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Industrial Waste Characterization

In the Ontario Pesticide Industry

Solid Waste Management Branch
Report EPS 3-EC-77-2

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A STUDY ON

INDUSTRIAL WASTE CHARACTERIZATION

IN THE ONTARIO PESTICIDE INDUSTRY, QUANTIFYING THE

PESTICIDE WASTES GOING ULTIMATELY TO LANDFILL

This study was carried out under a Contract from Environment Canada on behalf of the Canada-Ontario Joint Committee working under the Canada-U.S. Great Lakes Agreement.

D.S.S. File #SSO2 KE-204-4-EP-105.

by

UNIROYAL RESEARCH LABORATORIES

GUELPH, ONTARIO.

REVIEW NOTICE

This report has been reviewed by the Solid Waste Management Branch, Environmental Protection Service, and approved for publication. Approval does not necessarily reflect the views and policies of the Environmental Protection Service. Mention of trade names or commercial products does not constitute endorsement for use.

ABSTRACT

The wastes from pesticide formulators going ultimately to landfill consist principally of containers, cartons, bags and fibreboard drums. Based on information provided by the formulators, there are some 80,000,000 lbs of pesticides formulated annually in Ontario (1974) and the container wastes amount to 20 lbs/1000 lbs of formulations. 75% of this waste is landfilled at Burlington and Hamilton municipal landfill sites. Most formulators allow for a 1% loss of materials and insist that an unweighable amount of material is left in the containers. The bulk of the loss is due to package overfill.

Other wastes going to landfill consist of empty plastic containers, fillers used for blender clean-outs and some air filter clean-outs, amounting to 32,000 lbs annually, or 0.4 lb/1000 lbs of formulation. Plant wash-downs, and blender clean-outs (solvent or water), are stored and periodically shipped to one of the two incineration companies and amount to 34 lbs/1000 lbs of formulation.

Practically all wastes from the Manufacturer go to landfill, deepwell disposal or incineration. Stillbottoms or tars going to landfill at Corunna, Ontario, amount to 71 lbs/1000 lbs of production. Liquids (scrubber waters and reaction washes) at the rate of 7125 lbs/1000 lbs of production go to deepwell disposal at Corunna (Detroit porous formation). Liquid scrubber wastes (4615 lbs/1000 lbs of production) go to incineration by Interflow Systems Ltd. at Hamilton, Ontario. The clinker left after incineration (containing sodium chloride and sodium sulphate) amounts to nearly 800 lbs/1000 lbs of production and is landfilled at the Hamilton municipal landfill site.

The pesticide waste containers from the formulating operations of the Manufacturer amount to 1.4 lbs/1000 lbs of formulations produced. These waste containers go to landfill at North Woolwich, Ontario. The containers are thoroughly emptied of all pesticide and any residue remaining is an unweighable amount, clinging electrostatically to the containers.

RÉSUMÉ

Les déchets que les fabricants de pesticides expédient dans les décharges sanitaires se composent principalement de contenants (cartons, sacs et fûts de carton). D'après les renseignements venant des fabricants, la production annuelle de pesticides en Ontario (1974) s'est élevée à quelque 80 millions de livres et le poids des contenants de rebut a atteint 20 lb par 1000 lb de préparation. Les trois quarts de ces déchets s'ont enfouis dans les décharges municipales de Burlington et Hamilton. La plupart des producteurs prévoient 1 p. 100 de perte et soulignent qu'une quantité impondérable de substance reste collée à la paroi du contenant. Le gros des pertes est dû au remplissage excessif.

D'autres déchets sont également expédiés aux décharges sanitaires: des contenants vides en plastique, des composés ajoutés aux solutions de lessivage du mélangeur et de certains filtres à air, dont la quantité s'élève à 32000 lb annuellement ou 0,4 lb par 1000 lb de préparation. Les solutions de rinçage des installations et du mélangeur (eau ou solvant) sont accumulées et envoyées périodiquement à l'une des deux entreprises locales d'incinération. On en estime le poids à 34 lb par 1000 lb de préparation.

Presque tous les déchets des fabricants sont déversés dans les décharges sanitaires ou dans les fosses profondes ou bien sont envoyés à l'incinération. Les résidus de distillation ou les goudrons envoyés àla décharge de Corunna (Ontario), atteignent 71 lb par 1000 lb de production. Les eaux de lessivage et les solutions réactives, s'élevant à 7,125 lb par 1000 lb de pesticides, sont déversées

dans des fosse profondes à Corunna (formation poreuse de Détroit). Les déchets de nettoyage hydraulique (4,615 lb par 1000 lb de production) sont confiés à Interflow Systems Ltd., à Hamilton (Ontario), qui les incinère. Les scories qui résultent de ce traitement, contenant du chlorure de sodium et du sulfate de sodium, s'élèvent à près de 800 lb par 1000 lb de production et elles sont enfouies à la décharge municipale de Hamilton.

Les contenants recueillant les rebuts de pesticides dans les usines accumulent 1.4 lb de déchets par 1000 lb de produits. Ces contenants, envoyés à la décharge de North Woolwich (Ontario), sont minutueusement vidés et les résidus adhérant aux parois sous l'effet de l'électricité statique ne constituent qu'une quantité négligeable.

C O N T E N T S

I N D E X

TO TABLES, DIAGRAMS AND MAPS

A STUDY ON

INDUSTRIAL WASTE CHARACTERIZATION IN THE ONTARIO PESTICIDE INDUSTRY

QUANTIFYING THE WASTES GOING ULTIMATELY TO LANDFILL

D.S.S. FILE #SS02 KE-204-4-EP-105

INTRODUCTION

This study of the Pesticide Industry in Ontario was contracted on March 13, 1975 by Environment Canada to Uniroyal Ltd. Research Laboratories, Guelph, Ontario, to characterize the pesticide industry wastes being ultimately discharged to the land.

This study was conducted under the direction of Environment Canada's Scientific Officer, Mr. Hans Mooij, and his supervisor, Mr. Ted Rattray, for the Joint Canada-Ontario Committee, working under the Canada-U.S. Great Lakes Agreement. Based on the information obtained from this study, we propose to provide a description of the typical processes involved in the manufacture and formulating of pesticides in Ontario. The nature and quantities of waste from each process are described and in addition, information is presented on the ultimate land disposal techniques.

SCOPE OF STUDY

This study covers pesticide manufacturers and pesticide formulators in Ontario who are all located in Southern Ontario around the Great Lakes or close to watercourses running into the Great Lakes.

Fourteen formulators (93% of total), one manufacturer (100%

of total), five pesticide repackagers (30% of total) and one warehouse-distributor were contacted in personal interviews at the plant locations.

As information was obtained from the various companies, this information was discussed with Ontario Ministry of Environment personnel at the various regional offices and with the Central Supervisory Group, Pesticide Section, of the Ontario Ministry of Environment in Toronto.

Companies handling the landfilling of various pesticide wastes, as well as those companies handling the disposal by incineration, were contacted in the study. Although incineration destroys all the organics, some dissolved inorganics are left behind as a solid clinker which must be disposed of to landfill areas. Tricil Waste Management Co. at Corunna incinerate wastes at their location and in addition have an approved landfill site and deepwell on their property.

Finally, some municipal officials concerned with landfill sites in their areas were contacted, to obtain more information on the types of soil at the landfill sites.

The landfill sites at Burlington and Hamilton are municipally owned and they receive about 75% of the total amount of waste pesticide paper containers. This waste is landfilled along with other municipal wastes.

The soil conditions at Burlington are a red clay and broken shale type of material. The Hamilton landfill site is clay till about 7-10 feet deep over rock shale.

The municipal and industrial wastes are buried together to a depth of 7-10 feet at Burlington and Hamilton.

WASTE DISPOSAL COMPANIES

The major waste disposal companies handling pesticide wastes other than paper bags and fibreboard drums are Interflow Systems Ltd. (Thermal Degradation) located at Hamilton, Ontario, and Tricil Waste Management Co. with facilities at Mississauga and Corunna (near Sarnia), Ontario. Interflow Systems operate an incineration facility but have no landfill areas. Tricil Waste Management Co. operate an incineration facility at Mississauga and also have both an incinerator and a large landfill area at Corunna for handling solid industrial wastes. The clay depth at Corunna is reported to be 150-200 feet deep and Tricil Waste Management stated they buried the solid wastes to a depth of 20 feet.

Tricil Waste Management also operate a deepwell at Corunna where industrial liquid wastes are gravity fed 600 feet into the Detroit River formation.

PESTICIDES FORMULATED BY A TYPICAL FORMULATING COMPANY

Most formulators handle a range of pesticide formulations which include herbicides, insecticides, fungicides, some bactericides and rodenticides. Materials used for herbicides include the triazines and chlorinated phenoxyacetic acids. The more toxic organic chemicals are the ones used for insecticides, including Parathion and Guthion.

Chemicals used for fungicides include the Dithanes as well as many other types.

Tables 1 and 2 show the technical trade name, generic name and structures for a range of pesticides formulated by a typically large formulating company in Ontario and illustrates the wide range of chemicals handled in the pesticide industry.

PESTICIDE FORMULATORS

This study revealed that most formulators have four or five types of wastes resulting from their formulating operations as follows:

(1) Empty bags and drums used for the delivery of technical pesticides;

(2) Plant wash-downs;

(3) Blender clean-out:

a) Solvent;

b) Dummy filler clean-out;

(4) Obsolete formulations or old inventory materials.

The largest amount of wastes going to landfill from the pesticide formulating industry are the waste containers. Due to the high cost of technical pesticides (concentrated material sold by the manufacturer) every formulating company ensures that the container is completely emptied and the only amount left in the bags is due to electrostatic charges. Precise data on the amount of pesticides remaining in the discarded containers was not available from the formulating companies.

Losses allowed for in a formulating operation are about 1% of total incoming materials. These losses, according to opinions expressed by three of the largest formulators, may be due to material in the bags, may be lost in blender clean-outs or more probably can be due to overfills of outgoing packaged formulations. One formulator has recently started to vacuum out his waste containers prior to disposal to ensure even better removal of pesticides. If an educated guess is required, the estimated amount of concentrated pesticide left in paper bags and fibreboard drums amount to about 0.01 lb/1000 lbs of pesticide production.

Diagram 1 shows the processes used for producing dusts or wettable powders, and Diagram 2, the processes used for emulsifiable concentrates. Generally the dust or wettable powder formulations are produced in a blending operation where concentrated pesticide is blended with inert filler such as clay or talc, and wetting agents, to produce a 5% to 50% wettable powder or dust. The emulsifiable concentrates are produced by adding solvent, surface active agents and emulsifiers to the concentrated pesticide in a blending tank.

The concentrated pesticides used by the formulators are delivered in tank cars, metal drums, fibreboard drums, or paper bags. Some very toxic material may be shipped to the formulator in a sealed plastic container inside a fibreboard drum.

The emptied paper bags and fibreboard drums are crushed and sent to landfill at a municipal disposal area. The plastic liners for very toxic materials and emptied plastic containers go to land disposal at Corunna.

Drums containing residuals of very toxic material are

perforated at the bottom, drained completely and crushed. They are sent to the scrap metal dealer and re-used in steel making.

Solvent drums and drums containing less toxic materials are cleaned and sent to a drum reconditioner.

After the production of a specific pesticide formulation, the blender or blending tank is cleaned out, either with a dummy filler load, or with a solvent. One formulator holds these "clean-outs" until the same pesticide is again scheduled for production and then utilizes them in the process. Other formulators indicate that the dummy filler clean-out goes to landfill areas and the solvent clean-outs are incinerated by Tricil Waste Disposal Co. or Interflow Systems Ltd.

Plant wash-downs are held in underground storage and shipped periodically to the incineration companies. The incineration companies may screen the material prior to feeding it to the incinerator. Any retained solids, which may be large lumps, are landfilled at the property of the incineration company (Tricil Waste Management Co.) at Mississauga, Ontario.

The obsolete formulations or old inventory accumulations have largely either been hauled to the storage area at Simcoe, or landfilled at a site approved by the Ontario Ministry of Environment. Some have been transhipped to Suffield, Alberta, for incineration. Although this material accumulation occurs infrequently with each formulator, the restricted use of chlorinated hydrocarbons, including DDT, in recent years has caused a problem with storage at Simcoe. The warehouse for storing waste pesticide materials is owned by the Ontario Ministry of Environment. Material is being held there awaiting a decision on the ultimate disposal method.

Map 1 shows the location of each pesticide formulator in Ontario indicated as a circled cross. The disposal or landfill site for each formulator is shown on Map 2 as a small dot. The location of incinerators are indicated by an 'x' on Map 2.

Table 3 indicates the amount of pesticides formulated by the companies contacted and shows figures for the various types of waste at each plant location. This study shows that nearly 80,000,000 lbs/annum of pesticide formulations were produced in Ontario in 1974. Approximately 1,554,000 lbs/annum (20 lbs/1000 lbs formulation) of empty containers went to landfill sites, with nearly 75% of this amount being disposed of at the Hamilton landfill site and the Burlington landfill site. In addition, about 32,000 lbs/annum (0.4 lb/1000 lbs of formulation) of various wastes went to landfill at Corunna, Ontario, from the formulators and 2,700,000 lbs/annum (34 lbs/1000 lbs of formulation) of plant wash-downs, blender clean-outs or scrubber wastes etc. were incinerated either at Hamilton (Interflow), Mississauga (Tricil), or Corunna (Tricil). Table 4 summarizes the data for wastes from the formulators and the manufacturer of pesticides

PESTICIDE MANUFACTURER

As indicated elsewhere in this report, most technical pesticides formulated in Ontario are imported via Canadian subsidiaries of foreign manufacturers in the U.S.A., Europe and Japan. There is only one manufacturer of pesticides in Ontario.

Table 4 shows the principal waste materials produced at the manufacturer's plant. Diagrams 3 and 4 show, in a simplified form, the process flow sheets and the wastes resulting from the processes used.

Two pesticides are manufactured which give rise to wastes. These are the fungicides Vitavax® (5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxanilide) and Plantvax® (5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxanilide 4,4-dioxide). In the Vitavax® process, the major waste (Waste #1) arises from the generation of sulphur dioxide and hydrogen chloride, which are removed from the reactor effluent gases by scrubbing with aqueous sodium hydroxide. This waste contains inorganics (sodium sulphite, sodium chloride and sodium hydroxide) and organics. The exact chemical composition of the organics portion cannot be defined. In 1974, of the 9230 lbs of waste/1000 lbs of Vitavax®, one-half of the total was incinerated by Interflow Systems (Thermal Degradation Ltd.) in Hamilton and one-half went to deepwell disposal at the Tricil Waste Management location in Corunna. Incineration of Waste #1 at Interflow Systems Ltd. generates a clinker containing sodium chloride and sodium sulphate (800 lbs/1000 lbs of Vitavax®) which is landfilled at the Hamilton municipal landfill site.

A further aqueous waste (Waste #2) from the Vitavax® process contains ammonium chloride, calcium chloride and organics. In 1974, 1540 lbs of this waste was generated for each 1000 lbs of Vitavax®. This waste was disposed of to the deepwell at Corunna.

The Plantvax® process generates an aqueous waste (Waste #4) containing formic acid, hydrogen peroxide and organics, which goes to the Corunna deepwell. The volume of this waste was 961 lbs/1000 lbs of Plantvax® in 1974. In addition, distillation of the carrier solvent used in the Vitavax® and Plantvax® processes gave rise to Waste #3 and

Waste #5 respectively. In 1974, the waste generated amounted to a combined total of 71 lbs/1000 lbs of production. Due to chemical decomposition which occurs during distillation, the exact composition of these stillbottom residues is unknown. These tars, in metal drums, are landfilled at Corunna.

Losses in formulating operations at the manufacturer's plant are about 1% of the total materials handled, including the inert fillers. As with other formulators the bulk of this loss is probably due to overfill in the outgoing packaged pesticide.

Diagrams 3 and 4 show, in a simplified form, the process flow sheets and the wastes resulting from the processes used by the manufacturer. 3000 lbs of pesticide containers are landfilled at the North Woolwich landfill site by a St. Jacobs disposal company.

POLLUTION ABATEMENT MEASURES TO REDUCE VOLUMES OF WASTE - MANUFACTURER

During the first quarter of 1975, the volumes of scrubber waters (Waste #1) from the processes in two buildings averaged 5700 lbs/1000 lbs versus a 1974 actual and 1975 estimated value of 9230 lbs/1000 lbs of Vitavax®. This reduction has been achieved despite increased production of pesticide, principally by better controls and improved yields of Vitavax®. A modified operation of the scrubber has been tested in the laboratory and equipment will be installed later in 1975. The process will give a higher solids content for Waste #1 and reduced volume. An improved Plantvax® process has resulted in the elimination of formic acid and greatly reduced

toluene content in Waste #4. Volume of Waste #4 has been reduced from 970 lbs/1000 lbs to 925 lbs/1000 lbs and the volume of the tars (Waste #5) reduced from 31 lbs/1000 lbs to 14 lbs/1000 lbs.

CANADIAN SUBSIDIARIES OF FOREIGN MANUFACTURERS

Several subsidiaries of foreign manufacturers import and warehouse concentrated pesticides and pesticide formulations for shipment to their formulating customers in Canada. Some have formulating done by the existing formulating companies. In addition, these companies may bring in tank car shipments of liquid pesticides which they repackage into smaller containers. All companies in this category, contacted in the study, indicated they have no waste materials from their warehousing operation and repackaging.

WAREHOUSER AND DISTRIBUTOR

One large co-operative in Ontario warehouses pesticides and distributes these materials to their distribution centres and stores in Ontario. They do not formulate but after a recent move to a new location, they had some quantities of residual material or damaged containers which are being held for disposal. This company indicates that exact disposal methods for this material have not been clarified.

PROBLEMS WITH PESTICIDE DISPOSAL INDICATED FROM THIS STUDY

(1) Disposal of pesticides after a fire at a distribution centre

has caused Ministry of Environment personnel considerable difficulty on at least one occasion. Containers of pesticides were blackened by fire and some of the contents were damaged by water during a fire at a distribution centre in the Niagara peninsula. The Ontario Ministry of Environment experienced considerable difficulty arranging for the disposal of this material. Although somewhat vague about the actual disposal method, the Ministry personnel at the West Central Regional Office indicated that the materials were ultimately disposed of in a satisfactory manner.

(2) The storage area for obsolete or restricted use pesticides is being filled up at Simcoe and methods for disposal have not been clarified.

(3) The disposal of the manufacturer's liquid wastes to the deepwell at Corunna will be discontinued by December 1975. Alternative disposal methods for handling large volumes of the manufacturer's waste will have to be devised.

(4) Some wastes now going to incineration, e.g. blender clean-outs, could be held and re-used by formulators when production of the same pesticide is again scheduled.

(5) Some pesticide container wastes are going to the Beare Rd. disposal site east of Toronto, which is an abandoned gravel pit site. This site will be filled sometime in 1976. The Ontario Ministry of Environment is testing for signs of well water contamination in wells close to the site.

Contacts with the various companies indicated that the Ontario Ministry of Environment, through its central and regional offices, maintains a close contact with both the formulators and the manufacturer, as well as distribution outlets, so that all wastes generated are disposed of to land, incinerated or stored awaiting decisions for ultimate disposal.

FORMULATORS

NAME	ADDRESS
Chemagro Ltd.	379 Bowes Road, Concord, Ont. L4K 1B1
Chipman Chemicals Ltd.	Box 3100, Postal Station C, 519 Parkdale Ave. N., Hamilton, Ont. L8H 5Y6
King Pesticide Ltd.	Campbellville, Ont. LOP 1BO
FMC of Canada Ltd., Agricultural Chemicals Div. (Niagara Chemicals)	1274 Plains Rd. E., Burlington, Ont. L7S 1W6
Plant Products Co. Ltd.,	314 Orenda Rd., Bramalea, Ont. L6T 1G1
Pfizer Company Ltd.,	Plant - Sarnia, Ont.
Shamrock Chemicals Ltd.	P.O. Box 321, 595 Exeter Rd., London, Ont. N6A 1A9
Tuco Products Co., Div. of Upjohn Co. of Canada.	3 McCarthy St., Orangeville, Ont. L9W 1A9
Wilson Laboratories Ltd.	Brock & Hatt Streets, Dundas, Ont. L9H 2H9
Rohm and Haas Canada Ltd.	2 Manse Rd., West Mall, Toronto, Ont. M1E 3T9
Shell Canada Ltd.	(1) 500 Commissioner St., Toronto (2) First Avenue, Simcoe St.
N.M. Bartlett Manufacturing Co. Ltd.,	P.O. Box 490, 931 Bartlett Rd., Beamsville, Ont. LOR 1BO
Ciba-Geigy Canada Ltd., Agrochemicals Div.	1200 Frandlin Blvd., (Galt) Cambridge, Ont. N1R 5X9

MANUFACTURERS

Uniroyal Chemicals Ltd.	Erb St., Elmira, Ont. NOB 1RO

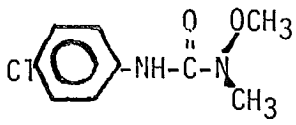
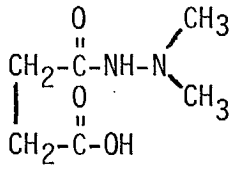
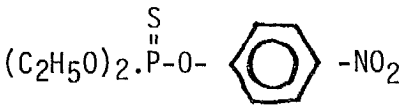
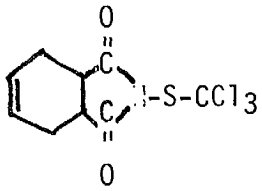
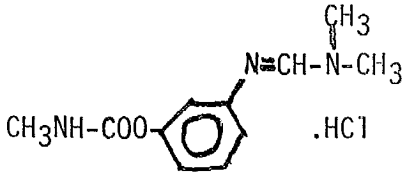
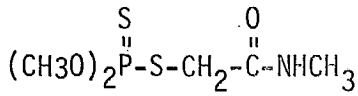
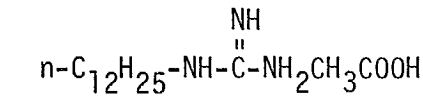
TABLE 1

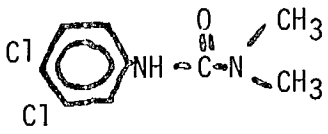
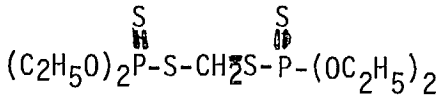
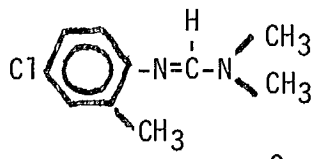
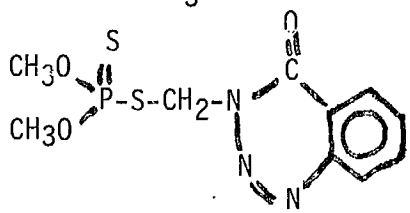
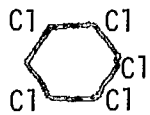
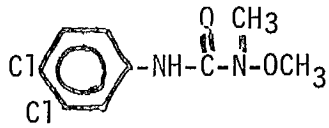
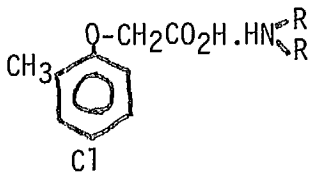
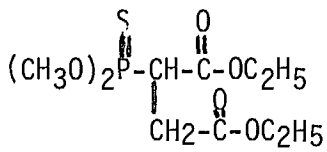
PESTICIDES FORMULATED BY A TYPICAL FORMULATING COMPANY

AFESIN	LINDANE	RODENT REPELLENT
ALAR	LINURON	ROTENONE
AMSOL	MCP AMINE	SEVIN
AQUA PARATHION	MCP SODIUM	SILVAPROP
BRACO	MALATHION	SINOX PE
BRUSH KILLER-PREMIUM	MANEB	SOLAN
CAPTAN	MANZATED	STIK (N.A.A.)
CARZOL SP	MANZATE 200	STIKCOL-D
CHLORDANE	MECOTURF	SULPHUR, AGRICULTURAL
CYGON	METHOXOL	SUPERIOR OIL 70
CYPREX	MICRO NIASUL	SUPER-SPRED
DIURON	MOUSE BAIT 2 (WAXED)	TANDEX-DUIRON
DYTOP	ORTHOCIDE (CAPTAN)	TANDEX
ESTAPROP	PARATHION	THIMET
ETHION	PHALTAN	THIODAN
ETHION/THIRAM	PHYGON	THIRAM
ETHION SUPERIOR OIL	POLYRAM	ZINEB
FERBAM	POLYRAM-DIAZINON DUST	ZOLONE
FIXED COPPER	POLYRAM-LINDANE SEED PROTECTANT	
FUNDAL SP	POLYRAM-LIQUID SEED PROTECTANT	
GUTHION		

TABLE 2

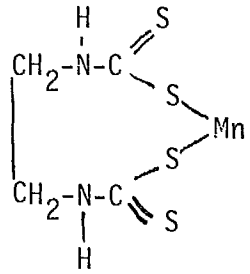
TRADE NAMES OF PESTICIDES HANDLED BY A TYPICAL LARGE FORMULATING COMPANY

Trade Name	Generic Name	Structure
AFESIN	3-(p-Chlorophenyl)-1-methoxy-1-methyl urea	
ALAR	Succinic acid 2,2-dimethyl hydrazide	
AQUA PARATHION	0,0-Diethyl 0-p-nitrophenyl phosphorothioate	
CAPTAN	cis-N-((trichloromethyl)thio) -4-cyclohexene-1,2,dicarboxamide	
CARZOL SP	N,N-Dimethyl,N(3((methylamino carbonyl)oxy)phenyl)methanimide amide monohydrochloride	
CHLORDANE	1,2,4,5,6,7,8,8-Octachlor-2,3,3a 4,7,7a-hexahydro-4,7-methanoindane Chlorinated Hydrocarbons	
CYGON	0,0-Dimethyl S-(N-methylcarbamoyl-methyl) phosphorodithioate	
CYPREX	n-Dodecyl guanidine acetate	

Trade Name	Generic Name	Structure
DIURON	3-(3,4-Dichlorophenyl)-1,1-dimethylurea	
DYTOP	See DINOSEB	
ETHION	0,0,0,0-Tetraethyl S'S-methylene bisphosphoro dithioate	
FUNDAL	N'-(4-chloro-o-tolyl)-N,N-dimethyl formamidine	
GUTHION	0,0-Dimethyl S-[(4-oxo-1,2,3-benzotriazine-3(4H)-yl) methyl]phosphorodithioate	
LINDANE	Eexachlorocyclohexane	
LINURON	3-(3,4-Dichlorophenyl)-1-methoxy-1-methylurea	
MCP-AMINE	[(4-chloro-o-tolyl)oxy] acetic acid, amine salt	
MCP SODIUM	Sodium salt MCP acid	
MALATHION	0,0-Dimethyl S-(1,2-dicarbethoxyethyl)phosphorodithioate	

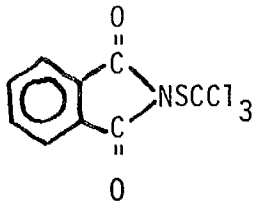
MANEB

Manganese salt of ethylene bisdithiocarbamate



PHALTAN

N-(Trichloromethylthio) phthalimide

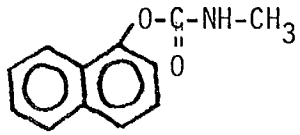


POLYRAM

Mixture of ethylene bis(dithiocarbamate) zinc and (dithiobis(thiocarbonyl) iminoethylene)bis(dithiocarbamate) zinc

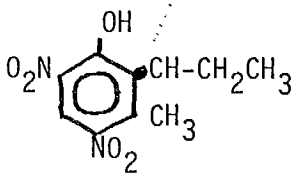
SEVIN

1-Naphthyl N-methyl carbamate



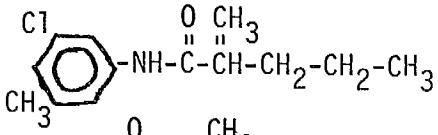
DINOSEB (SINOX)

2-sec-Butyl-4,6-dinitrophenol



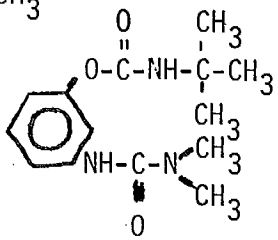
SOLAN

3'-Chloro-2-methyl-p-valerotoluidide



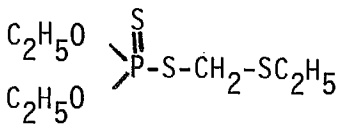
TANDEX

m-(3,3-Dimethylureido)phenyl-tert-butylcarbamate



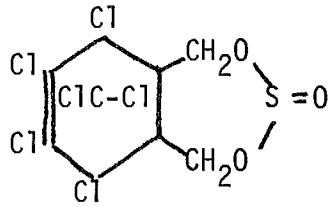
THIMET

O,O-Diethyl S-(ethylthiomethyl) phosphorodithioate



THIODAN (ENDOSULFAN)

6,7,8,9,10,10Hexachloro 1,5, 5(a) ,6,9,9(a) hydro-6,9-methano-2,4,3 benzo(e) dioxathiepin-3-oxide



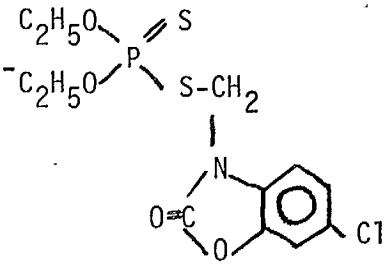
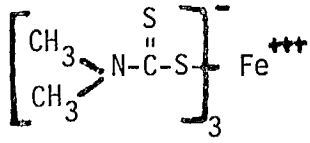
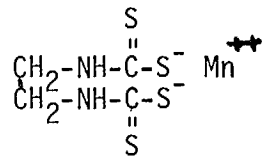
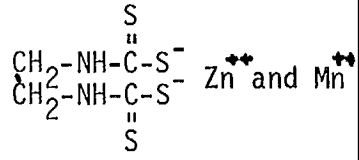
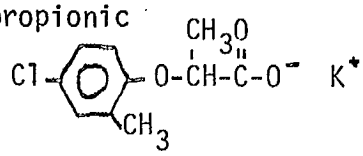
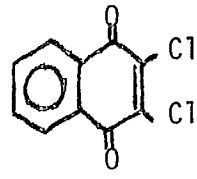
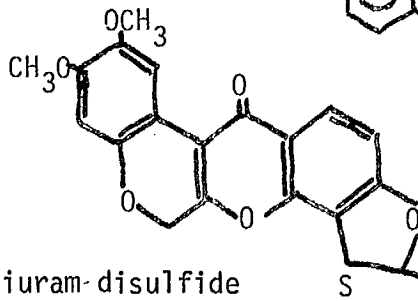
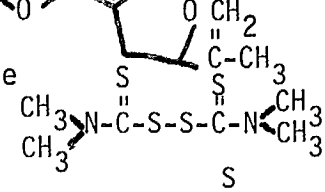
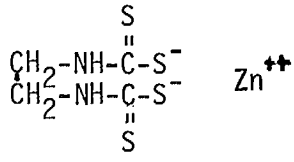
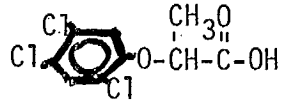
ZOLONE	0,0-diethyl S-[(6-chloro-2-oxo-benzoxazolin-3-yl)methyl] phosphorodithioate	
FERBAM	Ferric dimethyldithiocarbamate	
MANZATE	Manganese ethylene bisdithiocarbamate	
MANZATE 200	Zinc and manganese ethylene bisdithiocarbamate	
MECOTURF	2-(4-chloro-2-methylphenoxy)propionic acid, potassium salt	
PHYGON	2,3-Dichloro-1,4-naphthoquinone	
ROTENONE	-	
THIRAM	Tetramethylthiuram disulfide	
ZINEB	Zinc ethylene bisdithiocarbamate	
SILVEX	2-(2,4,5-Trichlorophenoxy)propionic acid	

TABLE 3

PESTICIDE FORMULATING INDUSTRY WASTES IN 1974

Company Code	Type of Production	Type and Amount of Waste				Waste Incinerated	Waste to Land Fill	Landfill Disposal Site
		Empty Containers (a)	Toxic Scrap (b)	Wash Down (c)	Inert Fillers (d)			
A	Formulator	lbs/annum 15,000	lbs/annum 15-18,000	lbs/annum 80,000	lbs/annum Nil	lbs/annum 98,000 Mississauga Corunna	lbs/annum 15,000 (a)	Vaughan Township
B	Formulator	150,000		15-16,000	20,200	15-16,000	170,000 (a)	Hamilton Landfill
C	Formulator	160,000	Nil	2,600,000	Nil	2,600,000 (c)Hamilton	160,000 (a)	Cambridge Landfill
D	Repackager (Formulation)	5,000	Nil	Nil	Nil		5,000 (a)	Beamsville
E	Formulator	11,000	Nil	Nil	Nil		11,000	Campbellville
F	Formulator	1,000,000		20,000	Obsolete 175,000	20,000 Mississauga	1,000,000	Burlington Landfill
G	Formulator		Herbicide Drums					Waste Herbicide sprayed on property
H	Formulator	4,000		3,000		3,000		Corunna
I	Formulator Repackager	60,000	-	-	-	-	60,000	Near Bradford Concession 12
J	Formulator	5,000	-	-	-	-	5,000	Dundas Municipal Site
K	Formulator	7,500	-	22,000	-	22,000	-	Scarborough
K1	Formulator	15,000	Filter 300			300		Dover Landfill
L	Formulator Mfg.	3,000	-	-	-	-	3,000	North Woolwich

TABLE 4

SUMMARY OF PESTICIDE INDUSTRY WASTES IN 1974

FORMULATOR

Type of Waste	Waste to Landfill lbs/annum	lbs/1000 lbs Product	Waste Incinerated	lbs/1000 lbs	Waste to Deepwell	lbs/1000 lbs
Discarded Paper Containers	1,415,000	17				
Toxic Scrap	15-16,000	0.2				
Wash-Down Materials			2,740,000	34		
Inert Filler Clean-Out	20,000	0.25				
Drums	7,500	0.09				
MANUFACTURER						
Scrubber Wastes				4,615		
Reaction Washes						7,125
Oxidation Carrier						
Containers (from formulating)	3,000	1.4				
Stillbottoms (Tars)	—	71				
Clinker from Incineration		800				

TABLE 5

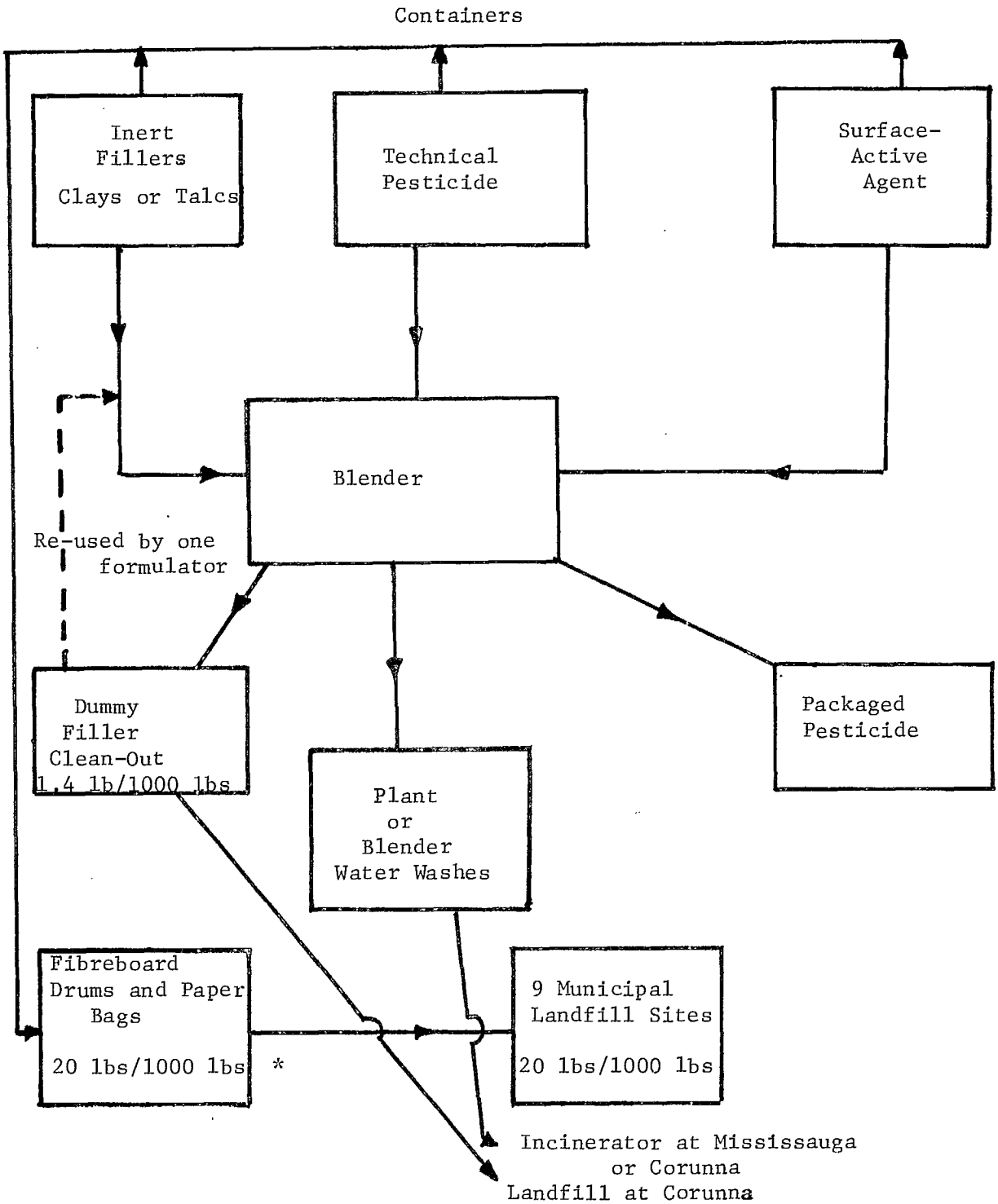
LANDFILL SITES FOR PESTICIDE WASTES

AND INDICATED SOIL CONDITIONS

Location of Landfill Site	Type of Landfill Site	Soil Conditions	Type of Sub-Surface
Corunna, Ont.	Tricil Landfill	Clay - Clay Till 120-150 ft. deep	
Corunna, Ont.	Tricil Deepwell		660 ft. Detroit formation
Burlington, Ont.	Municipal Landfill	Clay	
Hamilton, Ont.	Municipal Landfill	Clay on Shale	
Cambridge, Ont.	Municipal Landfill	Clay and Rock	
Bradford, Ont. 12th Concession	York Sanitation		
Vaughan Township	Municipal Landfill		
Maple, Ont.	Municipal Landfill	Gravel	
Campbellville, Ont.	Municipal Landfill		
Beares Road	Municipal Abandoned Gravel Pit		
North Woolwich	Regional Landfill		
Scarborough, Ont.	Municipal Landfill		
Dover, Ont.	Municipal Landfill		

DIAGRAM 1

PESTICIDE FORMULATORS'
SIMPLIFIED PROCESS FLOW SHEET
DUSTS OR WETTABLE POWDERS



* Total amount of waste containers from sprayable concentrates and wettable powders

DIAGRAM 2

PESTICIDE FORMULATORS'
SIMPLIFIED PROCESS FLOW SHEET
SPRAYABLE EMULSION CONCENTRATES

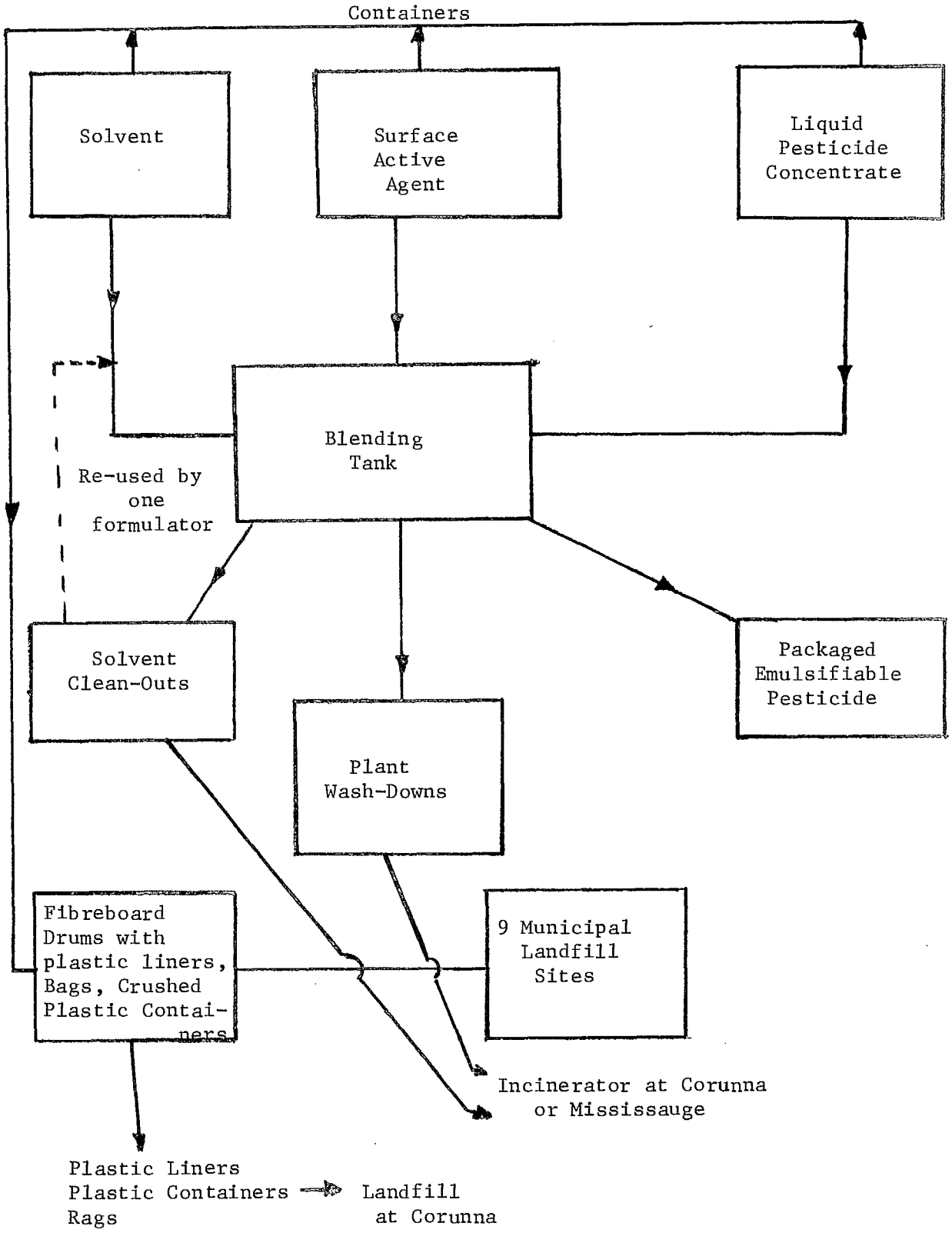


DIAGRAM 3

MANUFACTURER'S SIMPLIFIED

VITAVAX® PROCESS FLOW SHEET

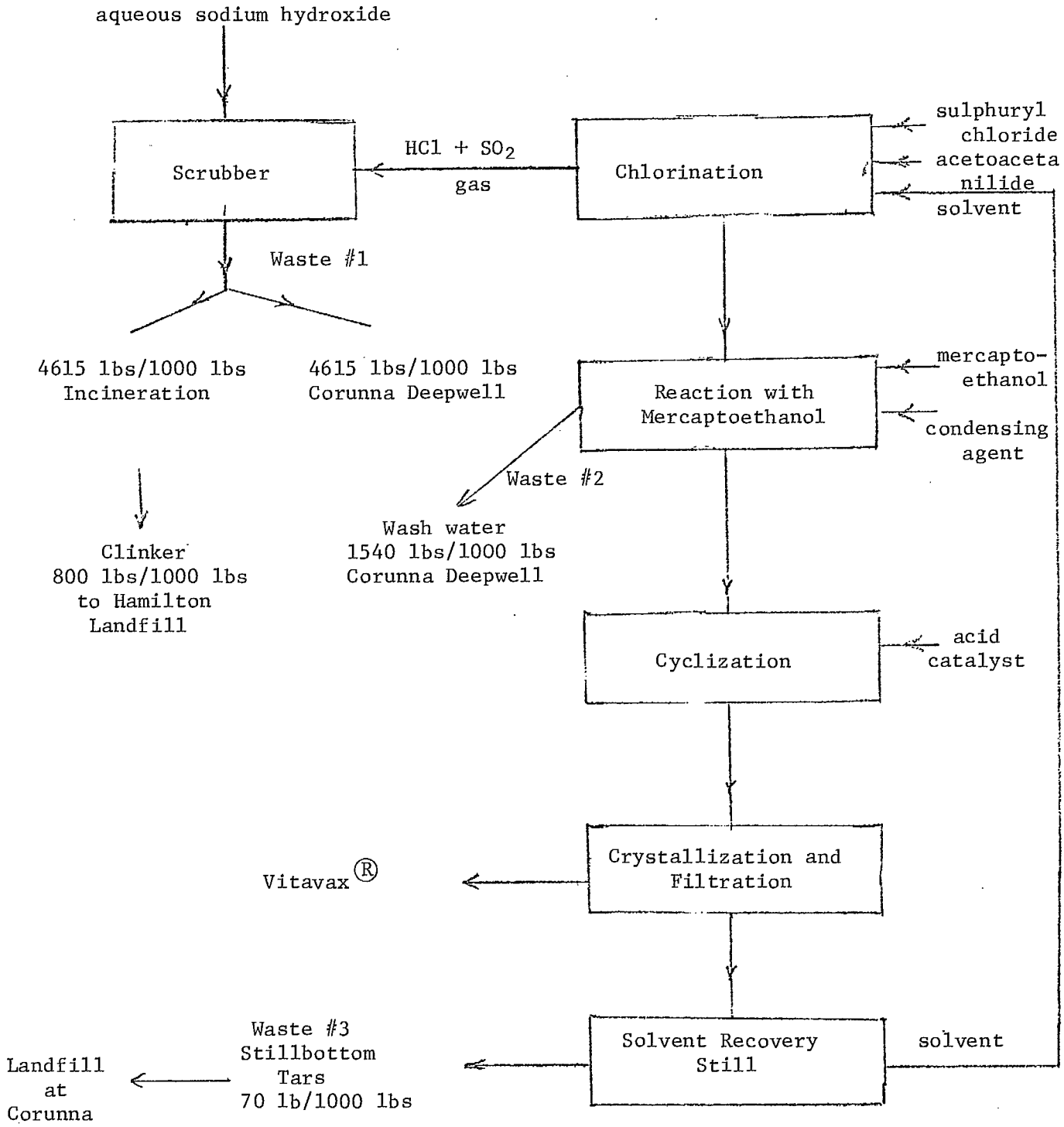
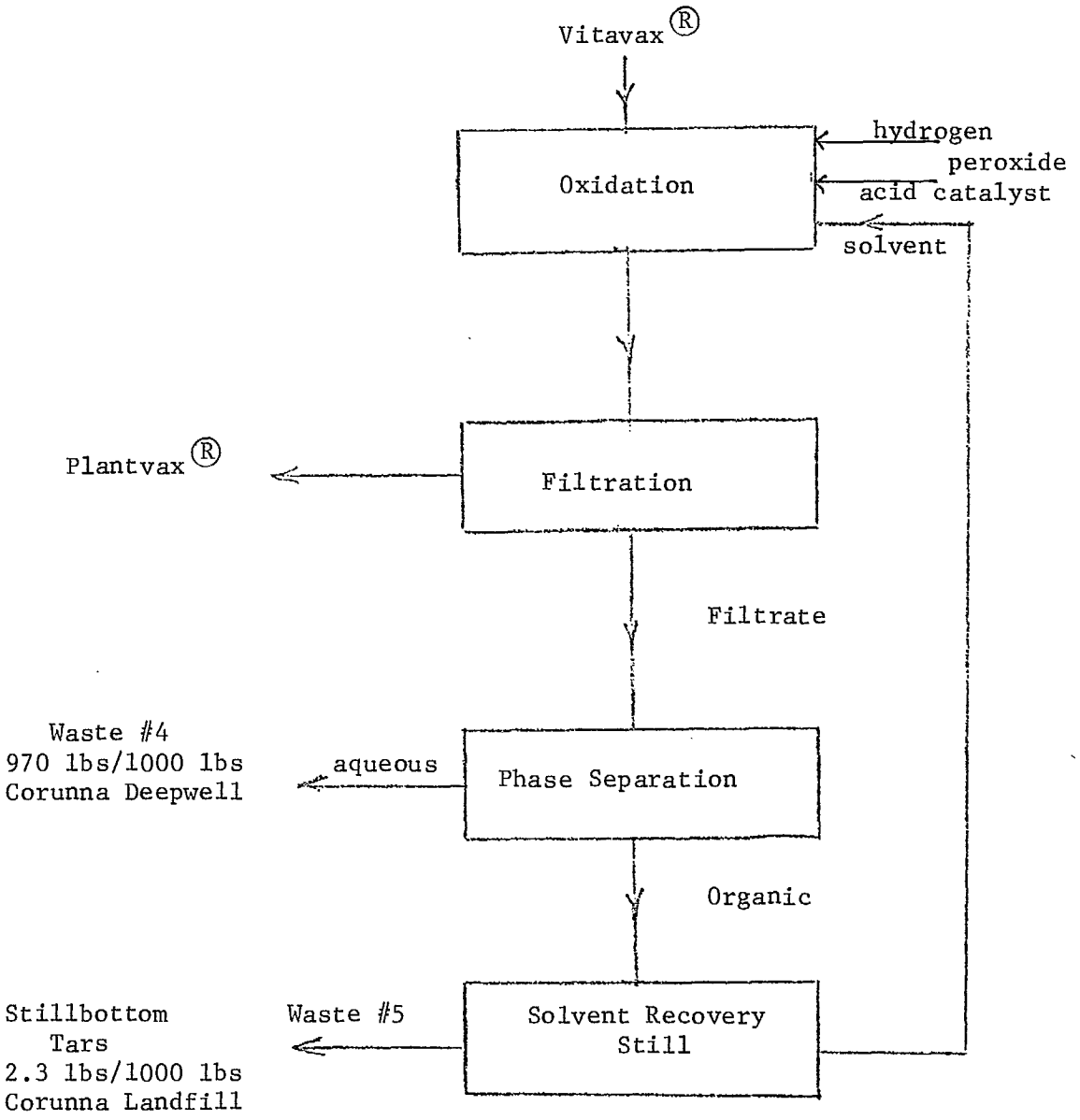


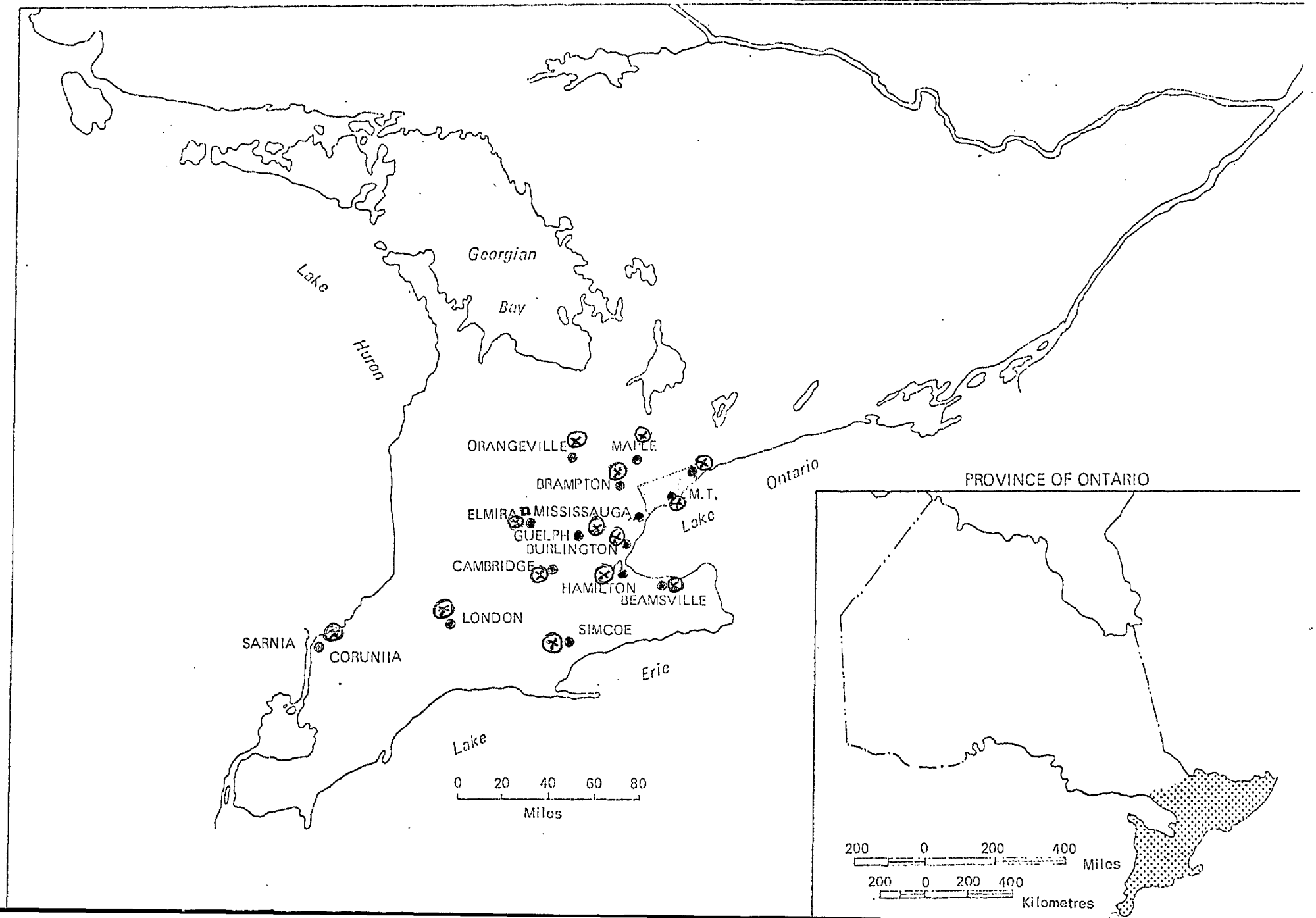
DIAGRAM 4

MANUFACTURER'S SIMPLIFIED

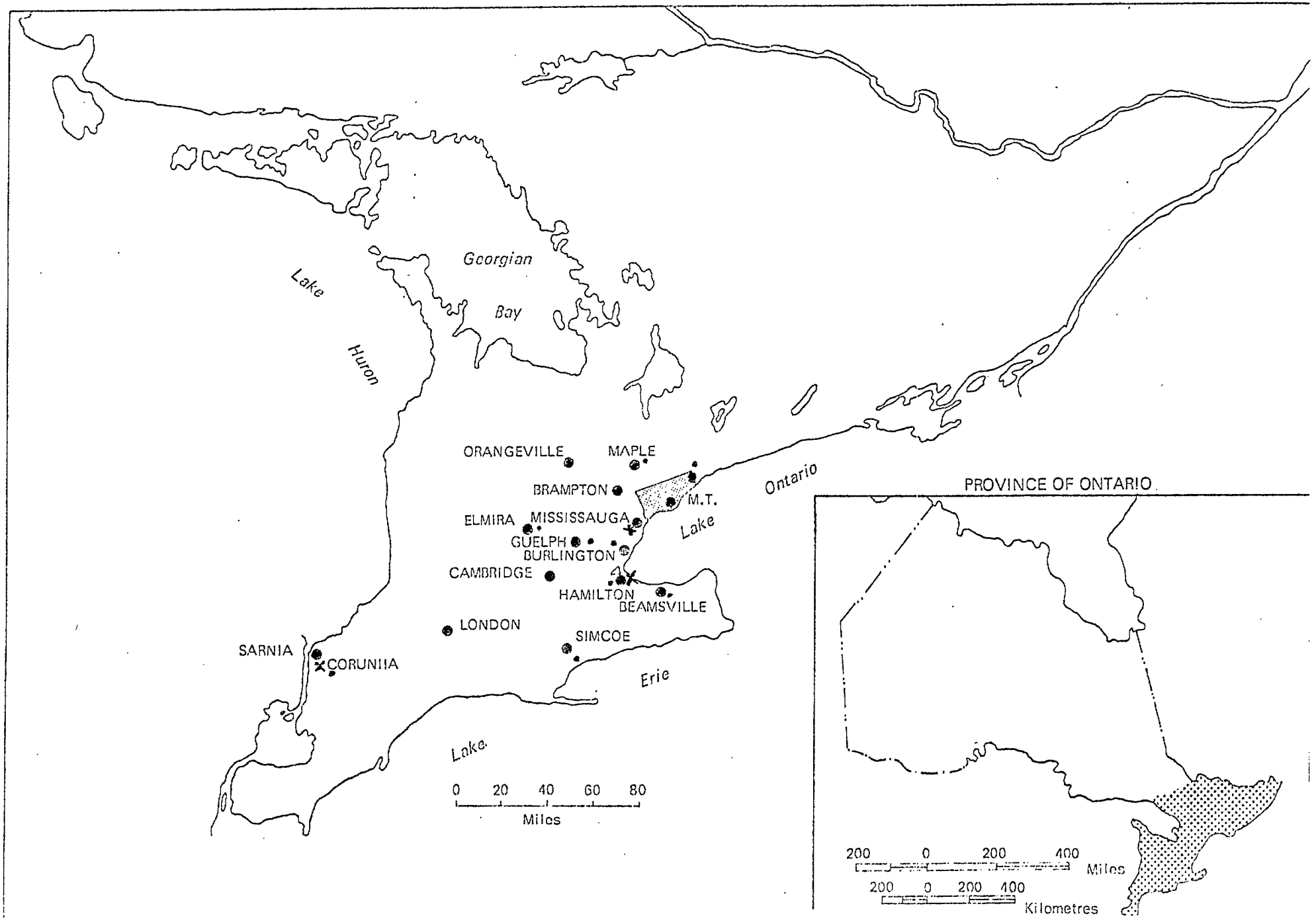
PLANTVAX® PROCESS FLOW SHEET



MAP 1. LOCATION OF FORMULATORS ⊗ AND MANUFACTURER □



MAP 2. DISPOSAL OR LANDFILL SITES • INCINERATORS ×



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