

Oregon Electronic Scrap Baseline Survey

October 2006



Oregon Department of Environmental Quality
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*Prepared by Eco Stewardship Strategies
with Gracestone, Inc.
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2006 Oregon DEQ Electronic Scrap Baseline Survey

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Executive Summary

The Oregon Department of Environmental Quality (DEQ) contracted with Eco Stewardship Strategies in mid-2006 to conduct a survey to establish a baseline characterization of the infrastructure for collecting and handling electronic scrap (e-scrap) in the state. E-scrap is defined in this study to include end-of-life computers (including CRTs, CPUs, laptops, printers and peripherals) and televisions. The project's objectives were to determine:

- The current infrastructure for collection and processing of e-scrap in Oregon
- Location of gaps in the infrastructure
- The current environmental management practices of handlers in Oregon, in order to inform the development of best management practices (BMPs) guidelines for Oregon electronic waste handlers

The overall survey response rate was 88%: 65 out of 74 entities contacted participated in the survey. The response rate for handlers and collector/handlers was 83% (29 out of 35) and for collectors was 92% (36 out of 39).

The survey identified 167 collection points around the state where the public can bring e-scrap. Thrifts, charitable organizations and non-profits comprise two-thirds (66%) of the collection sites in Oregon. Fifteen rural counties in southern and eastern Oregon have no collection points available. However, four of these counties with no collection points are within a reasonable driving distance of identified collection sites. About 95% of the state's population has reasonable access to electronics recycling services. There are 16 collectors or collector/handlers out of 61 who do not accept TVs, located in 12 counties. In all but two of the 12 counties other collectors or collector/handlers are providing service for TVs.

Approximately one-third (18 of 61) of all collectors and collector/handlers say they serve the entire state, and 5 out of 61 say they serve eastern and southern Oregon, perhaps with periodic collection events. The majority of collectors and collector/handlers are serving the greater Willamette Valley and Portland metropolitan area.

An estimated total of 16,720,000 pounds of e-scrap material was managed (meaning collected and/or processed) in Oregon during 2005, the survey found. More than 50% of the material is managed by private businesses and about 40% by non-profit organizations. Of the nearly 17 million pounds of e-scrap managed in Oregon in 2005, the portion collected from residents (40%) is similar in size to the portion collected from the commercial sector (46%). The remaining 14% from unknown generators is primarily collected by haulers, landfills and local governments.

Using an Oregon population of approximately 3.64 million, this is the equivalent of a total of 4.6 lbs per person of e-scrap managed in 2005. For the residential and small business portion, the annual per capita e-scrap collected is estimated to be 1.8 pounds. This number could be as high as 2.4 pounds per capita because much of the "unknown" portion is collected by haulers and local governments serving primarily residential customers.

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Nearly half the e-scrap handled in Oregon is processed by just three entities (one private business, one non-profit and one thrift/charitable organization). Each of these three entities processed over 2 million pounds of e-scrap in 2005.

Survey respondents reported that two-thirds of the e-scrap collected in Oregon in 2005 was recycled (67%); 25% was reused; 2% was landfilled or incinerated; and for remaining 6% they “don’t know” how it was handled. It is interesting to note, anecdotally, the survey revealed that a large percentage of e-scrap collected and/or processed in Oregon ultimately is exported for final use or disposition.

More than 60% of handlers and collector/handlers report having various environmental health and safety practices in place. The survey results indicate that the e-scrap industry in Oregon is in flux about environmental practices – with a very wide range of practices being exhibited by handlers and collector/handlers. Of the 29 handler and collector/handler survey respondents, 24% have an EPA Hazardous Waste Site ID Number; 41% have an Environmental Management System (EMS); 28% have some type of recycling certification; and 48% have some type of written hazardous materials management plan.

Less than half of collectors conduct “due diligence” to know the intermediate and final destination of the e-scrap they collect. The majority (62%) of the handlers on the other hand do have some knowledge of the final disposition of the materials they process.

The three most important environmental practices identified by handlers and collector/handlers include (in order of priority):

1. Tracking downstream vendors and final destinations
2. Responsible environmental health and safety management of a company’s own staff and operations
3. Identification of hazardous materials

The report’s authors note the following observations, as a result of this research:

- 5% of the state’s population (Eastern Oregon) lacks access to electronics recycling
- There was a fairly low level of interest in, and investigation of, downstream markets by collectors and some handlers surveyed
- Thrift stores, charitable organizations, and non-profits (66% of collection sites) play a prominent role in the e-scrap infrastructure
- Handlers (and collectors too, but less so) would like more guidance from the state on environmental practices
- Anecdotal evidence indicates significant export of e-scrap from Oregon, making it difficult for companies processing e-scrap domestically to compete with companies incurring less expense by simply exporting e-scrap; these domestic-processing companies would like to level the playing field between foreign vs. domestic handlers

1.0 Introduction

1.1 Project Background

The Oregon Department of Environmental Quality (DEQ) contracted with Eco Stewardship Strategies in June 2006 to conduct a survey to establish a baseline characterization of the infrastructure for collecting and handling electronic scrap (e-scrap) in the state. E-scrap is defined in this study to include end-of-life computers (including computers, CRTs, flat panel monitors, laptops, televisions, flat panel televisions, printers and peripherals).

The project's primary **objectives** were to determine:

1. The current infrastructure for collection and processing of e-scrap in Oregon;
2. Location of gaps in the infrastructure; and
3. The current environmental management practices of handlers in Oregon, in order to inform the development of best management practices (BMPs) guidelines for Oregon electronic waste handlers.

1.2 Survey Methodology

1. Working with DEQ, a list of known collectors and handlers of e-scrap generated in Oregon was developed.
2. A survey instrument (see Appendix B) was designed with questions in the following nine areas:
 - General
 - Type and location of services
 - Amount and type of e-scrap – for the year 2005 (or most recent 12 months)
 - Markets, or the downstream disposition of e-scrap materials
 - General management practices
 - Environmental practices, including hazardous materials management, health and safety
 - Information security & data destruction
 - Business prospects and challenges
 - Infrastructure financing
3. The survey was distributed via email or mail. Respondents could complete the survey on the Web via an online survey instrument or complete a Word document version and email, mail, or fax it back.
4. Follow-up emails and telephone calls were made to all survey recipients to encourage them to complete the survey. In several cases, survey responses were obtained verbally to ensure the information was captured. The survey response rate is discussed in the next section (Section 1.3).
5. The project team made site visits to 24 handlers' and collector/handlers' operations in the state to conduct more in-depth interviews with facility operators. The purpose of the in-

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person interviews was to determine more about materials handled, end-markets, general management practices, environmental practices, and business prospects and challenges.

6. Data were stored in a created database, and, after quality control (data cleaning for clarification of responses, converting units to pounds based on established conversion metrics¹), analyses were conducted.

1.3 Survey Respondent Categories

The project team worked with DEQ to create the following categories of survey respondents:

Collector: Entities that accept or collect and consolidate e-scrap for further processing at another facility. These entities do not handle or process incoming e-scrap.

Handler: Entities that de-manufacture, dismantle, shred, refurbish or otherwise process e-scrap, but do not collect e-scrap from businesses or individuals.

Collector/Handler: Entities that both collect e-scrap from generators and also engage in handling services (as described above).

Chart 1-1 illustrates the category breakdown of the 65 survey respondents (see Section 1.4 for a description of the survey response rates). Note that for most data, the categories of “handler” and “collector/handler” are grouped together.

Chart 1-1: Number of Survey Respondents by Category (Collector, Handler and Collector/Handler)

	# of Respondents
Collectors	36
Handlers	4
Collector/Handlers	25
Total	65

1.4 Survey Response Rate

As shown in Chart 1-2, the overall survey response rate was 88%: 65 out of 74 entities contacted participated in the survey.

Chart 1-2: Survey Response Rate

	Contacted	Participated	Response Rate
Handlers and Collector/Handlers	35	29	83%
Collectors	39	36	92%
Total	74	65	88%

¹ Product unit weights were obtained from the National Center for Electronics Recycling in September, 2006, and are based on Average Returned Product Weight. Average weights used were as follows: laptop/notebook computers: 8 lbs.; desktop computer: 26 lbs.; computer monitor: 38 lbs.; and television: 49 lbs. Flat panel display unit weights are not yet available from returned products – and no analyses in this report were based on quantities of flat panel display units. See <http://www.electronicrecycling.org/NCER/> for more information.

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The response rates for each entity category were as follows:

Handlers and Collector/Handlers: 29 out of 35 (83%) handlers and collector/handlers responded to the survey. A total of 35 handlers and collector/handlers were identified as either operating in Oregon, or handling a notable quantity of e-scrap from Oregon (the sample included three facilities in Washington that receive e-scrap from Oregon). The 35 entities included five manufacturers with national takeback programs available in Oregon. All five manufacturers declined to participate (either by directly declining or by failing to respond after repeated requests). Only one other handler declined to participate in the survey.

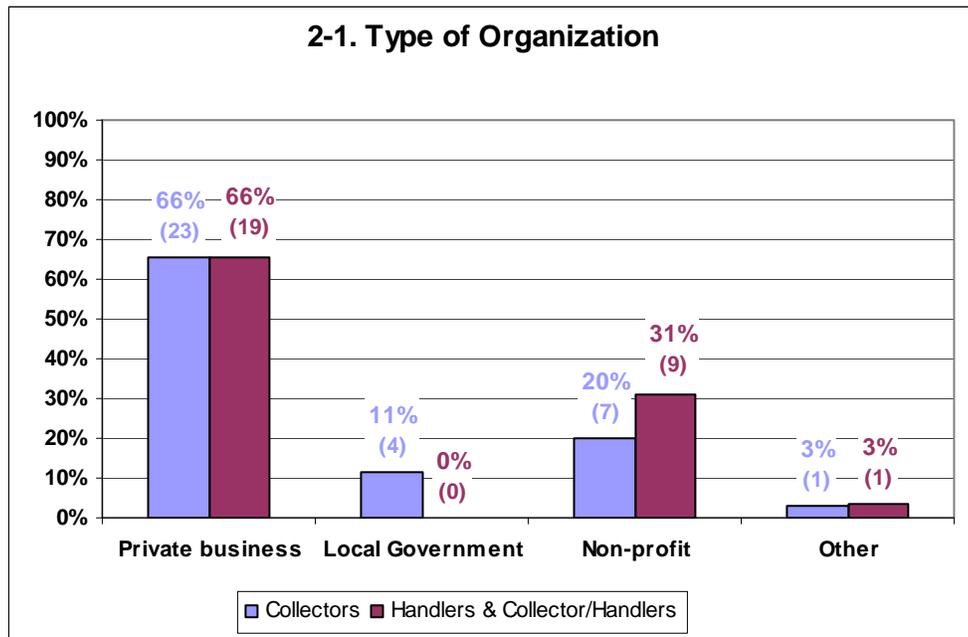
Collectors: 36 out of 39 (92%) collectors responded to the survey. Of the three collectors that did not participate in the survey, one collector declined to participate and the other two entities were retail companies. One of the retailers indicated that they have collection events every few years, but did not have data to share. The other retailer has a collection program, but it has been operational for less than 6 months and they are not tracking quantities collected. Additionally, some of the individual thrift stores did not have data or information to share. Although specific survey information was not collected from these thrift and retail entities, locations of retail and thrift collection sites are included in the geographic coverage discussion in Section 2.3.

2.0 Industry Profile and Type of Services

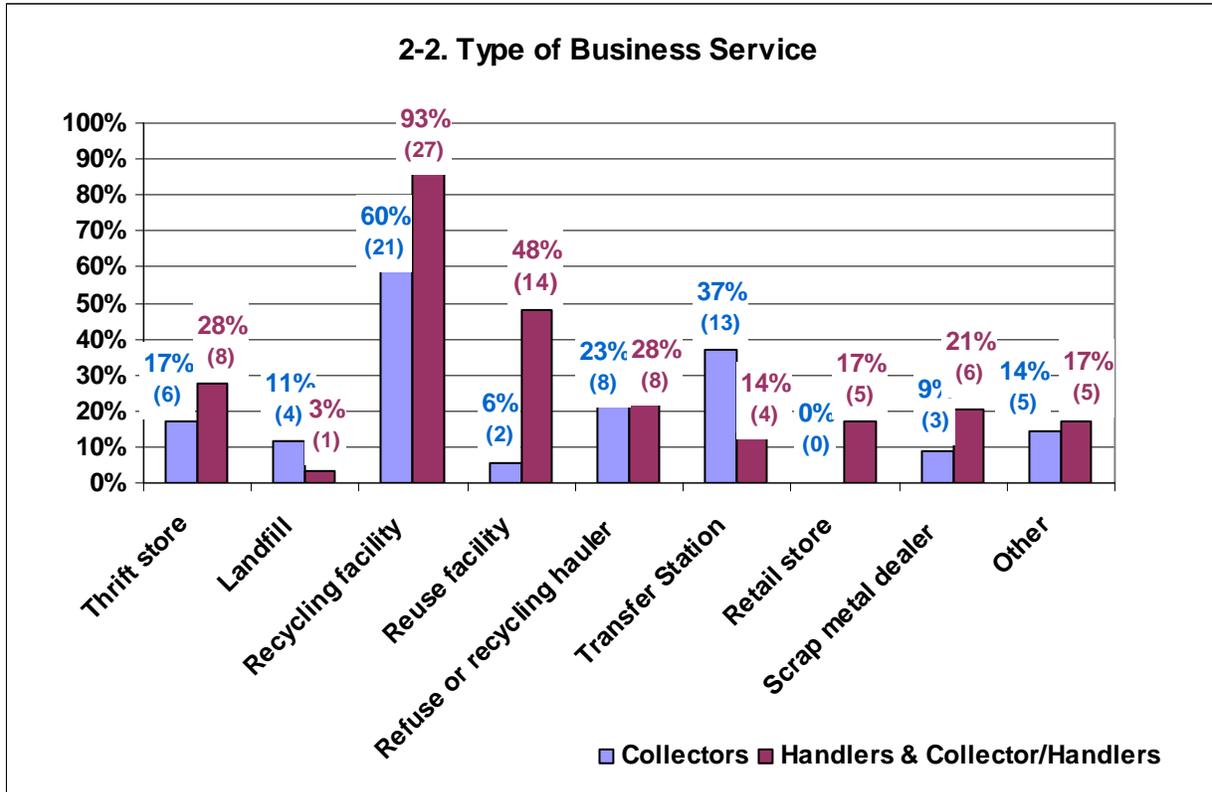
2.1 Profile of Businesses and Organizations

2.1.1 Types of Businesses and Organizations

For collectors, the majority are private businesses serving the state, with local governments playing a small part, as shown in Chart 2-1. For handlers and collector/handlers, the majority are private businesses serving the state (Chart 2-1).



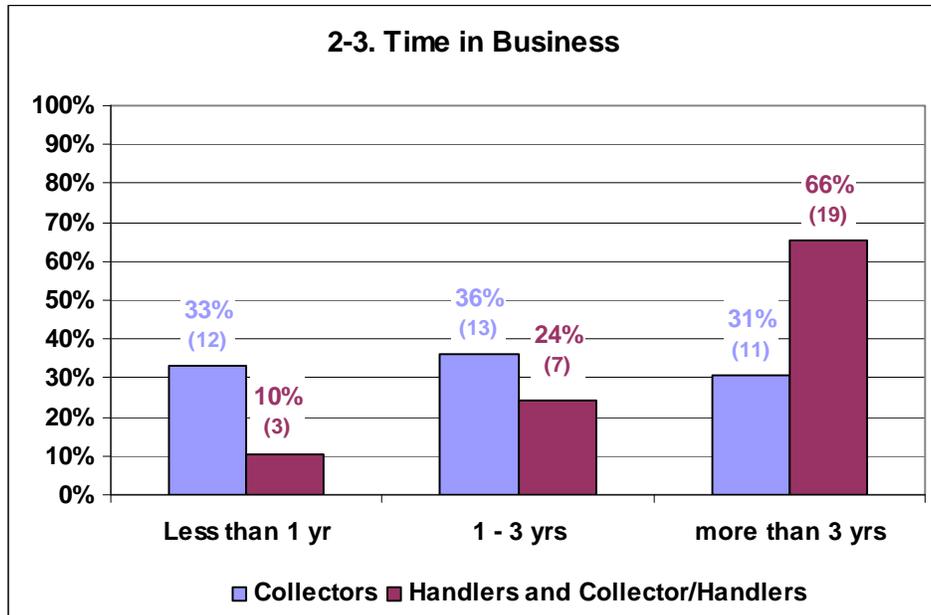
Survey respondents were asked what type of operation they were, and could check all descriptions that applied from thrift organization, landfill, recycling facility, reuse facility, hauler, transfer station, retail, scrap metal dealer, or other (no definitions were provided in the survey; respondents self-defined their operations). As shown in Chart 2-2, the majority of collectors (60%) define themselves as being recycling facilities. Beyond that, there are a wide variety of types of organizations collecting e-scrap, with no single type dominating. Also noted in Chart 2-2, nearly all handlers and collector/handlers (93%) define themselves as recycling facilities - with about half also defining themselves as reuse facilities. Like collectors, handlers and collector/handlers are a wide variety of types of organizations handling e-scrap in Oregon. A number of handler and collector/handler organizations do offer retail sales, where the public may come in and purchase electronics - either whole, working units or components.



2.1.2 Length of Time in Business

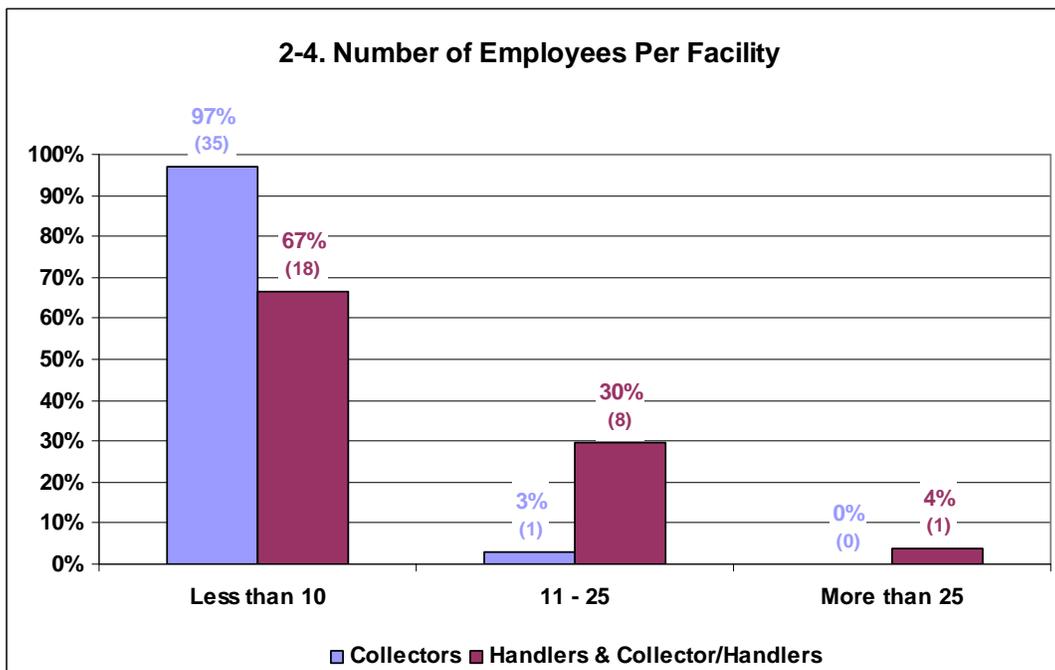
Two-thirds (66%) of handlers and collector/handlers report having been in the e-scrap business more than three years. This seems to indicate that, although still a changing and emerging business sector, handlers and collector/handlers appear to be fairly stable in Oregon.

However, only a third of collectors report having been in the business of collecting e-scrap longer than three years. Collectors continue to emerge as new business entities, as shown by their length of time in business (Chart 2-3).



2.1.3 Number of Employees

The e-scrap infrastructure in Oregon is dominated by small operations – with by far a very large majority of both entities managing their incoming e-scrap with fewer than 10 employees (see Chart 2-4). However, organizations providing handling services are more likely to have more employees, on average, as shown below.



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Survey respondents were asked to indicate by category the total number of employees engaged in e-scrap management at their establishment: (1) less than 10; (2) 11 to 25; or (3) greater than 25. However, this survey did not gather information on whether employees were permanent, FTEs, or part-time; if they are hired in response to increased quantities or busy seasons; what throughput per employee; share of materials handled by larger or smaller establishments; etc.

By making estimates of number of employees in the midpoints of each of these three ranges (less than 10; 11 to 25; or greater than 25), and looking at reported number of responses in each of these categories, it is estimated that approximately 460 people are directly employed in the e-scrap industry in Oregon (Chart 2-5).

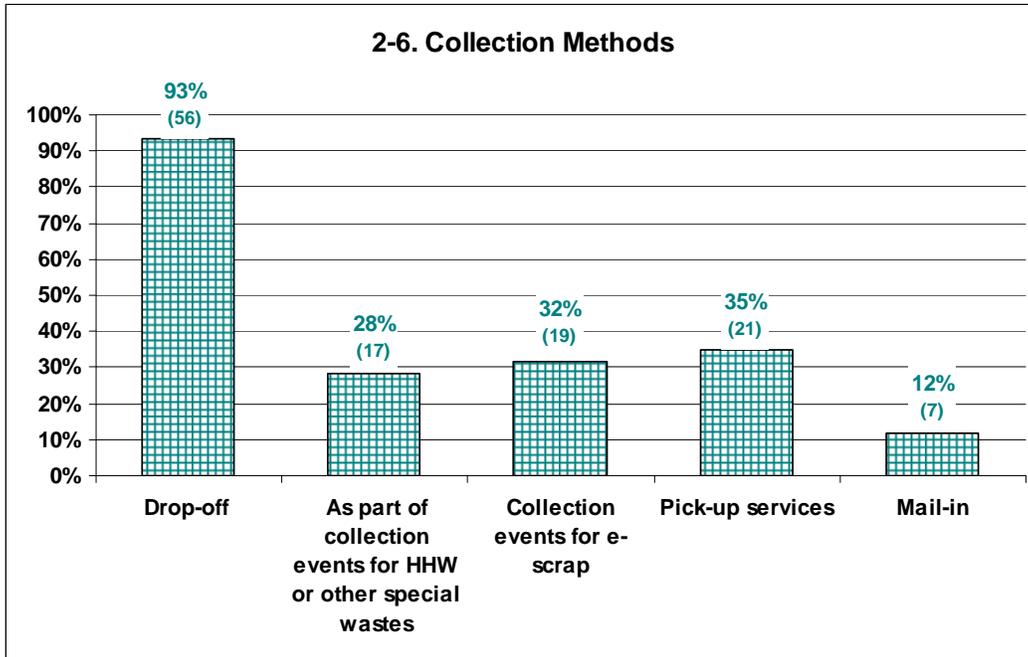
Chart 2-5: Estimated Number of Employees in Oregon's E-Scrap Industry

	Estimated # of Employees		Total
	Collectors	Handlers and Collector/Handlers	
Less than 10 (estimated 5)	175	90	265
11 to 25 (estimated 18)	18	144	162
More than 25 (estimated 35)	0	35	35
Totals	193	269	462

2.2 Type of Services Provided

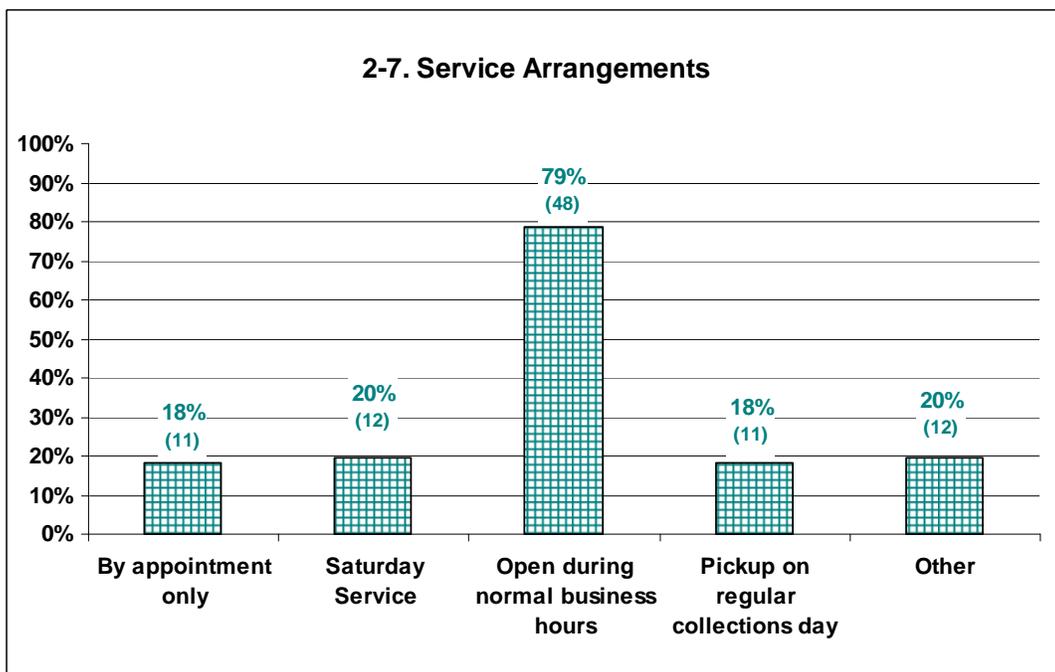
2.2.1 Collection Methods

Chart 2-6 shows how collectors and collector/handlers are gathering e-scrap from the public – for all types of e-scrap (televisions as well as computers). Almost all the collectors and collector/handlers welcome drop-off of e-scrap at their venues. The survey question about collection services did not differentiate between pick-up services offered to commercial customers who will have larger quantities of e-scrap, and curbside pickup services from residential generators of e-scrap.



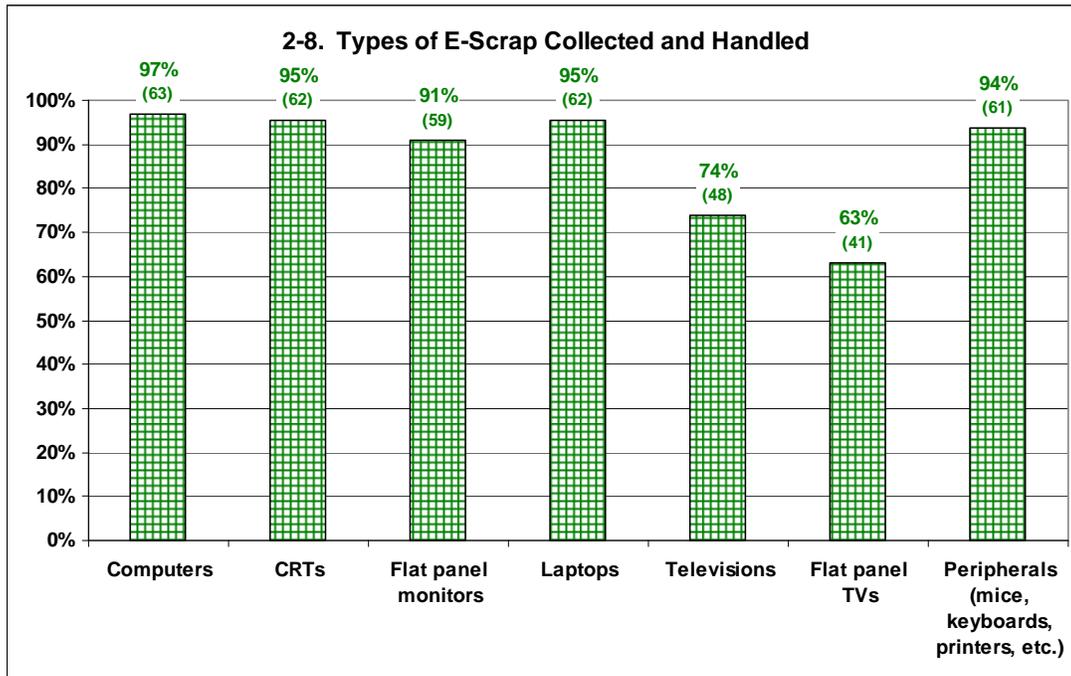
2.2.2 Service Arrangements

Chart 2-7 shows how collectors and collector/handlers make themselves available to their customers. Survey respondents were able to check more than one option. Survey data indicate that 18% of collectors are providing regular pickup services from customers – though it is not known if this is from the curb, from residential generators, or from commercial generators on regular routes.



2.2.3 Types of E-Scrap Collected and Handled

The survey asked respondents what types of materials they are handling. Chart 2-8 shows that the majority of entities in the e-scrap industry in Oregon are handling most types of equipment, as defined by this survey (computers, CRTs, flat panel monitors, laptops, televisions, flat panel televisions, printers and peripherals).



2.2.4 Types of Processing

The processing activities that handlers and collector/handlers engage in are defined² as follows:

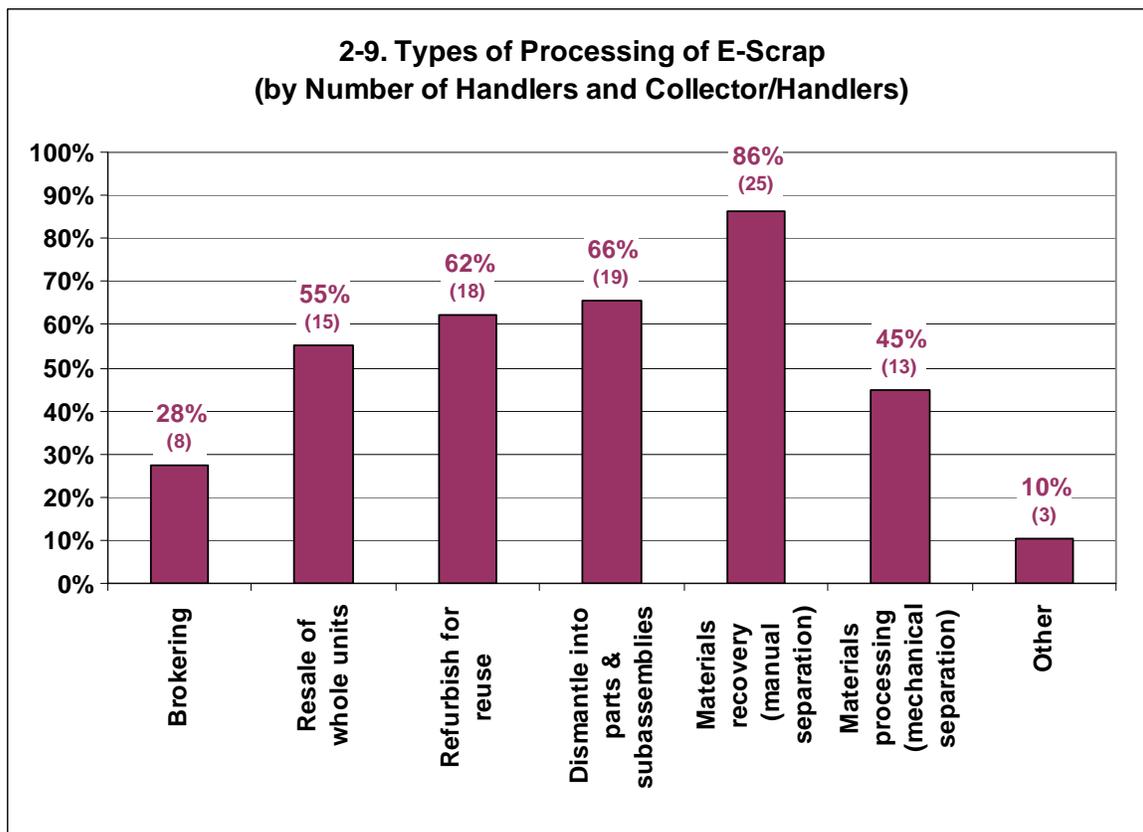
- **Brokering** – Making an arrangement between a buyer and a seller, often including arranging both transportation logistics and details of the transaction itself. Can include brokering exotic electronics, precious metals, valued sub-assemblies, as well as whole units, whether working or non-working. Can also include auctioning, resale, and export.
- **Resale of whole units** – Reselling e-scrap that has been collected in any marketplace or venue.
- **Refurbishing for reuse** – Replacing some or all of the parts or making cosmetic improvements to e-scrap to bring it to a workable condition. Equipment may be either resold or donated.
- **Dismantle into parts and subassemblies** – Manually taking apart equipment into distinct components such as printed circuit boards with market value. Also called demanufacturing.

² These definitions (representing the e-scrap industry’s major segments or activities) are drawn from those used by *E-Scrap News* in its industry surveys and also correspond to definitions found in the *IAER Electronics Recycling Industry Report: 2006*, published by International Association of Electronics Recyclers © 2006, Albany, NY.

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- **Materials recovery** – Manually taking apart equipment into materials such as plastics and metals, to be sold into secondary recycling markets.
- **Material processing** – Mechanically shredding or grinding equipment to capture plastics, metals, and/or glass which are also sold into secondary recycle markets. Can include further processing such as palletizing plastics, refining metals, etc.

The survey found that most handlers and handler/collectors conduct more than one processing activity. Chart 2-9 shows how handlers and collector/handlers are processing the material they receive (note this chart does not reflect quantity or pounds of e-scrap managed by these respective means – that information can be found in Chart 4-9).



Explanations from those entities that checked 'other' included:

- Don't know
- Landfilling of wood from television consoles

2.3 Geographic Coverage for Collection of E-Scrap

In the more populated areas of the state, Oregonians enjoy, on the whole, very good access to various types of e-scrap collection and drop-off services. The maps on the following pages (Chart 2-10: Oregon, and Chart 2-11: Portland Metropolitan Area) show locations of e-scrap collection points. The red flags indicate private businesses and local governments, while the

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blue dots are non-profit, thrift stores, and charitable organizations. Note that handlers who do not offer collection services are not shown in these maps. Also, there has been no qualification of collection and handling locations based on environmental management practices. These maps are only intended to show that these entities are available to the public for service.

Chart 2-12 shows collection points for scrap televisions in the state. Note that there are no collection points for scrap televisions in Eastern Oregon that this survey identified.

Additional maps showing the four quadrants of the state can be found in Appendix D.

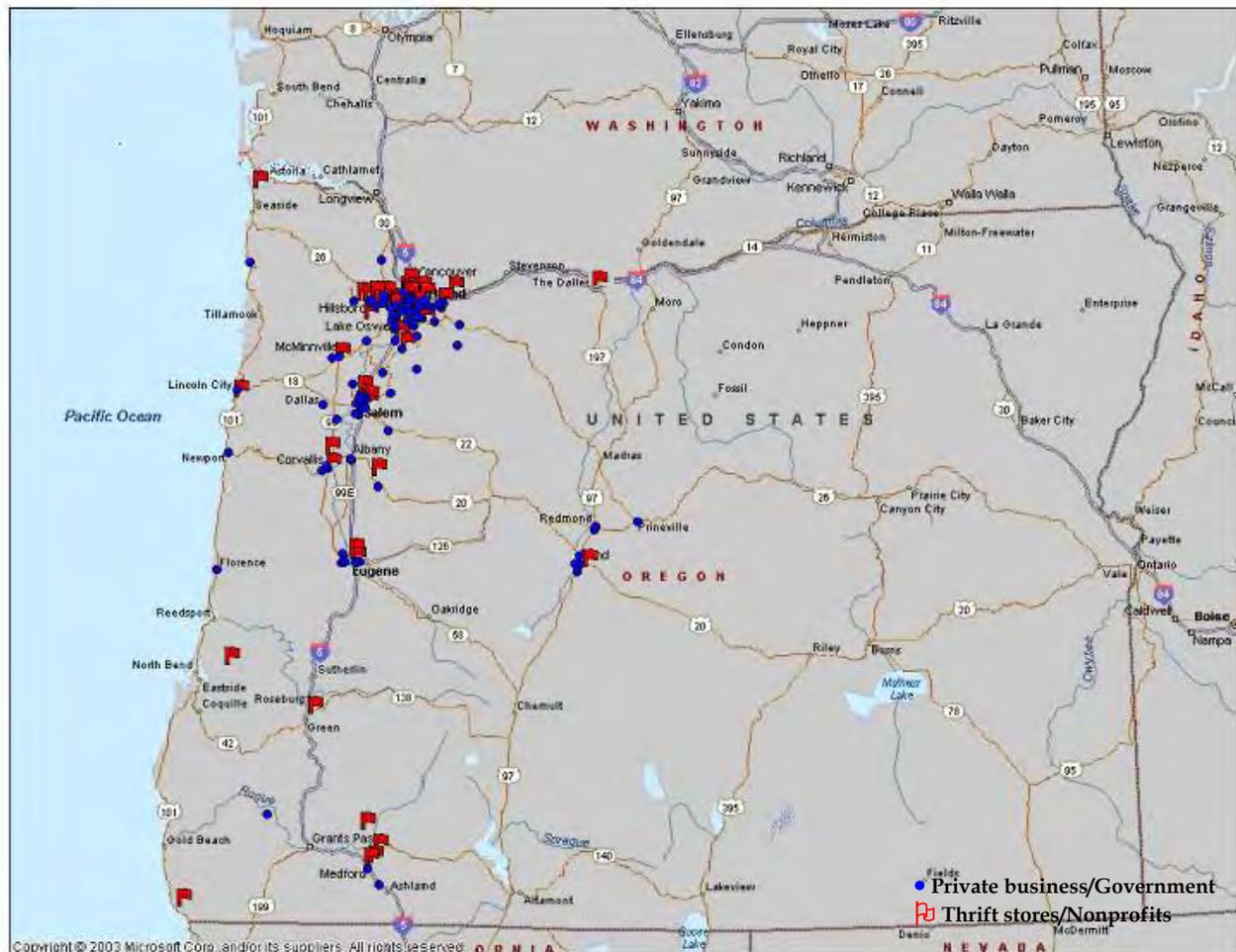


Chart 2-10: Map of Oregon with all E-Scrap Collection Points

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Chart 2-11: Map of the Portland Metropolitan Area with All E-Scrap Collection Points

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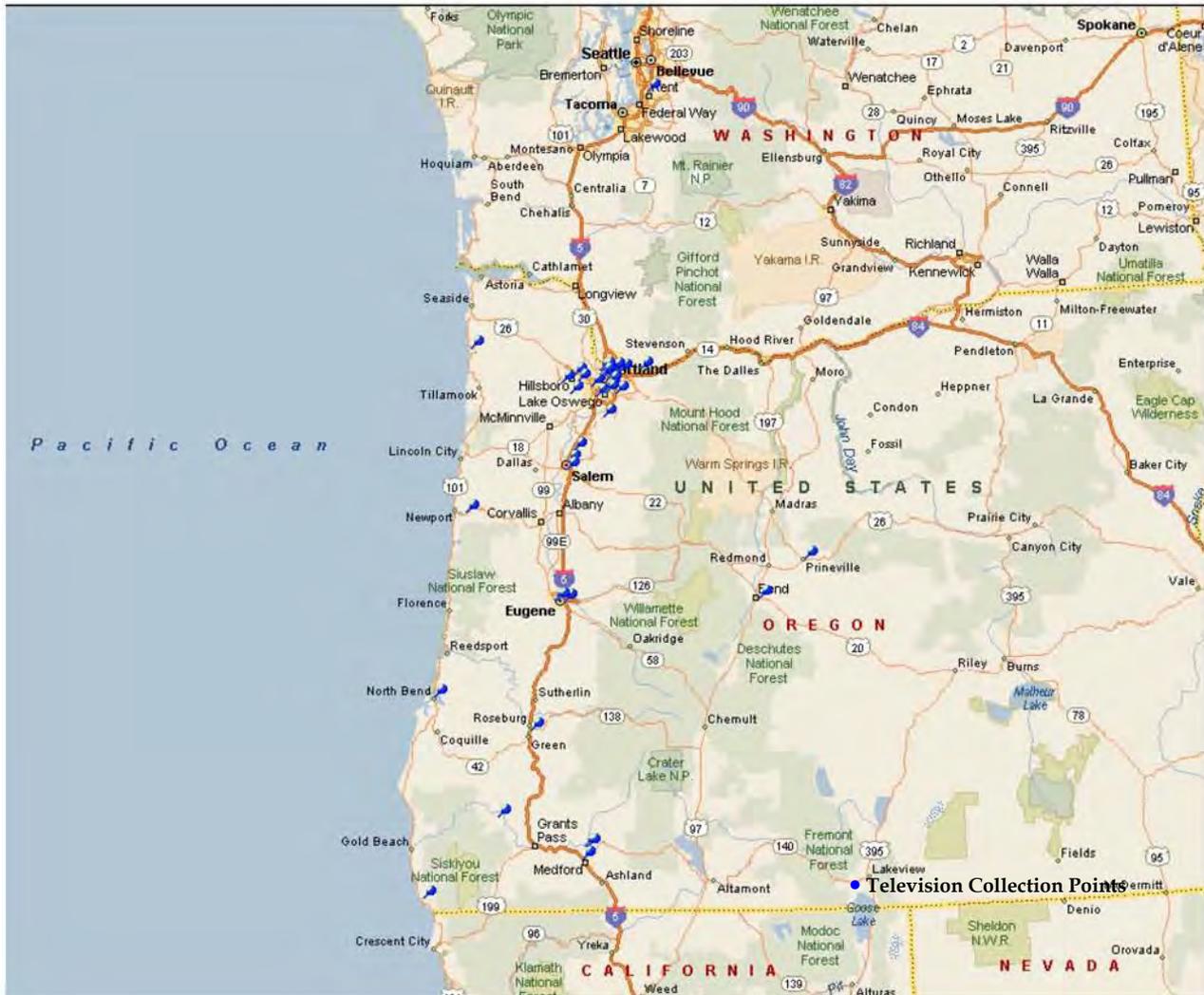


Chart 2-12: Map of Oregon with All Scrap Television Collection Points

Note that there are no collection points found in this survey for scrap televisions in the eastern half of Oregon.

The survey identified 167 collection points around the state where the public can bring e-scrap as summarized below in Chart 2-13. Thrifts, charitable organizations and non-profits comprise two-thirds (66%) of the collection sites in Oregon.

**Chart 2-13:
Number of Collection Points for E-Scrap in Oregon, by Type of Organization**

Private Businesses	38	23%
Retail Chain Store (Office Depot)	15	9%
Local Governments	4	2%
Thrifts, Charitable Organizations & Non-profits	110	66%
TOTAL	167	

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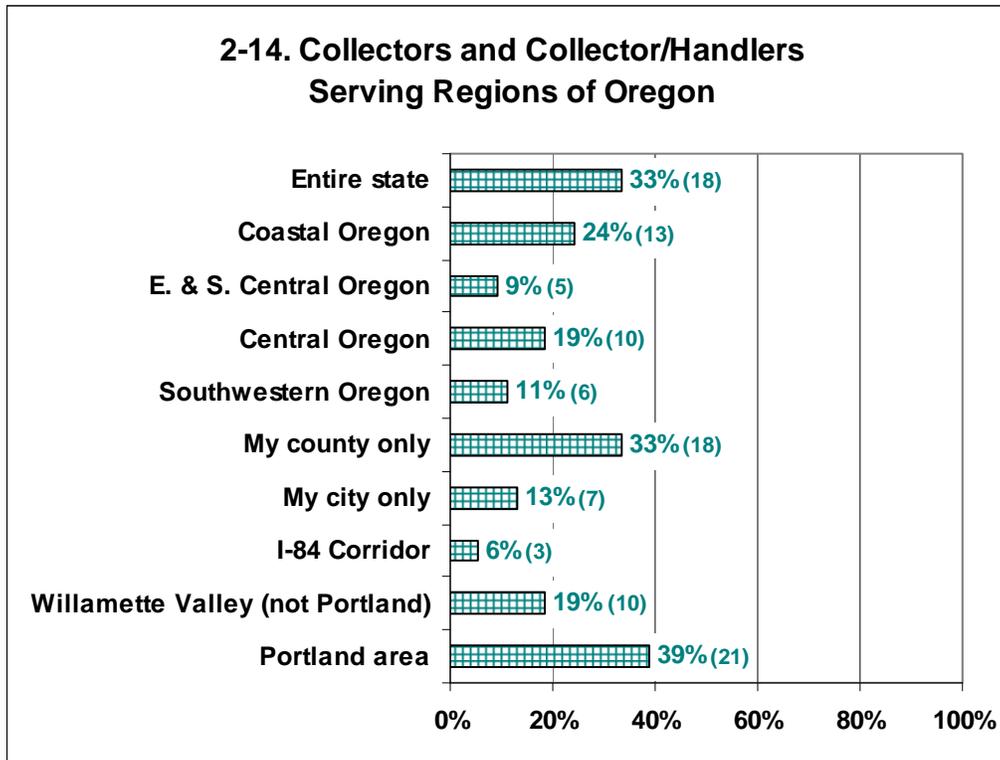
Note that several organizations have multiple collection points. For instance, in 2005 Goodwill Industries collected approximately 20% of all the e-scrap that is collected and processed in Oregon (by weight). Goodwill Industries has 83 distinct collection points in Oregon, including:

- 32 retail stores
- 48 attended donation centers
- 3 outlet retail centers which collect and process e-scrap

A number of other thrift organizations also collect e-scrap through multiple collection points – such as Value Village and St. Vincent de Paul. As well, Office Depot identified 15 of its stores as participating in its “Tech Recycling” program, whereby customers can bring old computers in for recycling.

There are 15 counties in the state where no collection points for any type of scrap electronics were identified during this study – primarily rural counties in southern and eastern Oregon. These counties represent 8.2% of the total population in Oregon. However, four of these counties with no collection points are within a reasonable driving distance of identified collection sites (Klamath, Jefferson, Hood River, and Sherman counties); when they are removed from the sample, the remaining 11 counties represent 5.2% of the state’s population. Those remaining 11 counties comprise Baker, Gilliam, Lake, Harney, Malheur, Grant, Wheeler, Morrow, Umatilla, Union, and Wallowa. Thus, about 95% of the state’s population has reasonable access to electronics recycling services.

As shown in Chart 2-13, however, 18 out of 61 collectors and collector/handlers say they serve the entire state, and 5 out of 61 say they serve eastern and southern Oregon. It is possible that these parts of the state receive periodic collection events, and our survey did not elicit that specific information. The majority of collectors and collector/handlers are serving the greater Willamette Valley and Portland area.



When asked “What is your best estimate of the *furthest* distance that your customers are located from your facility or program?” survey respondents reported a variety of lengths their customers traveled to get to them – from 1,000 miles (a handler only who ships equipment for processing in from out of state) to 450 miles (across state), to many in the 10-30 mile range. The average distance is 84 miles.³ However, it appears from the survey responses that the majority of citizens in Oregon travel far less than the 84 mile average distance.

Televisions are less widely accepted than other electronics products included in this survey. There are 16 collectors or collector/handlers out of 61 who do not accept TVs, located in 12 counties (Linn, Jackson, Deschutes, Multnomah, Clackamas, Marion, Lincoln, Yamhill, Washington, Wasco, Benton and Clatsop). In all but 2 of the 12 counties (Wasco and Clatsop) other collectors or collector/handlers are providing service for TVs. The large majority of population in Oregon has collection service available for televisions.

³ In calculating this average distance, “outliers” were removed (4 survey respondents claimed customers traveled more than 500 miles – all were facilities providing secondary processing) as they do not represent the experience of the majority of residential and business/corporate/governmental customers looking for e-scrap services.

2.4 Business Prospects & Challenges

To get an idea of the capacity for Oregon’s infrastructure to grow and expand, survey respondents were asked “at what capacity are your operations running on average?” Of the 65 survey respondents, 43 responded to this question (66%). Of those, answers varied widely (from 1% - presumably a startup, to 100%), but the average of that sample is 86% capacity. It appears that Oregon’s electronics recycling infrastructure has some capacity to grow.

Survey respondents were also asked about the greatest challenges they face, and were given the opportunity to rank a list of 10 options as great, moderate, minor or not a challenge. Fifty-one percent (51%) of all those surveyed responded. Of these, the challenges were ranked as shown in Chart 2-15 below.

Chart 2-15: Ranking of Challenges	
Challenge	Rank
Downstream markets	1
Tracking downstream vendors	1
Inadequate revenue	2
Transportation	2
Competing with e-scrap handlers who are not following best management practices	3
Determining material/commodity content	4
Government regulation	5
Communication with manufacturers	6
Insufficient e-scrap volumes	7
Competing certification systems	8

It is also interesting to note that more respondents ranked their challenges as “moderate” or “minor” than as “great” or “not a challenge.”

3.0 Industry Management Practices

3.1 General Practices

This survey explored basic business management practices including:

- What organizations are charging – the cost of services to customers
- How services are funded
- Record-keeping practices (maintaining records of e-scrap managed)
- Certification from an outside source (if survey respondents had certification and if customers ask about this)
- Documentation of e-scrap management (if customers ask about documentation of how and where e-scrap is managed/processed)

3.1.1 Cost of Services

Responses to the survey questions on customer fees by all survey respondents (collectors, handlers and collector/handlers) indicate that there are a range of business models being used in the electronics recycling industry. Some entities charge by the unit, others by the pound, others use a combination, and still others such as the thrifts do not charge at all. Many responses indicated the fees vary depending on volume of material, whether it is a “walk-in” residential customer or commercial account and the size of the unit (if charged by unit). A summary of the fees charged to customers is provided in Chart 3-1, below.

Depending on the product category, from 6% to 33% of private businesses accept e-scrap material at no charge. Those that do are primarily local governments and haulers. A majority of the charitable organizations also accept electronics at no charge (67% to 100% depending on the product category).

The range of fees for most products, with the exception of TVs and flat panel TVs, appears fairly consistent between products, typically between \$5 and \$15 per unit. Fees charged for TVs ranged from \$8 up to \$70. Chart 3-1 shows the range of fees and number of organizations involved in managing each of these types of e-scrap. Note that non-profit organizations are included in the “Charitable Organization” category and local governments are included in the “Private Businesses” category.

Chart 3-1: Customer Fees

Category	Number Accepting this Product (out of 65 respondents)	Range of Fees Charged					
		Private Businesses Accepting Material for Free	Charitable Orgs Accepting Material for Free	High Fee Per Unit	Low Fee Per Unit	High Fee Per Pound	Low Fee Per Pound
Computers	54	19%	100%	\$10.00	\$3.00	\$0.40	\$0.25
CRTs	55	9%	67%	\$15.00	\$5.00	\$0.55	\$0.20
Flat Panel Monitors	54	10%	83%	\$15.00	\$5.00	\$0.40	\$0.15
Laptops	53	24%	92%	\$15.00	\$5.00	\$0.40	\$0.15
Televisions	47	6%	82%	\$70.00	\$8.00	\$0.50	\$0.15
Flat Panel TVs	44	6%	82%	\$50.00	\$10.00	\$0.50	\$0.15
Peripherals	51	33%	92%	\$15.00	\$2.00	\$0.40	\$0.10

There do not appear to be notable regional variations within Oregon in the fees.

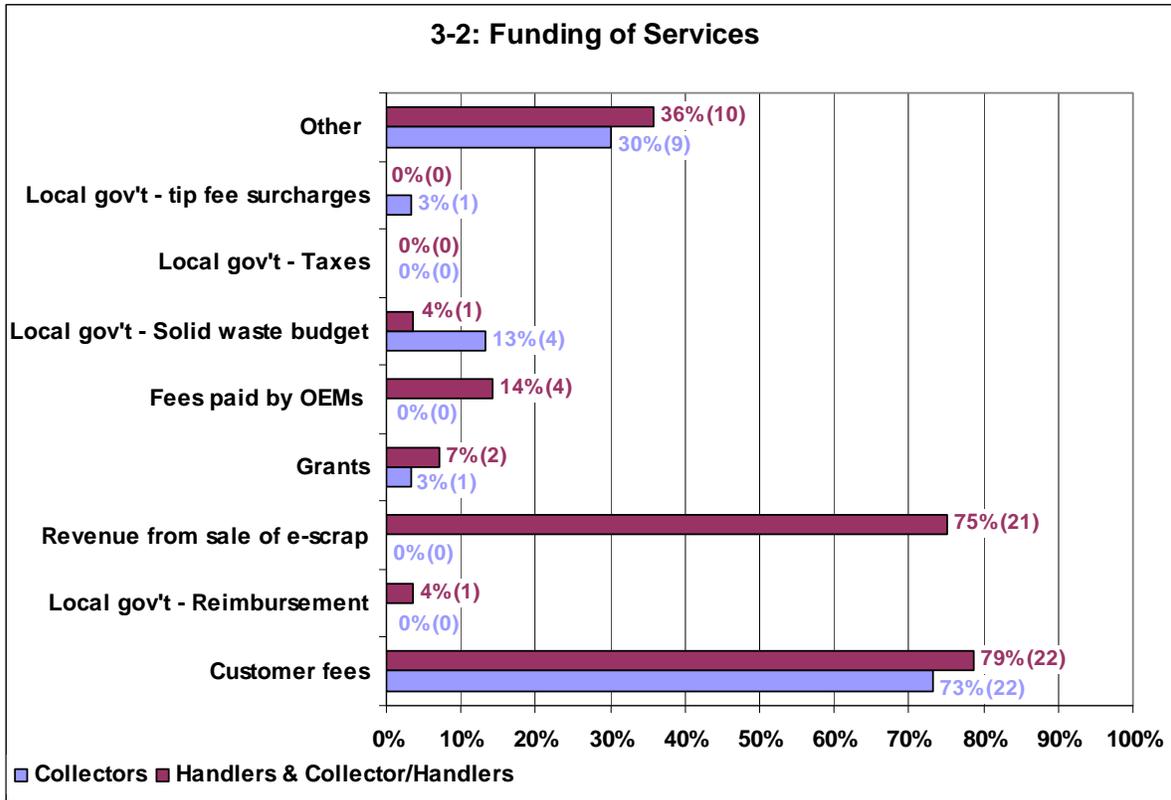
With the exception of the charitable organizations, which primarily serve residential customers and mostly do not charge a fee, there was not a notable difference in fees between entities serving residential and commercial customers. However, a few respondents noted that for higher volume commercial accounts their fees are lower.

Sixteen percent of respondents said that they pay customers for some particular type of e-scrap. These respondents explained the settings where they pay customers for e-scrap as follows:

- Buying at auctions (entities buying at auction will regard the seller as a customer)
- Servicing large original equipment manufacturer (OEM) contracts with some guarantee of high-value material (entities providing e-scrap recycling services to an OEM will typically structure a contract where they are paid for recycling the lower value material but will pay the OEM for higher-value material)
- Paying customers for more valuable commodities such as metals (certain customers who are knowledgeable about the market value for precious metals in their e-scrap (such as palladium), will ask their recycler for payment for a percentage of the value of the precious metals recovered)

3.1.2 Funding of Services

As shown in Chart 3-2, the most common funding source is “fees paid by customers” (above 70% for both collectors, handlers and collector/handlers). For handlers and collector/handlers, 75% report that they are covering portions of business costs through revenue from sale of e-scrap. It appears that local governments are not contributing significantly to the financing of e-scrap management in Oregon.

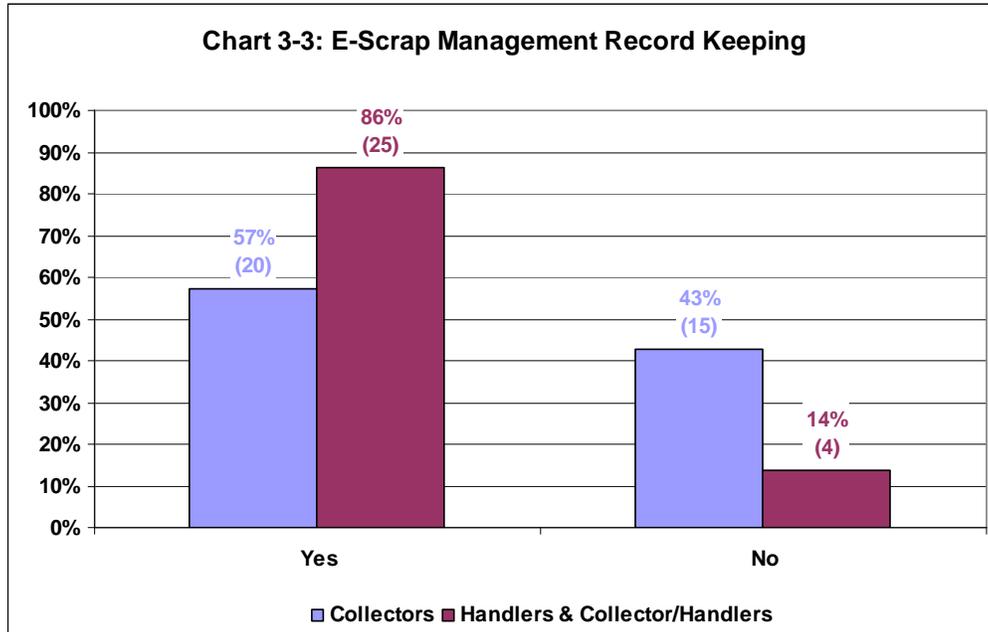


Responses in the “other” category – which is clearly a significant portion of funding operational costs – include a variety of revenue sources:

- Resale of reusable parts and working units (quite common)
- A nonprofit whose workers repair the e-scrap it receives are part of a vocational rehabilitation program, and the nonprofit is reimbursed from rehab funding
- A hauling company factors cost into overall garbage disposal rates, so residential customers have no fee at time of disposal

3.1.3 General Record-Keeping

Respondents were asked if they maintain records of e-scrap they receive, process, transport, store and/or sell. Chart 3-3 shows that just over half of collectors (57%) follow this practice, and nearly all of the handlers and collector/handlers (86%) do so.



During the site visits, many of the interviewees indicated the importance of record keeping. However, this was not a universal attitude, as other interviewees did not place much value in keeping records.

3.1.4 Documentation of Management

For some e-scrap generators, it is vitally important to obtain documentation on how their e-scrap is managed, such as a Certificate of Recycling or reports on data destruction, by equipment serial number or by asset tags. We asked survey respondents about customer' requests for documentation of equipment disposition:

- For collectors, 15 of the 36 collectors (or 42%) have had customers ask for this. And, of those 15 collectors, five reported that between one-third and two-thirds of their customers ask about this. The remaining ten reported less than a third of their customers have ever asked about documentation of equipment disposition.
- For handlers and collector/handlers, 22 of the 29 entities (or 76%) have had customers ask for documentation of equipment disposition. Of those 22 handlers and handler/collectors, four of them reported that 100% of their customers ask; seven said that between one-third and 90% of their customers ask, and eleven said that less than one-third of their customers ask about documentation.

The handlers and collector/handlers serving larger commercial accounts had customers asking for documentation of disposition – as stated above, this is due to larger corporations needing to manage environmental, financial, and other legal liability by gaining assurance of proper practices.

3.2 Disposition and Management of Collected E-Scrap

The Oregon e-scrap industry appears to be served by a variety of downstream (or end) markets for e-scrap that is collected in the state. And many of the nonprofits and charitable organizations process a significant fraction of the e-scrap they receive themselves, through refurbishment for resale. Thus, these entities serve as their own end market – a business model with tremendous benefit to the state in terms of employment, job training, social good, and reduced adverse environmental impact.

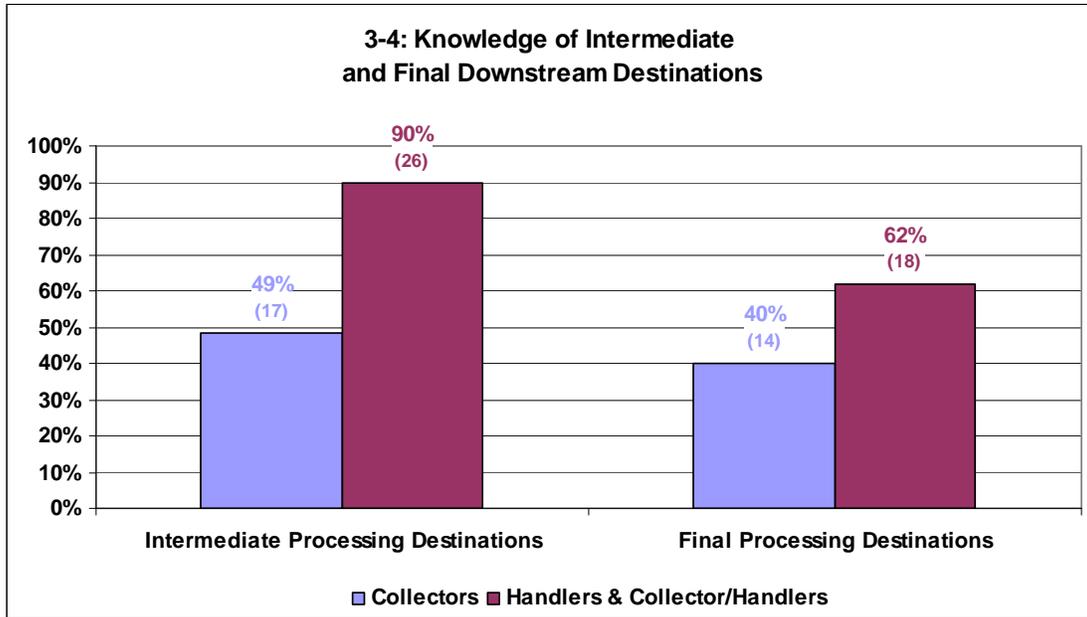
Challenges facing the e-scrap industry include operating in a global market and trading commodities that contains hazardous constituents. As well, not all players in the value chain are scrupulous about ensuring protection of human health and the environment in every step along the way. Responsible entities generally seek to gather information about downstream vendor management practices.

To understand the level of research conducted by collectors, handlers and collector/handlers about downstream vendors' practices (often referred to as 'due diligence'), the survey asked if respondents were aware of both intermediate and final destinations of the e-scrap they manage. For example, a collector might simply sort equipment it collects by type, and palletize. It would then send it to an *intermediate* market which could be a recycler that provides manual disassembly of all equipment except CRTs. From there, the recycler would send the sorted fractions to various *final* markets. Final markets for various materials might include:

- Metals from hard drives and printed circuit boards to a smelter
- Plastic external housings to a plastics reclamation recycler
- CRTs to a specialized CRT processor
- Lamps from flat panel displays containing mercury, and batteries from laptops, to mercury and battery recycling facilities

These markets can be local, national or international.

Chart 3-4 shows that less than half of the collectors have knowledge of intermediate and final markets. Handlers and collector/handlers, on the whole, do pay attention to their intermediate destinations (90%) and a majority (62%) indicated they have *some* knowledge of the final destinations.



Getting documentation of what intermediate and final end markets do with e-scrap is another way of ensuring responsible management. Respondents were asked if they require a record (or documentation) of where materials ultimately end up. Chart 3-5 shows that this is far from a universal practice – especially for collectors.

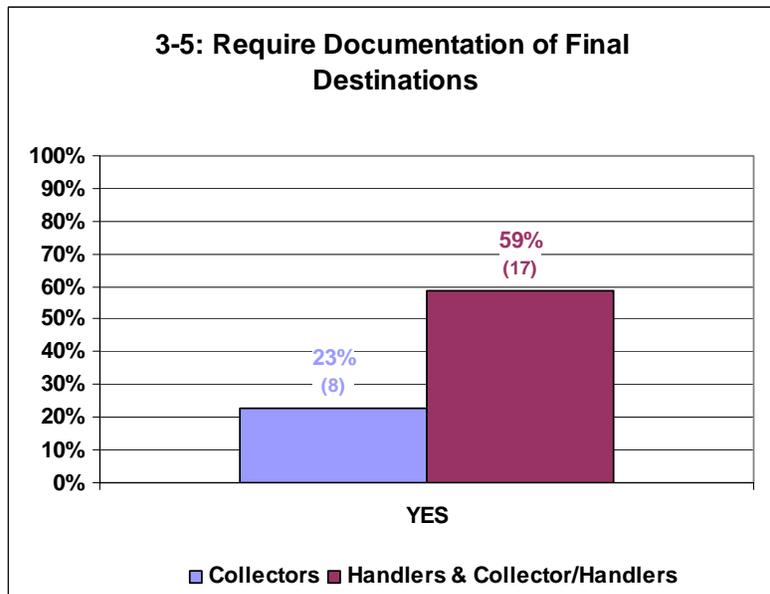
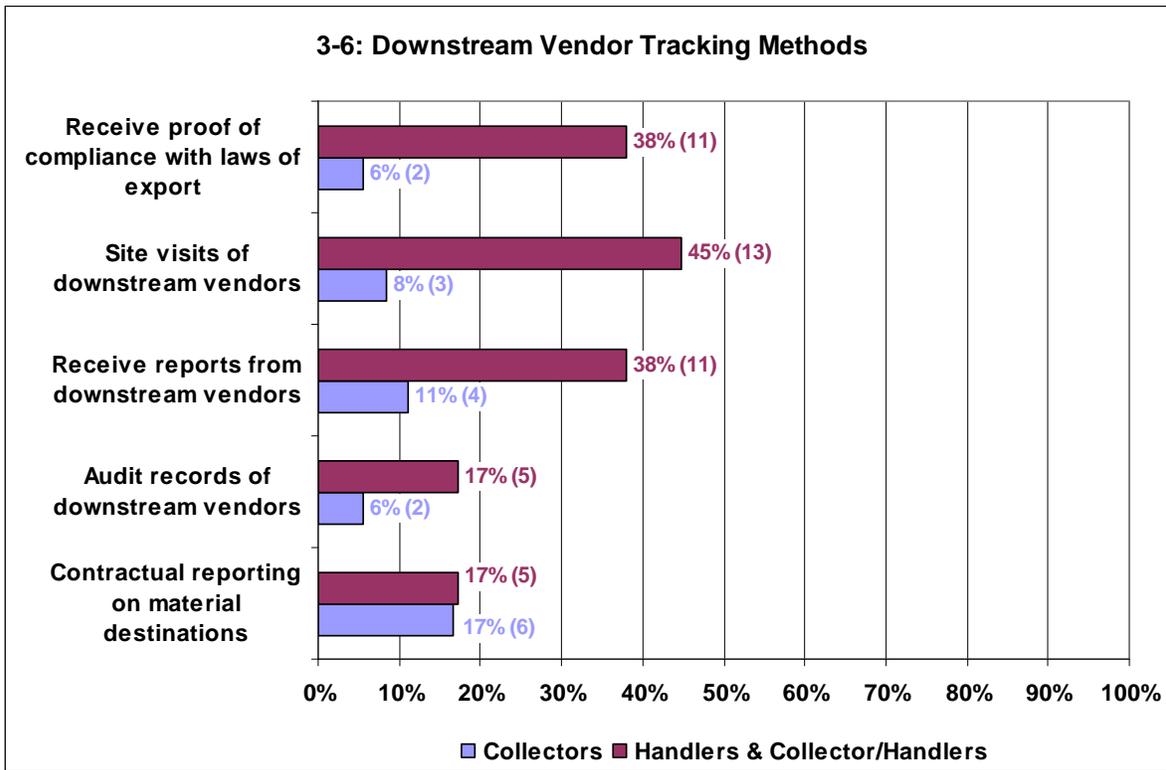


Chart 3-6 shows how survey respondents actually track downstream vendors. Clearly, the percentage of collectors who track downstream vendors is very low. The percentage of handlers and collector/handlers is also relatively low. A number of interviewees, at the site visits, voiced the opinion along the lines of ‘if someone is paying me for this material, it must have value and must be being handled properly, so why would I enquire further?’



How entities manage downstream markets seems to fall into two categories: those that know and select their downstream vendors, establishing stable ongoing business relationships, and those that sell e-scrap on the “spot market” or via auction to the highest bidder and do not track downstream vendors.

3.3 Environmental Practices

To aid the state of Oregon in its efforts to establish best management practices, the survey asked e-scrap handlers and collector/handlers about many aspects of environmental management practices in the e-scrap industry. The picture that emerges is of an industry that is in flux about environmental practices – with a very wide range of practices being exhibited by Oregon handlers and collector/handlers.

One of the first and simplest things an e-scrap handler or collector/handler can do is to obtain an EPA ID#. An EPA ID number is required for the larger generators of hazardous waste and for the most part is not required for e-scrap collectors, handlers and collector/handlers in Oregon. Obtaining an EPA ID# (registering with the Oregon DEQ and making it known that they are doing electronics recycling business) is a way of establishing legitimacy and a presence in the marketplace. In some cases, vendors have represented an EPA ID# as ‘certification’ or approval from EPA or the Oregon DEQ – which is not the case. Seven out of 29 (24%) of those surveyed have an EPA ID #.

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The next level of environmental protection practice for a business is to write and follow an environmental management system (EMS) – 12 of 29 (41%) report having done that.

Other types of written plans are often used by companies to establish and manage environmental practices and can be used as indicators of environmental due diligence. When asked if they had a written hazardous materials management plan, 14 out of 29 (48%) handlers and collector/handlers said that they do, and 15 out of 29 (52%) do not. Of the 14 that do have hazardous materials plans, the following hazardous materials are addressed:

- lead (9 plans)
- batteries (9 plans)
- mercury (9 plans)
- toner (5 plans)
- beryllium (3 plans)
- cadmium (4 plans)
- polychlorinated biphenyls (5 plans)
- free flowing fluids such as oils inks and lubricants (7 plans)

A series of questions was asked about environmental health and safety management practices. The responses to these questions are summarized in Chart 3-7. About two-thirds of all e-scrap handlers and collector/handlers reported in the survey and/or during the site visit that they do engage in these various standard practices.

Chart 3-7: Environmental Health & Safety Management Practices (Handlers & Collector/Handlers)	
EHS Question	Entities Answering YES (out of 29)
Do you perform regular environmental health and safety audits?	19
Does your company have a written employee training program for environment and health and safety?	18
Is there a trained employee who is responsible for environmental health and safety on site?	18
Do you have an emergency prevention preparedness and response plan including procedures for evacuation fires explosions chemical releases etc?	19
Have you had an OSHA inspection in the past 3 years?	17

Finally, one of the most rigorous due diligence steps that can be taken by a recycling operation is to certify or verify it meets a standard. A number of organizations involved in

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the e-scrap industry have sought to establish various types of certification, auditing, and credibility systems. These include certification standards established by industry such as:

- Institute for Scrap Recycling Industry's RIOS – Recycling Industry Operating Standards
- International Association of Electronics Recycler's certification
- ISO

All three of these certifications require an independent third-party auditor to certify the facility's operations to the standards as spelled out by ISRI, IAER or ISO.

Voluntary, self-reporting credibility methods include the Basel Action Network's Electronics Recyclers' Pledge of True Stewardship.

Large corporations will use independent auditors from CHWMEG to audit and report on plants – this is a very credible source; as well large corporations often audit their e-scrap vendors themselves. And, the U.S. EPA provides simple guidelines on choosing an electronics recycler to aid customers called the "Plug In To E-Cycling" Guidelines.

The barriers to entry to the e-scrap industry are fairly low – and there are many players seeking to enter this market all the time. For an emerging industry, certification (third-party or self-declared) is one method to establish credibility in the eyes of its customers. Large corporations, for instance, may seek a certification of some type to verify that an e-scrap handler will meet the corporation's standards for protection from environmental liability, compliant materials handling, avoiding unsound end markets, and insurance requirements.

Noting that a certification or credibility system works best when it is valued and known in the marketplace, we asked "what percentage of your customers request or ask about certification from an outside source?"

- For collectors, only 1 of the 36 collectors (or less than 3%) had its customers ask about certification – and that collector said "1% of my customers ask about certification."
- For handlers and collector/handlers, only 7 of the 29 entities (or 24%) have had customers ask about certifications. All seven reported that only between 1% and 15% of their customers ask about certification.

In the site interviews, we found that several handlers and collector/handlers expressed confusion over the various certifications available and some disappointment that a single universally accepted program was not available. No one indicated that the existing certification systems were important to their customers.

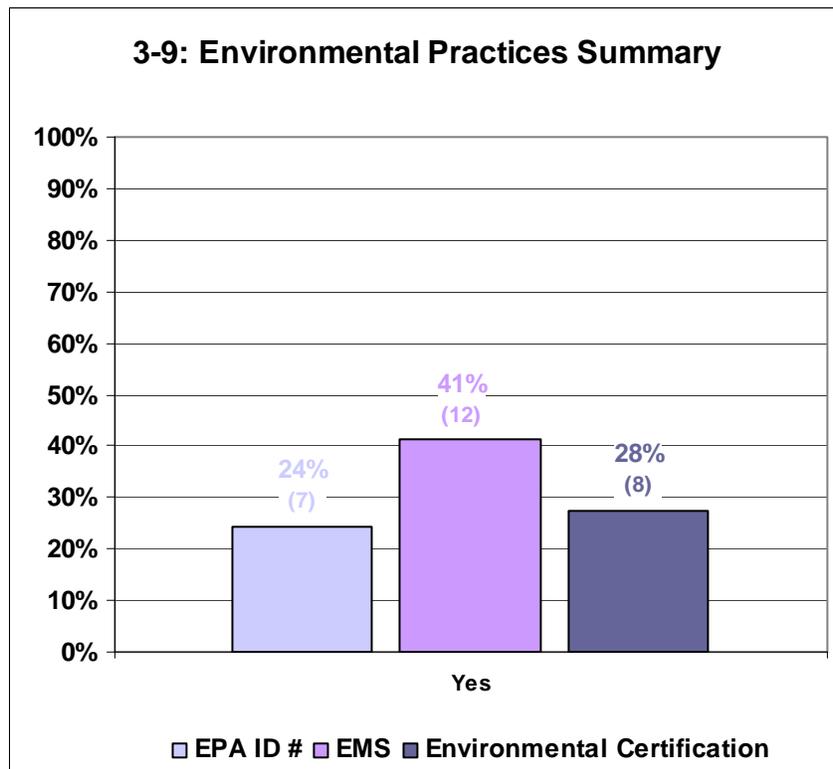
Chart 3-8 provides the answer to 'what type of certifications?' do Oregon e-scrap handlers and collector/handlers hold. Very few have pursued any type of certification, as the data below suggest. In fact, only 4 of the 29 handlers and collector/handlers have pursued these at all – and these represent companies with a national focus, not businesses operating only in

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Oregon. The 4 entities claiming some type of certification represent 14% of the total sample of 29 entities.

Chart 3-8: Number of Handlers and Collector/Handlers with Environmental Certification		
Type of Certification (include both 3 rd -Party and Self-Declared)	Number of Entities (out of 29)	Percentage of Entities
EPA Plug Into E-Cycling Guidelines	4	14%
Ban Pledge of True Stewardship	4	14%
IAER Certification	3	10%
ISRI RIOS Certification	2	7%
CHWMEG Audit	2	7%
ISO Certification	1	3%
Total Number of Entities with Any Certification	4	14%

In summary, as shown in Chart 3-9, 24% of handlers and collector/handlers have an EPA ID#, 41% report having an EMS and 28% have some kind of environmental certification.



3.4 Most Important Environmental Practices

Handlers and collector/handlers were asked the following open-ended question: "What do you believe are the three most important environmental management practices for e-scrap handlers?" Of the 29 entities in the sample, 25 provided thoughts on this question. From the responses we extracted the following prioritized responses:

- (1) The most important environmental practice to handlers and collector/handlers is **tracking downstream vendors** and knowing where e-scrap is going and how it is being handled. Presumably, this is because of concerns about improper export practices, illegal practices in this country, and potential liability under CERCLA. Respondents mentioned the importance of using on-site audits to obtain assurance of responsible practices with their downstream vendors. Regulators' audits of practices was mentioned by one party. Of the 29 respondents, 6 mentioned this as their first concern, 2 as their second, and 3 as their third concern.
- (2) Concern about responsible **environmental health and safety management of a company's own staff and operations** was the second most important environmental practice. As one respondent said, "development of robust in-house environmental, health, and safety practices" is critical. Several mentioned how important training is for staff doing manual disassembly and those working with hazardous materials. "You have to know your people are safe," said another. Of the 29 respondents, 5 mentioned this as their first concern, 5 as their second, and 1 as their third concern.
- (3) The third most important concern was **knowing what hazardous materials are in the equipment** received. Respondents mentioned several constituents of concern, including knowing where these items are and how to safely remove and manage them:
 - Mercury
 - Batteries
 - Chemicals from printers and copiers
 - PhenolsRespondents voiced a desire that information about hazardous materials in e-scrap be made available - and that such information be shared in the e-scrap industry. Of the 29 respondents, 2 mentioned this as their first concern, 4 as their second, and 4 as their third concern.
- (4) A number of other concerns were voiced but did not receive 10 or more mentions. These include (in order of priority):
 - Proper management of CRTs and lead-containing items (4 - 1st concern; 0 - 2nd & 3rd concern)
 - Keeping e-scrap out of landfills (2 - 1st concern; 1 - 2nd, & 1 - 3rd)
 - Maximizing reuse over recovery (1 - 1st concern; 1 - 2nd & 1 - 3rd)
 - Sufficient liability insurance (1 - 1st concern; 1 - 2nd & 1 - 3rd)
 - Regulatory compliance and record-keeping (1 - 1st concern; 2 - 2nd & 1 - 3rd)
 - Education of public, customers, and staff (0 - 1st concern; 1 - 2nd & 2 - 3rd)

4.0 E-Scrap Materials Collected and Handled

Data on quantity of materials collected and/or processed in Oregon were obtained from 61 of the 65 entities surveyed. The four entities without data were either small facilities who do not track the quantity of material they handle or they had not been operating long enough to collect data.

As mentioned in Section 1, one handler declined to participate in the survey. This handler functions as a 'transfer station,' exporting material to Asia, and does not seem to accept material directly from generators. Therefore we assume that this handler's quantities of material handled are already accounted for in other collectors', handlers' or collector/handlers' quantities reported.

Each of the handlers and collector/handlers was asked to provide the percentage of material that they process that comes directly from generators and the percentage that comes from collectors or other handlers and collector/handlers. This information was used to adjust the total quantities so that total material amounts were not being double counted both for collection and processing.

4.1 Total Quantity

Chart 4-1 and Chart 4-2 below summarize the total quantity of material managed by organization type. An estimated 16,720,000 pounds of e-scrap material was collected and/or processed in Oregon during 2005 based on these survey results. It should be noted, however, that although the survey was specific in scope (CRTs, CPUs, laptops, printers, peripherals and televisions); it is likely that this number includes some other electronic scrap material, such as some other consumer electronics or office equipment.

Using an Oregon population of approximately 3.64 million, this equals 4.6 lbs per person of residential and commercial e-scrap managed in 2005 by the infrastructure surveyed. For the residential and small business portion, the pound per person in 2005 is estimated to be 1.8 pounds. This number could be as high as 2.4 pounds per capita because much of the "unknown" portion (see Chart 4-1) is from haulers and local governments serving primarily residential customers.⁴

⁴ Data from the National Center for Electronics Recycling shows per-capita collection rates from residential/small business programs around the nation ranging from 1.6 to 3.4 lbs./capita/year. The range is attributable to frequency of service, whether small business is included, and the scope of products received.

Chart 4-1: Total Quantity E-Scrap Managed in 2005

	Residential ¹ (lbs.)	Commercial ² (lbs.)	Unknown (lbs)	TOTALS
Local Government	280,000	120,000	930,000	1,330,000
Non-Profit: General	2,220,000	1,190,000	30,000	3,440,000
Non-Profit: Charitable Org	3,110,000	170,000	170,000	3,450,000
Private Business	1,050,000	6,320,000	1,130,000	8,500,000
TOTALS	6,660,000	7,800,000	2,260,000	16,720,000
Pounds per person	1.8	2.2	0.6	4.6

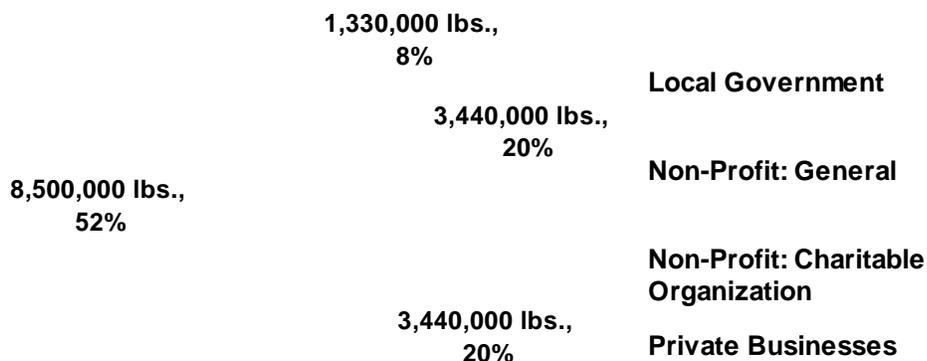
¹ - includes small business

² - includes large businesses and corporations, schools and universities, hospitals, government, and other institutions

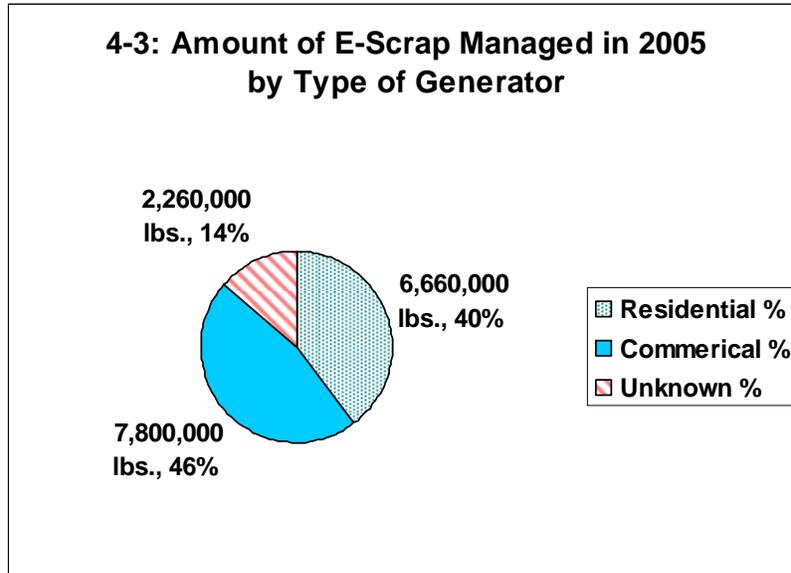
Nearly half the e-scrap handled in Oregon is processed by just three entities (one private business, one non-profit and one thrift/charitable organization). Each of these three entities processed over 2 million pounds of e-scrap in 2005.

As shown in Chart 4-2, 52% of the material is managed by private businesses and about 40% by non-profit organizations. This distribution shifts, however, when residential and commercially generated material is evaluated, as discussed below.

4-2. Amount of E-Scrap Managed in 2005, by Type of Organization



Of the nearly 17 million pounds of e-scrap managed in Oregon in 2005, the portion collected from residents (40%) is close to the portion collected from the commercial section (46%). The unknown percentage (14%) is primarily collected by haulers, landfills and local governments.



As shown in Chart 4-4, private business e-scrap entities manage the majority of the commercial e-scrap collected (by weight) (81%). Non-profits (excluding charitable organizations) make up another 15%, with local government and charitable organizations managing approximately 2% each.

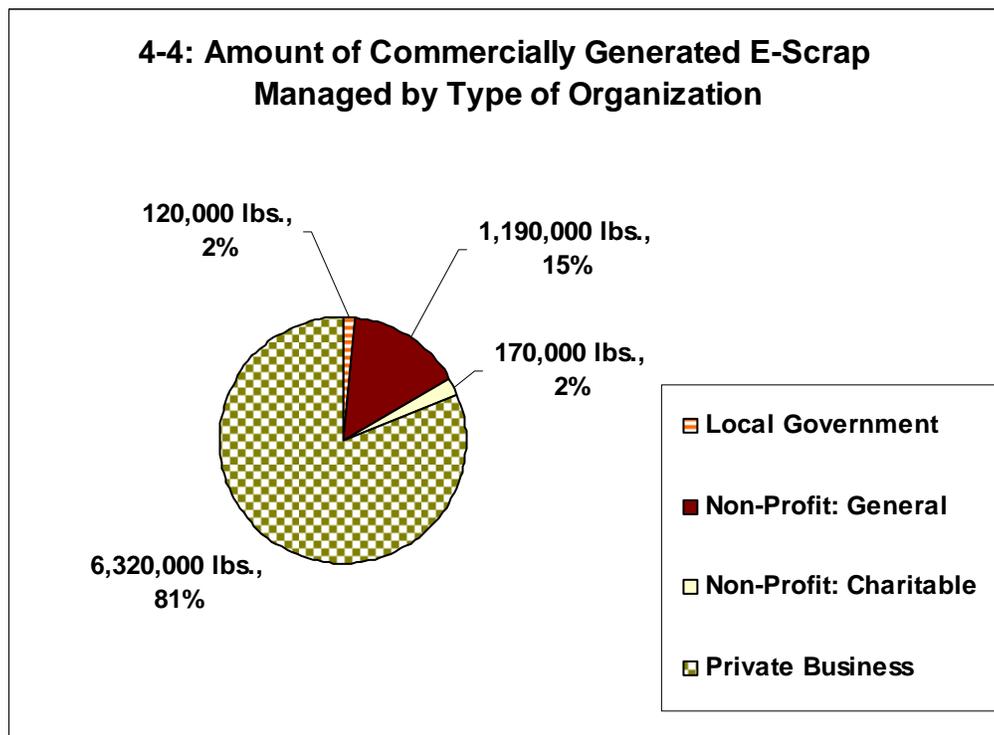
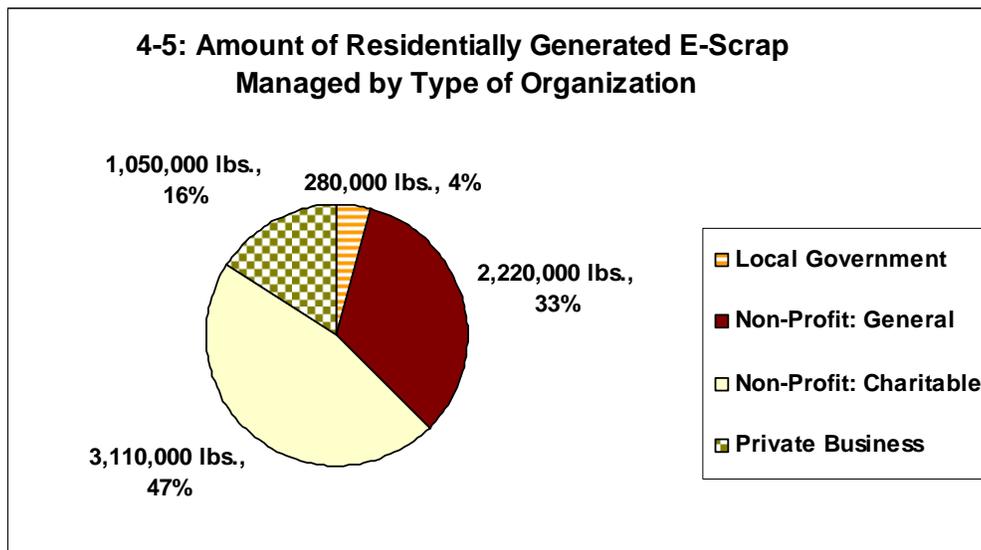


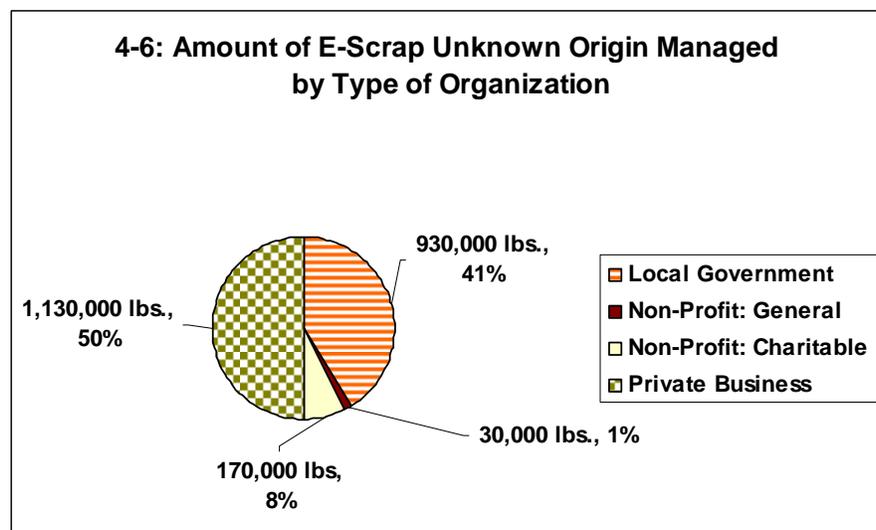
Chart 4-5 shows this picture shifting dramatically for residentially generated e-scrap where charitable organizations collect and/or handle nearly half of the e-scrap generated (47%).

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Another 33% is managed by other non-profits. These findings indicate that the non-profit e-scrap infrastructure serves primarily residential generators.



Many collectors and handlers do not know whether certain batches of e-scrap they receive are from residential or commercial sources. Perhaps this large share of 'unknown generator' equipment is due to mixed loads, poor record-keeping, or failure to ask on the part of the collector or handler. Chart 4-6 shows that private businesses collect the most unknown generator equipment, with local government a close second. Given that local government collects a relatively small fraction of all the e-scrap generated in Oregon (8% or 1.3 million lbs., Chart 4-1, above), it would appear that local governments do not usually enquire about the source of the e-scrap they receive.



4.2 Management of E-Scrap

There are four major types of e-scrap handling in Oregon:

- Reuse –where e-scrap is refurbished for sale or reused “as is”
- Recycling – where e-scrap is taken apart for use as input to or feedstock for various industrial processes
- Landfilling – end-fractions (such as wood scrap from old console TVs) are sent for disposal. No respondents reported landfilling whole products.
- Unknown – survey respondents didn’t know what happened to certain fractions

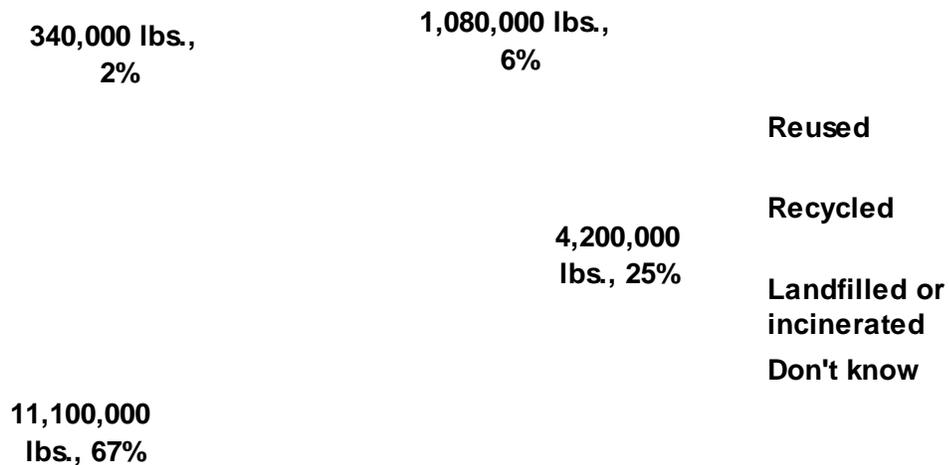
Chart 4-7 shows where the various types of organizations (all survey respondents) involved in e-scrap are sending the e-scrap they manage.

Chart 4-7: Management of E-Scrap (Pounds)

	Reused	Recycled	Landfilled or Incinerated	Unknown	TOTALS
Local Government	380,000	940,000	10,000	0	1,330,000
Non-Profit: General	1,620,000	1,800,000	20,000	0	3,440,000
Non-Profit: Charitable Org.	950,000	2,230,000	230,000	40,000	3,450,000
Private Business	1,250,000	6,130,000	80,000	1,040,000	8,500,000
TOTALS	4,200,000	11,100,000	340,000	1,080,000	16,720,000

Chart 4-8 shows the same data as above in a pie chart format.

4-8: Management of E-Scrap (Percentage)

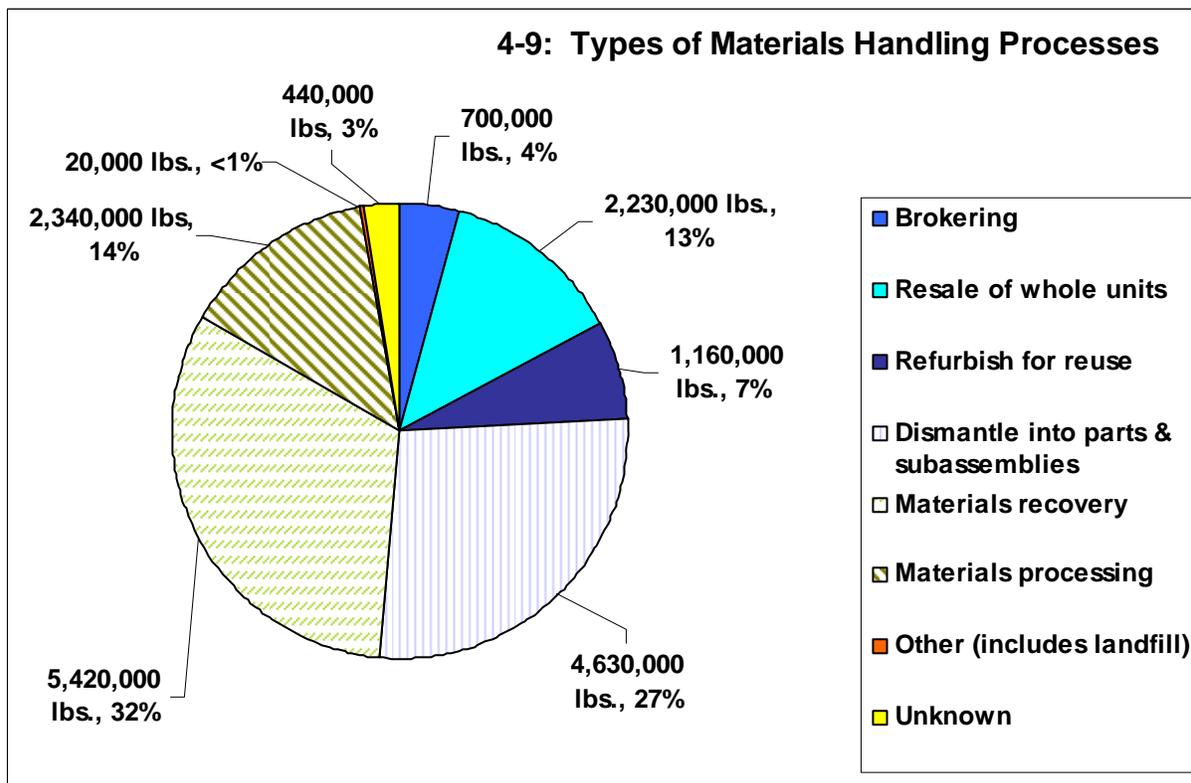


4.3 Types of Material Handling

Handlers and collector/handlers, by definition, decide how to process e-scrap received to extract the most market value. There are a variety of methods available to do this. These methods are defined in detail in Section 2.2.3 and include:

- Brokering – setting up a transaction between a buyer and seller of e-scrap
- Resale of whole units – usually tested to be sure they are working, but not necessarily
- Refurbish for reuse
- Dismantle into parts and subassemblies – usually for resale (e.g., the market for used printed circuit boards is very strong in 2006)
- Materials recovery – manual separation into plastic, metal, glass, etc. – usually done with workers at benches with fairly standard tools
- Materials processing – mechanical crushing, shredding & grinding into plastic, metal, etc.

Chart 4-9 shows the percent of entities engaging in various types of materials handling processes, based on reported e-scrap weights.



This survey did not find any large-scale mechanical crushing of whole units of e-scrap being conducted by handlers in Oregon. Nor did we find any entities involved in crushing CRT glass. We did, however, find some handlers, primarily secondary processors, who are doing

some shredding of metals and grinding of plastics. We observed that it is usually the larger companies that can afford crushing or shredding machines.

4.4 Final Disposition of Material

How entities manage downstream markets falls into two categories: those that know and select their downstream vendors, establishing stable relationships, and those that sell e-scrap on the “spot-market” or via auction to the highest bidder and do not track downstream vendors. Most of the larger, more established recyclers tend to know and select their downstream vendors. However, 41% of the handlers and collector/handlers of Oregon’s e-scrap do not track their e-scrap as it moves on downstream.

During the site visits, each handler and collector/handler was asked about barriers to getting information on environmental practices and compliance of downstream vendors. The responses were prioritized from most to least important:

- 1) Only work with companies that provide information and/or perform audits
- 2) Don’t screen downstream vendors and/or don’t consider it their responsibility
- 3) Use larger, reputable companies and assume they are doing the right thing
- 4) Other
- 5) They trust their broker
- 6) Brand new business – no vendors yet

There appear to be five primary categories of e-scrap heading to downstream vendors:

- 1) Whole working units
- 2) Whole or partial non-working or untested units
- 3) Components (working or non-working)
- 4) Commodities (metals, plastics, etc.)
- 5) CRTs and CRT glass

4.5 E-Scrap and Export Issues

Handlers and collector/handlers we visited indicated anecdotally that their material was being exported overseas, primarily to Asia. They either had direct knowledge of export, or inferred that it was occurring. For some of the exported e-scrap material streams, this practice appears to pose little harm to overseas environments. For example, tested, working whole units are typically exported to companies that do cosmetic or simple upgrades and re-sell them to “third world” markets. Or commodities such as metals may be exported to overseas smelters that are well-regulated by their home countries, such as Sweden’s Bolliden operation.

Reputable export markets are known businesses with a degree of accountability (to customers, and/or to the national government). When U.S. companies export e-scrap to such operations, the risk of causing harm to the environment or human health outside the U.S. is less than exporting to unknown vendors. An unknown fraction of exported e-scrap (whether from Oregon or elsewhere) goes to less scrupulous vendors where it is impossible to determine environmental health and safety practices.

However, because used electronics and electronic scrap sometimes contain what are considered hazardous wastes internationally, it is important to be aware of the international treaties and domestic laws in recipient countries that govern this trade in used electronics.

As background information it is helpful to know, because the US has not ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal⁵ (and remains the only developed nation not to ratify), it is legal under U.S. law for businesses to export electronic waste to most countries. It is important to be aware, however, that for about 138 developing nations that have ratified the Basel Convention but are not members of the Organization for Economic and Cooperative Development⁶, it is illegal for them to accept hazardous wastes, as defined in the Basel Convention, from the U.S.⁷ Because the Basel Convention places responsibility on the exporting parties (Basel countries) to determine if any exports are considered Basel wastes, and because it is very difficult for importing countries to monitor and control all imports, it is therefore very difficult to prevent this illegal trade from the U.S.

Basel Convention-regulated wastes include hazardous materials destined for both recycling (materials reclamation and reuse) and disposal, and also provide restrictions on equipment going for major repairs or refurbishment. Although each Basel nation has its own definition of hazardous materials, many interpret Basel definitions of hazardous wastes to include:

- CRTs
- CRT glass
- Circuit boards (in any form),
- Mercury
- Beryllium
- PCBs
- Any non-working or untested devices containing any of the above to the extent that they exhibit hazardous characteristics, sometimes determined by the Toxic Characteristic Leaching Procedure (TCLP)

For a responsible e-scrap handler who does not wish to cause harm overseas, there are very practical challenges in auditing overseas vendors in Asia. Barriers such as distance, cost, language, and differing regulations have impeded most e-scrap handlers from doing this. Few organizations have the wherewithal to responsibly determine import and export restrictions (specifically with Asian countries) as well as to conduct audits.

4.6 Oregon and the Federal CRT Guidance and Regulations

During the site visits some handlers and collector/handlers expressed confusion about regulatory requirements for handling CRTs.

⁵ www.basel.int

⁶ www.oecd.org

⁷ Basel Convention, Article 4, Paragraph 5. "A Party shall not permit hazardous wastes or other wastes to be exported to a non-Party or to be imported from a non-Party."

2006 Oregon DEQ Electronic Scrap Baseline Survey

In July of 2006 the federal Environmental Protection Agency announced the adoption of its new Cathode Ray Tube (CRT) rule which is designed to streamline the end-of-life management requirements for recycling of used CRTs and glass from CRTs. The new rule amends the Resource Conservation Recovery Act (RCRA) 40 CFR Parts 9, 260, 261, and 271 [Docket RCRA-2004-0010; FRL-8203-1]. These amendments exclude CRTs and glass from CRTs from RCRA's definition of solid waste if certain conditions are met.

EPA's new rule provides conditional exclusions from the federal hazardous waste management standards for CRTs and CRT glass destined for recycling. These exclusions include:

- Used, unbroken CRTs will not be regulated as hazardous waste unless they are stored for more than year (limited storage requirements apply only to CRT recyclers and collectors)
- Used, broken CRTs will not be regulated as hazardous waste if the following conditions are met:
 - CRT containers are clearly labeled regarding contents;
 - Safe transportation in containers designed to minimize releases;
 - Storage in a building or container to minimize releases; and
 - Storage on site less than year before recycling the used, broken CRTs.
- To remain unregulated as hazardous waste, CRTs that are being processed into glass must follow the same requirements – and also must be processed:
 - Inside a building; and
 - At temperatures not high enough to volatilize lead from the glass.
- CRT glass that has been processed and sent to a CRT glass manufacturer or a lead smelter will not be regulated as a hazardous waste unless:
 - it is stored for more than one year; or
 - it is used in a manner constituting disposal (applied to the land).

The new rule also requires exporters shipping broken or unbroken CRTs to another country to do the following:

- Notify the EPA – a one-time written notification is needed for used, unbroken CRTs being shipped to another country for re-use.
- Receive written consent from the receiving country, through the EPA, before shipments can be made.

EPA notes that this requirement is similar to requirements applicable to exporters of hazardous waste [found at 40 CFR Part 262].

Oregon Dept. of Environmental Quality is reviewing its existing CRT policy in light of the recently adopted federal CRT regulation.

5.0 Surveyor Observations

The project's quantitative analyses and site visits led the authors of this report to conclude the following observations.

First, the authors were impressed at the quantities per capita (4.6 lbs. per capita in 2005) being collected in Oregon. To our knowledge, there is no comparable data being captured at a national level – data which includes e-scrap collected from all sources. As noted in Section 4.1, current data available nationally is primarily gathered from collection programs serving residential and small business generators of e-scrap.

Next, we note the lack of service in Eastern Oregon. While those Oregonians without ready access to e-scrap recycling number about 5% of the state's population, this does still pose a service access issue.

We noted a fairly low level of interest in, and investigation of, downstream markets by collectors we surveyed. This was also true of some handlers (probably less than half). Cost is likely an impediment to collectors making inquiries into their downstream markets. In addition, several entities indicated that they just felt it was not their responsibility to track downstream markets. This raises certain environmental concerns.

Also of interest in Oregon is the prominent role thrift stores, charitable organizations, and non-profits play in the e-scrap infrastructure. These groups comprise 66% of collection sites. The advantage of this growing infrastructure is the high level of reuse the not-for-profit groups wring out of the e-scrap they collect – an environmental benefit. The disadvantage is that some of the not-for-profit organizations' indicated a lack of interest in what happens to material as it goes downstream from them.

The site visits and data from the survey indicate a strong desire from handlers (and collectors too, but less so) for more guidance from the state on environmental practices. As well, handlers expressed a need to have the state aid the industry, in terms of leveling the playing field between exporters vs. domestic handlers. Coupled with the anecdotal evidence of significant export of e-scrap from Oregon, it appears that it can be difficult for handlers wishing to process e-scrap domestically (in order to assure their customers of safe and compliant environmental practices) to compete with companies incurring less expense by simply exporting e-scrap.

APPENDIX A
GLOSSARY AND DEFINITIONS

APPENDIX A

Glossary and Definitions

Glossary and Definitions

Brokering – Making an arrangement between a buyer and a seller. This can often include arranging both transportation logistics and details of the transaction itself. Can include brokering exotic electronics, precious metals, valued sub-assemblies, as well as whole units, whether working or non-working. Can also include auctioning, resale, and export.

Collector (as defined for this survey) – Entities that accept or collect and consolidate e-scrap for further processing at another facility. These entities do no handling or processing to the incoming e-scrap.

Collector/Handler (as defined for this survey) – Entities that both collect e-scrap from generators and also engage in handling services (as described below).

CRT - Cathode Ray Tube – The device used to display images inside a television or computer monitor. Being replaced by flat panel displays in the U.S. marketplace, CRTs are known by their characteristic shape and size. CRTs contain hazardous substances such as lead (Pb), which require special handling at end of life to protect human health and the environment.

Dismantle into parts and subassemblies – Manually taking apart equipment into distinct components such as printed circuit boards with market value. Also called demanufacturing.

Downstream – The movement of e-scrap materials from one entity to another - from collection, through handling and processing, on to final handling of the material. From the point of view of a collector of e-scrap, the generator (party getting rid of its e-scrap) is *upstream* and the handler is *downstream*. From the point of view of a handler of e-scrap, a collector is *upstream* and the companies that take material for further processing or disposition from the handler are *downstream* vendors.

E-scrap – Electronic scrap resulting from end-of-life electronic equipment, including computers, televisions, and related devices.

Handler (as defined for this survey) – Entities that de-manufacture, dismantle, shred, refurbish or otherwise process e-scrap, but do not collect e-scrap from businesses or individuals.

Manufacturer – Entities that manufacture electronic products. Only those manufacturers with national takeback programs available in Oregon were included in the survey.

Material processing – Mechanically shredding or grinding equipment to capture plastics and/or metals which are also sold into secondary recycle markets. Can include further processing such as palletizing plastics, refining metals, etc.

APPENDIX A

Glossary and Definitions

Materials recovery – Manually taking apart equipment into materials such as plastics and metals, to be sold into secondary recycling markets.

OEM – Original Equipment Manufacturer – The brand owners of electronic equipment, including well-known names such as Sony, Dell, Panasonic, HP, Gateway, etc.

Refurbishing for reuse – Replacing some or all of the parts or making cosmetic improvements to e-scrap to bring it to a workable condition. Equipment may be either resold or donated.

Resale of whole units – Reselling e-scrap that has been collected in any marketplace or venue – presumably for re-use but sometimes non-working units are sold whole.

Retailer – Entities that sell electronic products at stores located in Oregon. Only those retailers with electronic product takeback programs were included in this survey.

Secondary processing – An e-scrap handler may provide the first level of processing such as dismantling a computer. It may then send the parts or components to a secondary processor, which is another company that then provides further processing to turn parts or components into a commodity with value in the marketplace. An example of a secondary processor would be a metal smelter who receives hard drives from a handler, and turns them into steel ingots (which are then sold on the metals market).

APPENDIX B
SURVEY INSTRUMENT

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

2. Type of Service or Processing Activity

a. What is your intended service area in Oregon (Check all that apply)?

- | | |
|--|---|
| <input type="checkbox"/> Portland Metropolitan Area | <input type="checkbox"/> Willamette Valley (except Portland) |
| <input type="checkbox"/> I-84 Corridor (except Portland) | <input type="checkbox"/> My City only |
| <input type="checkbox"/> My County only | <input type="checkbox"/> Southwestern Oregon |
| <input type="checkbox"/> Central Oregon | <input type="checkbox"/> Eastern Oregon (includes south central counties) |
| <input type="checkbox"/> Coastal Oregon | <input type="checkbox"/> Entire state |

b. What is your best estimate of the furthest distance that your customers are located from your facility or program [approximately]: _____ miles

c. Type of services. (Check all that apply):

- Collector:** generally any public, private or nonprofit entity that accepts or collects used/waste electronics and consolidates/sorts them so they can be delivered for further processing.
- Handler:** generally any public, private or nonprofit entity that de-manufactures, dismantles, shreds, or otherwise processes electronic wastes (includes brokers of e-scrap).

d. Are you a:

- | | |
|---|--|
| <input type="checkbox"/> Private business | <input type="checkbox"/> Non-profit organization |
| <input type="checkbox"/> Local government | <input type="checkbox"/> Other. Please specify _____ |

e. What do you do? (Check all that apply):

- | | |
|---|---|
| <input type="checkbox"/> Thrift store or organization | <input type="checkbox"/> Refuse or recycling hauler |
| <input type="checkbox"/> Landfill | <input type="checkbox"/> Transfer station |
| <input type="checkbox"/> Recycling facility | <input type="checkbox"/> Retail store |
| <input type="checkbox"/> Reuse facility | <input type="checkbox"/> Scrap metal dealer |
| <input type="checkbox"/> Other. Please specify _____ | |

f. Length of time you have provided e-scrap services in Oregon:

- less than 1 year
- 1 to 3 years
- more than 3 years

g. How many employees are engaged in e-scrap management at this location?

- less than 10 11 to 25 more than 25

h. **Collectors only** - Collection services (Check all that apply)

- | | | |
|---|--|---|
| <input type="checkbox"/> Drop-off | <input type="checkbox"/> Collection events for e-scrap | <input type="checkbox"/> Pick-up services |
| <input type="checkbox"/> As part of collection events for HHW or other special wastes | | <input type="checkbox"/> Mail-in |

i. **Collectors only** - Arrangements for services (Check all that apply)

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

- By appointment only Open during normal business hours
 Saturday services Pickup on regular collection day
 Other: _____

j. **Handlers only** – Handling Services

Provide your best estimate of percentage by weight that goes through each type of processing:

- _____% Brokering
_____% Resale of whole units
_____% Refurbish for reuse
_____% Dismantle into parts & subassemblies
_____% Materials recovery (manual separation into plastic, metal, glass, etc.)
_____% Materials processing (mechanical crushing, shredding & grinding into plastic, metal, etc.)
_____% Other (please explain) _____

3. AMOUNT AND TYPE OF ELECTRONIC SCRAP

Amount and Type of electronic scrap handled in 2005 or during the most recent 12 months. Provide your best estimate if you do not have exact data. Report data in number of units if you do not have data in pounds.

a. Do you keep records based on weight or units?

- weight
 units

b. **Collectors only** – Annual Quantity of e-scrap collected at this location?

_____ lbs. or _____ units

c. **Handlers only** – Annual Quantity of e-scrap handled and processed at this location?

_____ lbs. or _____ units

d. **Handlers only** – What percentage of e-scrap that you processed in 2005 is from e-scrap generated in Oregon? _____%

e. For 2005 or the most recent 12 months, what is the breakdown of types of material you receive? (Weight in pounds, or number of units)

Computers, laptops, and peripherals * _____ lbs. or _____ units
CRTs _____ lbs. or _____ units
Televisions _____ lbs. or _____ units

**Peripherals include printers, mice, keyboards, etc.*

f. The e-scrap you are managing comes from: (Check all that apply)

- Residential (includes small businesses)
 Commercial (includes large businesses, schools and universities, government, and other institutions)
 Unknown

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

g. What is the approximate percent by weight of the e-scrap you manage? (If known)

Residential _____%

Commercial _____%

Unknown _____%

4. Markets

a. Where do you send e-scrap materials from your operations? (*Please report what you know by product types, material types or other, if possible*)

b. Do you know destinations where e-scrap goes after you manage it?

Intermediate destinations Yes No

Final processor Yes No

c. Do you know, receive, or require a record of where the materials ultimately end up ("downstream vendors")?

Yes No

If yes, how is this done? (Check all that apply)

Contract requires reporting on all downstream destinations of materials

Audit records of downstream vendors

Receive reports from downstream vendors

Site visits of downstream vendors

Receive documentation on export of material showing proof of compliance with laws of export, import and transit countries

d. Do you screen downstream vendors and end-markets for environmental compliance?

Yes No

If yes, how is this done? (Check all that apply)

Obtain verbal verification

Contract or procurement process requires disclosure of environmental law violations

Audit facilities for environmental compliance

Ask vendors to complete questionnaires or self-report on environmental compliance

5. General Management Practices

a. How is the e-scrap you manage handled?

_____ % Reused

_____ % Recycled

_____ % Landfilled or Incinerated

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

_____ % Don't know

- b. Do you maintain records of e-scrap (CRTs, CPUs, TVs, laptops, and flat panel display devices) received, processed, transported, stored, and/or sold?

Yes No

- c. What percentage of your customers request or ask about:

Documentation of disposition _____%

Certification from an outside source (e.g., IAER, ISO, ISRI etc.) _____%

6. Current Environmental Practices – HANDLERS ONLY

If you are a collector only, please skip to question 7.

- a. Do you have an EPA ID number? Yes No

- b. Do you have a written environmental management system (EMS), environmental operating guidelines, or environmental risk management plan?

Yes No

- c. Do you have any electronic recycling certifications or do your operations meet any industry standards or guidelines?

Yes No

If yes, check all that apply:

- | | |
|--|------------------------------------|
| <input type="checkbox"/> BAN E-Cycler's Pledge of True Stewardship | <input type="checkbox"/> CHWMEG |
| <input type="checkbox"/> EPA Plug-In To eCycling | <input type="checkbox"/> IAER |
| <input type="checkbox"/> ISO | <input type="checkbox"/> ISRI RIOS |
| <input type="checkbox"/> Other. Please specify _____ | |

- d. Do you have a written hazardous materials management plan?

Yes No

If yes, check all materials addressed:

- | | | | |
|---|----------------------------------|--|----------------------------------|
| <input type="checkbox"/> Lead | <input type="checkbox"/> Mercury | <input type="checkbox"/> Beryllium | <input type="checkbox"/> Cadmium |
| <input type="checkbox"/> Batteries | <input type="checkbox"/> Toner | <input type="checkbox"/> Polychlorinated Biphenyls | |
| <input type="checkbox"/> Free-flowing fluids such as oils, inks, and lubricants | | | |

Health and safety:

- e. Do you perform regular environmental, health, and safety audits?

Yes No

- f. Does your company have a written employee training program for environment and health and safety?

Yes No

- g. Is there a trained employee who is responsible for environment health and safety on site?

Yes No

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

h. Do you have an emergency prevention, preparedness, and response plan including procedures for evacuation, fires, explosions, chemical releases, etc.?

Yes No

i. Have you had an OSHA inspection in the past 3 years?

Yes No

j. What do you believe are the three most important environmental management practices for e-scrap handlers?

(1) _____

(2) _____

(3) _____

7. Information Security and Documentation

a. Do you offer or ensure data destruction?

Yes No

If yes, please check all services that apply:

Data wiping using software to enable hard drive re-use

Manual destruction (e.g., with a hammer)

Mechanical destruction (e.g., shredder)

Customers can observe hard drive destruction in person

Provide customers with videotapes of destruction

Provide auditable reports documenting data destruction by serial number

Data destruction to DoD 5520 standards

Provide secure storage of equipment before

Educate customers about data security

b. What percentage of your customers ask about documentation of data destruction _____%

8. Business Prospects and Challenges

a. At what capacity are your operations running on average _____%

b1. What do you think the greatest challenges are that e-scrap collectors and handlers face?

	Great challenge	Moderate challenge	Minor challenge	Not a challenge
Downstream markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insufficient e-scrap volumes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inadequate revenue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competing with e-scrap handlers who are not following best management practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tracking downstream vendors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

Determining material/commodity content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication with manufacturers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competing certification systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

b2. Please describe other challenges that e-scrap collectors and handlers may face?

c. How could electronic equipment manufacturers best assist in the development of the e-scrap industry in Oregon?

d. How could government best help the development of the e-scrap industry in Oregon?

e. Are there any other electronics waste collectors or handlers in your area you would suggest we survey? Please provide contact information:

9. Finance

a. If you charge your customers for any of the following products, please describe the fee and fee structure. (For example, fee/unit, fee/entire system, fee/pound, or free)

- Computers _____
- CRTs _____
- Flat panel monitors _____
- Laptops _____
- Televisions _____
- Flat panel TVs _____
- Peripherals _____

b. Do you pay your customers for any particular type of e-scrap?

Yes No

If yes, please explain. _____

c. How are your collection and processing costs funded? (Check all that apply)

- Fees paid by customers
- Reimbursement from local government
- Revenue from sale of e-scrap
- Grants
- Fees paid by manufacturers for e-scrap collection and/or handling services

APPENDIX B

SURVEY: Oregon E-Scrap Handlers and Collectors Survey

Local government revenue source – solid waste budget

Local government revenue source – local taxes

Local government revenue source – tip fee surcharges

Other. Please specify

Survey Complete!

Thank You. Thank you very much for your time and effort assisting us collect this valuable information!

Please check below and provide your contact information if you would like to receive:

Summary of Survey Findings

Email address

PLEASE RETURN THIS FORM BY July 28, 2006 TO:

mail: Eco Stewardship Strategies
2527 NE 26th Avenue
Portland OR 97212

email: annep@indra.com
fax: (303) 494-4880



APPENDIX C

List of Entities Surveyed: Oregon E-Scrap Handlers and Collectors Survey

APPENDIX C

LIST OF ENTITIES SURVEYED

APPENDIX C

List of Entities Surveyed: Oregon E-Scrap Handlers and Collectors Survey

Company Name	Collector	Handler
American Appliance Recyclers	Collector	Handler
Cart'm Recycling	Collector	Handler
City Recycle, LLC	Collector	Handler
Computer Reuse and Recycling Center	Collector	Handler
Computer Drive Connection, Inc	Collector	Handler
Computer Drop-Off	Collector	Handler
Earth Protection Services, Inc.	Collector	Handler
Economy Appliances and Recyclers	Collector	Handler
E-Tech Recycling Inc	Collector	Handler
E-Waste Solutions, LLC	Collector	Handler
Free Geek, Inc.	Collector	Handler
Goodwill Industries of the Willamette Portland	Collector	Handler
Goodwill Industries of the Willamette Valley Salem	Collector	Handler
Goodwill Industries of the Willamette Valley Westside	Collector	Handler
Hallmark Refining Corp.	Collector	Handler
Jones International Group Inc.		Handler
LifeSpan	Collector	Handler
Metro Metals Northwest		Handler
Monitors and More	Collector	Handler
PC Plastics		Handler
Quantum Resource Recovery Inc	Collector	Handler
Recovery Options Inc. Of Oregon		Handler
Retronics, LLC	Collector	Handler
Simply Marvelous Computer Recycling Service	Collector	Handler
St Vincent de Paul Society of Lane County, Inc.	Collector	Handler
StRUT	Collector	Handler
Technology Conservation Group Inc.	Collector	Handler
Total Reclaim Inc.	Collector	Handler
Veolia (formerly Onyx) Environmental Service, LLC	Collector	Handler
Allied Waste of Albany-Lebanon	Collector	
Allied Waste Of Salem	Collector	
Coos County Solid Waste Department	Collector	
Curry transfer and Recycling	Collector	
Dahl and Dahl, Inc.	Collector	
Deschutes County Dept. of Solid Waste (Knott Landfill)	Collector	
Deschutes Recycling	Collector	
ElectroScrap, LLC	Collector	
Far West Fibers Beaverton	Collector	
Far West Fibers NE Portland	Collector	
Far West Fibers SE Portland	Collector	

APPENDIX C

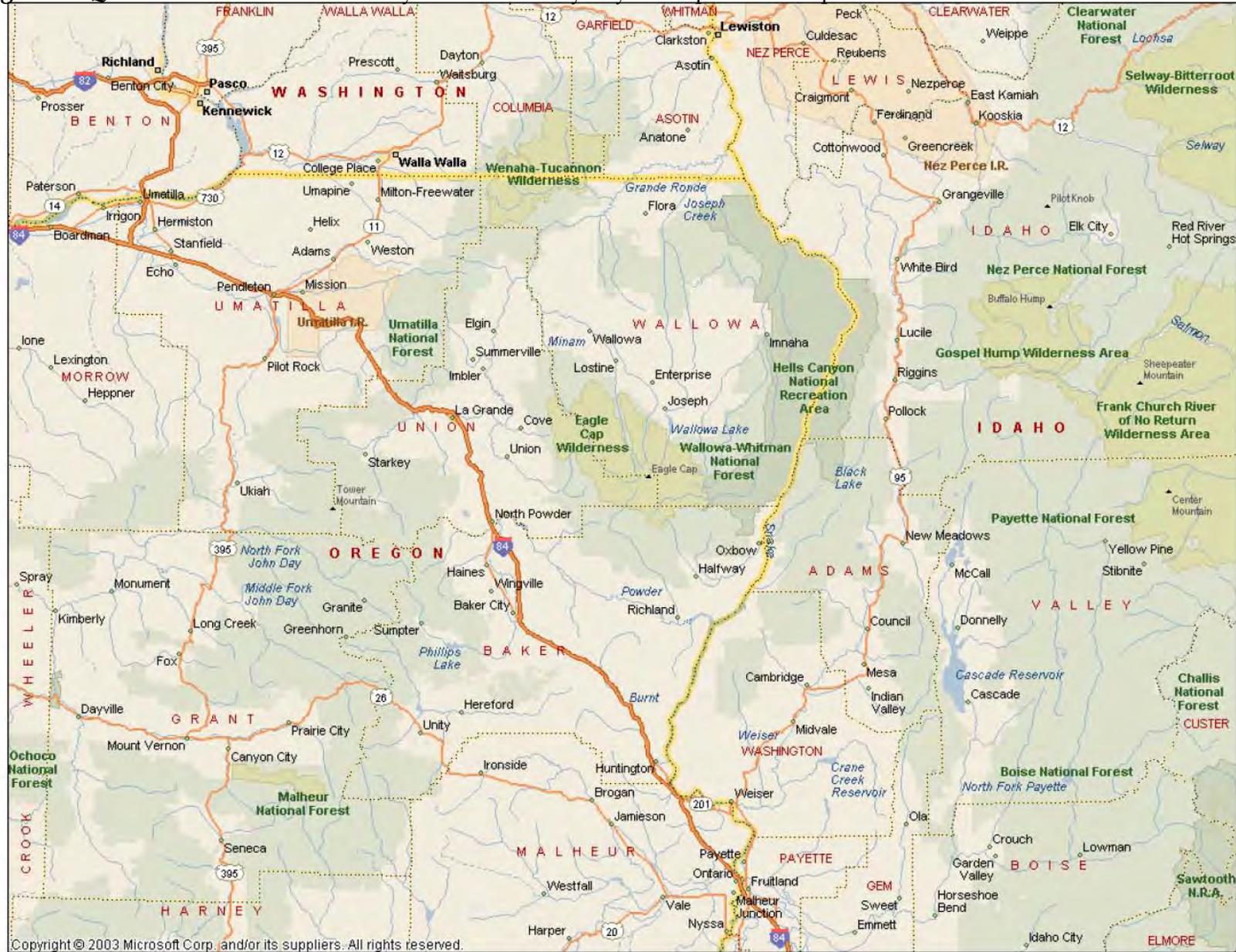
List of Entities Surveyed: Oregon E-Scrap Handlers and Collectors Survey

Company Name	Collector	Handler
Far West Fibers, Inc Hillsboro	Collector	
Goodwill Industries of Lane & South Coast Counties	Collector	
Goodwill Industries Southern Oregon	Collector	
KB Recycling Inc, Canby	Collector	
KB Recycling, Inc. Clackamas	Collector	
Lane County Public Works - Waste Management Division	Collector	
Legacy Health System	Collector	
Marion County	Collector	
Mercy Corps	Collector	
Meyers Environmental Services, Inc. dba Environmental Protection Services of Oregon	Collector	
N. Lincoln Sanitary Service	Collector	
Newberg Garbage Service	Collector	
Portland Recycling Centers #1	Collector	
Portland Recycling Centers #2	Collector	
Portland Recycling Centers #3	Collector	
PSC Environmental Services	Collector	
Salvation Army	Collector	
Society of St. Vincent de Paul - St. Joseph Conference	Collector	
St. Vincent de Paul Society of Crook County	Collector	
St. Vincent De Paul of LaPine	Collector	
Sweet Home Sanitation	Collector	
Thompson's Sanitary Service	Collector	
Valley Landfills, Inc. (Coffin Butte Landfill)	Collector	
Western Oregon Waste - Astoria	Collector	
Western Oregon Waste - McMinville	Collector	

APPENDIX D
ADDITIONAL MAPS

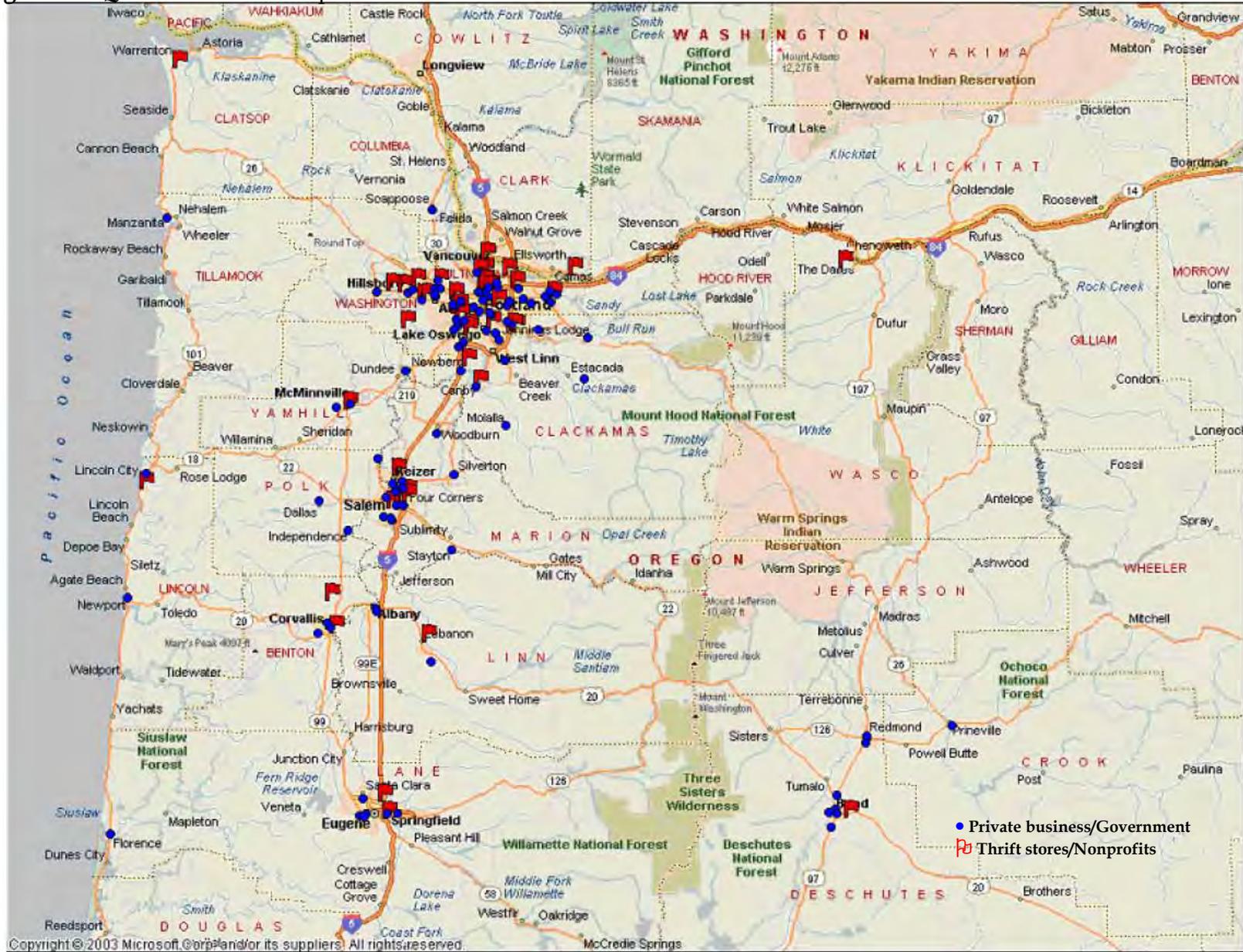
APPENDIX D: ADDITIONAL MAPS

Oregon NE Quadrant: Note that the survey did not identify any e-scrap collection points in this section of the state.



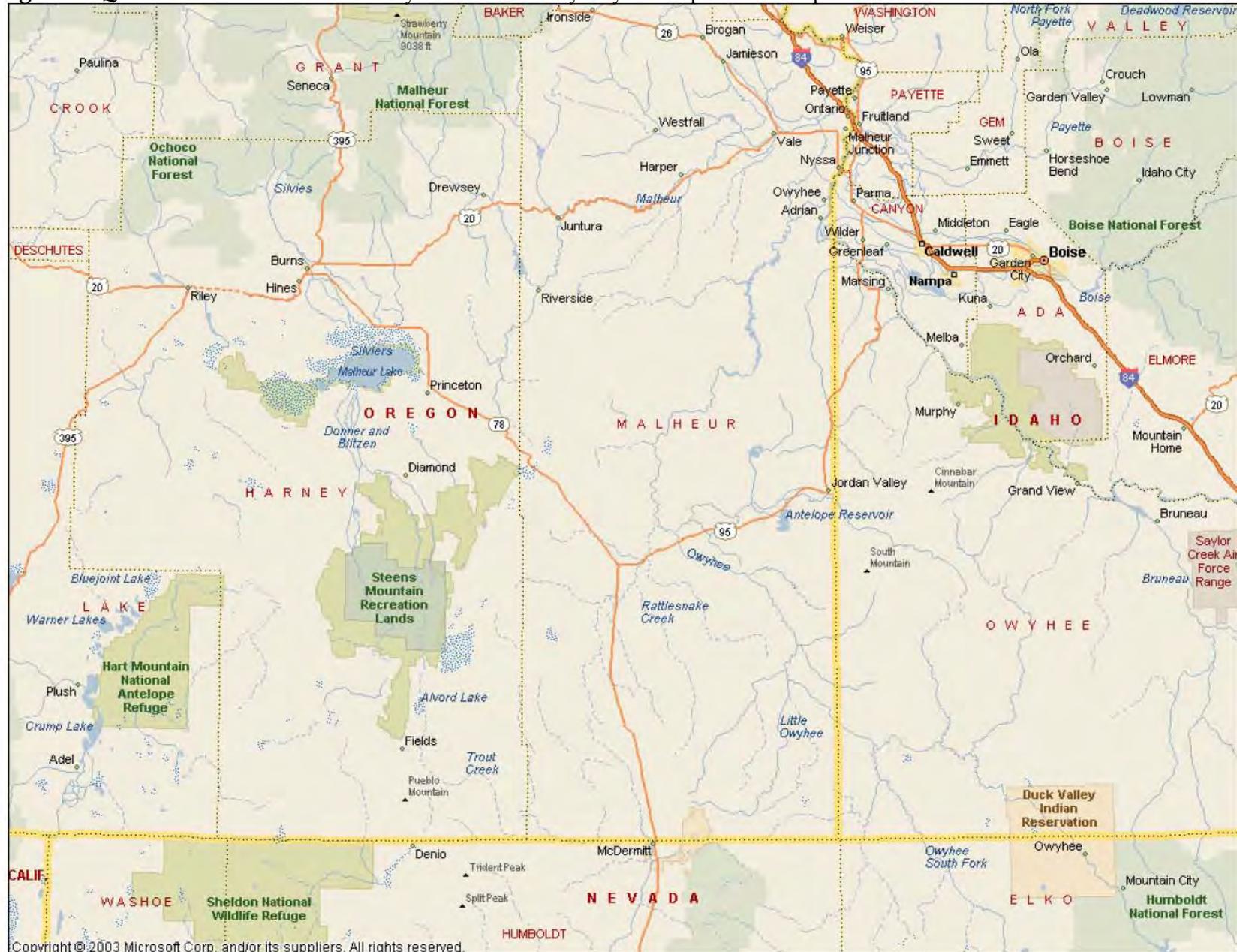
APPENDIX D: ADDITIONAL MAPS

Oregon NW Quadrant: All E-Scrap Collectors



APPENDIX D: ADDITIONAL MAPS

Oregon SE Quadrant: Note that the survey did not identify any e-scrap collection points in this section of the state.



APPENDIX D: ADDITIONAL MAPS

Portland, Oregon: All Scrap Television Collectors (indicated by purple push pins)

