Report for the Department of Families, Community Services and Indigenous Affairs

SCOPING STUDY

RECYCLING OF REDUNDANT COMPUTER EQUIPMENT

By

BUSINESS SERVICES

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INTRODUCTION

The purpose of this report is to investigate whether there are opportunities for Business Services to become involved in the recycling of computers that have reached the end of their working life.

The approach adopted has been to interview the key decision makers in the Federal and State Governments, staff in industry associations and key executives in the recycling and computer industries. Published date and reports where available, have been reviewed.

Based on the information collected, a strategic analysis of the sector has been carried out and a competitive strategy identified for Business Services.

To assist the Department of Families, Community Services and Indigenous Affairs and any other relevant decision makers, an outline plan of action has been prepared together with cost estimates and the possible number of jobs that could be created for supported employees.

Currently there are a number of terms used when referring to computers at the end of their working life. Unfortunately some people use the same terms for different purposes. The following terms are used in this report:

> **Recycling** refers to a computer at the end of its working life that has no further use.
>
> **Dismantling** refers to the action of taking a computer to pieces for the recycling of the components.
>
> **Scraping** assumes that the computer will be dismantled and its components recycled.
>
> **Reuse and resale** refers to computers that can continue to be used for their original purpose but possibly with some upgrading of replacement of components.

Where reference is made to ‘electronic equipment’ it includes products such as desk top computers, notebooks, TV’s, DVD’s, game consoles, VCR’s etc but excludes appliances such as washing machines, refrigerators etc.

EXECUTIVE SUMMARY

A large but unknown number of computers that have reached the end of their useful life are being dumped in landfill.

The volume of electronic waste accumulating in households is increasing. There are currently estimated to be about 4 million unused computers in households around Australia.

Cathode ray tubes are the most difficult part of a typical desktop computer to dispose of correctly.

The Federal Government, State Governments and Territories have formed the Environmental Protection and Heritage Council, which has asked the computer industry for a proposal by October of this year on the recycling of used computer equipment.

Some highly regarded computer companies already have computer recycling programmes in place for computers being returned at the end of their leases. Typically this does not cover computers owned by households.

Sustainability Victoria, part of the Victorian State Government operates 'Byteback' for the recycling of computers from households. One site in Melbourne is already operating and more are planned. When the national scheme commences, Byteback will become part of it.

At least two Business Services, in have had experience in dismantling computers. They have provided valuable information of the costs and the suitability of this work for people with disabilities.

The conclusion reached is that this work is suitable, potentially profitable and the total size of the national market is somewhere between 1 and 1.6 million computers per annum available for recycling.

An analysis of the structure of the sector has been undertaken and the principal issues identified.

Two competitive strategies have been identified, one for rural and regional Australia and one for the cities.

The competitive strategy for rural and regional Australia plays to the strengths of Business Services in that they are represented in every town and city around Australia. This is a strength unmatched by any of the current players.

The cities strategy is more problematic. The proposal is to negotiate an alliance with one of the three major recyclers. One of the recycling companies has the necessary equipment for an approved method of disposing of cathode ray tubes.

A possible option is to establish the 'Business Services E Recycling Group' to act as an umbrella organization for the Business Services who wish to be involved. This organization will assist with negotiating the contracts and act as a 'clearing house' to ensure information and best practices are shared amongst all those involved.

An outline plan has been prepared covering the first three years of the project including estimates of possible sales.

The number of new jobs created for people with disabilities has been estimated at between 112 and 320 positions.

The biggest risk to the project will be in not achieving the sales levels forecast in the time period. However the evidence in the report supports the contention that the sales will be achieved but the timing could differ from the forecast.

THE ELECTRONIC PRODUCTS SECTOR

The National Scene

The recovery and reuse of discarded material is a critical element of sustainable development as Australia endeavours to address a number of issues dealing with the environment.

Currently many items of an electrical and electronic nature are being disposed of in landfill. As explained later in this report it is the intention of the Federal Government, State Governments and Territories that there should be a nationally organized scheme to recycle virtually all of these items.

Consumption and use of electrical and electronic products can be examined in a variety of ways but the usual initial approach is to first segment the market into the business and household sectors.

This has the added advantage in that the purchasing, financing and disposal processes of the two sectors are different, especially in the case of computer equipment. The business sector often obtains their equipment by leasing. The equipment is then returned to the manufacturer and often has a 'second life' in either a household or is exported to another market, typically South East Asia or the Pacific. Households usually purchase their new or second hand computer equipment outright.

Households

In September 2005 a study funded by the Federal and State Governments was published called the 'Household Electrical & Electronic Waste Survey' that set out to quantify the amount of electrical and electronic equipment held by households in working order, in use or in storage. The survey only covered 62% of households, as it did not include Hobart, Darwin or rural and regional Australia.

In summary it estimated that there are around 92.5 million items representing an average of 22 items per household, which included TV's, Videos, DVD's, Computer monitors & box units, laptops and a miscellaneous range of computer equipment and cordless appliances.

Volumes of Major Equipment Types

Equipment Type	Number (Millions)	Average Number/ Household
TV's	9.74	2.3
Videos/DVD's	9.08	2.2
Radios	8.27	2.0
PC Monitors	4.29	1.0
PC Units/Hard Drives	4.18	1.0
Laptops	1.24	0.3

The study also noted that the percentage of households acquiring items is greater than the percentage of households disposing of them. This study confirmed that the volume of electronic waste held by households is rapidly growing.

In terms of disposal, the most common method was to give items to family or friends followed by council pick up/collection services and/or disposal via the local tip or council depot. Smaller items were typically placed in garbage bins.

DISPOSAL METHOD	**TV'S**	**PC MONITORS**	**BOX UNITS**
Gave away to family or friends	26%	31%	35%
Council pick-up collection service	26%	22%	19%
Took to local tip/council depot	17%	10%	12%
Sold privately to another person	5%	5%	6%
Gave to repair shop/PC mechanic/second hand dealer	4%	2%	2%
Took to charity shops/collection bins	3%	7%	8%
Used as a trade-in	2%	3%	4%
Wheelie bin/normal garbage bin	1%	2%	3%
Total items disposed of [millions]	4.35	2.03	1.66

Note the disposal method have been ranked by the number of 'top mentions' and expressed as a percentage.

Businesses

Large businesses and Government Departments typically enter into contracts with a computer supplier, which involves a number of aspects including networking, maintenance and financing. These agreements frequently include the replacement of equipment at the end of an agreed period by the computer supplier who will also be responsible for the disposal of the old equipment. Thus a computer initially used by a large organization may go through a series of different hands before being scrapped. The boundaries between businesses and households become blurred especially where smaller businesses are operated from the home with members of the household also accessing the equipment for their personal use.

One organization has endeavoured to understand the market by viewing it as a series of stages or life cycles, through which the computer passes as follows:

First Stage [new computer]

Households	17%
Schools & Universities	14%
Small/Medium Businesses	28%
Governments	16%
Large Businesses	25%

In its second ‘life’ the computer changes ownership

Second Stage

Households	50%
Schools & Universities	11%
Small/Medium Businesses	17%
Storage or dumped	22%

In its third ownership stage the following changes could occur.

Third Stage

Storage	50%
Recycled	4%
Landfill	46%

The last stage is the disposal of the computer.

Fourth Stage

Recycled	8%
Landfill	92%

There is anecdotal evidence that the reuse of older computers is declining as the price of new equipment continues to decline. When a second hand machine with new software could cost from say $300 to $500 why not purchase a new machine, with a guarantee, for under a $1,000?

Microsoft has a programme that enables software for ‘Windows 98 and 2000’ to be purchased for a small administration charge provided the computer with the new software is sold to a non-profit organization or to a person who is in receipt of a Centrelink allowance.

Branded and Unbranded Products

The Australian Information Industry Association [AIIA] estimates that approximately 50% of all computers currently sold in Australia are known brands with the other 50% being made up of ‘white boxes’. The term ‘white boxes’ refers to the computers assembled by the estimated 2,500 to 3,000 computer shops around Australia that will assemble a computer box to the customer’s specification. Frequently these products are ‘branded’ but the buying public does generally not recognize the brand.

This is one of the distinguishing characteristics of the Australian market and compares with Europe and the USA where the ‘white box’ segment hold a market share of around 25%.

However computers with known brand names and those from the ‘white box’ sector both use the same suppliers for many of their key components.

DESCRIPTION OF THE DISMANTLING/RECYCLING PROCESS

Cleaning of the C Drives

Some customers request that all existing data stored on the C drives etc be removed before recycling or resale. This can be done using software but in some cases additional precautions must be taken. There is a document 'Australian Government Information and Communications Technology Security Manual (ACSI 33) from the Defence Signals Directorate that sets out the requirements for different Federal Government Departments. The Defence Department for example requires that the destruction of all hard drives be carried out under the direct inspection of one of its staff and that no part is larger than 2 mm, after destruction.

Boxes

The box or tower units familiar to all computer users are generally easy to dismantle. Once the outer case has been removed many of the components can be removed by simply pulling them apart. There are a variety of different types of metal components, which must be segregated.

Based on figures supplied by a Business Service the average time taken to dismantle a box by one of their clients is half an hour. This compares with figures supplied by the major recyclers, which quote times of 5 to 10 minutes for a non-disabled person to dismantle a box.

Display Units or CRT's

CRT's or cathode ray tubes are the most difficult to recycle in an environmentally sensitive manner. They are manufactured from two different types of glass with one part having higher lead levels. In a typical CRT the front of the tube has a heavy lead content and the inside is sprayed with phosphorus whilst the remainder of the glass tube has a lower lead content.

One major recycler has a process where the tube is separated from its plastic housing, all associated wiring is removed and the front face of the tube (screen) is separated from the remainder of the glass tube, the phosphorus vacuumed out and the two different types of glass placed in separate bins for recycling. Another recycler crushes the complete glass tubes and then adds further lead to the crushed glass to give the desired lead/glass mix suitable for reuse when making new CRT's. This cullet [crushed glass] is then shipped to Europe where it is reused in the manufacture of CRT's. A third recycler has a similar glass crushing process. Although many of the newer computers currently on the market have 'flat' or 'LCD' screens there will be a considerable legacy of older style CRT's to be recycled for some time.

Keyboards and other Equipment

Keyboards, mouse or mice together with miscellaneous cables and other external pieces of equipment complete the range of equipment to be segregated/dismantled.

Printers

Based on information to date, printers are not returned for recycling as frequently as computers and are often retained for use with the replacement computer.

Other items such as photocopiers, scanners etc have a different range of recycling problems but can be accepted, subject to additional recycling conditions.

One recycler quotes up to 60 different products arising from the recycling process. These are generally placed (dumped) in second hand one tonne bulk bags for subsequent delivery to scrap merchants/recyclers.

Partial Further Recycling

One recycler now has equipment that can granulate PVC coated copper wire and then separate the plastic from the wire thus enabling a higher price to be obtained from the two materials. There are other opportunities to add value to other products.

Export of Used Electronic Equipment

The export of complete items of equipment or components is covered under the *Hazardous Waste (Regulations of Exports and Imports) Act 1989* which is summarized in a booklet published by the Federal Department of the Environment and Heritage.

Examples include:

Lead-containing glass from cathode ray tubes.

Nickel cadmium batteries.

Printed circuit boards.

Fluorescent tubes and backlight lamps from liquid display crystals.

Plastic components containing brominated flame retardants used in CRT's.

FEDERAL AND STATE GOVERNMENT POSITIONS

In 2004 the Environment Ministers from all States and Territories plus the Federal Government Minister working together as the Environmental Protection and Heritage Council issued a discussion paper on product stewardship for a range of products, including computers.

Product stewardship includes all aspects of a product's life from production, distribution, consumption, and waste. It seeks to ensure that environmental management policies focus on the product right through its life.

This framework has been used to draw up National Environmental Protection (Product Stewardship) Measures for each group of products.

In many cases a co-regularity approach has been adopted to allow both a voluntary approach by those companies who wish to run their own schemes and a regularity approach to capture those companies who do not take part in the voluntary scheme. These are sometimes referred to as the 'free rider regulations' to ensure that all participants contribute equally.

In the electrical and electronic products areas the scale of the potential problem is significant as outlined above.

Televisions

The Consumer Electronics Suppliers Association [CESA], who represent the majority of the major TV manufacturers, have set up Product Stewardship Australia Ltd, which is an industry led initiative to divert thousands of tonnes of TV's from landfill to recycling. With its co-regularity framework to capture the free riders it could be the model that the computer industry may follow. The CESA have submitted a draft agreement to the Federal Government for consideration. It is likely that a pilot study will be operating within three months in Melbourne. It is expected that about $24 -$27 per TV will be required to achieve the recycling goals. Two of the major challenges to be addressed are the weight of TV's, especially the older cabinet styles and the amount of lead in the cathode ray tubes.

After the pilot has been completed, it is likely that role out of the programme will be Sydney/Melbourne followed by the other State capitals and then rural and regional centres. This product area could be of interest to Business Services in the future as TV's could be added to say computers, thus increasing the range of products being recycled, especially in the smaller population centres.

The Executive Officer of Product Stewardship Australia expressed an interest in the possible use of Business Services in the recycling of TV's in rural and regional Australia.

Tyres

A national plan for the recycling of tyres is well advanced with a draft agreement already in place. It has some interesting differences from other programmes with a proposed system for an 'Advanced Recycling Fee' to be collected at or close to the point of sale of the new tyre. This fund will then be used to reimburse companies/organizations [possibly around $1,000

per metric tonne] that produce products, partly or totally made from old tyres, for an approved variety of end uses such as playground soft fall, road base and sporting arenas.

CURRENT & PROPOSED RECYCLING PROGRAMMES FOR COMPUTERS

The computer industry association, the 'Australian Information Industry Association' who represent about 50 per cent of the industry with the balance being the 'white box' or unbranded market will have a proposal, after several attempts, ready in October 2006 for discussion with the Federal Government. This proposal will cover the contentious issues of 'free loading' [the white box sector] and the opportunity for some manufactures to have their own scheme.

The legacy problem relates to computers that are branded but the company in question is no longer in existence or its ownership has changed.

It is probable that each computer sold will include an 'Advanced Recycling Fee' to fund the recycling programme. The 'white box' sector of the computer industry may contribute by way of an additional charge on a small range of key components used in the assembly of every computer. For example, there are a very small number of computer chip manufacturers worldwide. It is proposed that as these chips enter Australia they will attract a charge or levy which will be remitted to the administrators of the scheme, to help fund the recycling programme.

Depending on the outcome of the discussions it is likely that the Australian Information Industry Association will administer the fund. They have stated that they will be looking for a contestable tendering programme and will be ready to seek expressions of interest in October/November of 2006.

Details such as variable rates for the additional transport costs of collecting computers from say far western New South Wales will be covered in these tenders. The Association is not interested in any reuse of computers and has restricted its programme strictly to 'end of life' machines.

The proposed national programme will be expected to meet certain minimum standards which include some of the requirements set out in the European Directive [WEEE] that require some components to be processed separately due to their chemical composition and thus the computer must first be dismantled

Private Sector Recyclers

There are 3 major computer recycling companies in Australia, the largest one has recently established a new division to expand their businesses into the recycling of electrical and electronic products and have acquired the technology to recycle a range of products from dismantled or shredded computers and related equipment. They operate facilities in Melbourne, Sydney, Perth and Brisbane and have a contract to recycle the computers that are being deposited at the transfer station in the City of Boroondara under the 'Byteback' programme, and they have expressed an interest in working with organisations that employ people with disabilities. The second major commercial recyclers of computers and other electronic equipment have operations in Melbourne and Sydney. The company lists nearly all the major computer companies as their customers, with whom they have a variety of commercial relationships. They have also developed a process to separate the front section of the glass cathode ray tube, which has different lead levels from the remainder of the tube.

The smallest of the tree major recyclers is based in Melbourne and has a new 'Ewaste Management' unit set up within its Third Party Services Division. This unit recently acquired a special glass-crushing unit used for the disposal of cathode ray tubes.

Victorian State Government

Sustainability Victoria, a Victorian Government organization charged with the responsibility amongst other tasks, of promoting computer recycling, has establish 'Byteback' which is a free service available to residents and small businesses who want to dispose of unwanted, old and unused computers in a safe and environmentally responsible way. Large businesses are expected to use other routes to dispose of their computers.

They have established the first Byteback site in Camberwell in the City of Boroondara. .

Sustainability Victoria and a leading computer manufacturer are currently sharing the costs of operating the first site. It is Sustainability Victoria's hope that other industry participants will share the costs of additional sites as part of the plan. Larger businesses will be expected to use commercial recyclers to dispose of their old equipment. The proposed locations for the first sites are:

Eastern Melbourne [Already operating in Camberwell]

Western Melbourne

Northern Melbourne

South East Melbourne

Geelong

Ballarat

Bendigo

Traralgon

The plan is to establish Byteback first in the Melbourne locations and then follow with the country sites. Expressions of interest could be called as soon as October 2006 for the Western Melbourne site.

Byteback-Camberwell

The first long-term computer take-back pilot in Australia has been located at the waste transfer station in the City of Boroondara in Camberwell. The City is located in the eastern suburbs of Melbourne and has a population of around 160,000. It is the only source of accurate information about computer recycling in Australia. Some of the key facts to date are:

Annual volumes are around 200 metric tonnes. Based on an average weight of 25 kilogrammes for a complete computer [monitor, box and keyboard] this represents about 8,000 computers.

Based on the volume of computers deposited at the transfer station in the City of Boroondara and extrapolating to estimate a national figure there could be around 1,000,000 computers per annum available for recycling in Australia. Note however that the income levels of this part of Melbourne are relatively high. Conversely the City of Boroondara programme is still in its start up phase.

A manned transfer station has been the lowest cost way of collecting computers to date. Initial work has confirmed that residents are unwilling to pay more than a nominal figure for the disposal of unwanted computers. [Around perhaps $5 per computer.]

The fees being paid to the recyclers are equating to $1,000 per tonne or $200,000 per annum or $25 per computer.

The distance/time that people are prepared to travel to the transfer station is about 20 minutes.

Based on a local survey 80% of households are using or would be prepared to use the Byteback facility.

Byteback Contractor's Responsibilities

The following list covers the main points that the contractor operating the recycling programme is expected to achieve.

Planning

Development of safety and environmental plans for collection, transportation and processing.

Product/materials tracking, reporting and recording.

Work with Sustainability Victoria to provide all necessary information.

Execution, Operations, Collection, Sorting, Segregation and Processing

OH&S management system

Training of site staff

Provision of all labour and equipment

Segregation, sorting and processing of all products

Reporting

Weekly/monthly reports

Record amounts, brands and types of products and materials received.

Programme financials showing costs and revenues of all sections of the programmes.

Relationship between the Victorian and the Proposed National Programme

Sustainability Victoria's expects that the Victorian programme will be merged into the national programme when it commences. It is anticipated that there will be a smooth transition from the current State based system to the new national system due in part to the States and the Federal Governments current working together through the Environmental Protection and Heritage Council.

Other State and Territory Governments

There are no State Government wide programmes currently operating in other States. Various State Government Departments appear to have their own arrangements.

NGO's, Not for Profit, Business Services and Other Organizations

The Australian Consumer Association lists a number of locations in Queensland, Western Australia and the ACT that will recycle computers with some accepting drop-offs and some charging for the services.

Based on the pricing information, where stated, it is possible to infer that some sites are only interested in computers in volume and not single machines, thus effectively excluding households.

There are a number of small organizations that have been or are currently involved in computer reuse and recycling.

Victoria

Based on an Internet search there were ten recycling organizations listed in Victoria. Most were involved with community groups including supplying equipment for people with disabilities and shipping overseas to 'needy customers'. One of the commercially based organizations listed, has a service charge of $14 per monitor and a pick up fee of $50.

New South Wales

In the City of Sydney there are four organizations listed, some with multiple sites that are involved in recycling computers.

One currently operates a Business Service in Sydney which recycles computers from a number of New South Wales State Government Departments. Originally this operation was set up under the 'Work for the Dole' programme to train people in the basics of computer

repair but following recent changes it will now be operated as a Business Service with one supervisor and seven clients. It has to date concentrated on refurbishing computers for sale to unemployed people and those in receipt of a payment from Centrelink. The computers were typically sold for $50 to $450 depending on their specification with software. Any surplus components or other materials were placed in free skip bins and taken from the site at no cost but with no revenue either, for the components.

Another Business Service with outlets in Sydney and Melbourne is a non-profit company involved in employment, training, economic development and electronic repair services employing around 200 people with a turnover in excess of $20 million. They charge $15 per unit to cover the cost of disposal, transport and labour.

A Business Service based in regional NSW is currently dismantling computers and reselling a small number of used computers.

This service has a contract with a university to recycle used computer equipment including the cleaning of the 'C' drives. This service is provided at a cost of $15 per box.

Clients, employed by this business service, assessed as being at DMI Level 4 are capable of dismantling computers and the work is generally attractive as it is clean, can be carried out in pleasant surroundings without heavy or noisy machinery. There are opportunities to use air operated power tools or cordless drills which adds to the interest. For clients with higher skills there are opportunities to assist in the refurbishing of machines for resale.

SIZE OF THE MARKET & ECONOMICS OF RECYCLING

There are a number of 'unknowns' in attempting to estimate the size of the market for the recycling of computers:

> How many computers are currently in storage will be released and at what rate will they come on to the market?
>
> > It is reasonable to expect that as the price of new computers continues to decrease, the realization will dawn on householders that their old equipment has no commercial value and it should be dumped or scrapped. As more recycling facilities come on stream to make the disposal of old computer equipment easier then the 'legacy' of old equipment will be released and the stockpile will decrease.
>
> As computers operated by major businesses reach the end of their lease [usually about 3 years] how many will come on to the market and be absorbed by the household sector?
>
> > Will these computers 'push' older machines out and thus make them available for recycling?
>
> It is estimated that the total market for computers continues to grow in Australia thus there will be a net increase in the number of computers in use. It is difficult to estimate this number.

Industry sources report that in calendar year 2005 there were 2,360,000 new desktop units imported into Australia. The growth rate of shipments into Australia over the period from 2000 to 2005 was 34%.

The estimate by the people interviewed for this report agreed that about 1 million existing computers would be available for recycling and the balance would be absorbed into the market. However everyone was unsure about the accuracy of this number but in the absence of any research it was the number that most people supported. Note that the 'Total Environment Centre' is quoting a figure of 1.6 million computers dumped each year in landfill around Australia.

The figure of 1 million is supported by the figures available from the 'Byteback' programme in the City of Boroondara. Note however that income levels would suggest that areas with higher incomes would probably own more computers and thus have more available for recycling. The unknown of the existing stock of computers held by households and businesses still remains, with no accurate information available about the possible volumes that could be released for recycling.

For the purpose of this report the number of 1 million computers per annum available for recycling from households has been assumed as being reasonably accurate. It is further assumed that there is a 'shuffle effect' in the business sector where new computers replace computers coming off lease. The older machines are typically taken back by the computer suppliers who then refurbish and sell them into the used computer market, typically for purchase by households or small businesses or they are shipped overseas. The net effect is

that the machines ex Government and larger businesses do not directly pass into the recycling stream but enter it via households etc over a longer time period.

The total value of the market based on 1,000,000 computers per annum with fees of say $25 per computer and with a value for the disassembled components of say $4 per computer would be:

1,000,000 x ($25 + $4) =$29,000,000. This number has been rounded to $30,000,000.

Economics of Recycling for a Business Service

Revenue Streams

There are three potential main sources of revenue:

Fees earned by dismantling and recycling computer components and materials. Based on the current 'Byteback' programme they would be paid by Sustainability Victoria at the rate of $25 per computer.

Sales of computer components and materials to the scrap metal market. Two of the computer recycling companies have indicated a figure of around $3 to $5 per computer. Say $4 per computer.

Sale of reconditioned/rebuilt computers. The sale price will depend on the specification, the age of the equipment and the prices being charged by competitors in the local market. Prices quoted on 'E-Bay' also have an influence on the selling prices. The figures range from $50 to $450 with a 'typical figure being $100.

Cost of Inputs

Labour

Based on an average hourly cost of $2.90 for a typical client in a Business Service and allowing for a 25% surcharge to cover superannuation, holiday pay etc the effective hourly rate would be $3.62.

To cover the cost of facilities and other overheads assume that a doubling of the hourly rate will be required to cover all these costs, which would then give an effective hourly rate of $7.25.

Based on figures supplied by a Business Service that estimates the time taken to dismantle a computer is around half an hour and assuming fifty per cent efficiency this would give a time of one hour per computer for the dismantling process.

Transport

Assume the computers would need to be collected from say a transfer station and transported back to the Business Service for dismantling. Allow $1 per computer for transports costs.

Consumables

The replacement of gloves, hand tools, bulka bags and/or other packaging for the despatch of components to scrap metal dealers is assumed to cost a further $1 per computer.

Facilities

The assumption is made that the Business Service would either own a forklift or have access to a forklift. The factory space required does not need to be configured in a special way nor require buildings with high stud heights or other special characteristics. It would be possible for example to use an area equal to a say a double domestic car garage for low volumes of throughput. Storage space would be required for inwards and outwards goods.

Worked Example

Based on a rural centre with a population of 60,000 the key pieces of information are as follows:

> The number of computers to be recycled annually, based on the information from the 'Byteback' programme above would be 3,000. [Based on the minimum number of hours per week of 8 per employee this would result in the employment of around 8 people per annum.]
>
> The hourly labour cost would be $7.25. [See above]
>
> The revenue per computer when selling the components would be $4. [See above]
>
> Assume two computers per week would be sold in a 'going condition' at a selling price of $100.
>
> The 'Byteback' programme or its equivalent would pay $25 to the Business Service for every computer recycled.

Revenue

Fees	$25 x 3,000 computers	$75,000
Material sales	$4 x 3,000 computers	$12,000
Computer sales	$100 x 2 x 50	$10,000
Total		$97,000

Costs

Labour	$7.25 x 3,000 computers		$22,000
Transport	$1 x 3,000 computers	$3,000	
Consumables	$1 x 3,000 computers		$3,000
Total			$28,000

Surplus $69,000

NOTE: This assumes that the operation is operating fully loaded for a year with volumes similar to the City of Boroondara. This possible outcome looks to good to be true. The numbers used have been checked with a Business Service and they have confirmed that they look reasonable.

Break Even Point

Assuming that competition 'forced' the recycling fee lower, the estimated break even point would be reached when say the fees for recycling were reduced to $3 per computer and the transport costs were doubled to $2 per computer or another $3,000 per annum.

Thus one measure of the sensitivity to changes in recycling fees, assuming all other costs remained similar, would be a price decrease of over 80% and a freight increase of 100%. These figures suggest that Business Services have a reasonable margin of 'safety' in operating a computer-recycling centre.

ANALYSIS OF THE STRUCTURE OF THE PROPOSED COMPUTER RECYCLING INDUSTRY

To determine a strategy for Business Services in this industry, it is necessary to forecast the likely 'shape' or structure of the sector, the key drivers or aspects that are probably going to impact on the sector and then select a strategy for Business Services that is the most likely to be successful.

Definition of the Industry

It is important to determine exactly what is the 'industry' or 'sector' under review. For example, to include the recycling of computers from the large business and Government sectors changes the structure of the industry.

The definition of the business that this report seeks to address can be defined as follows:

> **The safe and environmentally responsible dismantling and sale of unwanted, old and unused computers from the household and small business sector.**

Note that a key assumption is that the strategy will be designed to directly target the household sector. The recycling of computers from the large business/corporate sector and Government will not be specifically targeted at this stage but any opportunities to service these areas will be followed up.

In the initial stages of the development of the business, the dismantling of TV's and other items of electronic equipment have not been included, although it is noted in other parts of this report that this could be an expansion opportunity, particularly for smaller centres where the volumes of computers to be recycled may be too small to support a full time activity.

The refurbishment and subsequent sale of used computer equipment is expected to continue and whilst it will be included in the revenue forecasts, sales are not expected to grow due to the continuing decline in the price of new entry-level computers impacting on the sale of second hand equipment. Thus the focus remains the recycling of computers from the household sector.

Competitive Forces

The following competitive forces are now analysed to gain an understanding of the sector and thus the identification of a successful strategy for Business Services.

Legislative Changes

> The fundamental change forecast to take place in the sector is the requirement by the Federal Government, State Governments and Territories that computers will not be accepted at landfill sites and that the industry must accept the new reality of recycling or change will be forced on it.
>
> The pressure for change is building with the industry being asked to present a plan by October/November of 2006. Previous plans from industry have been rejected and

there are suggestions that the previous approach consisted of delaying tactics by the computer industry to avoid as long as possible any requirements to recycle computers.

Customers/Buyers

There are potentially four different groups of customers:

The buyer(s) of the recycling services. The principal customer is likely to be the organization controlling the funding scheme that calls for and awards tenders. If this industry evolves in a similar manner to the consumer electronics industry then the principal industry association is likely to control the funding. Thus the Australian Information Industry Association or a subsidiary company, possibly with an overseeing board will be the 'customer' or buyer of the services. Individual computer companies who have elected to operate their own scheme may wish to use the services of this entity in some or all locations.

Metal and plastic recyclers will be customers for the disassembled computer parts.

Members of the public will be the customers for those computers suitable for resale.

Potentially, existing computer companies who operate their own recycling schemes, could be customers/buyers should they choose to use a third party to carry out their 'in house' recycling work for computers suitable only for dismantling.

This may happen outside the capital centres. For example, why pay the freight to bring back computers from say a country based University when there is a Business Service located nearby that is already dismantling computers and recovering the scrap. Thus a computer company may operate its own recycling schemes in the major centres but could sub contract in rural and regional areas, potentially to Business Services.

The buyer(s) of the dismantling services are likely to represent around 75% by value of the revenue projected to be earned by a Business Service followed by the revenue from the sale of dismantled components and lastly the revenue from the sale of computers to the general public.

Note that potentially there will be only one buyer for the dismantling services and this will put it in a very strong negotiating position with the opportunity to 'play' the suppliers of recycling services off against each other.

Competitors

There are a number of competitors already in the market, including, the medium to large players as well as other smaller commercial recyclers based in the main centres of population

Not for profit organizations which in some cases have had their origins in 'work for the dole' schemes'

Business Services who have usually been involved in general recycling work, typically for their local councils and have then moved into some activities based around the computers they have collected or being given/donated.

New entrants

Companies that become involved in the recycling of TV's and other electronic equipment could move into the computer area.

Companies involved in computer recycling overseas are possible new entrants.

Clearly another possibility could be a company from a lower cost economy who could provide a similar service. If computers were packed into shipping containers shipped overseas and dismantled in another country with lower costs, this could be a source of possible competitors.

Suppliers

Suppliers of goods and services to the sector are of limited significance. The tools and technology used to dismantle computers are widely available. Specialized equipment such as air operated screwdrivers and vacuum lifts are easy to obtain 'off the shelf' and require minimal instructions to operate.

Technology

However, within the parts used in a typical computer there are some specialized items, which do contain heavy metals and other contaminants that must be handled with care. The most difficult product is the CRT referred to above. Any organization will need to be able to demonstrate that it has an effective way of dismantling and disposing of these components.

Distribution/Collection

The Australian Information Industry Association and other participants in the sector have all acknowledged the importance of operating at the lowest possible cost. Part of the approach will be to use the existing infrastructure where possible. An example could be the use of 'Transfer Stations' as collection points for computers from households.

These computers and especially the glass CRT's will need to be collected in a manner that ensures they are still capable of being dismantled. This will require careful handling and transport and will add to the cost. Any organization that can use existing facilities or has a lower cost collection system will be at an advantage.

Future Developments

The penetration by computers into households will continue to increase but at lower rates according to the industry. Price decreases and new developments are likely to continue to support these trends.

However, the accumulation of unused and obsolete equipment including computers continues to grow. There is no information or forecasts/studies about the possible release of this material into the waste stream. It is reasonable to suppose that this will occur but is unlikely to cause a sudden demand or peak in recycling capacity.

COMPETITIVE STRATEGIES FOR BUSINESS SERVICES

Generic Strategies

When developing a competitive strategy there are three generic strategies that usually form the starting point:

> Overall cost leadership where the organization can achieve the lowest cost operation in the sector. This usually enables it to earn a return and still offer the lowest price to the buyer/customer.
>
> A differentiated strategy where the organization can offer the buyer/customer features that its competitors are unable to match.
>
> A focussed strategy where the product or service is concentrated on a narrow strategic target more effectively than its competitors.

Australian Geography & Population Distribution

Based on the research collected for this study it is recommended that two strategies be adopted, one for the country and one for the cities:

> Rural and Regional Australia
>
> Capital Cities, possibly including some major centres such as Geelong, Newcastle, Gold Coast etc.

Without exception everyone contacted referred to rural and regional Australia as being 'difficult' from the point of view of organizing and effecting computer recycling. This however is the unique strength of Business Services.

Thus two competitive strategies should be adopted, one for rural and regional Australia and one for the capital cities. For the sake of brevity in further references to 'capital cities', it will be assumed that this will include major centres close to a capital city that are contiguous with them. For example, Gold Coast/Brisbane and Central Coast/Sydney.

The two strategies will be referred to in the rest of this report as the 'Rural Strategy' and the 'Cities Strategy'.

The Rural Strategy

The competitive strategy for Business Services, is to pursue a 'differentiated strategy' outside the cities, as they have the unique distinction of having a presence in many rural and regional communities

It will be important for Business Services in rural and regional Australia to present a unified front and thus confirm in the minds of the people letting the tenders that they are dealing with one organization that is united, organized and capable of delivering on its promises. Clearly it will be known that the reality is that there are many individual organizations involved but

they all follow certain common practices and standards. Thus, when dealing with a representative from the organization those letting the tenders can be confident that the agreed actions will occur.

The rural based Business Services will need to 'play to their strengths. For example, potentially a Business Service in a location such as Bourke could simply act as a collection point and the computers collected could be transported say twice a month to the nearest Business Service that operates a computer recycling operation. In this case it might be say Dubbo. Clearly the Bourke Service would receive some financial return for acting as a collection point. Through a series of such arrangements areas like western New South Wales could be covered. This would be difficult for a competitor based in say Sydney to match, cost effectively.

The 'rural offer' from Business Services will be attractive as it will be able to 'deliver' large areas of rural and regional Australia.

Differential pricing

Different prices should be able to be charged which reflect the real costs of collecting and recycling in rural Australia. With suitable fine tunning it should be possible to achieve improved margins for county-based Business Services.

Profitability

To state the obvious, country based Business Services already exist and have a structure in place. As recycling essentially only requires factory space and no specialized equipment, especially in the start up phase, the cost of entry, apart from management time should be minimal. [See worked example on page 30.]

The Cities Strategy

The situation in the cities will be quite different from rural and regional Australia. The three existing large companies are very unlikely to withdraw from this sector. In addition there are other smaller players and the possibility of overseas entrants into the 'cities' market.

The Australian Information Industry Association has made it clear [and their position has been supported by their major members] that the emphasis will be on cost. Tenders will be let to attract the lowest cost operators. Comparisons will be made with overseas markets and the expectation will be that continual cost savings will be expected and will be passed back to the industry as they occur.

With around 75% to 80%of the population based in the cities should Business Services choose only to compete in the rural areas this would restrict them to a market of only $6 to $8 million and ignore the other $20 million? Given that Business Services ideally want a share of the 'Cities' market and thus a share of that 75% to 80%, a strategy is necessary.

The options facing Business Services in the cities are:

> Compete directly against the big three recycling companies and all others. [The 'go it alone' strategy.]

Negotiate with the big three recycling companies to work on an agreed basis with a mechanism to share the revenue. [Work with one or more of the major players.]

To become a straightforward subcontractor providing a dismantling service to any or all of the large recycling companies and possibly others. [Accept the position as a subcontractor.]

It is very likely that the initial strategy will evolve over time as the skills and knowledge about the market are developed. This could lead to a more aggressive approach over time and see the development of a different strategy.

The ideal initial outcome for Business Services would be:

Negotiate directly with the organization that is letting the tenders and thus receive all the revenue initially. In other words to be the 'lead' organization. The Business Services could then retain any efficiencies or savings and where outside services were used the best terms and conditions could be negotiated.

Establish relationships with the big 3 recycling companies where Business Services could transfer the disposal of cathode ray tubes to any of the of them and thus avoid the related technical difficulties.

Whilst selling most of the material arising from the dismantling processes to the big 3 recycling companies still retain a volume to sell to other parties to ensure that the prices offered for the components were competitive.

The strategy that appears to offer the best chance of achieving the 'ideal outcome' or a position close to it, could be achieved by negotiating with one of the recycling companies in the first instance to work with them and if possible to take the lead role. This may mean that the share going to Business Services may be less than desired but as more contracts become available the aim will be to improve the position of Business Services at each negotiation. If that approach was not possible, endeavour to do the same thing with either and or the other companies. If neither works, endeavour to secure a sub contractor position, which gives Business Services as much work as possible.

An alliance with the big three recycling companies would help to resolve in the short term the problem of the disposal of the CRT's.

A relationship with the recycling companies would enable a greater knowledge to be gained about the recycling of computers.

One of the recycling companies has expressed the greatest interest in working with Business Services and has identified that the geographic spread of Business Services could enhance its position. The transport network operated by the company is also a good fit with the dispersed nature of Business Services.

Should all of the above not be achievable then the approach would be to 'go for broke' and compete directly against all comers.

It is likely that the exact form of the negotiations will be amended as they proceed and Business Services learn more about the aims and objectives of the possible partner during the negotiations.

The strategy for the 'Cities' then can be described as a mixed strategy of a low cost approach using the labour resources of Business Services and a differentiated strategy of working as an alliance with one or more of the major recyclers.

Note that the 'Rural 'and the 'Cities' strategies will be kept separate from the negotiating point of view but the knowledge gained from within the two areas and any synergies arising will be shared across all the Business Services involved.

Business Services Strengths [Barriers to Entry]

To minimize the advantages of the competitors and to make it difficult for new competitors to enter the sector it is helpful to raise or strengthen as many 'barriers to entry' as possible. The following are an initial list but is likely that more will be identified and developed as the sector develops.

Large Geographic Areas

This activity will obviously mainly apply to the rural Business Services. There are individual recyclers located in various parts of Australia who could provide competition in their local area.

By persuading the proposed industry organization to let tenders on a regional basis it will be more difficult for individual organizations or companies to tender for these contracts. Thus one barrier to entry will be to influence the geographic scope of the tenders. The larger the area, the better placed will be a group of Business Services who have already agreed to work together.

Ease of doing Business

Another barrier to entry will be the ease with which an industry organization can negotiate coverage for large parts of the country. For example, if the industry organization could speak to one person about large areas of rural and regional Australia rather than having to find them many organizations it will make the 'Rural Strategy' more attractive. Queensland for example might be split into say four regions and submit four different prices but they might all be represented by just one person/organization.

Build on Existing Recycling Activities

Based on the 'expressions of surprise', by various people interviewed, about the extent of recycling activities already undertaken by Business Services around Australia another opportunity is to promote these activities as part of the overall offer from Business Services. Although they would not be directly included in the

negotiations they do give a level of comfort that Business Services could acquire the skills because they are already successfully involved in other recycling activities.

Standard Operating Procedures

By identifying 'best practices' and codifying them in an operations manual it will be possible to meet quality standards on a consistent basis across the country and induct or introduce Business Services new to the sector, quickly and efficiently. For example in one area off the country by working with the major computer companies and the industry body managing the scheme it will be possible to quickly transfer that knowledge to another part of the country.

OHS and Environmental Management

Occupational health, safety and environmental issues will also be codified and solutions shared amongst all the participants.

Continuous Improvement

With multiple sites it will be possible to develop benchmarks to monitor performance and test or develop new approaches to continually reduce the costs of operation and thus stay ahead of the competition.

Common Brand or Trading Name.

The introduction of a common trading name or brand will create the appearance of a common unified approach and give a 'degree of comfort' that the individual sites around the country are working together.

The trading name or brand will not need to be widely promoted. The 'target audience' will be those directly involved the sector. It is likely to number only a hundred or so people. [This name could be linked to the proposed new name for Business Services when it becomes available.]

Employment of People with Disabilities

As the number of decision makers with whom Business Services will be working/negotiating will be quite small they will quickly find out, if they don't know already, that Business Services employ people with disabilities. It is recommended that this fact should be acknowledged and quietly promoted to those key decision makers.

Business Services Weaknesses

Business Services will be at a disadvantage relative to their competitors especially at the start of this programme. The competitors are likely to exaggerate this lack of knowledge.

Cathode Ray Tubes

The principal problem currently facing Business Services is what to do with the cathode ray tubes [CRT's].

One of the recycling companies is currently crushing the glass tubes. The crushed glass is being supplied to a smelter in Port Pirie, South Australia to be used in a smelting process.

While another recycling company has developed a process 'in-house' to separate the glass screen from the remainder of the tube, remove the phosphorus and recycle the glass herein Australia.

Currently the only effective way Business Services have of disposing of the CRTs is in landfill, which will be unacceptable over the longer term.

Lack of Coordinated Approach

It will be very important to maintain an internal discipline amongst those Business Services involved in the programme to ensure that the undertakings given to meet certain objectives are achieved and that individual Services do not make 'side deals' or make other arrangements which will only serve to reinforce the perceived lack of professionalism of all the Business Services that are part of the programme.

Longer Term Developments

Overseas Sales

As the volume of recycled material from Business Services increases it may be possible to consider exporting the sorted waste direct to overseas metal recyclers thus improving the financial returns. Clearly this could be linked to the 'added value processing' referred to above.

Extensions to the Range of Products Recycled

Based on the responses to date it is likely that other products such as TV's, DVD's and games could also be recycled. This will increase the volume of materials and hence the amount of labour and may be particularly attractive in smaller centres where the numbers of computers are lower and thus the amount of dismantling work is also smaller.

Added Value Processing

As the volume of work increases, opportunities to add value can be considered. For example, copper wire can be processed by removing the outer PVC insulation covering and then granulating the wire. The scrap metal value will be increased. Depending on volumes there may only need to be one machine to service the needs of all Business Services at a cost of under $100,000 for a machine. Plastics are another product that can be shredded and again the financial returns increased.

Workability International

Overseas organizations employing people with disabilities who are also involved in recycling computers may have information that could improve the proposed operations.

Organizational Structure to Implement the Strategies

To implement the strategies, develop the strengths and over come the weaknesses identified above some fairly straightforward steps are required:

Structure

The Business Services involved will need to agree to work together and to accept a limited degree of central direction for the overall benefit of all the Services involved. Although the exact details of the structure can be resolved at a later date it is important that any Service understand that they will need to agree to work in a co-operative manner and follow the 'rules'. The Business Services themselves can develop these 'rules'. Hopefully the resources required can be limited to one part time person after the initial set up phase. [See budget below.]

Central Direction

There will be a small number of situations where any given Business Service will need to accept that decisions will be made on its behalf that it will of necessity, be required to accept. Note however that it would have been informed and involved in determining the details of that decision. One example could be the pricing and terms and conditions of say a regional recycling contract. One contract for say Far North Queensland could involve a number of different Services.

Central Source of Information

Contract negotiation, pricing and a source of information for Business Services will be the main activities of the 'central office'.

Self Funding

It will be proposed that initially a percentage of all revenue [external sales] arising from recycling of computers by individual Business Services will be contributed to fund the project. The intention is to ensure that in the project will be self-funding.

Brand Name

Reference has already been made to the use of a common brand name under which the Business Services involved will operate. As a 'working name' the name 'Business Services E Recycling Group' has been adopted for the remainder of this report.

Selection of Business Services

There may be a possible source of conflict if more than one Business Service id covering the same geographic area. A proposal to deal with this situation is covered in Appendix I.

OUTLINE PLAN

Phase I

Based on the responses from the key people interviewed for this report, it is evident that plans are being prepared and various competitors are positioning themselves to be ready when contracts are let or negotiations commence. The possibility of Business Services being interested and being able to deliver was a 'surprise' to those interviewed but generally well accepted with the proviso, could they [Business Services] deliver?

The existing competitors have been in the industry for a few years and are generally known quantities. Phase I then, is a period when Business Services will need to organize themselves ready for submitting tenders and to promote themselves to the key decision makers. Fortunately the numbers of people involved are quite small, probably less than fifty and nearly all located in Melbourne, Canberra or Sydney.

Identify and contact the key decision makers. This will involve face-to-face meetings, regular telephone contact and attendance at key meetings.

Endeavour to negotiate a relationship first with the one or all the big three recycling companies, as identified above in the strategy.

Identify upcoming contracts and find out as much as possible about the likely contents and requirements. It is very likely that the next contracts will be the additional 'Byteback' sites referred to earlier in this report.

Identify the Business Services that are located in the areas where contracts are likely to be let and secure their agreement, subject to the needs of the overall project.

Develop the parameters of the 'Business Services E Recycling Group'. This will be done in conjunction with Business Services currently involved in computer recycling and those who wish to become involved in submitting tenders for their areas.

The timescale for Phase I is estimated to be about 12 months and will overlap with Phase II.

Phase II

During Phase I opportunities will have been identified, Business Service(s) identified and their involvement negotiated. Working with the Business Services, submissions will be prepared and the tenders prepared.

Basic operational guidelines will be prepared before submitting tenders and these will be expanded and developed, as more information is available. Training will be provided to new participants.

Relationships will be developed with all the key players identified in Phase I.

Other opportunities will be identified including the recycling of TV's and domestic electronic equipment such as DVD's.

The timescale for Phase II is estimated to be 12 to 18 moths and will overlap with both Phases I and III.

Phase III

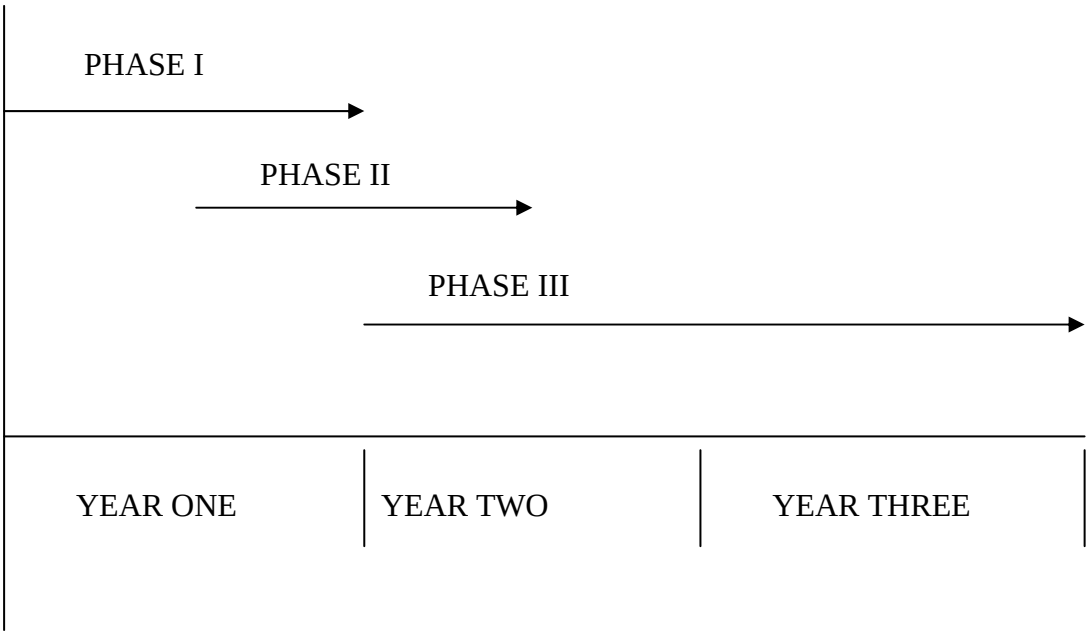
Contracts will be secured and work commenced. Costings and performance data will be collected and confirmed. This information will be used to continually update the operational guidelines and this information will be shared amongst all the Business Services involved.

Relationships will continue to be developed with all the key players identified in Phases I and II.

More contracts will be chased and proposals submitted.

The timescale for Phase III is estimated to be 12 to 24 moths and will overlap with both Phases I and II.

Overall Timescale



Sales Targets

It is very difficult to estimate how quickly the market will develop and how much market share Business Services will be able to capture.

There is one site up and operating in Melbourne and Sustainability Victoria have stated that they plan to let more tenders, possibly this calendar year.

The proposal for computer recycling from the Australian Information Industry Association is due to be delivered in October of 2006.

On the 'continuum' from guesstimate, to estimate, to forecast, to forward contract, to confirmed sale, these targets are at the 'guesstimate end' but are put forward to provide a starting point to aid the planning process. If Business Services are to be successful and be ready, then preparation work must commence. The project can be slowed down if the tenders are delayed. [See risks below']

Sales Forecasts

YEAR	LOW GUESSTIMATE	HIGH GUESSTIMATE
2007	$200,000	$700,000
2008	$700,000	$3,000,000
2009	$1,400,000	$4,000,000

Assumptions

In 2007 it has been assumed that one of the Byteback programmes will be secured by a Business Service in the low guesstimate and in the high guesstimate that two of the Byteback contracts have been secured by Business Services and that they start earlier in the calendar year.

In 2008 the low guesstimate assumes that two Byteback contracts will be secured. In the high guesstimate it is assumed that the national programme of recycling computers from the household has started and that Business Services secure $3,000,000 worth of business.

In 2009 the low guesstimate assumes that the national programme for household recycling has started and that Business Services secure some of these contracts. The high guesstimate assumes more penetration of the market by Business Services.

Project Manager and Related Funding

To develop this project there will need to be management input.

An estimate has been made that about three to five days per month will be required to develop the project and that about seven trips per year in total will need to be made to Melbourne/Canberra/Brisbane from say a Sydney base.

Funding for the Project by Business Services

As already mentioned in the report it is proposed that one of the conditions of joining the 'Business Services E Recycling Group' will be the agreement to contribute a percentage of external sales achieved through the recycling project to the central costs of running the Group. The intention is that the Group should be self-funding.

Return on Investment as an Industry

It is estimated that the cost of running the Group, including a Project Manager, would be in the order of $45,000 per annum in years 1 and 2 decreasing to $35,000 in year 3, that is, a total project cost of $125,000 over 3 years.

Based on supported employee working eight hours per week for fifty weeks of the year at the average hourly rate there are around eight positions per annum generated for every $100,000 of turnover.

YEAR	**LOW GUESSTIMATE**		**HIGH GUESSTIMATE**	
	Sales	No of Jobs	Sales	No of Jobs
2007	$200,000	16	$700,000	56
2008	$700,000	56	$3,000,000	240
2009	$1,400,000	112	$4,000,000	320

The 'return' to the sector at the low guesstimate of sales is approximately one position for every $1,000 invested. At the high guesstimate there would be one position for every $400 invested. In addition there are other advantages:

Positions created in rural and regional Australia.

Growth possibilities by moving into other recycling other electronic products such as TV's etc.

Opportunities to add value.

A good match between the skills of the supported employees and the work requirements.

Possibilities of reasonably long production runs enabling training to occur and skills to be developed.

The nature of the work is easily understood by the public at large and it has positive connotations associated with recycling. This is a 'good' activity with which to be associated.

RISKS

The principal risk will be the non-achievement of the sales guesstimates. The work will develop but the pace with which it occurs may be delayed. It is very likely to proceed but the speed with which the national programme can be established is the unknown. The time spent and thus the costs can be adjusted to reflect these changes.

From a commercial point of view, this project could be regarded as low risk as it does not involve the purchase of specialized equipment or the engagement of non-disabled people with specialized skills. A Business Service may however choose to employ some non-disabled people to lift productivity.

The possibility of not being successful in winning contracts or not renewing contracts would be a risk. By working as part of an organization and remaining close to the organization/individuals that award the contracts it should be possible to minimize these risks.

Occupational health issues, like any activity, are a risk. Some areas such as cathode ray tube dismantling are a definite risk. The alliance(s) recommended above with one of the major recyclers are one way of reducing this risk.

Longer Term Aspects

Opportunities to add value have been mentioned earlier in this report. It is conceivable that there could be national facilities for say the recovery of precious metals. Business Services could jointly own this one facility.

In the early stages, say the first two or three years, it is unlikely that the any significant investment other than Project operating costs would be required by individual Business Services. However, as the volumes increased and the management was seeking productivity improvements the equipment listed below could be purchased and be funded from retained earnings

Vacuum lifting equipment	$5,000 (approx.)
Air screwdrivers and other air operated equipment	$5,000 (approx.)
Lightweight powered conveyors	$10,000 (approx)

CONCLUSIONS

The Federal Government, all State Governments and Territories are pressing the computer industry to address the key issue of dealing with computers that have reached the end of their working life.

The evidence points to a growing problem of stored computers that are no longer operational and an acknowledgement that the current practise of dumping computers in landfill is unacceptable. The majority of these computers are coming from households.

The Australian Industry Information Association is due to deliver a proposal to the Federal Government in October that addresses this issue.

Sustainability Victoria has established the Byteback programme with one collection site operating in Melbourne that accepts computers from households and small business. These computers are then dismantled and the components recycled. More sites are planned to open.

Two Business Services are currently carrying out limited recycling of old computers and have stated that the work is very suitable for supported employees.

There are existing competitors in this market but two strategies have been identified for Business Services, one for rural and regional Australia and one for the cities.

By working together under the working name of 'Business Services E Recycling Group' it will be possible for a share of this work to be done by Business Services.

A phased programme has been prepared together with an estimate of the costs of establishing the Group.

Estimates of the number of jobs that could be created for supported employees have been included.