.1000	0.0282
PYRETHROIDS					
Anvil 2+2 ULV	1021-1687-8329	2.0% Sumithrin and 2.0% PBO, Technical/ 96.0% Inerts	0.1800	0.0036/0.0036	0.1728
Anvil 10+10	1021-1688-8329	10% Sumithrin and 10% PBO, Technical/80% Inerts (white mineral oil, aromatic hydrocarbons)	0.0360	0.0036/0.0036	0.0288
Aqua-Reslin	432-796	20.0% Permethrin and 20.0% PBO, Technical/60.0% Inerts (including odorless mineral spirits)	0.0350	0.0070/0.0070	0.0210
Biomist 1.5+7.5 ULV	8329-40	1.5% Permethrin and 7.5% PBO, Technical /91.0% Inerts	0.5080	0.0076/0.0381	0.4623
Biomist 3+15 ULV	8329-33	3.0% Permethrin and 15.0% PBO, Technical/82% Inerts	0.1720	0.0051/0.0257	0.1407
Mosquito Beater 2-2	4-389	2.0% Permethrin and 2.0% PBO, Technical / 96.0% Inerts (petroleum distillates)	0.3500	0.0070/0.0070	0.3360
Flit 10 EC	4816-688-8329	10% Permethrin/90.0% Other ingredients (petroleum distillates)	0.0700	0.0070	0.063
Mosquito Beater 4-4	4-390	4.0% Permethrin and 4.0% PBO Technical /92.0% Inerts (petroleum distillate)	0.1750	0.0070/0.0070	0.1610
Permethrin 57% OS	8329-44	57.0% Permethrin/ 43.0% Inerts	0.0410	0.0234	0.0177
Scourge Insecticide with SBP-1382/PBO 4%+12% MF Formula II	432-716	4.14%Resmethrin and 12.42% PBO Technical/83.44 Inerts	0.1690	0.0070/0.0210	0.1411
Scourge Insecticide with SBP-1382/PBO 18%+54% MF Formula II	432-667	18.0%Resmethrin and 54.0% PBO Technical/28.0% Inerts (including aromatic petroleum solvent)	0.0390	0.0070/0.0210	0.0109

* PBO=Piperonyl Butoxide, which is neither an active ingredient nor an inert ingredient but a synergist, only appears in pyrethroid products

** Inert Ingredient application rates are calculated from product application rates.

Source: New York State Pesticide Registration Labels

Table 2-12
Characteristics of Adulticide Products

Product Name	USEPA Reg. #	% Active Ingredients/ % Inert Ingredients*	Mandatory Labeling (40 CFR Part 156)		
			Toxicity Category**	Human Hazard Warning	Environmental Hazard Statement
ORGANOPHOSPHATES					
Atrapa Insecticide VCP	1812-407	96.5% Malathion/3.5% Inerts	III or IV	Caution	"This pesticide is toxic to fish, aquatic invertebrates, and aquatic life stages of amphibians." ***
Atrapa Insecticide ULV	1812-407	95.0% Malathion/5.0% Inerts	III or IV	Caution	"This pesticide is toxic to fish, aquatic invertebrates, and aquatic life stages of amphibians." ***
Dibrom Concentrate Insecticide	59639-19	87.4% Naled/12.6% Inerts	I	Danger	"This pesticide is toxic to fish, aquatic invertebrates, and wildlife." ***
Formula MU-17	5011-71	20.0% Naled/80.0% Inerts	I	Danger	"MU-17 is also toxic to fish, shrimp, crayfish, crabs and other aquatic Invertebrates." ***
Fyfanon ULV Ultra Low Volume Concentrate Insecticide	4787-8	95.0% Malathion/5.0% Inerts	III or IV	Caution	"This product is toxic to fish."
Trumpet EC Insecticide	59639-90	78.0% Naled/ 22.0% Inerts	I	Danger	"This pesticide is toxic to fish, aquatic invertebrates, and wildlife." ***
PYRETHROIDS					
Anvil 2+2 ULV	1021-1687-8329	2.0% Sumithrin and 2.0% PBO, Technical/ 96.0% Inerts	III or IV	Caution	N/A
Anvil 10+10	1021-1688-8329	10% Sumithrin and 10% PBO, Technical/ 80% Inerts (white mineral oil, aromatic hydrocarbons)	III or IV	Caution	N/A
Aqua-Reslin	432-796	20.0% Permethrin and 20.0% PBO, Technical/ 60.0% Inerts (including odorless mineral spirits)	III or IV	Caution	"This pesticide is extremely toxic to fish and aquatic invertebrates." ***
Biomist 1.5+7.5 ULV	8329-40	1.5% Permethrin and 7.5% PBO, Technical/ 91.0% Inerts	III or IV	Caution	"This product is extremely toxic to fish and aquatic invertebrates." ***
Biomist 3+15 ULV	8329-33	3.0% Permethrin and 15.0% PBO, Technical/ 82% Inerts	III or IV	Caution	"This product is extremely toxic to fish and aquatic invertebrates." ***
Mosquito Beater 2-2	4-389	2.0% Permethrin and 2.0% PBO, Technical / 96.0% Inerts (petroleum distillates)	III or IV	Caution	"This product is extremely toxic to fish and aquatic invertebrates." ***
Flit 10 EC	4816-688-8329	10% Permethrin/90.0% Other ingredients (petroleum distillates)	II	Warning	"This product is highly toxic to fish." ***

Table 2-12
Characteristics of Adulticide Products

Product Name	USEPA Reg. #	% Active Ingredients/ % Inert Ingredients*	Mandatory Labeling (40 CFR Part 156)		
			Toxicity Category**	Human Hazard Warning	Environmental Hazard Statement
PYRETHROIDS					
Mosquito Beater 4-4	4-390	4.0% Permethrin and 4.0% PBO Technical/ 92.0% Inerts (petroleum distillate)	III or IV	Caution	"This product is extremely toxic to fish and aquatic invertebrates." ***
Permethrin 57% OS	8329-44	57.0% Permethrin/ 43.0% Inerts	III or IV	Caution	"This product is extremely toxic to fish and other aquatic organisms." ***
Scourge Insecticide with SBP-1382/PBO 4%+12% MF Formula II	432-716	4.14%Resmethrin and 12.42% PBO Technical/ 83.44 Inerts	III or IV	Caution	"This pesticide is highly toxic to fish."
Scourge Insecticide with SBP-1382/PBO 18%+54% MF Formula II	432-667	18.0%Resmethrin and 54.0% PBO Technical/ 28.0% Inerts (including aromatic petroleum solvent)	III or IV	Caution	"This pesticide is highly toxic to fish."

* PBO=Piperonyl Butoxide, which is neither an active ingredient nor an inert ingredient but a synergist.
** Category I represents the highest toxicity and IV represents the lowest toxicity.
*** "This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds." Or " This product is highly toxic to bees."
N/A – Not Available

Piperonyl Butoxide (PBO)

As discussed above, the pyrethroid products contain PBO, a synergist, in addition to their active and inert ingredients. A synergist is a chemical that enhances the effectiveness of another chemical. Synergists are added to the pyrethroid products in order to slow down or prevent the metabolism of pyrethroids, thereby enabling a smaller amount of pyrethroids to have the same pesticidal effect. In some cases, PBO can function as an active ingredient.

Inert Ingredients

In addition to active ingredients including PBO, adulticide products contain "inert" or "other" ingredients. These are simply defined as ingredients with no pesticidal activity. In other words, inert ingredients are present in pesticide formulations mainly as a vehicle or dispersant for the active ingredient, and not necessarily for their insecticidal properties; however, these ingredients can and sometimes do possess toxicological properties. As described above, registrants of pesticide products are not required to publicly disclose detailed information on the inert ingredients in their products unless they pose a hazard to public health or the environment. Only the total percentage by weight of all inert ingredients must be disclosed on the product label. However, as part of USEPA's review during the registration process, registrants must disclose detailed information on each product's complete chemical composition, including inert ingredients, by submitting a CSF. CSFs must also be submitted to NYSDEC for all products registered in New York State. In preparing the analyses for this EIS, NYCDOH made numerous efforts to obtain information on the inert ingredients of each adulticide product being considered for the Proposed Action. In an effort to obtain information on inert ingredients, NYCDOH formally submitted Federal FOIA (Freedom of Information Act) and

State FOIL (Freedom of Information Law) requests to USEPA, NYSDEC, and NYSDOH. In order for these agencies to release such confidential data, the individual registrants must grant approval for the release of their proprietory information. In addition to the FOIA/FOIL requests, NYCDOH met with representatives of the pesticide industry, in an attempt to reach an acceptable agreement on both receiving and disclosing inert information. Ultimately, after several attempts, NYCDOH was unable to obtain the inert information for the purposes of this EIS.

In general, pyrethroid products such as Anvil 10+10, Aqua-Reslin, and Scourge Insecticide contain a higher proportion of inert ingredients (e.g., up to 80 percent), as compared to the organophosphate products, with the exception of Formula MU-17 which contains up to 80 percent inerts.

Inert Ingredients in Organophosphate Products

Information on the specific inert ingredients in the organophosphate products is not available. Only the proportion of inert ingredients appears on each product's label and MSDS. As discussed above, organophosphate products generally contain a small percentage of inert ingredients (with the exception of Formula MU-17, which contains up to 80 percent inerts) as compared to the pyrethroid products. The amounts of inerts found within organophosphate products range between 4 percent (Atrapa Insecticide VCP) and 80 percent (Formula MU-17). Since organophosphates are typically applied at technical grade and pyrethroid products have much larger percentages of inerts, throughout this EIS, the discussion and analysis of impacts from inerts in the products are presented under the pyrethroid products sections.

Inert Ingredients in Pyrethroid Products

A review of each product's MSDS indicates that pyrethroids generally contain petroleum-based inert ingredients called "petroleum distillates," which are also known as "hydrocarbons" or "petro-chemicals." Petroleum distillates include a broad range of compounds that are extracted by distillation during the refining of crude oil. They contain both "aromatic" hydrocarbons (they have an odor and include a chemical structure with carbon rings) and "aliphatic" hydrocarbons (they are odorless and have a chemical structure with straight carbon chains). Examples of the types of petroleum distillates found in the pyrethroid products include:

- Anvil 2+2 and 10+10: white mineral oil and aromatic hydrocarbons
- Aqua-Reslin: odorless mineral spirits
- Mosquito Beater 2-2 and 4-4: aromatic solvent carrier, parafinic solvent carrier
- Scourge Insecticide: aromatic petroleum solvent

Petroleum distillates are found in a wide variety of consumer products, including lip gloss, liquid gas, fertilizer, pesticides, furniture polish, plastics, paint thinners, and motor oil, among many others.[12]

REREGISTRATION, TOLERANCE REASSESSMENT, AND SPECIAL REVIEW

As discussed above, under "USEPA Pesticide Registration Process," the current reregistration process, established by the 1988 FIFRA amendments, requires USEPA to review older pesticides (those initially registered before 1984) to ensure that they meet contemporary health and safety standards and product labeling requirements, and that their risks are mitigated. This process has been integrated with the 1996 Food Quality Protection Act (FQPA), which requires USEPA to reassess the maximum allowable levels of pesticide residues in food (known as "tolerances"), using the

[12] www.epa.gov/seahome/housewaste/house/petrol.htm

"reasonable certainty of no harm" standard. Upon completion of the reregistration/tolerance reassessment process, a RED is issued. The RED summarizes the risk assessment conclusions and outlines any risk reduction measures necessary for the pesticide to continue to be registered in the United States.

USEPA has prioritized pesticide reviews (for both reregistration and tolerance assessment) into three groups based on the potential risk that each pesticide may pose. The first group, exhibiting the highest potential risk, includes: (1) organophosphate, carbamate, and organochlorine pesticides; (2) probable and possible human carcinogens; (3) high-hazard inert ingredients; and (4) any pesticides that exceed their reference dose. Under the first group, USEPA established 11 subgroups or "waves" that are intended to provide a general sense of the sequence of reviews. The organophosphate active ingredient naled appears in the first wave, whereas malathion appears in the third wave. The pyrethroid active ingredient permethrin appears in the ninth wave.[13]

Beginning in 1988 with the FIFRA amendments, USEPA also prioritized reviews of pesticides for reregistration into four lists, A through D. List A contains most food-use pesticides. Pesticides on Lists B, C, and D are divided based on their potential for human exposure and other factors, with List B containing pesticides of greater concern and List D containing pesticides of less concern.[14]

As noted above, USEPA can also conduct "special reviews" when there is reason to believe that a pesticide may have unreasonable adverse effects on humans or the environment. Special reviews have been initiated since the late 1970's, but many cases have been deferred to the reregistration process.

Organophosphate Products

USEPA has chosen the organophosphate pesticides as one of the first groups to undergo reregistration and tolerance reassessment. As part of the reassessment, USEPA is reviewing each of the organophosphate pesticides individually, and will conduct a cumulative assessment of all these pesticides together when the necessary methodology is complete. As noted above, naled and malathion represent two of almost forty different types of organophosphate compounds. The review process for organophosphates includes six phases, as follows:

- Phase 1: Registrant "error only" review, during which USEPA sends its preliminary human health and ecological risk assessments to the registrant(s) of the pesticide and USDA for a 30-day review;
- Phase 2: USEPA considers registrants' and USDA's comments (30 days);
- Phase 3: Public comment on preliminary risk assessments[15] (60 days);
- Phase 4: USEPA revises risk assessments, holds public meetings and technical briefings (90 days + meetings/briefings);
- Phase 5: USEPA solicits risk management ideas (60 days); and
- Phase 6: USEPA develops risk mangement strategies (60 days).

Upon completion of the review process, USEPA presents the results of its review in a RED. As discussed above, for large groups of pesticides that require cumulative assessment, like the

[13] Federal Register: October 7, 1998 (Volume 63, Number 194). Pages 53895-53902.
[14] U.S. Environmental Protection Agency. Office of Pesticide Programs. "Status of Pesticides in Registration, Reregistration, and Special Review (Rainbow Report)." Spring 1998.
[15] The risk assessments include a number of studies that evaluate the pesticide's effects on human health, as well as its environmental fate and effects. These studies are described in more detail above, under "Data Requirements and Testing."

organophosphates, USEPA is completing individual IREDs and TREDs. Once USEPA completes a cumulative risk assessment and risk management decision encompassing the *entire group* of related pesticides, the individual decisions may be issued as REDs. Further risk mitigation may be required at that time.

The active ingredient naled has proceeded through Phase 5. Phase 1, the public comment period for the preliminary risk assessments, was completed in October 1998. The revised risk assessments were released in October 1999. This was followed by a 60-day public participation period for risk management, which was completed in December 1999. The risk management strategies have not been completed and therefore the RED has not been issued yet. A special review was also initiated for naled in 1983 because it potentially met or exceeded the criteria for mutagenicity, fetotoxicity, and reproductive effects. However, the special review was terminated and deferred to the reregistration process, based on a review of all available data which indicated that there was no definitive evidence showing that naled met the special review criteria.[16]

The active ingredient malathion has also proceeded through Phase 5. The public comment period for the preliminary risk assessments was completed in July 2000; a technical briefing and public meeting was conducted in November 2000, as the revised risk assessments were released, and the 60-day public participation period for risk management was completed in February 2001.

Pyrethroid Products

Only the active ingredient permethrin has been listed in USEPA's first priority group for reregistration and tolerance reassessment, as noted above. Permethrin also appears on reregistration List B, which indicates that it is not a food use pesticide. According to USEPA's 1998 "Rainbow Report," permethrin is still being reviewed for its human health and environmental effects and no RED has been issued yet. Data have been submitted by the registrant(s) since 1991.

Sumithrin and resmethrin are classified as food use pesticides in List A. Like permethrin, these pesticides are still being reviewed by USEPA and no RED has been issued. Data have been submitted for both products since 1995.

On the State level, NYSDEC and NYSDOH have recently completed a review of permethrin, particularly for Biomist products that contain permethrin. Sumithrin products have also been reviewed by NYSDEC and NYSDOH. Resmethrin has not been reviewed on the State level.

Synergist (PBO)

PBO, the synergist in the pyrethroid products, is found on the reregistration List B, which indicates that it is not classified for food use. No RED has been issued for PBO yet, but data have been submitted by the registrant(s) since 1991. A special review was also initiated for PBO in 1982 because it potentially met or exceeded the carcinogenicity criterion. However, the special review was terminated and deferred to the reregistration process, and more data were requested.[17]

ADULTICIDE PRODUCTS SELECTED FOR DETAILED TECHNICAL ANALYSIS

Although all 17 adulticides could potentially be used by NYCDOH as part of the Proposed Action, five products, each containing one of the active ingredients of concern, were chosen for detailed

[16] U.S. Environmental Protection Agency. Office of Prevention, Pesticides, and Toxic Substances. "Status of Chemicals in Special Review." EPA-738-R-00-001. March 2000.
[17] U.S. Environmental Protection Agency. Office of Prevention, Pesticides, and Toxic Substances. "Status of Chemicals in Special Review." EPA-738-R-00-001. March 2000.

technical analysis to assess potential adverse impacts from application. These products, which are indicative of the products that are most likely to be used by NYCDOH as part of the Proposed Action, contain a combination of the highest content of active ingredient and/or PBO, and the least amounts of inerts. The exception to this was the choice of Fyfanon ULV Ultra Low Volume Concentrate Insecticide (which contains a slightly lower percentage of the active ingredient malathion as this was the product used by the City in 1999). These are:

- Fyfanon ULV Ultra Low Volume Concentrate Insecticide (active ingredient: malathion)
- Dibrom Concentrate Insecticide (active ingredient: naled)
- Permethrin 57% OS (active ingredient: permethrin)
- Scourge Insecticide with SBP-1382/Piperonyl Butoxide 18% + 54% MF Formula II (active ingredients: resmethrin/PBO)
- Anvil 10+10 (active ingredients: sumithrin/PBO)

Within the five products listed above, the six "active ingredients" refer to malathion, naled, permethrin, resmethrin, sumithrin, and PBO.

A representative of each type of organophosphate and pyrethroid product was selected for presentation of the detailed technical analysis results. The product with the highest concentration of active ingredient was chosen for presentation purposes. While in some technical sections, only these five products are presented, this EIS addresses the potential impacts from all 17 registered products.

The City would not use pyrethrin products as part of the Proposed Action because they are less effective for community-scale applications, as compared to the pyrethroid and organophosphate products.

Acute Toxicity

Table 2-13, below, lists the toxicity category of each adulticide product selected for detailed technical analysis, and its corresponding testing criteria as set forth in 40 CFR Part 156.10. The toxicity categories relate to acute toxicity in humans and domestic animals. During the registration process, pesticide producers are required to provide data on such toxicity, which are then compared to the regulatory testing criteria in order to classify the product into one, and possibly two, of the four categories. The product acute oral, inhalation, and dermal levels were determined by comparing the Hazard Statements on the labels with the CFR codes which require mandated statements based on the product acute toxicity tests. This information is further discussed and elaborated upon in Chapter 3.C, "Public Health."

Table 2-13
Toxicity Categories and Product Acute Toxity Levels

Product (Active Ingredient)	Toxicity Category*	Product Acute Toxicity Levels	
Dibrom Concentrate Insecticide (Naled)	I	Oral LD_{50}:	Up to and including 50 (mg/kg)
		Inhalation LC_{50}:	Up to and including 0.2 (mg/liter)
		Dermal LD_{50}:	Up to and including 200 (mg/kg)
Fyfanon ULV Ultra Low Volume Concentrate Insecticide (Malathion)	III or IV	Oral LD_{50}:	From 500 thru 5,000 or greater than 5,000 (mg/kg)
		Inhalation LC_{50}:	From 2 thru 20 or greater than 20 (mg/liter)
		Dermal LD_{50}:	From 2,000 thru 20,000 or greater than 20,000 (mg/kg)
Scourge Insecticide (Resmethrin)	III or IV	Oral LD_{50}:	From 500 thru 5,000 or greater than 5,000 (mg/kg)
		Inhalation LC_{50}:	From 2 thru 20 or greater than 20 (mg/liter)
		Dermal LD_{50}:	From 2,000 thru 20,000 or greater than 20,000 (mg/kg)
Anvil 10+10 (Sumithrin)	III or IV	Oral LD_{50}:	From 500 thru 5,000 or greater than 5,000 (mg/kg)
		Inhalation LC_{50}:	From 2 thru 20 or greater than 20 (mg/liter)
Permethrin 57% OS	III or IV	Oral LD_{50}:	From 500 thru 5,000 or greater than 5,000 (mg/kg)
		Inhalation LC_{50}:	From 2 thru 20 or greater than 20 (mg/liter)
		Dermal LD_{50}:	From 2,000 thru 20,000 or greater than 20,000 (mg/kg)

* Category I represents the highest toxicity and IV represents the lowest toxicity.

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