

REPORT ON ELECTRONIC WASTE BRAND SORT

**AT THE DECEMBER 2006 KANE COUNTY,
ILLINOIS ELECTRONICS RECYCLING EVENT**

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1.0 PROJECT BACKGROUND

The U.S. Environmental Protection Agency (EPA) Region 5 tasked Booz Allen Hamilton (Booz Allen) to perform a brand sort for returned electronic devices at one or two collection events. The primary target audience for the brand sort results is EPA and its partners in the electronics waste (e-waste) initiative, including Federal agencies; state and local governments; electronics manufacturers, recyclers, and reuse organizations; and non-profit organizations (e.g., the National Center for Electronics Recycling [NCER]). The purpose of the brand sort was to provide EPA with data on the brands and corresponding weights of returned consumer electronic equipment during a typical local government collection event in Region 5. The data will be used to provide EPA and the Agency's partners with baseline information regarding the specific types of equipment that are currently being returned at collection events in Region 5. The data will also be entered into an existing NCER database and compared against existing data from collection events in other parts of the country.

2.0 BASIC COLLECTION EVENT PROCEDURES

The brand sort occurred at the electronics and book recycling event organized by the Kane County Department of Environmental Management on Saturday, December 9, 2006, from 8:00 AM to noon. Mr. Gary Mielke is the Kane County recycling coordinator and point of contact. The collection event was held at the old Montgomery Ward store, located at 540 South Randall Road (between Routes 38 and 64), St. Charles, Illinois. The collection point was located near the loading docks at the back of the building.

The recycling collection event was staffed by eight county public works employees, who drove forklifts and managed the pallets on which returned e-waste was placed. A total of twelve community service workers were also at the event to remove electronic items from vehicles and place them on the appropriate pallets. Three Booz Allen employees attended the event and conducted the brand sort.

Approximately eight wooden pallets were set up to sort electronics: two pallets for televisions (TVs), two pallets for central processing units (CPUs), two pallets for computer monitors, and two pallets with Gaylord boxes for miscellaneous electronic pieces (e.g., keyboards, mice, laptops, compact disks [CDs], and floppy disks). One pallet was also set up with a box for returned/donated books.

Two to three cars pulled up at a time, single file, to the unloading area, and the community service workers unloaded the returned electronics from each vehicle. Unlike some electronics recycling collection points, Kane County does not accept "anything with a plug," so items that did not meet the county's criteria (e.g., dehumidifiers, electric can openers, vacuums) were not accepted. The vehicle occupants were asked what town they were from, as the collection event was open to residents of Kane County and the cities of Aurora and Elgin. According to Mr. Mielke, a small number of out-of-county residents usually participate in these collection events (Kane County accepts and processes their items to keep them out of landfills).

Once a pallet was sufficiently loaded with e-waste, it was secured with plastic wrap to prevent toppling. A forklift transferred the full pallet into one of the trailers parked at the loading docks. An empty pallet was then placed in the vacant spot for the next round of collection.

3.0 BASIC BRAND SORT PROCEDURES

The brand sort was conducted according to the *Electronic Waste Brand Sort Standard Operating Procedure* (Brand Sort SOP) that was submitted to EPA by Booz Allen on December 7, 2006. The three Booz Allen staff members positioned themselves adjacent to the pallets so that they could identify brands of the e-waste as the items were placed on the pallets (or into the Gaylord box, for the laptops). The brand names were recorded on the Brand Recording Form from the Brand Sort SOP, which is included as Attachment 1.

Raw data from the Brand Recording Forms filled out during the collection event were compiled into a Microsoft Excel™ spreadsheet. A quality control (QC) review was conducted of the data entry to ensure that no transcription errors were made. Attachment 2 contains the compiled brand sort data. Brands that did not originally appear on the Brand Recording Form supplied by NCER were thus manually added to the forms during the collection event, and are shown separately from the brands and unknown category that were recorded by hash marks on the Brand Recording Form during the collection event (refer to Attachment 2).

4.0 COLLECTION EVENT DATA AND BRAND SORT RESULTS

4.1 Weight and Unit Count Data by Product Category

Supply-Chain Services, Inc. (SSI) served as the transporter and recycler for this collection event. As required by its existing contract, SSI provided Kane County with the following data in mid-January: weight of all CPUs collected; weights and unit counts for monitors, TVs (non-wood), and TVs (wood) (i.e., TVs in a wooden console); and total weights for all electronics collected. Booz Allen obtained these data from Mr. Mielke on January 16, 2007 (see Table 1 below).

Table 1: Weights, Unit Counts, and Average Weights by Product Category

Category	Pounds	Units	Average Weight (Pounds)
CPUs	15,513	NC	--
Monitors	19,190	521	36.8
TVs (non-wood)	6,529	115	56.8
TVs (wood)	1,455	11	132.3
All Others	17,809	NC	--
Total	60,496	NC	--

NC = Not Counted

From these raw data, the average weights in pounds were calculated for monitors, TVs (non-wood), and TVs (wood). The total weight of all other product categories (e.g., laptops, computer peripherals) was also calculated from these data and presented in Table 1. The average weight for wood (i.e., console) TVs was 132.3 pounds, which is more than double the average weight for non-wood TVs (56.8 pounds). Thus, although console TVs comprise only nine percent of total TVs by unit count, they account for 18 percent of total TVs by weight.

A total of 425 vehicles dropped off e-waste at this collection event. Thus, the collection event yielded approximately 142.3 pounds of e-waste per vehicle. While the majority of the vehicles represented residents, one business did drop off a larger volume of e-waste at this event, which may be biasing this number slightly high. According to Mr. Mielke, the collection events typically draw a few larger loads each month from businesses and local government partners, so this occurrence was not unusual. The electronics returned for recycling at this event filled two and a half semi-trailers, which were loaded and transported to SSI’s recycling facility on Monday, December 11, 2006.

4.2 Brand Sort Results

Table 2 and Figure 1 below display the number of units that were included in the brand sort by major product category: monitors, CPUs, TVs, and laptops.

Table 2: Total Units Counted by Category

MONITORS	CPUs	TVs	LAPTOPS	TOTAL UNITS
412	386	113	32	943

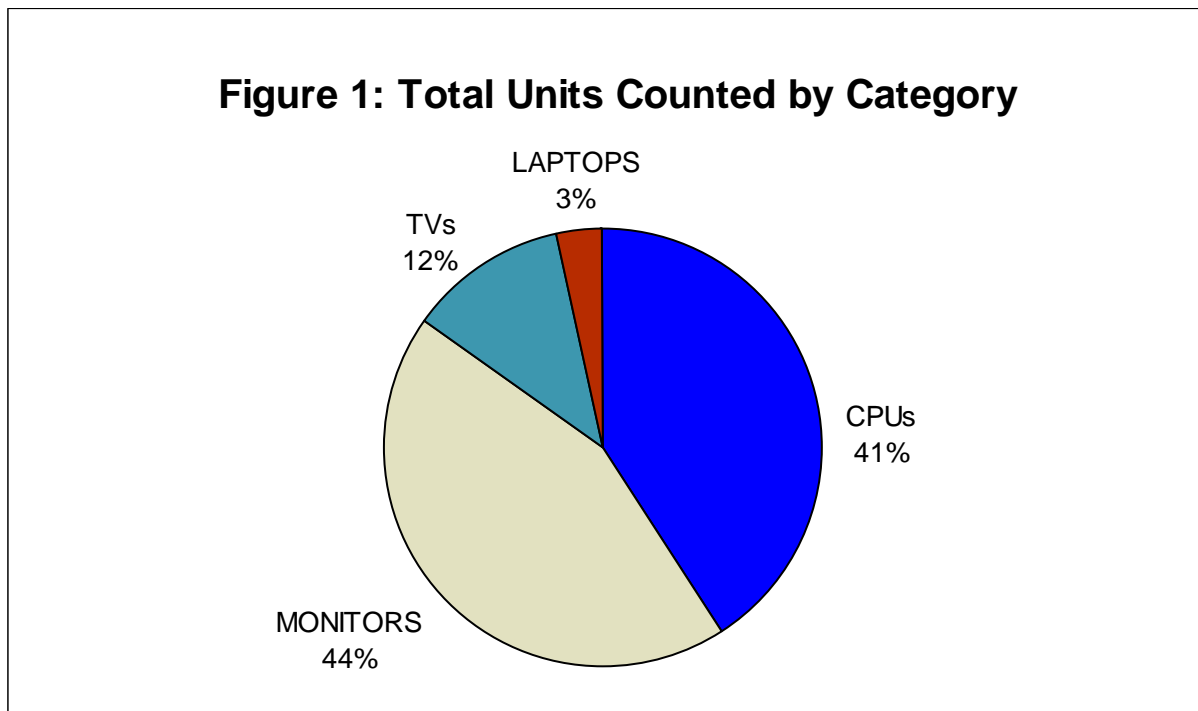


Table 3 and Figures 2 and 3 below display the brand sort results for monitors.

Table 3: Brand Sort Results for Monitors

BRAND	Percent of Monitors Collected	Number of Monitors Collected	Cumulative Percent
GATEWAY	11.9%	49	11.9%
DELL	8.5%	35	20.4%
IBM	7.8%	32	28.2%
COMPAQ	7.5%	31	35.7%
HP/HEWLETT PACKARD	5.3%	22	41.0%
UNKNOWN	5.3%	22	46.4%
SAMSUNG	4.6%	19	51.0%
CTX	4.4%	18	55.3%
OPTIQUEST	4.4%	18	59.7%
PACKARD BELL	4.1%	17	63.8%
VIEWSONIC/ VIEW SONIC	3.9%	16	67.7%
APPLE/MACINTOSH	3.4%	14	71.1%
SONY	3.4%	14	74.5%
ACER	2.4%	10	76.9%
NEC	1.9%	8	78.9%
MAG	1.7%	7	80.6%
EMACHINES	1.2%	5	81.8%
KDS	1.2%	5	83.0%
DAEWOO	1.0%	4	84.0%
MICRON/MICRONPC	0.7%	3	84.7%
KTV	0.7%	3	85.4%
NOKIA	0.7%	3	86.2%
PANASONIC	0.7%	3	86.9%
PHILIPS	0.7%	3	87.6%
PRINCETON	0.7%	3	88.3%
RASTOR OPS	0.7%	3	89.1%
AST	0.5%	2	89.6%
MITSUBISHI	0.5%	2	90.0%
PROVIEW	0.5%	2	90.5%
SANYO	0.5%	2	91.0%
RADIUS	0.5%	2	91.5%
SYSTEMAX	0.2%	1	91.7%
AOC	0.2%	1	92.0%
EPSON	0.2%	1	92.2%
MAGITRONIC	0.2%	1	92.5%
QUANTEX	0.2%	1	92.7%
TOSHIBA	0.2%	1	93.0%
AGI	0.2%	1	93.2%
EMC MULTISYSTEM	0.2%	1	93.4%
HITACHI	0.2%	1	93.7%
HYUNDAI	0.2%	1	93.9%
IMPRESSION	0.2%	1	94.2%

Table 3: Brand Sort Results for Monitors

BRAND	Percent of Monitors Collected	Number of Monitors Collected	Cumulative Percent
INFOTEK	0.2%	1	94.4%
NCR	0.2%	1	94.7%
ORION	0.2%	1	94.9%
TEKNIKA	0.2%	1	95.1%
TOUCH	0.2%	1	95.4%
TVM	0.2%	1	95.6%
ZEOS	0.2%	1	95.9%
II YAMA	0.2%	1	96.1%
BCI	0.2%	1	96.4%
BENTLY	0.2%	1	96.6%
CARDINAL	0.2%	1	96.8%
CL TECK	0.2%	1	97.1%
COMPUDINE	0.2%	1	97.3%
CORNERSTONE	0.2%	1	97.6%
EIZO	0.2%	1	97.8%
LLOYDS	0.2%	1	98.1%
MARK	0.2%	1	98.3%
MONITERM	0.2%	1	98.5%
NOBLEVIEW	0.2%	1	98.8%
PIONEX	0.2%	1	99.0%
RDP	0.2%	1	99.3%
SEPTRE	0.2%	1	99.5%
SYNCO	0.2%	1	99.8%
TECO IS	0.2%	1	100.0%
TOTALS:	100.0%	412	100.0%

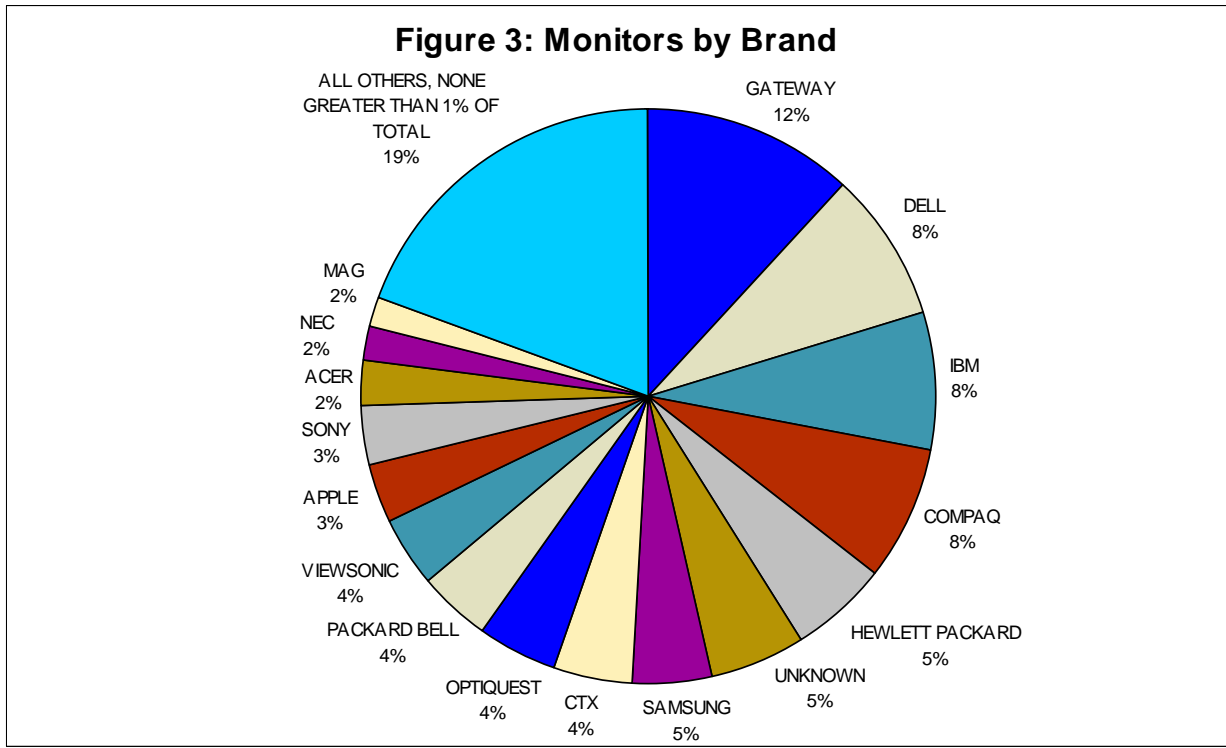
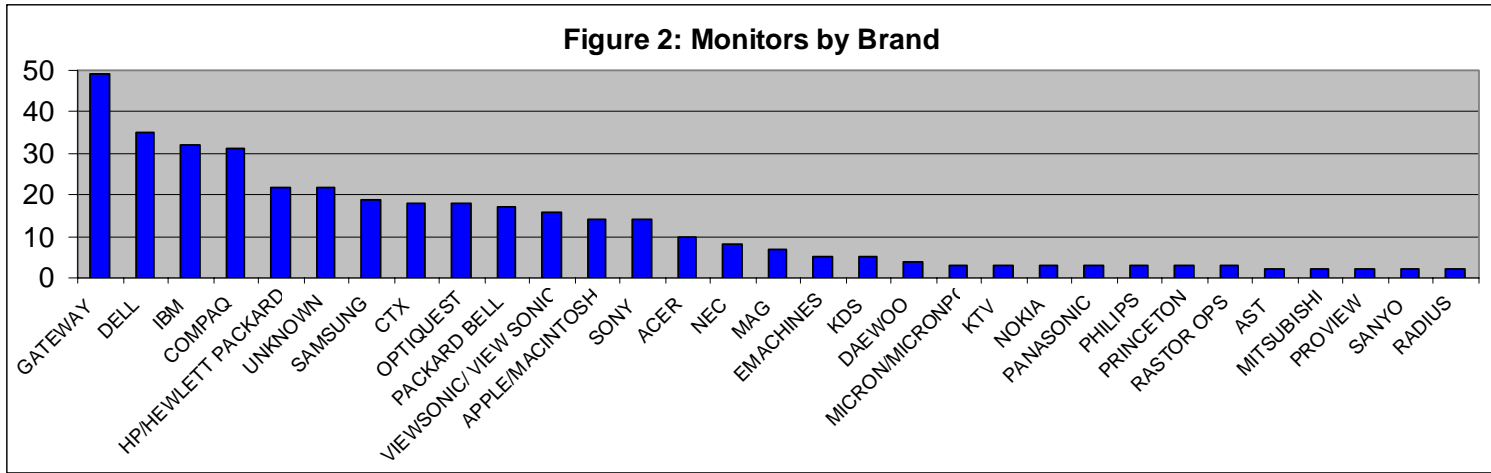


Table 4 and Figures 4 and 5 below display the brand sort results for CPUs.

Table 4: Brand Sort Results for CPUs

Brand	Percent of CPUs Collected	Number of CPUs Collected	Cumulative Percent
COMPAQ	23.3%	90	23.3%
IBM	14.8%	57	38.1%
GATEWAY	12.7%	49	50.8%
HP/HEWLETT PACKARD	12.2%	47	63.0%
UNKNOWN	11.9%	46	74.9%
DELL	8.5%	33	83.4%
APPLE/MACINTOSH	2.8%	11	86.3%
PACKARD BELL	1.8%	7	88.1%
DTK	1.6%	6	89.6%
EMACHINES	1.3%	5	90.9%
ACER	1.0%	4	92.0%
MICRON/MICRONPC	0.8%	3	92.7%
DIGITAL	0.5%	2	93.3%
SYSTEMAX	0.5%	2	93.8%
AOC	0.3%	1	94.0%
AOPEN	0.3%	1	94.3%
AST	0.3%	1	94.6%
AT&T	0.3%	1	94.8%
CHAMPION/CHAMPION KLH/KLH	0.3%	1	95.1%
EPSON	0.3%	1	95.3%
KFC	0.3%	1	95.6%
LEADING EDGE	0.3%	1	95.9%
MAGITRONIC	0.3%	1	96.1%
NEC	0.3%	1	96.4%
QUANTEX	0.3%	1	96.6%
QUASTAR	0.3%	1	96.9%
SONY	0.3%	1	97.2%
TELETYPE	0.3%	1	97.4%
TOSHIBA	0.3%	1	97.7%
ADI	0.3%	1	97.9%
BAY	0.3%	1	98.2%
BTK	0.3%	1	98.4%
CYBERMAX	0.3%	1	98.7%
FOUNTAIN/BESTEC	0.3%	1	99.0%
HBS	0.3%	1	99.2%
KENITEC	0.3%	1	99.5%
PROTIVA	0.3%	1	99.7%
UNION FRIENDLY	0.3%	1	100.0%
TOTALS:	100.0%	386	100.0%

Figure 4: CPUs by Brand

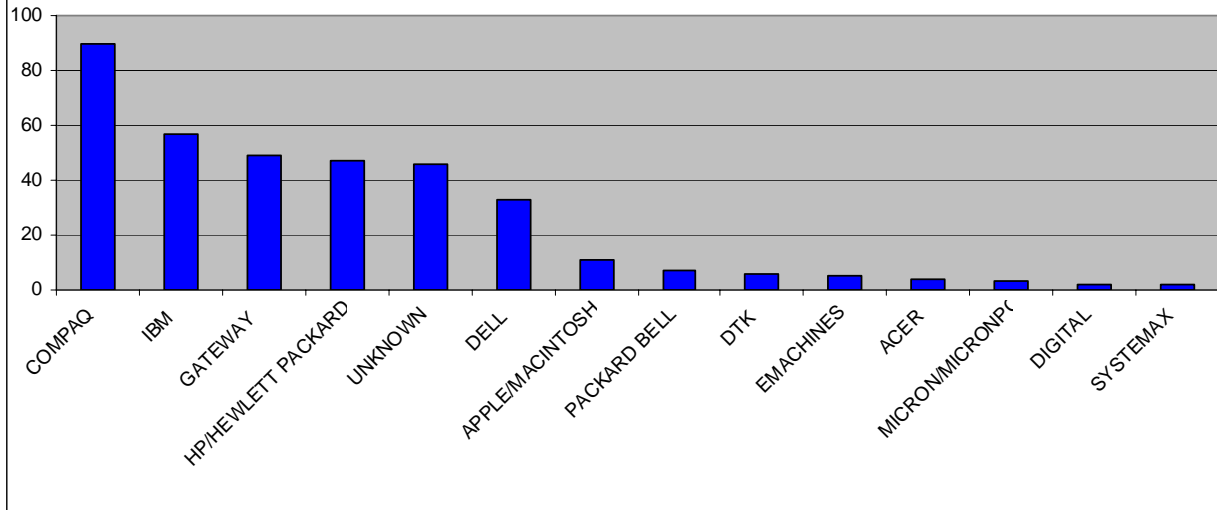


Figure 5: CPUs by Brand

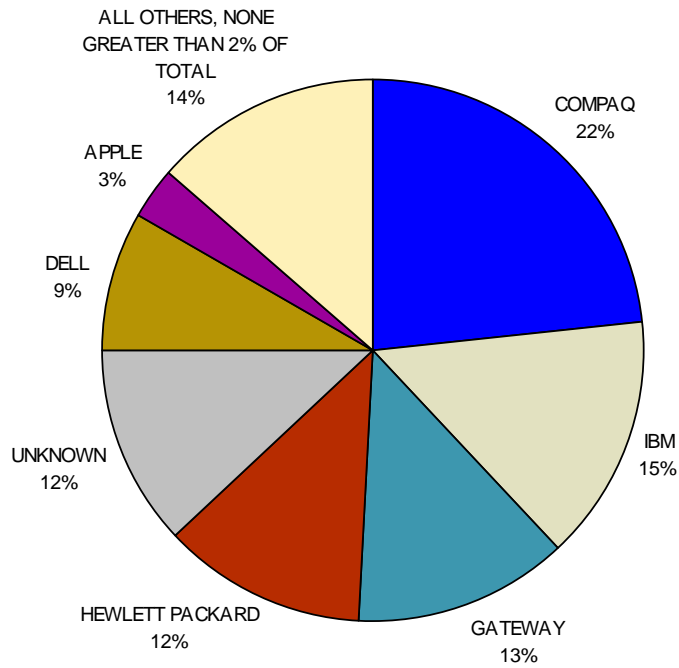


Table 5 and Figures 6 and 7 below display the brand sort results for TVs.

Table 5: Brand Sort Results for TVs

Brand	Percent of TVs Collected	Number of TVs Collected	Cumulative Percent
ZENITH	19.47%	22	19.5%
RCA	11.50%	13	31.0%
SONY	7.96%	9	38.9%
TOSHIBA	7.08%	8	46.0%
MAGNAVOX	7.08%	8	53.1%
MITSUBISHI	6.19%	7	59.3%
GE/G E	5.31%	6	64.6%
SHARP	4.42%	5	69.0%
SYLVANIA	3.54%	4	72.6%
SYMPHONIC	3.54%	4	76.1%
QUASTAR	2.65%	3	78.8%
JVC	2.65%	3	81.4%
SEARS	2.65%	3	84.1%
UNKNOWN	1.77%	2	85.8%
SAMSUNG	1.77%	2	87.6%
PANASONIC	1.77%	2	89.4%
PHILIPS	1.77%	2	91.2%
HITACHI	1.77%	2	92.9%
ADMIRAL	1.77%	2	94.7%
GOLDSTAR	1.77%	2	96.5%
MONTGOMERY WARD	1.77%	2	98.2%
HYUNDAI	0.88%	1	99.1%
COMMODORE	0.88%	1	100.0%
TOTALS:	100.00%	113	100.0%

Figure 6: TVs by Brand

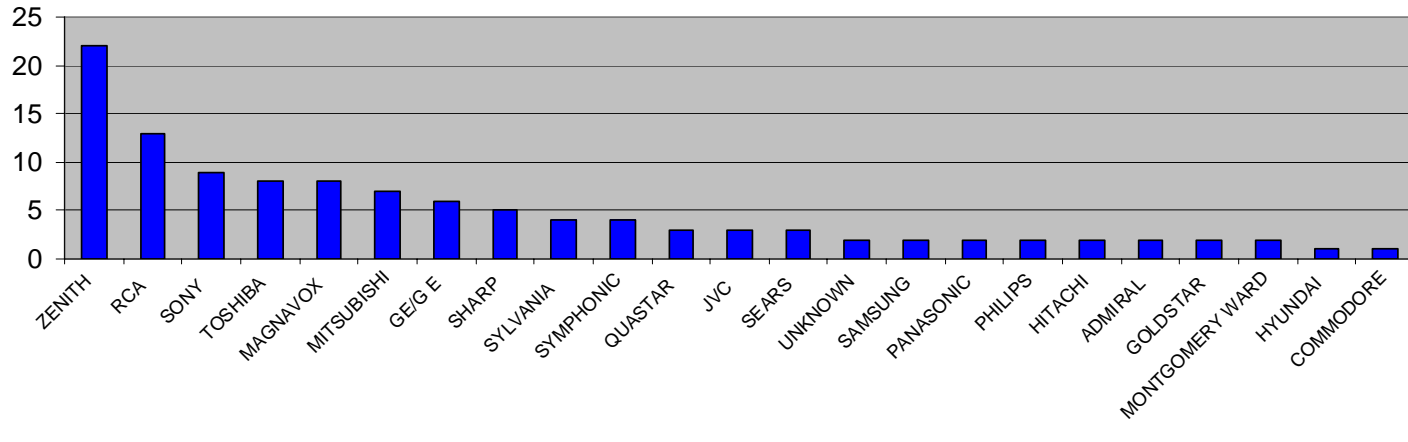


Figure 7: TVs by Brand

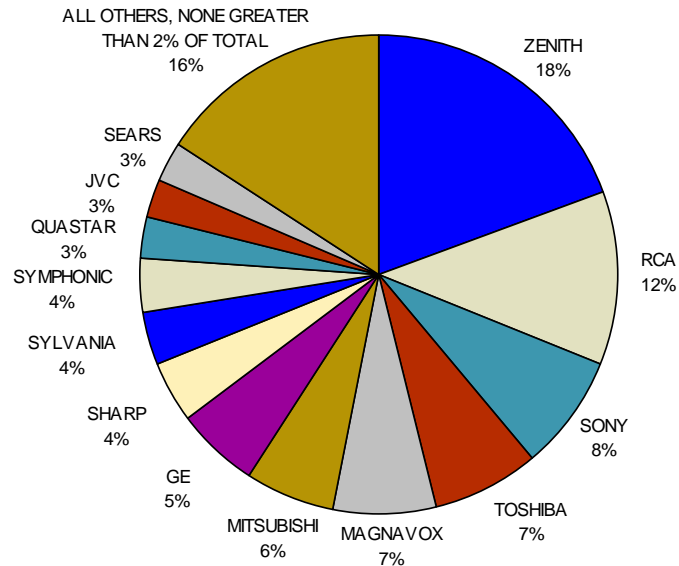
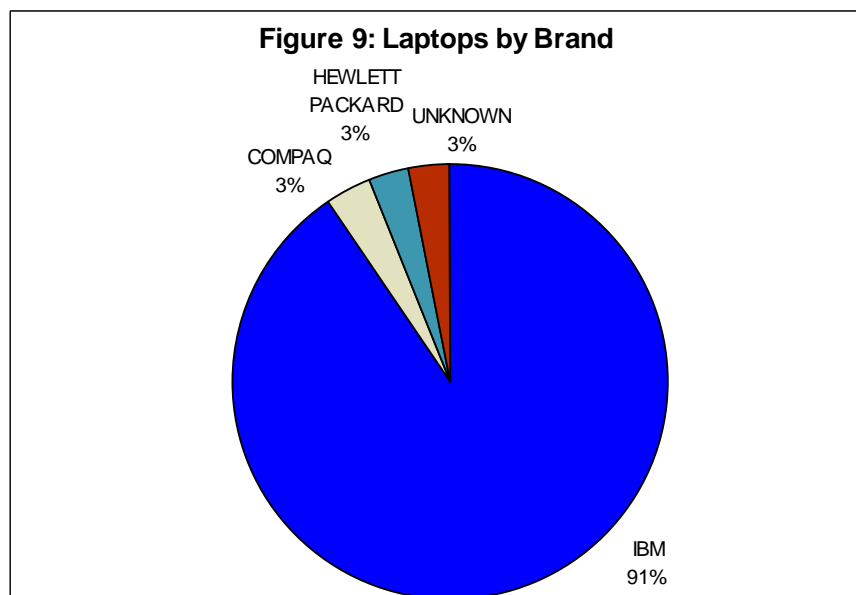
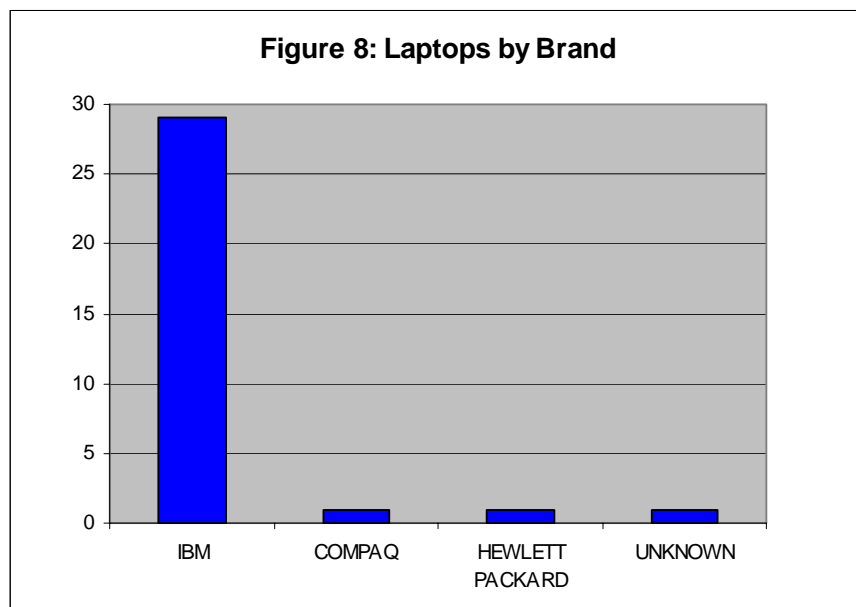


Table 6 and Figures 8 and 9 below display the brand sort results for laptops.

Table 6: Brand Sort Results for Laptops

Brand	Percent of Laptops Collected	Number of Laptops Collected	Cumulative Percent
IBM	90.6%	29	90.6%
COMPAQ	3.1%	1	93.8%
HEWLETT PACKARD	3.1%	1	96.9%
UNKNOWN	3.1%	1	100.0%
TOTALS:	100.0%	32	100.0%



4.3 Brand Recording Rate

It should be noted that Booz Allen recorded the brands of 412 monitors, and a total of 521 monitors were collected at the event, which yields a brand recording rate of 79 percent. Booz Allen also recorded the brands of 113 TVs, and a total of 126 TVs (both wood and non-wood) were collected at the event, which yields a brand recording rate of 90 percent. As noted above, total unit counts were not available for CPUs or laptops. These items were likely missed due to the fast-paced nature of the event—additional items were sometimes brought to the pallets as Booz Allen staff members were still recording the brands of previous items. The brand recorders were instructed ahead of time not to delay the collection event by attempting to record the brand of every single monitor, CPU, TV, or laptop in these situations. Additionally, when the truck with the commercial electronics arrived, one staff member was tasked with recording the brands of the items coming off this truck, which may have temporarily affected the overall brand recording rate. However, the brand recording sample was assumed to be representative of the total population of items received at the collection event, as no conditions were identified that could have biased the brand recording results.

5.0 SUMMARY AND RECOMMENDATIONS

A brand sort was conducted at the Kane County electronics recycling event on December 9, 2006, according to the Brand Sort SOP. Available weight and unit count data from the event were obtained from Mr. Mielke and presented in Section 4.1, along with an analysis of average weights for monitors and TVs. The raw brand sort data were compiled (see Attachment 2) and analyzed to develop the summary tables and figures presented in Section 4.2. The brand recording rate was calculated at 79 percent for monitors and 90 percent for TVs.

Lessons learned from the collection event primarily focused on improving the layout of the Brand Recording Form adapted from NCER, as the ability of staff members to quickly locate and record the brand of a particular item impacted the overall brand recording rate. Specifically, it is recommended that the form be redesigned to include the top brands across categories (e.g., Compaq, Dell, Gateway, Hewlett-Packard, IBM, RCA, Sony, Zenith) on the front page of the form to increase accessibility. It is also recommended that the orientation of the form be rotated from landscape to portrait to increase the number of brands that will fit on one page, thus reducing the need to flip between pages when recording brands.

Finally, it should be noted that the Technical Direction Memorandum (TDM) for this task originally included vintage information as one of the potential data elements. Once the Kane County recycling event was identified for the brand sort and logistics were worked out; however, it was determined that vintage information would not be collected due to the fast-paced nature of the event and the primary focus on accurately recording brand names. If EPA is still interested in obtaining vintage information as part of a future brand sort, it is recommended that such data be collected after the collection event, as the equipment is being sorted or processed for recycling, as applicable. This would

ensure a higher quality of data and minimize potential impacts of the brand/vintage sort on the efficiency of the collection event.

ATTACHMENT 1
BRAND RECORDING FORM

BRAND	Desktop Computer	Monitor	TV	Laptop
A2Z Computers				
ACER				
Addonics				
Admiral				
Agl				
Amber				
Ambra				
AMDEX				
Americomp, Inc.				
AMG				
Amiga				
AOC				
AOpen				
Apple/Macintosh				
Arche/Arch				
AST				
ASTVision				
AT Jr				
AT&T				
Blaster PC				
Brother				
CC				
CCS/5 CCS				
CHAMPION/Champion KLH/KLH				
Commodore				
COMPAQ				
COMPUADD				
Computer Care, Inc				

BRAND	Desktop Computer	Monitor	TV	Laptop
Computer Products, Inc				
COMREX				
Craig				
CREATIVE				
CTX				
Curtis Mathes				
CW				
Daewoo				
Dearmax				
Dee One Systems				
DELL				
DIGITAL				
DS				
DTK				
Dynex				
eMachines				
EMC Multisystem				
EMERSON				
ENVISION				
Epson				
Excel				
Fastdata 386				
First Computer System				
Flexvision				
Fujitsu				
Funai				
GATEWAY				
GE/G E				
GEM				
Global				
Goldstar				

BRAND	Desktop Computer	Monitor	TV	Laptop
GV				
HITACHI				
HP/Hewlett Packard				
HYUNDAI				
IBM				
IMPRESSION				
Infotek				
Inteva				
JVC				
KDS				
KFC				
KLH				
KTV				
LASER				
Leading Edge				
Leo				
Link				
Loop				
MAG				
Magitronic				
MAGNAVOX				
Maximus				
MAXTECH				
MGA				
MICRON/ MICRONPC				
Microtech				
Midwest Micro				
Minite				
MITSUBISHI				

BRAND	Desktop Computer	Monitor	TV	Laptop
MONTGOMERY WARD				
NCR				
NEC				
Nitro				
NOKIA				
Northgate				
OPTIQUEST				
ORION				
Orion				
PACKARD BELL				
PANASONIC				
PCS				
Philips				
Pixie				
Ponex				
Pony Computer				
Portland				
Positive				
Power Computer				
POWER II				
PRINCETON				
Professional Computer Systems				
Proteva				
Proview				
PSI				
QUANTEX				
Quasar				

BRAND	Desktop Computer	Monitor	TV	Laptop
RCA				
RELESYS/RELISUS/ RELESI				
Rembrandt				
Reveal				
SAMPO				
SAMSUNG				
SAMTRON				
SANYO				
SC				
Sears				
SHARP				
Signature/Signature 2000				
SMITH CORONA				
Softek				
SONY				
Sun				
Supero				
Supersync				
Supertron				
SWCG				
Sylvania				
Symphonic				
SYSDYNE				
Sysdyne				

ATTACHMENT 2

COMPILED RAW BRAND SORT DATA

Data From December 9, 2006, E-Waste Collection Event, Kane County, Illinois

Brand	CPUs	Monitors	TVs	Laptops
Brands on Brand Recording Form				
ACER	4	10		
ADMIRAL			2	
AGI		1		
AOC	1	1		
AOPEN	1			
APPLE/MACINTOSH	11	14		
AST	1	2		
AT&T	1			
CHAMPION/CHAMPION KLH/KLH	1			
COMMODORE			1	
COMPAQ	90	31		1
CTX		18		
DAEWOO		4		
DELL	33	35		
DIGITAL	2			
DTK	6			
EMACHINES	5	5		
EMC MULTISYSTEM		1		
EPSON	1	1		
GATEWAY	49	49		
GE/G E			6	
GOLDSTAR			2	
HITACHI		1	2	
HP/HEWLETT PACKARD	47	22		1
HYUNDAI		1	1	
IBM	57	32		29
IMPRESSION		1		
INFOTEK		1		
JVC			3	
KDS		5		
KFC	1			
KTV		3		
LEADING EDGE	1			
MAG		7		
MAGITRONIC	1	1		
MAGNAVOX			8	
MICRON/	3	3		
MITSUBISHI		2	7	
MONTGOMERY WARD			2	
NCR		1		
NEC	1	8		
NOKIA		3		
OPTIQUEST		18		
ORION		1		
PACKARD BELL	7	17		
PANASONIC		3	2	
PHILIPS		3	2	
PRINCETON		3		
PROVIEW		2		
QUANTEX	1	1		

Data From December 9, 2006, E-Waste Collection Event, Kane County, Illinois

Brand	CPUs	Monitors	TVs	Laptops
QUASTAR	1		3	
RCA			13	
SAMSUNG		19	2	
SANYO		2		
SEARS			3	
SHARP			5	
SONY	1	14	9	
SYLVANIA			4	
SYMPHONIC			4	
SYSTEMAX	2	1		
TEKNIKA		1		
TELETYPE	1			
TOSHIBA	1	1	8	
TOUCH		1		
TVM		1		
VIEWSONIC/VIEW SONIC		16		
ZENITH			22	
ZEOS		1		
Manually Recorded Brands (Brands Not on Original Form)				
II YAMA		1		
ADI	1			
BAY	1			
BCI		1		
BENTLY		1		
BTK	1			
CARDINAL		1		
CL TECK		1		
COMPUDINE		1		
CORNERSTONE		1		
CYBERMAX	1			
EIZO		1		
FOUNTAIN/BESTEC	1			
HBS	1			
KENITEC	1			
LLOYDS		1		
MARK		1		
MONITERM		1		
NOBLEVIEW		1		
PIONEX		1		
PROTIVA	1			
RADIUS		2		
RASTOR OPS		3		
RDP		1		
SEPTRE		1		
SYNCO		1		
TECO IS		1		
UNION FRIENDLY	1			
Unknown Brands (No Labeling or Identifying Marks on Equipment)				
UNKNOWN	46	22	2	1
TOTALS	386	412	113	32