

ELECTRONIC WASTE MANAGEMENT IN VERMONT

January 2004



**Agency Of Natural Resources
Department Of Environmental Conservation**

Table 1:
ESTIMATED LIFE OF SELECTED CONSUMER ELECTRONICS
(in years)ⁱ

	Range of Primary and Secondary Use (Reuse) Life Expectancy (in years)
Video Products	
Direct View Color TV	13 to 15
Projection TV	13 to 15
LCD Color TV	13 to 15
Videocassette Players	7 to 10
VCR Decks	7 to 10
Camcorders	7 to 10
Laserdisc Players	7 to 10
Audio Products	
Rack Audio System	3 to 15
Compact Audio System	3 to 15
Portable CD	3 to 15
Portable Headset Audio	3 to 15
Total CD Players	3 to 15
Home Radios	3 to 15
Information Products	
Cordless/Corded Telephones	3 to 6
Wireless Telephones	2 to 4
Telephone Answering Machines	3 to 6
Fax Machines	3 to 6
Personal Word Processors	3 to 6
Personal Computers	3 to 6
Computer Printers	3 to 5
Computer Monitors	6 to 7
Modem/Fax Modems	3 to 6

ⁱ Municipal Solid Waste in the United States: 2000 Facts and Figures. US EPA Office of Solid Waste and Emergency Response. June 2002, Pages 150-160.

Table 3:
MATERIAL CONSTITUENTS OF CONSUMER ELECTRONICS
IN THE MUNICIPAL WASTE STREAM
(In percent of total generation)ⁱ

Type of Consumer Electronics	Steel	Copper & Brass	Aluminum	Lead	Other Metals	Glass	Wood	Plastic	Other
Video Products	22%	3%	0%	7%	10%	27%	20%	11%	0%
Audio Products	21%	0%	0%	0%	30%	0%	3%	47%	0%
Information Products (includes computers, etc.)	27%	5%	4%	3%	4%	8%	0%	46%	2%
Total	24%	3%	2%	4%	11%	15%	9%	32%	1%

How are Computers Recycled?

COMPUTER RECYCLING

Some products destined for recycling, such as aluminum cans and newspapers, find themselves reborn as like products. But tracing the path of recycled electronic products is considerably more complicated. What follows are some of the steps a typical computer could undergo during recycling:

CIRCUIT BOARDS

Most circuit boards and some hard drives can be marketed for resale as operational parts. Unusable circuit boards are chopped into a powder and separated into fiberglass, metals, and precious metals through a process called fire assay.

PLASTIC HOUSINGS

Plastic housings are separated from the electronic equipment, and materials such as labels and foam insulation are removed through air classification. Unfortunately, plastic housings on computers and monitors will not fit on newer equipment. At present, these plastics are difficult to market because they contain mixed or unmarked resins that cannot be readily identified or separated, as well as some additives such as flame-retardants that complicate recycling. Some near-term uses of these plastics include use in roadbed fill. Efforts are under-way, however, to find higher value applications for these plastics in products such as flooring, computer, and automotive parts.

SMALL PLASTIC COMPONENTS

The small plastic parts inside computers are typically made from uniform-colored, high-density polyethylene (HDPE). This makes them easier to remove, grind, and process. Recyclers must take great care not to mix other materials (e.g., metals) or different resins in with these plastics. Even a small amount of contamination can cause a buyer to reject an entire load. If ground plastic resins appear to have contamination from mixed resins, the recycler can hydroseparate them because of their varying densities.

SCREWS, CLIPS, SMALL METAL PARTS

Screws, clips, and small metal components are sorted and separated magnetically into ferrous and nonferrous groups. The metals are sold as scrap.

MONITORS

Monitors are handed over to a separate demanufacturing line; where workers remove the plastic housings, metal supports, and circuit boards. The cathode ray tube (CRT) itself is a funnel-shaped, leaded glass tube with a metal frame inside. The worker separates the funnel from the front panel glass. The CRT is then crushed, and the leaded glass and metal are separated. The glass is screened, processed, and inspected for contaminants. Much of it can be sold to CRT manufacturers for use in new CRT glass. The metal is sold for its scrap value.

Current Vermont Regulations Affecting Discarded Electronics

All household-generated waste is categorically exempt from regulation as hazardous waste in Vermont. Most business-generated electronic waste, however, is subject to regulation as hazardous waste. This is due to the lead in circuit boards and cathode ray tubes as well as other hazardous constituents in these wastes. Currently there are no landfill bans or mandatory separation for residential TVs and computers (except for some mercury-containing liquid crystal display (LCD) monitors (see below).

Vermont Hazardous Waste Management Regulations address electronic waste as follows:

- Shredded circuit boards are exempt if they are recycled and managed prior to recycling (according to certain conditions).
- Hazardous waste management regulations are being proposed to include cathode ray tubes (CRTs) as Universal Wastes. If designated as Universal Waste, CRTs could be managed according to standards that are more streamlined than the existing hazardous waste management regulations in order to promote recycling.
- Finally, the Department does not consider electronics that are designated for reuse, or that are dismantled for the purpose of reusing components, to be hazardous waste. However, any hazardous components that are not reused must either be managed as hazardous waste or according to applicable exemptions or alternative standards (i.e., universal waste).

In addition, Vermont's mercury labeling law (10 V.S.A. § 6621 d) requires a visible label for liquid crystal display (LCD) computer monitors prior to purchase due to the presence of a mercury-added fluorescent lamp. Labeled LCD monitors are banned from landfill disposal.

Table 2:

**NATIONAL GENERATION, RECOVERY, AND DISCARDS OF CONSUMER
ELECTRONICS IN THE MUNICIPAL WASTE STREAM 2000
(in tons)ⁱ**

Type of Consumer Electronics	Total Generation	Total Reused or recycled	% Reused or recycled	Total Discards ¹
Video Products	859,300	1,200	0.1%	858,100
Audio Products	348,200	0	Neg.	348,200
Information Products (includes computers, etc.)	916,900	192,500	21%	724,400
Total	2,124,400	193,700	9%	1,930,700

¹ Discards include electronics that are stored in basements, attics, garages, etc., and those placed in the trash.

**Table 4:
ESTIMATED VERMONT GENERATION, RECOVERY,
AND DISCARDS OF CONSUMER
ELECTRONICS IN THE MUNICIPAL WASTE STREAM (Year 2000).
(In tons)**

Type of Consumer Electronics	Total Generation	Total Recovery	% Recovered	Total Discards ¹
Video Products	1804	0	Neg.	1804
Audio Products	731	0	Neg.	731
Information Products (includes computers)	1925	453 ²	23%	1472
Total	4460	453	10%	4007

¹ Discards include electronics that are stored in basements, attics, garages, etc and those placed in the trash.

² This total represents mostly computers and computer related equipment and a small percentage of TVs (less than 10%). It does not include direct recycling by businesses (i.e., from a business to a demanufacturer or a recycler).

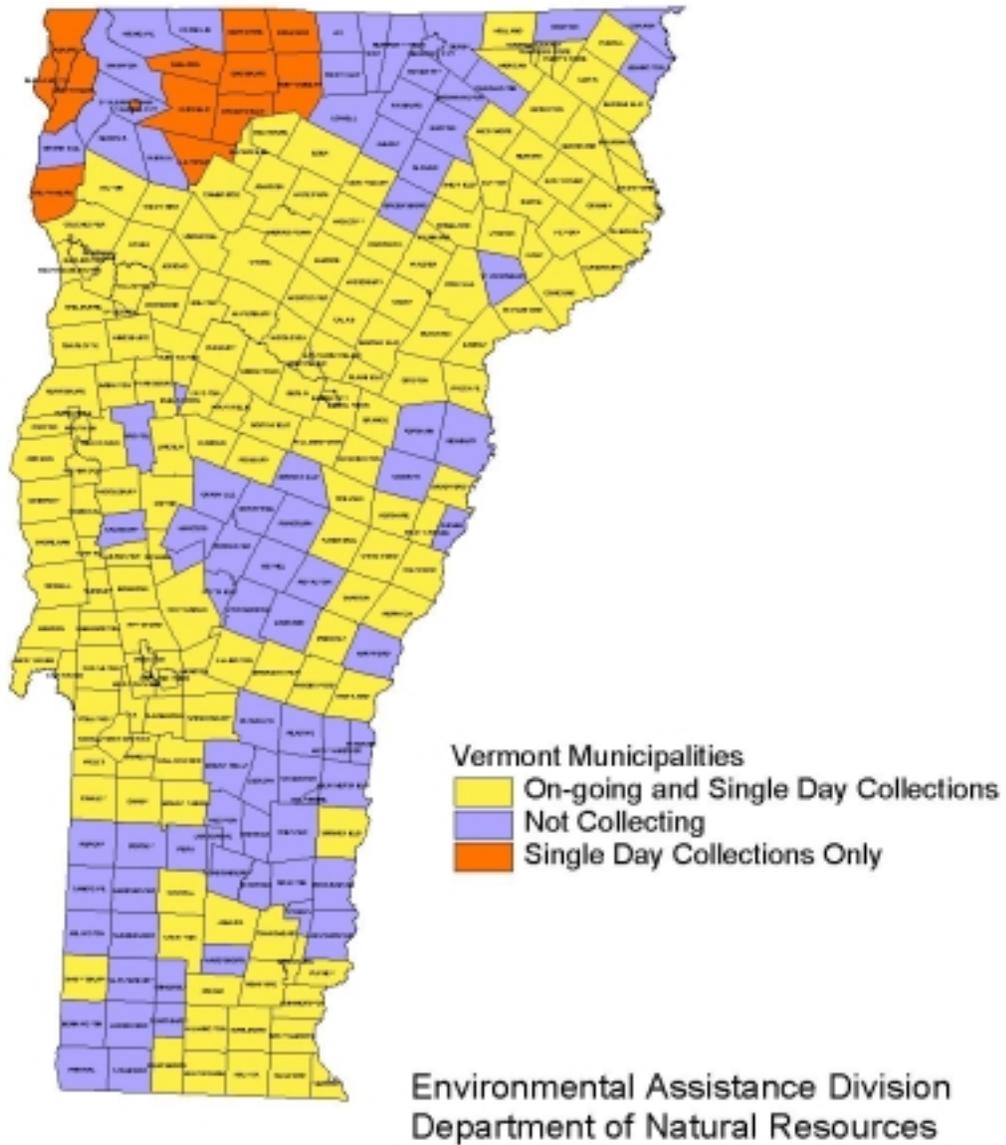
CURRENT STATUS, ISSUES, AND TRENDS

- Vermont has no landfill ban or mandatory separation requirement for discarded electronics (except for liquid crystal display monitors with fluorescent lamp under VT's mercury product labeling law and non-residential CRTs)
- CRTs are the only electronic product component consistently identified as meeting the definition of hazardous waste
- VT DEC was requested by various legislative committees to submit a report on the current status of e-waste in Vermont. This report has been submitted to the legislature (January 2004)
- VT DEC has promoted the collection of residential computers since 2000 and has supported collection program development by municipalities and solid waste districts through a grant program. Very limited collection of TVs.
- At least 23% of computers are recycled in Vermont (does not include good data on business-generated computers, which would increase recycling rate)
- 19 entities collected 453 tons in 2002
- 76% of Vermonters have access to a residential computer collection outlet. Collection fees range from \$5 to \$15.
- VT DEC expects to see increased participation in municipal computer collection programs due to recent submission of municipal solid waste implementation plans
- Consumers and businesses have shown a willingness to pay a reasonable recycling fee
- Initial pilot programs have succeeded in establishing permanent municipal collection programs

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- It is unlikely that voluntary collection programs alone will be able to achieve 50% or more diversion rate for computers, CRTs and other e-waste (general goal in state solid waste plan)
 - While DEC cannot point to data showing significant environmental impact from disposal of e-wastes, the potential exists for air and ground water contamination from landfilling or incinerating these devices.
 - The toxic nature of some of the e-waste constituents should be considered in making the determination of whether to take actions to increase the capture rate of electronics, which is largely a resource conservation and landfill space issue.
 - DEC anticipates that e-waste will be an issue of debate in the current Vermont legislative session. DEC has not sponsored any e-waste bills nor taken a position at this time on the need for legislation. It is possible that the current session will lead to further study and a report to the legislature with recommendations for action by January 2005 (Note: this is speculation!)

STATE OF VERMONT

2002 Discarded Electronics Management



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