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DESIGNING THE DUCK RIVER CATCHMENT WASTE EXCHANGE PROGRAM - PRELIMINARY REPORT



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DESIGNING THE DUCK RIVER CATCHMENT WASTE EXCHANGE PROGRAM

Preliminary Report

For Auburn City Council and Parramatta City Council

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Institute for Sustainable Futures

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EXECUTIVE SUMMARY

The primary aim of this Waste Exchange project is to design the form, function and operation of a waste exchange program tailored to the needs of the Duck River Catchment business community. This project forms part of the 'TBL – A model for industrial sustainability in the Duck River Catchment' and focuses on themes of waste exchange, industrial ecology / symbiosis, resource recovery, waste education and business sustainability for small-to-medium enterprises (SMEs) in the Camellia and Silverwater business districts.

This preliminary report outlines the results of the first four stages of this project including a desktop review of models of waste exchange, a contextual analysis, consultation with key stakeholders, and finalisation of the scope of the Waste Exchange Program. The review, contextual analysis and stakeholder consultation were undertaken to determine the best opportunities and key logistical considerations for setting up a waste exchange in the Duck River Catchment. The outcomes of these stages then directly informed a collective decision between ISF and Auburn and Parramatta City Councils on the final scope of the Waste Exchange Program.

A literature review of existing waste exchange tools (website based and journal articles) found that there are no Australian examples to date of waste exchanges targeted at SMEs that have been successful. However, review of waste exchange tools and industrial symbiosis experiences in Australia at larger scales, and internationally at all scales, provided some useful insight for the Duck Creek Catchment context.

The literature review highlighted the following key factors for successful exchanges (operating for five years or more):

- Objectives of the waste exchange need to be clear and explicit from the outset.
- Long running waste exchange programs tend to expand to cover adjacent councils or regions and need to be designed with this in mind.
- Website exchanges that have lasted for more than 5 years are administered by non-for-profit organisations based in the same area/region as the exchange.
- A project advisory group or steering committee with representative businesses from different waste streams can be useful in driving the direction of the exchange and in business-to-business motivation.
- The target audience (SMEs) and business associations should shape the design of the exchange website or database. Exchanges with mixed target groups (businesses, schools, and community groups) need and have a wider range of waste categories for exchange whereas industry specific exchanges tend to focus on hazardous or prescribed wastes.
- When setting up a waste exchange it is useful to 'uncover' existing exchange or symbiosis between businesses and then support, strengthen and replicate these 'kernels' of successful exchange; catalyse new exchange opportunities by identifying key "precursors to exchange" and providing incentives around these; and utilise waste exchange project 'champions' in project launches and the local media.
- A waste exchange tool is best situated in an existing program that seeks to provide connections, relationships, and ongoing support.

The literature highlighted that technical and stand-alone solutions (i.e. an unmaintained website) become redundant quickly and are have little to no lasting waste exchange legacy.

The context analysis looked at the demographics (types of industry) and needs of the business sector in the project area using results from a recently conducted Business Needs Assessment, and identified institutional stakeholders and existing relevant programs in the area.

The business sector analysis found that the majority of businesses are small to medium enterprises (SMEs) with 30 or less employees. The majority of businesses are wholesalers (one in six businesses) and other key local industries include manufacturing and processing, retail, construction and demolition, and information technology and communications.

Key characteristics of business in the target area:

- There are 27 potential sources of e-waste; 13 likely generators of wood waste (not including those businesses in the construction and demolition sector); 13 likely sources of food waste; and six businesses that may generate waste carpet.
- The large number of wholesalers would suggest that wooden pallets and other packaging materials are likely to be significant waste streams with the Catchment.
- There are six listed businesses involved in waste management and recycling including; a food waste processor, a concrete recycler, building and demolition waste recyclers, and a liquid waste recycler.
- Businesses feel reasonably well informed on issues related to environmental sustainability and many are proactive in responding to these issues. However waste was identified as the primary risk to the environment posed by their business activities.
- 63% of businesses surveyed had already been involved with the exchange or sale of waste materials and 51% had actually used recycled materials or reused materials.
- There are a number of documented cases of waste exchanges already taking place whereby businesses are using waste products from other industries and/or transfer their own wastes to other industries for reuse.

In addition to the target businesses there are a number of other stakeholders for this project. Accordingly, the project has sought to identify the institutional and program landscape for participating businesses. This has included a review of existing programs, stakeholder institutions and organisations; experiences of people trying to engage businesses in general sustainability programs, waste reduction or other resource efficiency; and a review of incentives, assistance and recognition offered to businesses (funding, awards etc.) in order to identify possible mechanisms for additional support or recognition for businesses.

- Institutional stakeholders included in the analysis were: Local business organisations, associations and services
- Waste organisations
- Local Government organisations
- State Government stakeholders such as the Department of Environment, Climate Change and Water
- Organisations delivering waste reduction and resource recovery programs

Stakeholder consultation was undertaken through two separate workshops; one for institutional stakeholders and a second for local businesses. The workshops sought to identify specific features of programs that have successfully engaged with business in the area, find potential champions, partners and advocates for the project, and learn more about

business needs in relation to a waste exchange program. Further consultation with business stakeholders is planned through a second business workshop subsequent to this report.

Specific recommendations arising from the workshops were:

- communication of best practice waste examples with the aid of business champions;
- providing waste networking opportunities;
- facilitation of collectively negotiated waste servicing contracts; and
- Encouraging recycling of food and other organic waste.
- Development of a web-based support tool that acts as a 'one-stop-shop' for business seeking to engage in waste exchange

All these suggestions are now being directly addressed in the development of the waste exchange project.

Based on the information gathered about previously successful projects, business needs, and existing exchange practices in the area, the project team proposes that the Duck River Waste Exchange is initially centred around particular priority waste streams that are prevalent in the Catchment (and amongst commercial and industrial waste in Sydney more broadly) and/or already have potential local resource recovery options. These four priority streams are **paper and cardboard, food waste, wooden pallets and e-waste**. A web based decision support tool will provide the functional underpinning of the Program. It will provide businesses with resource recovery options for their wastes that provide alternatives to landfill and focus on using local holding/processing facilities or facilitating exchange with another local business. The food waste processing plant **EarthPower** has been identified as a primary recipient of food waste while the **Sydney Turf Club** has been identified as a potential depot site for recyclables including paper and cardboard. Other recovery options will be explored through the development of two case studies that will address the waste management issues faced by two local businesses within the Duck River Catchment. The case studies will also demonstrate the economic and environmental benefits and costs that arise from the execution of the waste exchanges identified.

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GLOSSARY

Term/ abbreviation	Definition
ACC	Auburn City Council
Industrial ecology / symbiosis	Industrial ecology is the shifting of industrial process from linear (open loop) systems, in which resource and capital investments move through the system to become waste, to a closed loop system where wastes become inputs for new processes.
LGA	Local Government Area
PCC	Parramatta City Council
Recycling sinks	Businesses or organisations that recycle waste materials
SME	Small to medium enterprise –represent 99% of all employing businesses in Australia (July 2007) Source: Australian Bureau of Statistics (www.abs.gov.au)
TBL	Triple bottom line – the social, economic and environmental considerations or implications of business operations
Waste exchange	<p>(1) A transaction in which a waste product from one organisation becomes a raw material for another organisation. Exchanges can be in the form of a 1-way or 2-way exchange between or among organisations and works on the concept that one organisation's waste is another's resource.</p> <p>(2) A system that facilitates waste exchanges</p>
Waste Exchange Program	A system that facilitates waste exchanges
BNA	Business needs assessment
TBL project	Abbreviation for the 'TBL – A model for industrial sustainability in the Duck River Catchment' project
The Councils	Auburn City Council and Parramatta City Council

1 INTRODUCTION

Parramatta and Auburn City Councils have been awarded a NSW Government Environmental Trust Urban Sustainability Grant to promote sustainability and institute 'Triple Bottom Line' (TBL) activities amongst the businesses of the Duck River Catchment. This is to be achieved through building linkages and relationships between industry and local authorities, providing sustainability services and developing 'communities of practice'. A key project activity under the grant (titled 'TBL – A model for industrial sustainability in the Duck River Catchment') is to develop a pilot program for the identification and facilitation of waste exchanges between businesses within the Duck River Catchment. This preliminary report presents the research findings from the initial phases of the waste exchange project.

1.1 The project area

The Duck River Catchment encompasses an area of about 39 km², which drains to the Duck River and its tributaries. Duck River joins the Parramatta River downstream of the Parramatta Weir and upstream of the mouth of Homebush Bay. The Duck River Catchment is located across four Local Government Areas (LGAs) including Bankstown, Auburn, Holroyd and Parramatta. Within the Parramatta and Auburn LGAs it includes the industrial suburbs of Camellia and Silverwater, respectively.

This area is being used as the project boundary, as Auburn City and Parramatta City Councils have worked collaboratively to focus on this catchment for previous business projects, and have received funding to continue working in this location with a focus on industrial sustainability. Figure 1-1 provides a map of the project area.



Figure 1-1 Project Area - Duck River Catchment (scale 1:18,000)

1.1.1 Camellia and Rosehill

The site of many historical landmarks and areas of Indigenous significance, it is known mostly for its long history of industrial usage. The Shell Oil Refinery has been operating from the Camellia Peninsula for over 100 years. The Rosehill Racecourse occupies land once part of John Macarthur’s Elizabeth Farm estate. The Camellia Peninsula has been the subject of much public and regulatory scrutiny on account of chromium contamination, a legacy of earlier industrial activity.

1.1.2 Silverwater

The Silverwater industrial precinct largely consists of light manufacturing and service industries. Some industries such as print making benefit from the clustering of supply chain networks across the precinct, enhancing competitiveness and making it an easy and commercially advantageous location from which to operate.

1.2 Project aims and objectives

The primary aim of this project is to design the form, function and operation of a waste exchange program tailored to the needs of the Duck River Catchment (herein 'the Catchment') business community. Specifically the project is to

- Determine logistics of running the program
- Develop appropriate data collection and storage techniques
- Develop an input/output tool for identifying exchange opportunities
- Identify and report on waste exchange case studies

The project broadly sits within the rapidly growing field of 'industrial ecology', which is defined as the shifting of industrial processes from linear (open loop) systems, in which resource and capital investments move through the system to become waste, to a closed loop system where wastes become inputs for new processes.

There are, however, two features of the waste exchange program (herein 'the Program') that will distinguish it from other industrial ecology projects currently under development in NSW.

1. The Program will target the large contingent of small to medium enterprises (SMEs) that operate within the Catchment. Other industrial ecology projects have tended to focus on larger industries that have a broader resource base to draw upon when initiating waste recovery and other sustainability initiatives.
2. The Program is to be tailored to operate under the prevailing geographic, demographic, environmental, business and other conditions that define the Duck River Catchment.

There are also a number of secondary objectives of the waste exchange project, which are related to quantifying of the costs and benefits that may arise from a waste exchange opportunity. It is intended that the input/output tool has the ability to account for the monetary costs and benefits of an exchange such as reduced costs of waste disposal savings from lower raw material inputs. The tool should also be capable of measuring some basic quantifiable sustainability indicators such as volume of waste diverted from landfill and tonnes of greenhouse gas emissions avoided.

1.3 Project scope and methodology

The project has five main phases:

1. Context analysis including institutional stakeholder consultation
2. Initial outreach and ongoing engagement of local businesses (recruitment to the Program)
3. Tool selection
4. Tool development
5. Formulation of case studies based on feasible potential waste exchange opportunities

The **context analysis** comprises a broad characterisation of the business community of the Catchment and a review of the institutional stakeholders that may play a role in or be affected by the waste exchange program. It also involves a consultation component in which institutional stakeholders were asked to provide their suggestions for the development of the Program as well as strategies for the next phase of the project – business engagement.

The Program is to be supported by an **input/output tool** that analyses waste data from participant businesses to identify potential exchanges and quantify the benefits and costs of preferred exchanges. The nature and form of this tool is to be determined by the outcomes of the preliminary research documented in this report and then further developed through ongoing consultation with local businesses and Council. Hence the project includes a significant **business engagement** component that is designed to

- engender buy-in to the Program,
- bring considerations of resource consumption and waste management closer to the fore of day-to-day business operations,
- and ensure that the Waste Exchange Program and the supporting tool are appropriate to the context in which they will operate.

The business engagement component initially involves two workshops, the first of which is documented in this report. These workshops are designed primarily to help develop and test the conceptual design of the waste exchange program and supporting tool.

Following the workshops, the design of the program and the supporting tool will be developed in close consultation with the subjects of two **case studies**, both of whom will be local businesses that are considered likely to benefit from involvement with the Program. The case studies will

- describe the resource recovery and/or exchange opportunities available to the businesses (based on current known conditions),
- demonstrate how the tool would be used to identify these opportunities, and
- estimate the economic and environmental benefits and costs that arise from the execution of the opportunities identified.

It should be noted that the brief of the project is to design the Waste Exchange Program. Whilst efforts will be made to develop the functionality of Program to the furthest extent possible, it is not within the scope of the project in its current form and funding arrangement to establish a fully operational Program. The tool will be developed to a point where it can be used to demonstrate how it can be used within the Program; however it will not be fully-functional. The case studies are to be used as evidence of the benefits of initiating the Program, but will not be expected to result in actual exchanges of resources.

1.4 Links to other projects

This project sits within a larger project which aims to unite the social, environmental and economic fabric of the industrial areas within the Duck River Catchment. Using a 'place management' approach, businesses, government and key stakeholders will work together over three years to collaboratively research, develop and implement a model which will deliver greater regional resource synergies. It will focus on how we inform, motivate and manage change towards sustainable business practices through:

1. Enhanced governance
2. Futures thinking (future planning)
3. Resource sharing (input/ output & supply chain)

4. Mentoring
5. Public domain and environmental works which create pride and shared responsibility in the 'place'

This will translate the theory of sustainability into practical action and change.

1.5 Report outline

This report is the first deliverable for the project, and summarises information gained from a literature review of tools, initial consultation with industry stakeholders and businesses, discussions with the clients about the socio-economic features of the catchment, and desktop review of stakeholder organisations and aligned programs.

This report seeks to answer the following questions:

What are waste exchange tools: what are their features? What options do we have in designing one suitable for the Catchment context?

What kinds of waste exchange tools are operating internationally? How successful have they been? What features maximise their success?

What are the waste needs characteristics of the business community in the Duck River Catchment?

What level of interest in waste or waste exchange have businesses in Duck River expressed?

Who are the key institutional stakeholders in this project? What do they know about waste exchanges? How might they be involved?

What are the existing programs that involve businesses in the area on sustainability? Which programs exist elsewhere that we can learn from? How can this project complement existing projects?

Where do the 'kernels' or seeds of waste exchange lie in the Catchment? How can we harness these to provide to catalyst for upward involvement in a waste exchange?

The report structure is shown in Figure 1.

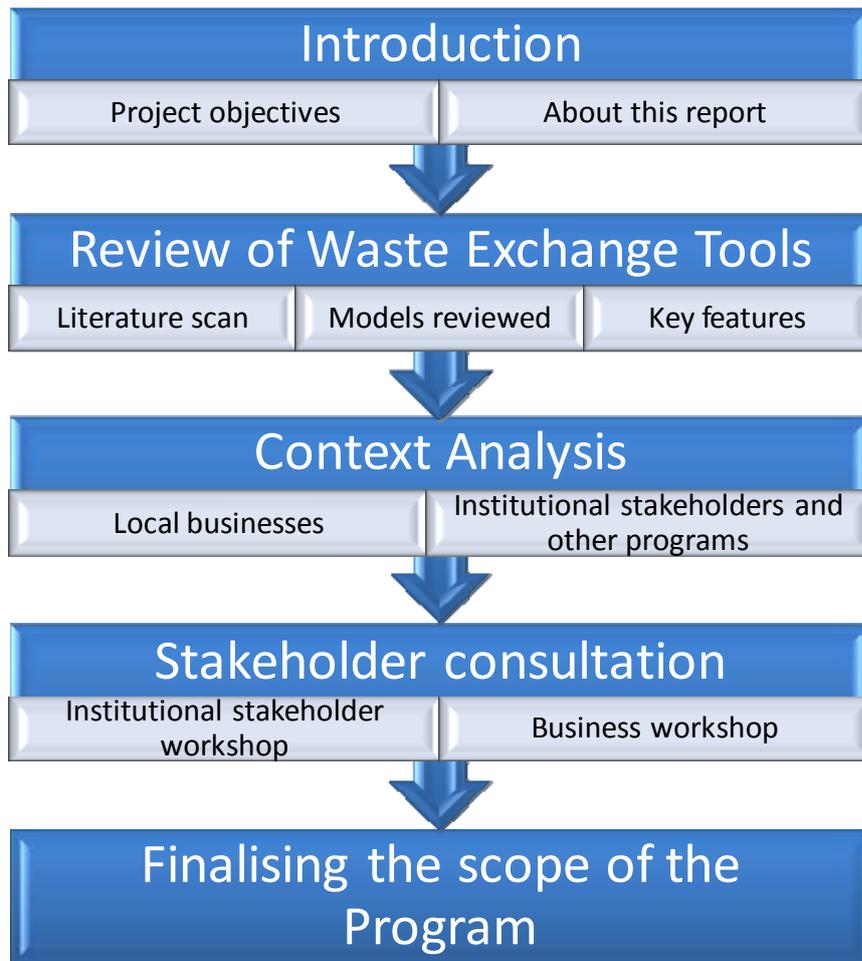


Figure 1-2 Structure of this report

2 LITERATURE REVIEW: MODELS OF WASTE EXCHANGE

In order to obtain an appreciation of Australian and international waste exchange precedents, a review of available literature was undertaken. The aim of the review was to first gauge the range of different models that have been developed to initiate and support waste exchanges and then to understand the context of those models and any measures of their success (or failure). The findings of the review will be used to aid in shaping the form of Waste Exchange Program that is this project adopts, to inform the development of the supporting 'tool', and to guide the manner in which stakeholder engagement is conducted. Below is a shortened version of the literature review. The full review is located in Appendix A.

2.1 Approach

It is important to distinguish between two meanings of 'waste exchange' used in this document and in the literature. The title of this project uses the term waste exchange to refer to the *transaction* that occurs when someone gives their waste to another party for re-use. However, the term waste exchange is also widely used to refer to a *place* where or a *system* within which exchanges are facilitated; in this sense, it is similar in meaning to a stock exchange or a telephone exchange in that it is a place/system rather than an action. When describing the different models of material exchange transactions, we have used the latter form of the term.

The project team looked for websites and journal articles to inform the literature review. The most useful keywords to access relevant information were waste exchange and industrial symbiosis. Terms such as resource exchange and resource brokerage were too broad and were used to describe other concepts not related to waste.

Websites were found that act as an online waste exchange database. There are a large number of these websites, the majority are designed with users in mind and provide little information on their development or the organisational structure behind them. While these websites are useful to understand the range of online waste exchange databases, they represent only a segment of the range of ways to facilitate waste exchange between organisations.

As such, journal articles were canvassed to obtain a broader perspective on waste exchange project models. The review of journal articles was limited to those providing a review of the field and those focusing on learning by case study example rather than theory-based papers.

This review focuses on program approaches rather than tool design. The initial aim of the tool review was to produce a matrix that listed the functionality, key features, usability, strengths and weaknesses of waste exchange tools. However the field of tools was found to be too broad to suit such an analysis. As such, this review introduces waste exchanges and industrial symbiosis as the two main approaches to facilitating materials exchange and re-use between businesses. It then looks at each of these approaches in more detail describing the types of projects that typify each approach. The full Literature Review can be found in Appendix A.

2.2 Key tools reviewed

Some of the key tools reviewed are below while a full list is located in Appendix A.

Name	Country	Website (as at Sep 2009)
Resource Exchange Network for Eliminating Waste (RENEW)	USA	www.zerowastenetwork.org/renewdev/
New York Wa\$te Match Materials Exchange	USA	www.wastematch.org/
Eastex Regional Exchange	UK	www.eastex.org.uk/east/
The Waste Exchange	NZ	www.nothrow.co.nz
Terra Nova Waste Exchange from the Recovered Materials Foundation	NZ	www.rmf.org.nz
RENEW Waste Exchange	NZ	www.renewwasteexchange.org.nz
WastePro Waste eXchange database	Australia	http://www.wasteexchange.net.au/
City of West Torrens Waste exchange register 2009	Australia	http://www.wtcc.sa.gov.au/site/page.cfm?u=741
Freecycle	Australia	http://www.freecycle.org/
Scoodi	Australia	http://www.scoodi.com/

2.3 Models for the exchange of materials: waste exchange vs. industrial symbiosis

A range of models have been employed in industrial ecology inspired material exchange projects. As Parramatta and Auburn City Councils are looking to facilitate exchanges of materials between existing firms in the Duck Creek Catchment, the models to focus on are a waste exchange or an industrial symbiosis network amongst local firms¹. There are significant differences between these two approaches, which have implications for the design of the supporting input-output tool, the approach to stakeholder engagement and the general direction of the project.

Waste exchanges are defined by a key researcher in the industrial ecology field as being “typically one-way [transactions] and generally focused at the end-of-life stage” (Chertow 2007, p.322) and are geared towards “formal[ising] trading opportunities by creating hard-copy or online lists of materials one organization would like to dispose of and another organization might need” (ibid). Chertow sees waste exchanges as typically involving older, more traditional forms of business and being further from the ideas of collaboration and exchange that underpin industrial ecology. Waste exchanges may exist on a range of scales from local to national or global.

By contrast, basic industrial symbiosis involves “at least three different entities... involved in exchanging at least two different resources” (Chertow 2007, p.11). Industrial symbiosis has been further defined as engaging:

“traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity” (Chertow 2000).

An industrial symbiosis network is one that develops this symbiosis between existing businesses in close local proximity, rather than attempting to develop a new site or ‘eco-

¹ The other models are industrial symbiosis (1) within a firm, (2) within a co-located eco-industrial park or (3) among firms organized “virtually” across a broader region. (Chertow 2000).

industrial park' using the symbiosis model. Table 2-1 below summarises the differences between waste exchange and industrial symbiosis.

Table 2-1 Characteristics of waste exchange and industrial symbiosis

Waste Exchange	Industrial Symbiosis
One-way material disposal	Multiple parties
End of life stage	Material becomes an input for a new product
Materials only	Materials, energy, water, and/or by-products
Local, regional, national, or global	Based on local proximity
Transactions initiated through database searches	Negotiated transactions

While the title brief for this project suggests a waste exchange approach, the focus in the brief on establishing local networks and a cooperative business environment suggests an industrial symbiosis model may be preferable. This has implications for determining which projects are most relevant to review. Accordingly, both types of material exchanges are discussed in more detail below with an overview and examples of each approach given.

2.4 Waste exchanges

The idea of a waste exchange database is a well-established concept recently given new life and new format through the advent of the internet. Waste exchange databases provide a location for people or organisations to list waste materials for re-use and for others to look at materials on offer and contact the person listing the material. Formalised waste exchange databases have been in operation in Europe since the early 1970's and a review conducted in 1988 included 23 waste exchange programs in Canada, the US and elsewhere (Canadian Council of Resource and Environment Ministers 1988). This review mentioned, among its many findings, that the majority of North American exchanges had already installed a computer system to facilitate keeping database listings up to date. Prior to the internet the exchange of wastes between companies was facilitated through listings in newsletters or trade magazines, however the internet now appear to be the dominant medium for waste exchange databases.

Globally, waste exchanges are numerous and diverse so it is useful to understand the different characteristics which shape these projects. The CCREM (1988) review categorised waste exchanges based on the organisational structure, objectives, geographical area served, and user matching approach (passive vs. active). The present review of web-based waste exchanges found that, with the addition of target audience for re-use, these categories are still relevant in describing the diversity of waste exchanges. Detailed findings regarding these categories can be found in the full literature review in Appendix A.

2.4.1 Waste matching approaches

Apart from hosting organisation, geographic area covered by the waste exchange and the target audience it is also useful to think about waste exchanges in terms of their user matching approach and objectives as described in the 1988 Canadian review of waste exchanges (Canadian Council of Resource and Environment Ministers 1988). This review introduced the categories 'passive', 'active', 'pro-active' and 'broker' to describe waste exchanges as explained in the descriptions below.

Passive	A clearinghouse of information regarding the availability of waste materials. Inquiries which are generated by way of the exchange bulletin or newsletter are simply forwarded to the generator or potential user of the waste and the waste exchange plays no role in the transfer negotiations
Active	An exchange that actively attempts to match generators and potential users of waste, by way of listings in the exchange bulletin or through telephone solicitation. Some degree of follow-up is undertaken to encourage successful transfer of waste materials
Pro-Active	An exchange that, in addition to providing the above level of service, also offers technical expertise in waste management. Such an exchange may be involved in consulting with industry and recommending methods by which waste output may be cost-effectively reduced or reused
Broker	A profit-oriented private enterprise that acts as an agent or consultant for a waste generator or recycler, receiving either an up-front fee or a commission for wastes that are successfully sold. Such an operation frequently takes control of a waste product prior to its resale.

These user matching approaches can be seen in the differing designs of current waste exchange databases. Waste exchanges without government funding generally take a passive approach to user matching; this is true of Freecycle and Ozrecycle which do not keep a record of successful transfers. Most government funded waste exchange databases use 'success stories' to illustrate successful waste transfers, which would be characterised as an 'active' approach. However, these are often minimally active, relying on asking users to report their stories, rather than having a high degree of follow up. This is the approach taken by the EastEx regional exchange and The Waste Exchange (NZ) amongst others.

The exchanges New York Wa\$te Match (USA) and Terra Nova's Waste Exchange (NZ) both list success stories but they also provide 'pro-active' consulting for businesses on how to reduce waste. Terra Nova describes its service as "rather than just listing materials available and materials wanted our co-ordinator visits businesses to assess their needs, and to advise them about waste materials that could be redirected to more productive uses." Similarly, New York Wa\$te Match has a technical assistance program which "can perform free waste stream assessments and recommend reuse and recycling options that reduce waste disposal costs". New York Wa\$te Match is coordinated by the City College of New York and also has a waste reduction research and development program.

The Sydney Waste Exchange can be classified as a 'broker' type waste exchange as it is run by a private company that takes commissions on successful exchanges and appears to be an agent for a recycling company.

2.4.2 Common features of successful exchange tools

The literature review found that there are no Australian examples of exchanges with a lifespan of five years or more. As such we asked, what are the standout, common features of international tools that appeared successful? The common features of successful exchanges are outlined below.

Objectives

- Objectives of the waste exchange need to be clear and explicit from the outset.

Geographical area

- The geographical area of the waste exchange and the target audience need to match.
- Long running waste exchange programs tend to expand to cover adjacent councils or regions and need to be designed with this in mind.

Administration

- Website exchanges that have lasted for more than 5 years are administered by non-for-profit organisations based in the same area/region as the exchange.
- A project advisory group or steering committee with representative businesses from different waste streams can be useful in driving the direction of the exchange and in business to business motivation.

Target audience

- The target audience (SMEs) and business associations should shape the design of the exchange website or database.
- Exchanges with mixed target groups (businesses, schools, and community groups) need and have a wider range of waste categories for exchange whereas industry specific exchanges tend to focus on hazardous or prescribed wastes.

Approach

- When setting up a waste exchange it is useful to 'uncover' existing exchange or symbiosis between businesses and then support, strengthen and replicate these 'kernels' of successful exchange.
- Map the waste exchange or industrial symbiosis patterns that exist and opportunities that could exist.
- Catalyse new exchange opportunities by identifying key "precursors to exchange" and providing incentives around these.
- Utilise waste exchange project 'champions' in project launches and the local media.
- A waste exchange tool is best situated in an existing program that seeks to provide connections, relationships, and ongoing support.

The literature highlighted that technical and stand-alone solutions (i.e. an unmaintained website) become redundant quickly and are have little to no lasting waste exchange legacy.

2.5 Industrial Symbiosis projects

Reviews of industrial symbiosis projects suggest that success in industrial symbiosis is difficult to achieve, difficult to quantify and dependent on a wide range of factors. This section is based on two reviews of industrial symbiosis programs; Mirata (2004) used a case-study format to review the three programs which formed the early stages of the national industrial symbiosis programme (NISP) in the UK, and Chertow (2007) who reviewed 17 industrial symbiosis programs looking for indicators of success. Both made recommendations regarding what they saw as the features of successful programs.

Both authors note that there is a low number of successful industrial symbiosis programs and that this had been identified by many authors. For example, after a review of 63 'eco-industrial' sites Gibbs et al. (2005, cited in Chertow 2007) concluded that "initiatives based

upon the interchange of wastes and cascading of energy are few in number and difficult to organize". In summarising the reasons for this low success rate, Mirata (2004) concludes that it is the reliance on the alignment of so many different factors that makes success difficult.

These multiple factors also make it difficult to measure the success of industrial symbiosis programs. Mirata (2004) used a case-study format to review three NISP programs. Even amongst these programs which were located within one region, the differences in context, approach and stage of development were so different that Mirata (2004) found it difficult compare programs and measure success. Success across programs was measured by both Mirata (2004) and Chertow (2007) as the continued existence and development progress of a program and the presence of some exchanges rather than comparisons between programs about the number and scope of exchanges.

One aspect that has been identified as being critical to the success of IS projects, however, is uncovering and capitalising on existing cooperation and exchanges, which suggests that industrial symbiosis is best driven by the industries involved rather than imposed by an external party.

Two prominent industrial symbiosis projects are the UK NISP mentioned above and the Kwinana Synergies Project in Western Australia. Learnings from these projects are presented in Appendix A.

2.6 NSW Industrial Ecology Network

A recent development in the field of industrial ecology in Australia has been the establishment of the NSW Industrial Ecology Network (IEN). Seeded through industrial ecology activities within the building products cluster of the NSW Department of Energy, Climate Change and Water (DECCW) Sustainability Advantage Program (see Section 5.3), the network was formalised through the establishment of a NSW Industrial Ecology Network Working Group under the umbrella of the Waste Management Association of Australia (WMAA). The Working Group was formalised with industry endorsement at the Australasian Industrial Ecology Conference (30 – 31 July 2009) and seeks to bring government and industry together to create a platform for and foster broad scale industrial ecology.

The IEN has been recruiting members and requesting from them data on waste streams and 'wish list' materials sought through the Network. The Network is currently being established within NSW but the ultimate goal is to expand the network across Australia through establish a working group in each State and subsequently forming a National Division for Industrial Ecology.

At this early stage in its development it is not clear whether the network will adopt an industrial symbiosis or waste exchange framework. Material exchanges that have been used as case studies in the Sustainability Advantage Program could be classified as industrial symbiosis. However the ongoing development of the network appears to be moving towards developing an on line waste exchange database with formalised structures and support to facilitate (even broker) material transfers (Edge Environment, 2009). A key objective of the network and the database appears to be overcoming regulatory barriers to industrial ecology such as cumbersome processes for waste exemptions and licensing and disparities between state regulations while ensuring the Network database remains independent from government. As such WMAA will have the lead role in both the establishment of the working group and potentially the management of the database. In this sense the IEN is likely to take the form of an active waste exchange with some form of brokering.

Box 2-1: Implications of the literature review for the Duck River Waste Exchange

Two waste exchange models are potentially applicable to the Duck River Waste Exchange Program; a waste exchange and an industrial symbiosis network.

Waste exchanges are diverse in nature but predominantly look like an online database which users can access to list materials available for reuse or to browse and make contact regarding a material they seek to reuse. They can exist at a range of scales from local to international and typically enable one-way exchanges at the end of a product life cycle. There are several Australian precedents for waste exchange database projects; however they have had mixed success in terms of establishment and usage. There are several overseas examples of long lived waste exchange projects established by local governments. Notable features of these long lived local government developed waste exchanges are that they are designed for both business and community users and that the geographic area covered has expanded over the life of the project from a local to a regional scale.

Industrial symbiosis networks focus on developing local collaborations between businesses involving the physical exchange of materials, energy, water and by-products. These networks are based on close proximity and aim to develop ongoing relationships between multiple parties in which waste materials become inputs for new products. Reviews of industrial symbiosis programs reveal that they are most successful when they focus on deepening existing co-operative relationships, utilise the influence of peer businesses (e.g. through industry project champions) and are initiated by organisations with strong existing relationships with businesses in the region. These findings are supported by the success of the Kwinana project in Australia which built on existing co-operative relationships and was developed in close collaboration with the Kwinana Industries Council.

Currently DECCW in collaboration with Edge Environment and WMAA is establishing an Industrial Ecology Network in NSW with views to expanding across Australia. The case study waste exchanges that have been used to promote the benefits of establishing the Network were industrial symbiosis-type transactions, but the Network activities appear to be moving the project towards an active waste exchange type model. The program has strong industry backing; however while it does seek to accommodate small to medium enterprises it appears at this stage to be mainly geared towards larger industry. Also with its large geographic reach may not always be able to cater to specific local business needs, particularly those of smaller businesses.

The selection of the model to be adopted for the Duck River Catchment waste exchange program will largely be guided by the stakeholder (particularly local business) consultations. Adopting a waste exchange model has advantages of a potentially broader and more public reach and less hands-on involvement in the identification of exchange opportunities. An industrial symbiosis approach requires perhaps a greater level of commitment from the Councils (and/or consultant on behalf of the Councils) in terms of business engagement but will enable the development of strong and potentially more effective and long-term industrial ecology based relationships between specific businesses. The design and ultimate implementation of the Duck River Waste Exchange Program, however, will need to be mindful of the objectives and scope of the Program so as to build upon outcomes and lessons from past waste exchange projects. Moreover, the design of the Program must ensure that the service the Program offers is unique and beneficial to Duck River Catchment businesses and not something they are likely to access via other avenues such as the NSW Industrial Ecology Network of the Sydney Waste Exchange.

3 OVERVIEW OF CONTEXT ANALYSIS & STAKEHOLDER CONSULTATION

It is critical for this project to be aware of the various businesses operating in the target area of the Catchment and the prevailing geographic, demographic, environmental, business and other conditions that define the Duck River Catchment. Apart from local businesses, other stakeholders that are relevant to the project include:

- business organisations that currently offer support services to business, whether specifically related to sustainability or other services
- other institutional stakeholders (both local and state government for example) who may have existing relationships and planned programs for businesses in the target area

It is also valuable to learn from other environmental programs offered to businesses that may have relevant lessons to transfer to this project.

In addition, an appreciation of existing waste servicing of businesses in the Catchment and business perception of the Councils' role in waste servicing will in part determine the nature of the Waste Exchange Program. This includes other government-sponsored waste programs that businesses in the project area may currently be eligible to participate in.

3.1 Approach

The context analysis and stakeholder consultation were each segmented into two components defined by the type of stakeholder: local business and institutional stakeholders. The four components drew on various sources of information as summarised in Table 3-1.

Table 3-1 Information sources for the context analysis and stakeholder consultation

Study component	Information sources
<p>Context analysis</p> <p>Local businesses</p> <p>Institutional stakeholders</p>	<p>Parramatta and Auburn City Councils' Duck River Catchment business list</p> <p>Parramatta and Auburn City Councils' Business Needs Assessment data and reported findings</p> <p>Findings from research projects undertaken by students from the University of Western Sydney on behalf of Parramatta City Council</p> <p>Discussions with Parramatta City Council project staff</p> <p>Stakeholder snowballing (asking known stakeholders to suggest other contacts who may have a stake in this project or may have relevant experience or information to share)</p> <p>Reviews of organisations' websites</p> <p>Discussions with Parramatta City Council project staff</p>
<p>Stakeholder consultation</p> <p>Local businesses</p>	<p>Discussions in an institutional stakeholder workshop</p>

Institutional stakeholders	Discussions in a business stakeholder workshop
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In broad terms the context analysis looks at:

- Businesses in the Duck River Catchment and business attitudes to sustainability issues
- Other stakeholders for this project (business, Local, State and Federal Government, and waste management organisations)
- Current waste servicing of businesses in the Catchment
- Other waste and sustainability programs that engage local businesses
- Other projects that may have transferable learning to this project

Consultation with institutional stakeholders focused on the strategic positioning of the Duck River Waste Exchange Program relative to other existing and planned waste/sustainability-oriented programs as well as identifying business engagement strategies. Consultation with local businesses was primarily designed to gauge the need/demand for a waste exchange program and the role(s) it could best be designed to fill in terms of promoting and supporting sustainable waste recovery and reuse amongst local businesses.

The outcomes from the context analysis and stakeholder consultation are presented over the following four sections of the report. Section 4 provides an overview of the business community in the Duck River Catchment. Other stakeholders and relevant existing waste and sustainability initiatives are described in section 5. Outcomes from the institutional and business stakeholder workshops are presented in sections 6 and 7, respectively.

4 BUSINESSES IN THE DUCK RIVER CATCHMENT

The business sector in Duck River Catchment comprises more than 600 businesses from a diverse range of industries.

A database of active businesses from the area based on ABS and ATO data was purchased by the Councils in late 2008. The database contains business addresses and contact details as well as information on the line of business, number of employees and annual sales for (most of) the listed businesses. The Councils attempted to contact each of the listed businesses in the database to generate interest in the *TBL – A model for industrial sustainability in the Duck River Catchment* project (herein the TBL project) and to more up to date contact details including email addresses. The database was also used by the Councils to inform a postal mail out to local businesses again designed to promote sustainability and the TBL project.

The data gathered from the telephone campaign was used by the Councils to initiate a detailed business needs assessment (BNA) consisting of an online survey, in-depth interviews and a number of case studies. Both the postal mail out and the BNA online survey asked businesses to register their interest in the present waste exchange project. This section provides a summary of the business database along with a description of the businesses that have responded positively to the prospect of being involved with the waste exchange project.

4.1 Types of industry and likely waste streams

The businesses listed in the Duck River database were categorised by industry type based on their line of business, where recorded. 444 of the 613 business listings included an entry for line of business. The industry category for another 21 businesses could be assumed from the name business. The representation of the various industry sectors in the Duck River Catchment shows that wholesaling has the largest contingent amongst the businesses with a recorded line of business with a total of 100 businesses handling a large variety of products including automotive parts, toys, pharmaceuticals and industrial valves. Other key local industries include manufacturing and processing, retail, construction and demolition, and information technology and communications.

In terms of common materials and waste products, there are (at least):

- 27 potential sources of e-waste;
- 13 likely generators of wood waste (not including those businesses in the construction and demolition sector);
- 13 generators of food and/or organic waste; and
- 6 businesses that may generate carpet waste.

The large number of wholesalers would suggest that wooden pallets and other packaging materials are likely to be significant waste streams with the Catchment. Waste oil is likely to be a consistent and sizeable waste stream from the automotive sector, although it is not clear the extent of oil recycling that may already occur through existing waste disposal arrangements.

It should also be recognised that most businesses will produce common wastes such as paper and cardboard, packaging wastes, food waste, plastics, metals and glass from day-to-day operations. Indeed much of this waste will be recyclable. Paper, cardboard and packaging wastes are likely to be generated in particularly large volumes given the universal administrative and material supply needs of business.

4.2 Recycling businesses

There are six listed businesses involved in waste management and recycling who could be potential recipients of waste materials in the Program including:

- a food waste processor;
- a concrete recycler;
- building and demolition waste recyclers; and
- a liquid waste recycler.

While sourcing recycling sinks is not the primary intention of the waste exchange, coordinated recycling of particular waste streams may be a desirable contingency where exchanges are impractical. And although not located within the Duck River Catchment boundary, there are numerous other waste recycling companies in the Parramatta/Auburn districts that could also potentially act as recycling sinks.

4.3 Size of businesses

The majority of businesses in the database (63%) have less than 50 employees and fall into the TBL project's definition of an SME. The numbers of businesses falling within different size bands are presented in Table 4-1.

Table 4-1 Sizes of businesses listed in the Duck River Catchment business database

Number of employees	Number of listed businesses
1-20	389
20-50	115
50-100	41
100+	43

4.4 Businesses interest in sustainability and the proposed Waste Exchange Program

4.4.1 Engagement with sustainability, waste management and Council

Two recent studies have documented business activity and attitudes in relation to sustainability (including waste management and resource recovery) along with opinion on the role of local Council in supporting such activities. These were University of Western Sydney student research and the PCC- and ACC-initiated Duck River Catchment business needs assessment (see Appendix B for more information). Common findings to both pieces of research were:

- Low existing awareness of Councils sustainability initiatives but willingness to work with Council on sustainability
- Interest in waste as the key potential environmental impact their business poses
- Businesses, motivated to 'do their bit' in relation to sustainability and were able to identify numerous enabling factors such as marketing advantages, reputation gain and potential cost savings.

The primary recommendation to come from the Duck River Catchment business needs assessment was that the Councils actively engage businesses through waste management initiatives as 'waste seems to be the best leverage for immediate sustainability returns'. The study also uncovered some promising sustainability initiatives including waste recovery and reuse activities already occurring within the Duck River business community. Some examples of this are given in Box 4-1.

Box 4-1 Examples of existing sustainability and waste recovery and reuse practices

The BNA revealed that local businesses were already taking steps to be more sustainable in their approach to waste management and resource recovery. As part of the first business workshop (see section 7 below), representatives from three businesses actively engaged in developing sustainable practices were asked to give a presentation to the group about their activities. The presentations are summarised below.

Case Study 1. 'Where there's waste there's brass', AB Mauri, Chris King

AB Mauri is a yeast manufacturer. Chris shared AB Mauri's experience of making a new products from their waste products. 3 years ago Chris might have said that there was little that could be done to reduce and recover waste. Since then AB Mauri have made huge improvements to their waste management practices and their bottom line. Waste sludge from their molasses treatment process was previously removed off site by for contractors at a significant cost. With some opportunity scoping, it is now exchanged to an animal business to make new products. This exchange has resulted in a large cost saving and slight profit for AB Mauri (net \$30,000 per year).

AB Mauri is currently looking at sending their treated effluent to Boral or EarthPower to save up to \$100,000 a year on effluent disposal. Another by-product which was previously 'waste' has been identified as being a 'resource'. As such AB Mauri now uses beta-glucose to make their own secondary product which is a potential animal feed or fermentation aid. The process has the potential to save up to \$150,000 a year in waste costs and generate up to \$200,000 a year in revenue. Chris reflected on the innovation journey that gave rise to identifying the new product opportunities and explained the benefit of encouraging opened minded, business savvy employees who also care for the local environment to think beyond the square.

Case Study 2. 'Employees are green gold' Lubrizol, Philip Lane

Lubrizol manufactures and supplies Specialty Chemical Additives for the Lubricants and Fuels markets. Philip described Lubrizol's sustainability journey and reflected on why sustainability is becoming embedded in the companies culture.

In 2008 Lubrizol's Health Safety and Environment (HSE) Team introduced a 3R segmented waste stream system. As a result, in 2008 two thirds of their solid waste was recycled, as opposed to 2005 where the majority of waste went to landfill. The initial driver to recycle oil was to reduce costs, the fact that environmental outcomes were realised was an added bonus. In Lubrizol's experience waste recovery = revenue. Examples of waste recovery include reusing nylon container strapping, reconditioning and reusing drums, recycling cardboard interleaving and waste oil and selling waste steel drum

Philip outlined that success of the system relies on employee education, skills and action. Lubrizol use an employment HSE feedback form called "Bluey" where 'no idea is a silly idea' and every suggestion is rewarded with a \$2 scratchie to ensure momentum was maintained. On a broader scale, success in sustainability is celebrated at Lubrizol and the company is moving toward a heightened focus on energy efficiency, water reduction and end of life issues.

Case Study 3. 'Champions for the journey ahead' The Sydney Turf Club, Russell Phillips

The Sydney Turf Club is a large venue, with stables, tracks and a function venue. Russell briefly outlined that the Turf Club is currently starting out on their sustainability journey and have recently formed an 'Eco Committee'. As part of their initiatives they are undertaking a waste assessment (looking at waste types, streams and opportunities). To date the Club has been involved in or developing recycling initiatives for manure (to a mushroom farm), plastic and cardboard. The Turf Club currently have a vision and growing commitment to mainstream sustainability in to their corporate culture.

4.5 Current waste servicing of businesses in the Catchment

Waste management at both Auburn and Parramatta City Councils has traditionally prioritised domestic waste servicing and generally do not provide commercial and industrial properties with waste collection or recycling services. This is in part on account of the fact that only residents of LGAs pay a waste and recycling levy, meaning that business servicing can only occur on a user-pays basis. The Councils are legally obliged not to undercut private waste contractors thus it is generally left to businesses to arrange waste contractors independently. General rubbish is, however, collected from the central business districts (CBDs) of PCC but no recycling service is offered.

Other factors that prevent the Councils from providing waste - and more particularly recycling - services to businesses include:

- The inconsistent geographical distribution of businesses
- Space constraints on storage and presentation of bins for collection in central business districts.
- Existing collection contracts only allow for the provision of a 240 litre commingled recycling service that is to be collected on a fortnightly schedule which would not be suitable for many businesses.
- Existing contractual arrangements between businesses and private waste and recycling contractors.
- A significant percentage of businesses are tenants whose building owners are not prepared to pay additional fees to Council to provide waste services.

In response to the NSW Waste Avoidance and Resource Recovery Strategy 2007 target for Councils to achieve 63% diversion of commercial and industrial waste from landfill by 2014, PCC is investigating options for providing recycling services to businesses within its CBDs (Parramatta, Epping, Granville and Guildford). This would involve altering its current waste collection contract and potentially allowing for collection from larger commingled recyclables bins in areas where storage and presentation of multiple 240 litre bins is problematic.

4.6 Geographical constraints

Aside from the factors that limit waste servicing to businesses mentioned above, there are a number of geographical barriers that could potentially impact the proposed Waste Exchange Program:

- The Duck River which acts as a physical divide between the Silverwater and Camellia/Rosehill precincts and already significantly restricts interactions between businesses of the two precincts.
- Poor traffic access to the Camellia/Rosehill peninsula is said to constrain business productivity in the area and could also impact the transport of waste materials in and out of the area.
- Encroachment of residential development on industrial land may pose a problem for the program in terms of planning and land use certainty and for transport of waste, particularly regular, large loads.

Box 4-2: Business analysis - Implications for the Duck River Waste Exchange

The Duck River Catchment business community comprises a diverse range of industries, producing an assortment of wastes. Predominant waste streams, however, are likely to be:

- **E-waste**
- **Wood waste including off-cuts, sawdust and pallets**
- **Food and/or organic waste**
- **Carpet waste**
- **Paper and cardboard and other recyclables**
- **Packaging wastes**

There appears to be genuine willingness amongst local businesses to engage in sustainability and for many businesses waste recovery is a top priority both in terms of achieving environmental outcomes and improving business operations. Whilst there is a low awareness amongst businesses of Council sustainability initiatives, there is both demand for Council assistance and a desire to cooperate with Council. **Moreover, businesses are already demonstrating significant initiative in developing their own sustainable waste management practices.**

To date both Councils have not offered waste servicing to businesses beyond collection of general rubbish from CBD areas; however, PCC is considering extending CBD servicing to collect commingled recyclables. **The design of the Waste Exchange Program must take into consideration the current and planned waste servicing of businesses in the Catchment as well as a number of geographical constraints that could potentially impact the Program.**

5 INSTITUTIONAL STAKEHOLDERS & EXISTING PROGRAMS

5.1 Overview

As well as understanding the business context for the target area, it is important for this project to identify the institutional and program landscape for participating businesses.

This section identifies and describes some key:

- **Stakeholder institutions and organisations** working in this space – so we can consider their plans for future programs, as well as identify potential collaborators / supporters of the tool (to ensure its long term effective use).
- **Existing projects & programs** targeting the same industries – both for credibility in the sector we are approaching, and to ensure the tool design complements existing structures and avoids duplication. Where relevant we have noted any **incentives, assistance and recognition** currently offered to businesses (funding, awards etc.) by these organisations. This is in order to identify possible mechanisms for additional support or recognition for businesses using a potential tool and design it with these in mind.

This part of the context analysis has been informed by discussions with stakeholders and reviews of program and organisational materials. The stakeholders identified through this desktop review informed the list of stakeholders who were invited to the Institutional Stakeholder workshop described below.

5.2 Stakeholder institutions and organisations

In addition to the target businesses there are a number of other institutional stakeholders and organisations of interest to this project. The following organisations are identified as potential stakeholders for this project, who may be interested in being kept informed about the development of the project, or organisations whose existing communication avenues and relationships with local business could be used to benefit the project.

5.2.1 Business organisations, associations and services

There are a number of active business organisations operating in the project area that offer services to members or the broader business community generally. These vary from membership based associations open to all businesses, to those that target specific industry types, to those that support specific functions (e.g. innovation, export). Some have a specifically Western Sydney focus, while others provide services to business across the state. Some of these organisations raise revenue through membership fees, others are part local government funded, and others are state government funded, or are program areas of government.

These include:

- Parramatta Chamber of Commerce
- Granville Chamber of Commerce
- Western Sydney Business Advisory Service (Department of State and Regional Development)
- Western Sydney Business Connection
- Western Sydney Innovation Advisory Service

- NSW Business Chamber
- Industry Associations

Note that there are no local chambers of commerce for the other suburbs within the Duck River Catchment.

Waste organisations

Relevant waste organisations identified as having potential synergies with the waste exchange project include:

- Waste Management Association of Australia - WMAA (inclusive of the NSW Metal Recycling Working Group and the NSW Waste Educators Working Group whom may have expertise, experiences and projects relevant to the waste exchange)
- The Australian Council of Recyclers (ACOR)
- The Waste Contractors and Recyclers Association of NSW (WCRA)

Local Government organisations

Local government organisations relevant to the project include:

- Auburn City Council
- Parramatta City Council
- Western Sydney Regional Organisation of Councils
- Local Government and Shires Association

State and Federal Government stakeholders

- NSW Department of Environment, Climate Change and Water (DECCW)
- Greater Western Sydney Economic Development Board

Organisations delivering waste reduction and resource recovery programs

- The Bower
- Reverse Garbage
- Edge Environment
- Zero Waste

More information on these organisations can be found in Appendix B.

Many of these stakeholders were invited to share their experiences working with business and their ideas for a potential waste exchange tool, in our Stakeholder Workshop. **See section 6 for more information on the Institutional Stakeholder Workshop.**

5.2.2 Discussion

Business organisations & associations may be appropriate avenues for making first contact with businesses for this project (especially those with strong or exclusive Western Sydney membership); others may be possible partners in promoting any program or tool to emerge

from this project; others may need to be briefed on the existence of the tool to increase its uptake and long term success. Using existing business-targeted publications and events will be effective ways of reaching local businesses to communicate project outcomes. Using existing relationships and networks may be an effective way to recruit businesses for the project (e.g. seeking advice of councils or business associations on who 'already engaged' businesses may be; or simply getting an introduction).

Waste organisations may provide technical knowledge helpful for a collection program where parties may need to tender (i.e. to access a wide range of recycling / waste collection service providers), as well as broad industry contacts and waste education and engagement program design expertise.

State Government agencies will need to be informed of the project's development, to avoid replication of services to the business community, to draw on lessons learnt from similar programs, and to make sure that this project is also able to promote complimentary projects and resources produced at the state level.

Several of these organisations also run programs that could provide synergistic opportunities if the concept of the Waste Exchange Program and the supporting waste tool are to be widely promoted in business – for example awards programs, training and development programs.

Possible ways of involving these institutions include;

- Engaging – asking them to play an active role in visioning, designing or reviewing the tool, using their networks to help recruit businesses
- Consulting – asking for views
- Informing – keeping the stakeholder informed, sharing information about project goals and outcomes

Box 5-1 Stakeholders institutions and organisations and their implications for the Duck River Waste Exchange Tool

The main outcome of identifying institutional stakeholders for this project is identifying the opportunity for partnerships and networks. Partnerships and networks with existing organisations will be important for accessing existing communication channels to business and therefore increasing awareness within the business community of the tool or resource that is ultimately developed.

These stakeholders and industry experts also represent a source of expertise and local knowledge that the project can access– including expertise and knowledge of waste reduction projects, successful business engagement, working with business, working with small business and working with small business in Western Sydney. The project sought to canvass some of this expertise through inviting many of these stakeholders to the stakeholder workshop, to help develop ideas for the waste exchange tool.

In developing the waste exchange tool we will need to consider what type of relationships we seek to maintain with these organisations and institutions: for the design phase, the pilot phase and the ongoing use phase.

5.3 Existing projects & programs

The programs and resources listed in Table 5-1 are linked to the organisations and institutions listed above and may provide opportunities for the waste exchange tool. Other programs are working with business on sustainability – these may not relate to the target geographical area, nor focus on waste but may be useful contacts for learning about engagement approaches generally.

What can we learn from other sustainability programs and services being offered to business? What issues to consider are highlighted by the experiences of existing programs? The learning and experiences of people trying to engage businesses in general sustainability programs, waste reduction or other resource efficiency programs is a valuable insight for this project.

The following is a brief list of key challenges, opportunities noted from review of other programs, and anecdotal information from discussions with those working in waste management and related areas, in the review of programs and identification of stakeholders, prior to the stakeholder workshop.

Considerations for engaging businesses generally:

- Lots of money is being invested in water and energy – linking to these programs could be a good entry point

Considerations for engaging SME's in particular:

- SME's are so busy trying to keep their businesses running, that they don't have time to research grant opportunities, different resources, better waste deals etc.
- A single point of contact can help develop close relationships and keep businesses engaged in waste reduction or resource efficiency programs
- SME's not a homogenous group – it contains micro, small and medium sized business, including sole traders or businesses made up of two or three people who operate out of a house - it can therefore be difficult to design resources that meet the needs of these different scale businesses
- Very small operators may not have the 'language' to talk about the technical terms required to negotiate exchange or explore waste disposal options.
- On sustainability issues - businesses are trying. Important to acknowledge their existing actions and efforts – message is: *'don't suggest I don't care. Congratulate me on what I have done'*.
- Engagement with smaller businesses on waste exchange issues could be potentially embedded within Council's Environmental Health Officer (EHO) functions, as these staff have regular and ongoing contact with local businesses.
- Are there opportunities to gain contacts or in some other way dove-tail with energy audits being offered to SME's by DECC?

Considerations for developing a waste exchange tool/program:

- Market prices of recyclables has dropped even within the last financial year. This means that diverting waste from general disposal (landfill) to recycling offers less financial savings than it once did.
- Small companies might want access to materials from big companies

- There is informal waste exchange taking place – e.g. by private brokers (especially in chemicals) and facilitated by government (on an ad-hoc, not advertised basis).
- Long period of time needed to establish relationship. Need for long timeframes to ensure continued involvement (as opposed to e.g. 12 monthly funding cycles and project timelines)
- Business need for commercial in confidence – therefore could pose problems for reporting who gave what to whom (waste exchange is one way to garner a financial edge in the market place, by reducing input or disposal costs – public reporting of this may therefore undercut this advantage by revealing the opportunity to their competitors).
- Anecdotal evidence that companies are requesting support for waste exchange already – i.e. engaging with sustainability issues and feeling bad about disposing of waste, and seeking alternatives
- Depending on the types of waste to be targeted, a central location for storage and collection could be required. One option would be to have a retail outlet, allowing staggering ‘exchange’ between businesses, much like the ‘Bower’ does for residents. This would require ongoing staffing and other resources.
- DECCW’s Sustainability Advantage takes a holistic, process based approach to sustainability for business (i.e. Not water, waste, energy etc specific) and focuses on assessment, planning, policy and procedures to achieve sustainability outcomes. A waste exchange tool may be received differently by businesses who have worked through this type of thinking (either within or outside of participation in the SA program, set a sustainability target, have an environmental policy etc). For businesses who have not established a sound conceptual framework about sustainability, and a team of staff with shared concepts and language around sustainability, it could be more challenging getting lasting engagement with a waste exchange tool, even if the technical feasibility/possibilities for exchange and waste reduction are large.

Region-specific issues

- NESB/ CALD communities in the target area, literacy levels may be variable

Box 5-2 Existing projects and programs and their implications for the Duck River Waste Exchange Tool

Initial discussions with waste and small business programs held in metropolitan Sydney reinforce the learning from the literature review on waste exchange tools.

SME's are diverse, time poor, interested in doing their bit for the environment, but not in a position to invest lots of time in research about opportunities or resources. Very small operators may not have the 'language' to talk about the technical terms required to negotiate exchange or explore waste disposal options.

There is some evidence that informal waste exchange is already taking place, e.g. by private brokers (especially in chemicals) and facilitated by government (on an ad-hoc, not advertised basis).

A long period of time is needed to establish relationships. There is a need for long timeframes to ensure continued involvement (which may not match funding cycles and project timelines). Using existing programs or services (including Council's own EHO service, or ensuring some other consistent, single point of contact will be useful for businesses who don't have time to be creating new relationships for each new sustainability initiative.

Table 5-1 Related programs offered by other institutions/organisations

Program Name	Target Group	What the program does	Mode of delivery	Relevance to Parramatta/Auburn SMEs and the Waste Exchange project
<p>DECCW Sustainability Advantage Program</p>	<p>Medium to large businesses in NSW. Over 330 companies are currently taking part in the program around NSW². Participating businesses commit to an 18 month period of participation and make a financial commitment to their involvement.</p>	<p>This DECC program focuses on helping businesses evaluate the potential for sustainability changes within their organisations, in a systematic way. The program seeks to empower staff members of the business to engage with sustainability issues that are specific to their particular area of operation as well as those that are faced by all businesses. It uses a learning approach, delivering a set of intensive training and development modules, to lead participants through the thinking and types of activities required to develop a strategic response to sustainability improvements for their business. A Cluster Manager has recently been appointed for businesses in Parramatta³.</p> <p>The specific modules offered are: Visioning, Commitment and Planning, Environmental responsibility, Climate change, Strategic support, Staff engagement, Supply chain, Resource efficiency, and External Stakeholder engagement.</p>	<p>Through participation in the workshops, and additional one-on-one specialist advice as needed, participants are supported in creating plans, policies, checklists, procedures to help achieve specific outcomes in relation to these thematic areas⁴. An overarching objective is to achieve continuous improvement through adopting sustainability as a core business value.</p>	<p>Existing program</p> <p>Means that large businesses in the area are already being engaged on waste reduction</p>
<p>Industrial Ecology Network NSW -</p>		<p>Currently <i>DECCW in collaboration with Edge Environment and WMAA</i> is establishing an Industrial Ecology Network in NSW with views to expanding across Australia. The program</p>	<p>The case study waste exchanges that have been used to</p>	<p>Existing program</p>

² Source: <http://www.environment.nsw.gov.au/sustainbus/sustainabilityadvantage.htm>

³ Pers comm., Parramatta Council project staff, April 2009

⁴ Source: DECC (2008) Sustainability Advantage

		has strong industry backing; however while it does seek to accommodate small to medium enterprises it appears at this stage to be mainly geared towards larger industry. Also with its large geographic reach may not always be able to cater to specific local business needs, particularly those of smaller businesses.	promote the benefits of establishing the Network were industrial symbiosis-type transactions, but the Network activities appear to be moving the project towards an active waste exchange type model.	
DECCW 'Energy Efficiency for Small Business Program'	SMEs in NSW	DECCW is offering Small and Medium Businesses low cost energy assessments, followed by assistance with the development of an Action Plan, and on implementation of energy efficient measures, the possibility to apply for and receive a rebate, as well as a certificate of participation.	The rebate is a reimbursement from the NSW Government of 50% of the cost of purchasing and implementing energy efficient measures with a payback period of more than 2 years ⁵ .	Opportunity for learning
Other DECCW resource recovery programs for SME's		DECCW also offer: <ul style="list-style-type: none"> - An on line recycling guide for businesses (similar to old "Brown book"). - SME resource recovery on line tool - a self-assessment waste auditing tool that provides educational fact sheets e.g. what to do with batteries - Now targeting wood and food wastes from C&D and C&I sectors 	Information materials to assist in recycling and reuse	Opportunity for learning Existing program

⁵ DECC 2009 'Energy Efficiency for Small Business Program Registration Form' Feb 2009 and www.environment.nsw.gov.au/sustainbus

NSW Green Business Program		The NSW Green Business Program provides \$30 million over five years for projects that will save water and energy in business operations in NSW. Round 1 projects included: installing power factor correction equipment; providing energy audits to participating dry cleaners to identify energy waste from boilers and provide incentives to fix any problems, lighting upgrades, installation of new utility management system, installation of tri-generation power systems, 'bundled' energy savings projects including upgrades to lighting, air-conditioning, hot water and the building management systems; collecting rainwater to re-use in production process, installing water recycling technology, and cooling tower water recycling.	Provides grant funding for demonstrable water and energy savings.	Resource for business May be available to business for changing practices if an energy or water benefit could be demonstrated.
The Business Sustainability Toolkit	SME's in the Parramatta Council Area	This was a joint initiative of the Department of State and Regional Development's Western Sydney Business Centre and Parramatta City Council, and was launched during Small Business September, 2008. The Toolkit aims to provide a one-stop-shop for businesses looking for information on Business Sustainability Government Programs and Funds, calculators and networks. http://www.parracity.nsw.gov.au/business/sustainability_toolkit	Web based information resource	Resource for business Opportunity for linkages with waste exchange tool project
Groundswell	Urban food waste producers and farmers in the Goulburn Mulwaree, Palerang, Queanbeyan City and Lachlan	A current project by Zero Waste is 'Groundswell' ⁶ , a collaboration between Wiradjuri Condobolin Aboriginal Corporation, the Palerang Agricultural Society, Bettergrow, Zero Waste Australia and the South East office of the DECC Sustainability Programs Division, which focuses on collecting and composting urban organic waste to farmers in the surrounding area, in Goulburn Mulwaree, Palerang, Queanbeyan City and Lachlan Council areas. This builds on the 2004 'City to Soil' project.	Linkages, information	Opportunity for learning

⁶ See <http://www.groundswellproject.blogspot.com/> and <http://www.zerowasteaustralia.org/australia/nsw/groundswell>

	Council areas			
Suncorp Parramatta Regional Awards for Business Excellence	Open to all businesses located in or serving Sydney's Greater West ⁷ .	Coordinated by the Parramatta Chamber of Commerce this program provides recognition for business excellence in Western Sydney. Some of the categories that a business participating in an innovative waste reduction program (e.g. through waste exchange) could potentially apply for: 4. Excellence in the Implementation of New Technology; 7. Excellence in the Development of a New Product; 8. Excellence in the Development of a New Service; 9. Excellence in Staff Training and Development; 10. Excellence in Contributing to the Community; 11. Excellence in Contributing to the Environment.	Awards program	Resource for business Potential opportunity for business recognition
Business Treading Lightly	targeted businesses in the Illawarra, Southern Highlands and South Coast	<p>This Environment Trust funded, Seven member councils of Southern Councils Group run project, supports business in reviewing their operations in the areas of strategic planning, risk management, waste, water, energy, biodiversity, stakeholder engagement, and supply chains; using specifically tailored diagnostic software and the advice from technical experts. The program began by targeting aged care facilities, followed by clubs and hotels (service clubs), and then small business sectors identified by each participating council for example, one council is focusing on manufacturing, another on wineries.</p> <p>The program has involved a Sustainability Officer to act as a 'one stop shop' for businesses, to lead them through other programs and resources, and keep them engaged. As part of this project they have developed their own tool for smaller businesses (based on similar concepts to Sustainability Advantage). They also encourage all businesses to participate in the DECC SA 'Resource Efficiency' module, as they believe it is highly practical and helps answer questions that business have about what tangible changes they can</p>	Technical advice, support, access to workshops.	Opportunity for learning

⁷ Western Sydney is generally considered to include the local Government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly. Source: Business Excellence Awards FAQ. <http://www.businessexcellenceawards.com.au/faqs.htm>

		make to their operations and how they can use resources more efficiently ⁸ .		
City of Sydney Green Clean Chinatown	Small businesses in Chinatown	Outreach and education campaign to reduce littering, illegal dumping, increase recycling & and to remind businesses of their waste responsibilities.	Face to face consultation, distribution of education materials, public promotional campaign	Opportunity for learning
Business needs assessment	All Businesses in Parramatta	<i>Parramatta Council</i> recently undertook a survey, 30 in depth interviews, and produced 6 detailed multimedia case studies.		Opportunity for learning
Sustainable Business Management Program	Businesses in Parramatta	This pilot program was jointly funded through the Economic Development Levy and contributions by the <i>Department of State & Regional Development and the Greater Western Sydney Economic Development Board</i> . This program focuses on a retailer training program focusing on reducing business overhead costs and increasing turnover by focusing on environmental management issues such as energy conservation, water consumption, waste management and transport.		Resource for business

⁸ Pers com. Business Treading Lightly staff, April 2009.

6 INSTITUTIONAL STAKEHOLDER WORKSHOP

6.1 Workshop background and objectives

This workshop was an invitation only stakeholder workshop for government, business group and local government representatives with expertise in resource recovery, business engagement and waste exchange. It was held on 10 June 2009 at the Institute for Sustainable futures at the University of Technology, Sydney (UTS).

The workshop aimed to harness the experience of selected organisations that are involved with promoting industrial ecology, resource recovery and sustainability, particularly at the level of SMEs. It was designed to map contemporary activities in the field of industrial ecology in NSW and achieve a common understanding of where this project sits in relation to other activities and how the broader benefits of the project can be maximised.

6.2 Key questions and workshop outputs

The workshop was intended to consult stakeholders on six key considerations in the development of the waste exchange program:

1. Range of possible forms or models of waste exchange that should be considered
2. Regulatory and structural risks and constraints and how they might be overcome
3. Engaging businesses and maintaining relationships
4. Meeting specific SME needs
5. What might be the 'low hanging fruit' in terms of waste stream/ business types/ exchange types in Camellia and Silverwater
6. Which areas are already 'covered' i.e. Which waste streams or business types are covered by existing programs?

A detailed summary of the workshop outcomes is presented in Appendix E.

Box 6-1 outlines the implications of this workshop for the ongoing development of the Waste Exchange Program.

Box 6-1 Stakeholder workshop and its implications for the Duck River Waste Exchange Tool

It was suggested that this waste exchange project has the potential to provide a model for other councils/LGAs with industrial areas to replicate and create their own SME waste networks. To do this it will be critical to engage effectively with business in a way that is locally relevant, easy to access and understand, cost-neutral and targets priority waste streams.

The workshop generated a diverse and useful set of responses to each of the six focus questions listed above. The most prescient messages from the day were related to enabling meaningful and lasting businesses engagement and designing the Program to meet business needs.

In particular it was clear that tapping into existing business networks and/or the establishment of a new waste exchange network would be integral to getting the Program off the ground. In addition, it would be beneficial to both build on and make an example of existing business efforts in waste recovery and reuse and also to harness the influence of business champions who are willing to be involved in the Program and set an example to others.

For the Program to be useful to business, it must be easy to access and use, cost-effective and provide all the necessary information required to make decisions about engaging in a waste exchange. Essentially it would be of most use if it was a 'one-stop-shop'

7 BUSINESS WORKSHOP

7.1 Workshop background and objectives

The workshop was held at Dooleys, Silverwater on 20 August 2009 and was attended by 18 businesses. The objective of the workshop was to bring together local businesses with an interest in a Waste Exchange, to share experiences to date and scope possibilities for future waste exchange opportunities in the local area. It was the first of two workshops designed to consult business in the development of the Program. The workshop enabled a common understanding among attending businesses of what a Waste Exchange might look like (in form and function) and where it sits in relation to other environmental/sustainability activities. The second workshop will be held subsequent to this report and will focus on more detailed aspects of Program design.

7.2 Key questions and workshop outputs

The workshop was intended to consult businesses on four key considerations in the development of the waste exchange program:

1. Business waste exchange needs
2. Desirable forms or models of a waste exchange for the Duck River Catchment area
3. Explore regulatory and structural risks, constraints and opportunities of a waste exchange
4. Discuss incentives for businesses to become involved and how the broader benefits of the waste exchange program can be maximised for and by local businesses

Appendix F contains a detailed summary of the workshop.

Box 7-1 outlines the implications of this workshop on the ongoing development of the Program.

Box 7-1 Business workshop and its implications for the Duck River Waste Exchange Tool

Most businesses seemed to agree that a Duck River Catchment waste exchange has the potential to assist their businesses in a variety of ways pending the involvement of more businesses.

Many of the points raised in this first business workshop related to methods of business engagement, enablers and barriers to the Program and the form and function of the Program were much the same as those raised in the institutional stakeholder workshop.

Some key Program enablers from a business perspective were that it's a local initiative, it could reduce cost of engaging contractors to take waste away / treat waste, it could provide an opportunity for cost effective environmental inputs into processes and that it was generally perceived to be good for the environment. It was also thought that the Program could help overcome barriers to waste recovery, recycling and reuse such as lack of awareness/knowledge of available options, waste handling protocols and regulation, and load limitations (too small or large for a cost-effective individual collection contract).

Participants identified a number of locally-specific barriers to the program including conservative business attitudes to waste management, a lack of manufacturers to utilise recovered waste and perceptions of conflicting Council and Government waste codes and

standards.

There was general agreement that the Program would benefit from a web-based tool which could be used to list and search for waste exchange opportunities. The emphasis was again on the fact that this tool should be a 'one-stop-shop', being easy to use and contain as much relevant information as possible (for example regulations associated with waste recovery). It was also suggested that listings on the database could be spatially referenced and mappable.

Participants identified various contributions that the Councils could make to the Program including collection of target waste streams, land for an exchange depot and dedicated staffing resources to manage the program.

8 PROGRAM SCOPE FINALISATION

The development of the Duck River Catchment Waste Exchange Program as documented in this report is emergent in nature in that the form and function of the final Program is not predetermined but gradually realised as the research unfolds. In order to finalise the conceptual scope of the Program, a meeting between ISF (the consultant) and Auburn and Parramatta City Councils (the clients) was held on 15 September 2009. The research outcomes described in the preceding sections directly informed the decision-making process in the meeting.

Discussions in the meeting were directed towards locating the project within the scope spectrums depicted in Figure 8-1 and Figure 8-2. This helped to specify the key features of the Program and thereby narrow the range of options to be considered. The concept design for the Program was then finalised with direct reference to the research findings to date. The concept is as described below.

8.1 The “Not Waste” Exchange (*working title*)

The Program will centre around a pilot web-based or internal Council database tool that has the following characteristics:

Waste stream oriented

- Links to purpose-built web pages designed to cater to the particular waste stream

Decision support functionality

- Tool presents user with **options** for waste recovery and recycling, including local waste exchange opportunities

Data collection/collation functionality primarily developed for two of the following four waste priorities, depending on outcomes from the planned second business workshop and ongoing consultation with business:

- **food waste**
- **paper and cardboard**
- **wooden pallets**
- **e-waste**

Primary (local) recovery/recycling options identified for functional tool components to potentially include:

- Food waste to **EarthPower**
- Recyclables to **Sydney Turf Club (STC)**
- Coordinated collection service(s) or communal holding facilities
- Waste exchange opportunities

Web pages for other wastes may or may not have functionality / content

- May have functionality for data entry for general waste exchanges
- Where no functionality to support exchanges, the page may provide links to other tools (e.g. DECCW calculators), services (eg. Planet Ark, Battery World etc.), websites (IE Network), information/fact sheets.

Spatial referencing

- Addressing confidentiality and clustering needs

8.1.1 Case studies

The case studies for the project will focus on individual businesses whose principle waste streams match those addressed by the functional components of the tool. Hence the subjects of the case studies will be dependent on which two of the four priority streams mentioned above are selected for incorporation into the tool. Each case study will look at the waste generated by the business and develop a suite of waste recovery/recycling/exchange options. The sustainability benefits of undertaking each of the options identified will be quantified, making projections of landfill, greenhouse gas and other savings wherever possible. Additional case studies may be developed where funding is made available.

8.1.2 Degree of tool finishing

The budget for the tool development phase is not sufficient to build a fully functional and well-presented tool. The emphasis will be placed on finishing the components of the tool that will link to the case studies and extracting the numbers required to report on sustainability benefits to Environmental Trust / DECCW. A balance will be sought between the level of functionality provided (detail, capability) and delivering a fully functional end product.

8.2 Justification

This design concept satisfies a number of particular issues identified through the context analysis and consultation stages including:

- Addresses dominant wastes streams in the commercial and industrial sector (DECCW 2009) and in the Duck River Catchment – paper and cardboard and food waste.
- Can be designed in such a way as to minimise user time commitments
- Provides a unique and locally-focused service not offered by other existing and planned waste recovery programs such as DECCW's SME tools, Sustainability Advantage or the NSW Industrial Ecology Network.
- Links the project components of tool development and case study generation
- Capitalises on existing and planned local business infrastructure for waste recovery and recycling

8.3 Next steps and considerations for the project

Following this report a second workshop for local businesses is to be held. The design concept for the Program will be presented to the participants for comments and suggestions. Participants will also be asked to provide data to inform the two case studies.

Undertaking the project case studies will require a more extensive data collection the originally proposed for the project as it will involve collecting data from as many businesses as possible rather than key selected businesses. This process may require an additional outreach and/or survey component.

Since the tool will focus on waste streams with known end points for recovery/recycling (Sydney Turf Club and EarthPower), the development of the web tool will be directly informed by the case studies that are based on those end points. This will mean that a key feature of the tool is the ability to keep it 'live'; that is, up to date in terms of current local circumstances such as waste processing capacities and waste collection contracts.

In this next phase of the development of the Program it is essential that business networks continue to be involved in the promotion of the Program that partnerships with key institutional stakeholders are firmed and made use of. Finally, in the interests of the

adoption ongoing use and longevity of the Program, future Program funding, promotion and administration options must be explored.

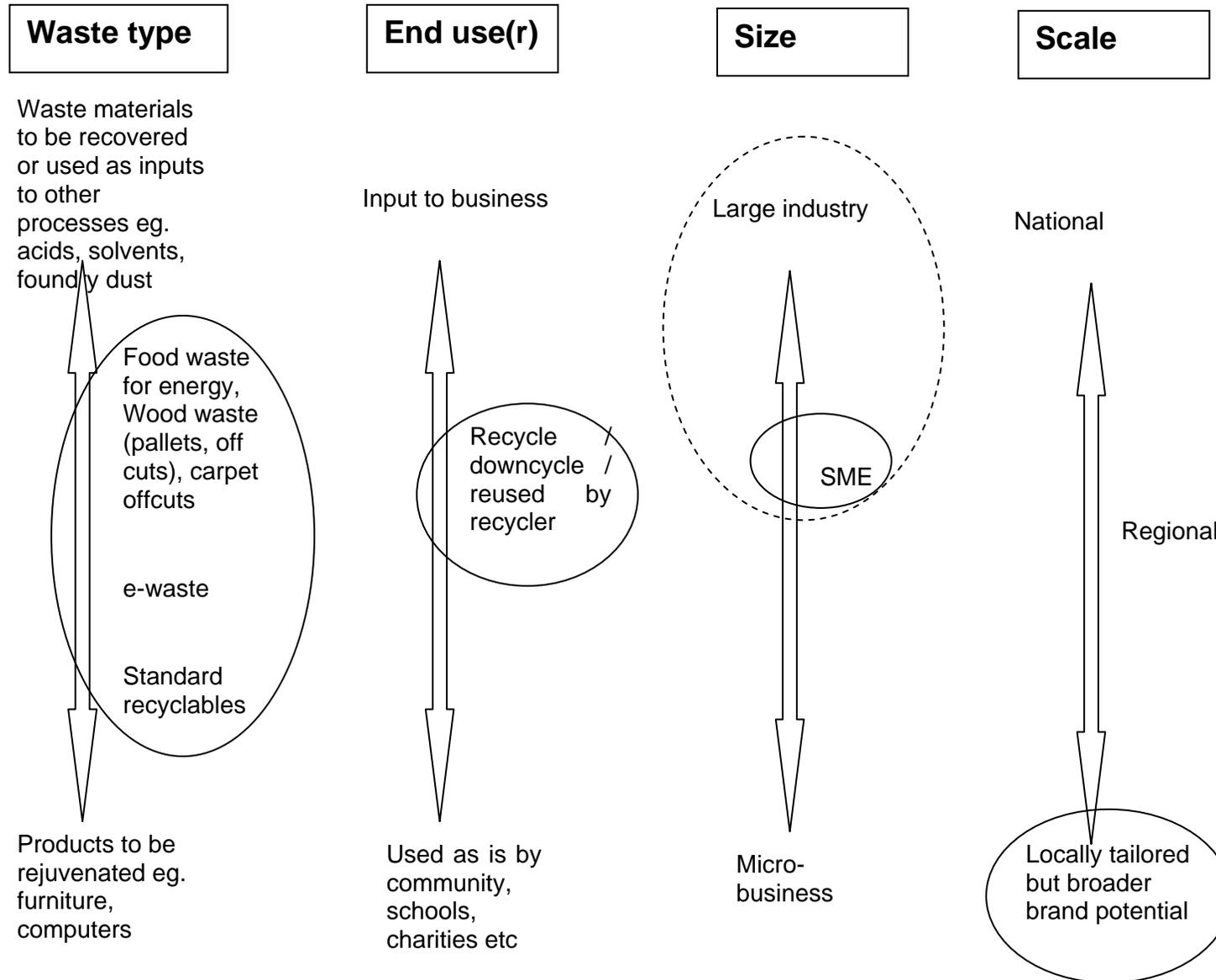


Figure 8-1 Scope spectrums for target waste types, target end uses, size of enterprise and scale of program

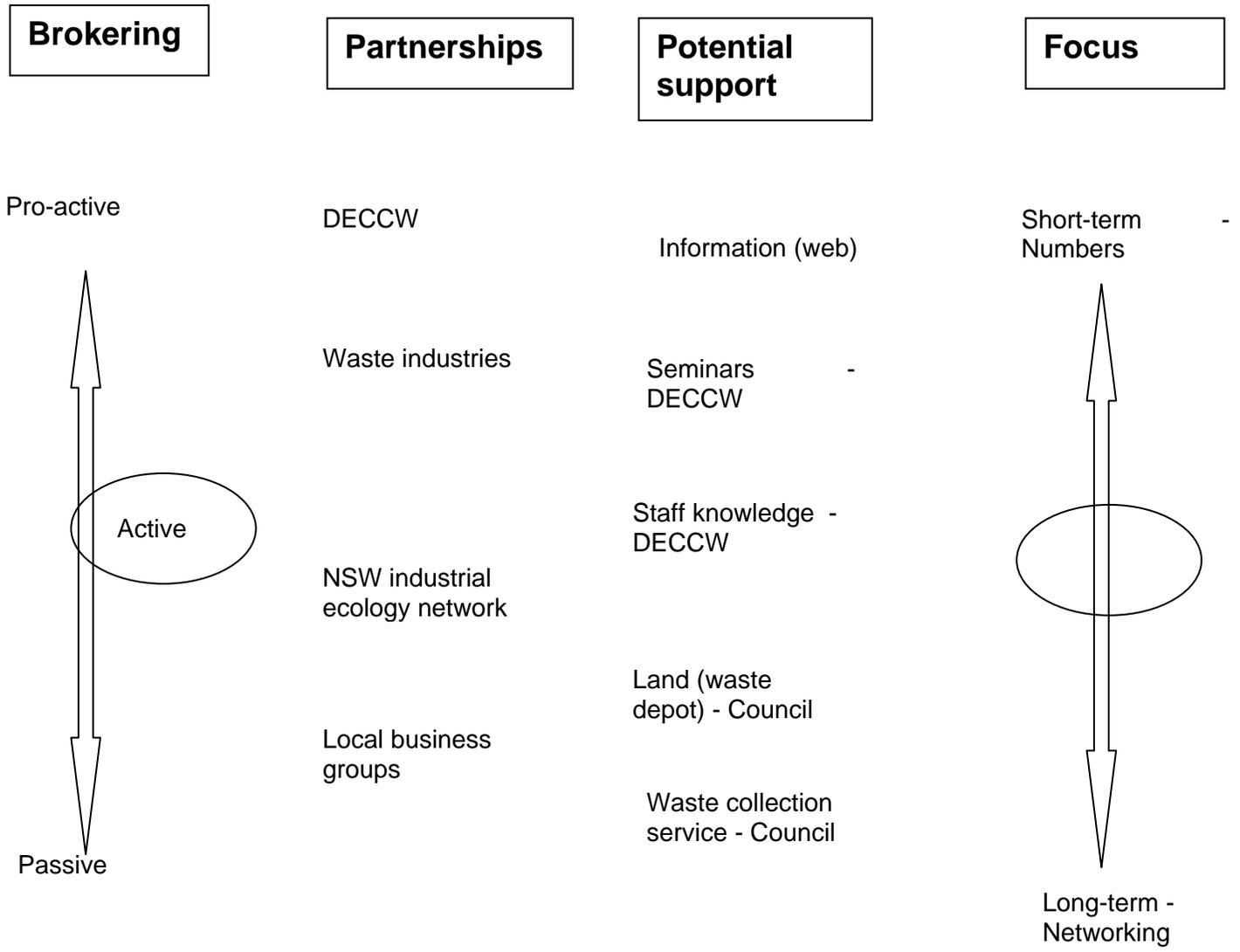


Figure 8-2 Scope spectrums for exchange brokering, institutional partnerships, potential support options and general Program focus

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APPENDIX A WASTE EXCHANGE LITERATURE REVIEW

Models for the exchange of materials: waste exchange vs. Industrial symbiosis

A range of models have been employed in industrial ecology inspired material exchange projects. As Parramatta and Auburn City Councils are looking to facilitate exchanges of materials between existing firms in the Duck Creek Catchment, the models to focus on are a waste exchange or an industrial symbiosis network amongst local firms⁹. There are significant differences between these two approaches, which have implications for the design of the supporting input-output tool, the approach to stakeholder engagement and the general direction of the project.

Waste exchanges are defined by a key researcher in the industrial ecology field as being “typically one-way [transactions] and generally focused at the end-of-life stage” (Chertow 2000, p.322) and are geared towards “formal[ising] trading opportunities by creating hard-copy or online lists of materials one organization would like to dispose of and another organization might need” (ibid). Chertow sees waste exchanges as typically involving older, more traditional forms of business and being further from the ideas of collaboration and exchange that underpin industrial ecology. Waste exchanges may exist on a range of scales from local to national or global.

By contrast, basic industrial symbiosis involves “at least three different entities... involved in exchanging at least two different resources” (Chertow 2000, p.11). Industrial symbiosis has been further defined as engaging:

“traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity” (Chertow 2000).

An industrial symbiosis network is one that develops this symbiosis between existing businesses in close local proximity, rather than attempting to develop a new site or ‘eco-industrial park’ using the symbiosis model. Table 1 below summarises the differences between waste exchange and industrial symbiosis.

Table 9-1 Characteristics of waste exchange and industrial symbiosis

Waste Exchange	Industrial Symbiosis
One-way material disposal	Multiple parties
End of life stage	Material becomes an input for a new product
Materials only	Materials, energy, water, and/or by-products
Local, regional, national, or global	Based on local proximity
Transactions initiated through database searches	Negotiated transactions

⁹ The other models are industrial symbiosis (1) within a firm, (2) within a co-located eco-industrial park or (3) among firms organized “virtually” across a broader region. (Chertow 2000).

While the title brief for this project suggests a waste exchange approach, the focus in the brief on establishing local networks and a cooperative business environment suggests an industrial symbiosis model may be intended. This has implications for determining which projects are most relevant to review. Accordingly, both types of material exchanges are discussed in more detail below with an overview and examples of each approach given.

Waste Exchanges

Characteristics of online waste exchange databases

The idea of a waste exchange database is a well-established concept recently given a new life and new format through the advent of the internet. Waste exchange databases provide a location for people or organisations to list waste materials for re-use and for others to look at materials on offer and contact the person listing the material. Formalised waste exchange databases have been in operation in Europe since the early 1970's and a review conducted in 1988 included 23 waste exchange programs in Canada, the US and elsewhere (Canadian Council of Resource and Environment Ministers 1988). This review mentioned, among its many findings, that the majority of North American exchanges had already installed a computer system to facilitate keeping database listings up to date. Prior to the internet the exchange of wastes between companies was facilitated through listings in newsletters or trade magazines, however the internet now appear to be the dominant medium for waste exchange databases.

Globally, waste exchanges are numerous and diverse so it is useful to understand the different characteristics which shape these projects. The CCREM (1988) review categorised waste exchanges based on the organisational structure, objectives, geographical area served, and user matching approach (passive vs. active). The present review of web-based waste exchanges found that, with the addition of target audience for re-use, these categories are still relevant in describing the diversity of waste exchanges. Figure A- 1 shows the range of characteristics which may be used to describe waste exchanges and their approaches. These characteristics come together in different ways in different waste exchange projects. The remainder of this section draws on the characteristics in Figure A- 1 to describe the variety of online waste exchanges found in the review. A full list of the international and active and inactive Australian waste exchanges examined in the review is given in Table A- 1, Table A- 2 and Table A- 3, respectively.

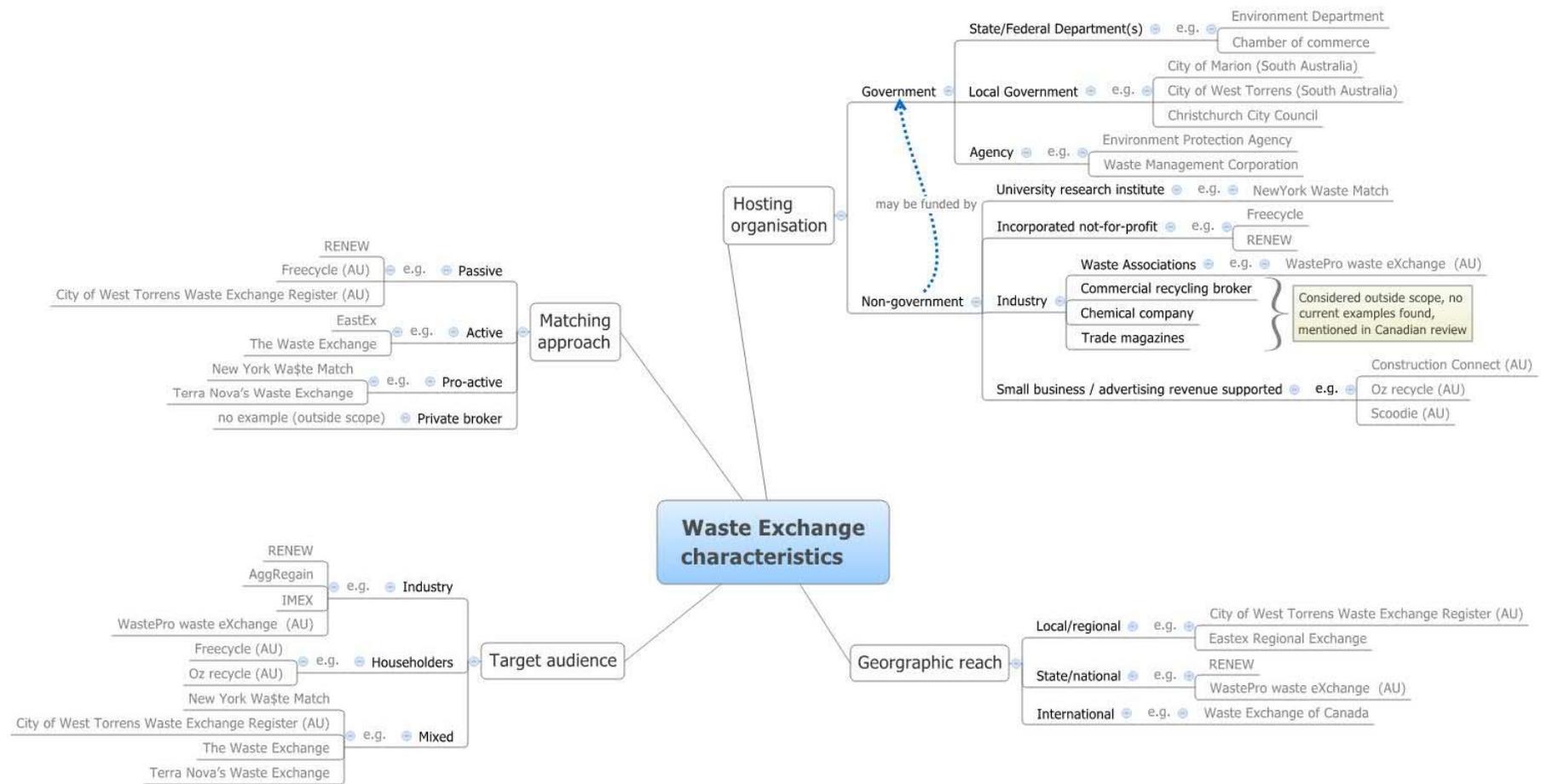


Figure A- 1 Waste exchange characteristics and examples

Table A- 1 International Waste Exchanges

Country	Name	Host organisation	Geographic coverage	Website (as at Sept 2009)	Date established
USA	Resource Exchange Network for Eliminating Waste (RENEW)	Southwest Network for Zero Waste	US EPA Region 6 which covers Arkansas, New Mexico, Oklahoma, Louisiana and Texas	www.zerowastenetwork.org/renewdev/	1987
USA	New York Wa\$te Match Materials Exchange	NYC Materials Exchange Development Program (MEDP), a project of the City College of New York (CCNY)	New York City	www.wastematch.org/	1997
USA	IMEX	King County Local Hazardous Waste Management Program	King County region covers four local governments in the Pacific Northwest	http://www.govlink.org/hazwaste/business/imex/	unknown
UK	Eastex Regional Exchange	Eastex is funded by the BREW programme administered by the East of England Development Agency (EEDA) with multiple supporting funding sources. Eastex project applicant and administrator is Peterborough Environment City Trust. The technology is managed by Norfolk County Council.	East of England	www.eastex.org.uk/east/	2004
UK	Why Waste	Bradford Environmental Action Trust is the applicant and administrator of Why Waste exchange which operates using the Eastex Regional Exchange platform	Yorkshire & Humber regions	www.eastex.org.uk/yorks/	2006
UK	AggRegain	Wastes and Resources Action Programme (not-for-profit)	United Kingdom	http://www.aggregain.org.uk/supplier_directory/	2003
UK	Netregs Waste Directory	NetRegs (a partnership between the UK environmental regulators)	England and Wales	http://netregs.wastedirectory.org.uk/	2006
NZ	The Waste Exchange (NZ)	The Waste Exchange	North Island coverage including Northland, Auckland, Waikato, Bay of	www.nothrow.co.nz	1999

			Plenty, Hawkes Bay, Gisborne, Wellington		
NZ	Terra Nova Waste Exchange from the Recovered Materials Foundation (NZ)	TerraNova (not-for-profit organisation established by the Christchurch City Council)	South Island regions including Christchurch, Dunedin, Marlborough, Tasman district, Kaikoura and Southland	www.rmf.org.nz	1997
NZ	RENEW Waste Exchange	Auckland Regional Council	Auckland region (seven council areas) and Northland	www.renewwasteexchange.org.nz	1995

Table A- 2 Active Australian Waste Exchanges

Name	Host organisation	Geographic coverage	Website (as at Sept 2009)	Date established
WastePro Waste eXchange database	WastePro Developed by the Victorian Waste Management Association (VWMA) with support from EPA Victoria	Victoria	http://www.wasteexchange.net.au/	unknown
City of West Torrens Waste exchange register 2009	City of West Torrens (South Australia)	City of West Torrens LGA	http://www.wtcc.sa.gov.au/site/page.cfm?u=741	unknown
Freecycle	Freecycle Network	International with local groups e.g. Freecycle East Sydney	http://www.freecycle.org/	unknown for Australian groups
Scoodi	Scoodi Pty Ltd	Australia-wide	http://www.scoodi.com/	2007
Construction Connect	Construction Connect Australia	Australia-wide	www.arnnetwork.com.au	unknown
Oz recycle	Pocket Money Marketing -ARKAD Enterprises Pty Ltd.	Australia-wide	http://www.ozrecycle.com/	unknown

Table A- 3 Inactive Australian Waste Exchange Databases

Name	Host organisation	Website (as at Sept 2009)	Date established
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Waste Exchange	Anon.	www.wasteexchange.com.au	2004
The Waste Exchange Web Page	Anon.	http://pricom.com.au/waste/waste.html	2003
Sydney Waste Exchange Website	Concrete Recyclers (Group) Pty Ltd	http://www.sydneywaste.com.au/	2002

Hosting organisation

The hosting organisation, the geographic area covered by the waste exchange and the target audience are the most readily apparent features of an exchange and are closely linked. The hosting organisation may be government, non-government, or in some cases, a waste exchange database may be volunteer run. However, it is notable that the majority of the sites which have been in existence for 5 years or more are now managed by a non-profit organisation, even if they were started by a government body. For example New York Wa\$te Match (since 1997) is run under a project of the City College of New York but is funded by the NYC Department of Sanitation's Bureau of Waste Prevention, Reuse and Recycling, and had also received funding from Empire State Development's Environmental Services Unit and the US EPA. The Resource Exchange Network for Eliminating Waste (RENEW) was established by the Texas legislature in 1987 but is now run by the non-profit Southwest Network for Zero Waste.

Geographic area

Government hosted or government funded waste exchange databases initially tend to follow the geographic coverage of the associated government body but tend to change over time. For example, local government waste exchange databases will usually start by covering the local government area, as does the South Australian City of West Torrens Waste Exchange Register (City of West Torrens 2009). However, international examples show that long running projects have generally expanded to cover adjacent geographic areas. For example, RENEW (Texas, USA) started in Texas but now covers EPA Region 6 (Arkansas, New Mexico, Oklahoma, Louisiana and Texas). The Eastex regional exchange in the UK started from a local system called the Norfolk Materials Exchange, which was then adopted by a neighbouring council area. The two exchanges showed that cross-border exchanges were possible enabling the scheme to be scaled up to a regional exchange incorporating several local councils (Eastex 2009). The Eastex regional database now comprises six localised exchanges, which are connected by a central platform and public web interface¹⁰.

Target audience

Mixed audience

The hosting or funding organisation also influences the target audience of the exchange, which then shapes the design of the website and database. Local government hosted or funded waste exchange databases are generally focused on minimising local business waste and aim to appeal to local businesses, schools, community groups or individuals as re-uses of waste materials. The NZ based RENEW exchange developed by Auckland City Council (no relation to the USA RENEW) is explicit about its target audience, describing itself as "a free service available to all business and industry and also may be used by non-profit organisations, individuals and schools to locate materials they need". This exchange does not list residential or household items and directs users to other services for recovery of such waste materials.

Exchanges with this mixed target group of businesses, schools and community groups tend to list broader categories for their waste. For example, the eighteen categories for the Eastex regional exchange include: paper and card, batteries, drums and containers, glass and ceramics, pallets, plastic and rubber, textiles and clothing, oils and metals amongst others. The West Torrens Waste Exchange Register, The Waste Exchange (NZ), New York Wa\$te

¹⁰ The Bedfordshire Materials Exchange (http://www.eastex.org.uk/beds/about_us.asp) provides a detailed description of the development of the project and provides an overview of the how EastEx exchange platform works. The site also has some interesting design features like listing 'top 5 exchangers' and 'newest listings'.

Match (USA) and Terra Nova's Waste Exchange (NZ) all use similarly broad material categories.

Specific industry audiences

By contrast, exchanges that form from a collaboration between government agencies and industry bodies tend to target industry specific waste streams such as hazardous wastes and specific re-users such as waste processing and recycling companies. These waste exchanges focus on hazardous or prescribed wastes and target industry users and look quite different to sites targeting community users. Examples of these exchanges include the Australian Wastepro waste eXchange database which was developed by the Victorian EPA for prescribed industrial waste (Tytherleigh 2009) as well as RENEW (USA) and IMEX (USA) which also focus on hazardous wastes. Categories of material on these sites include acid, alkali, solvent, lab chemicals, organic chemicals and other specific industry oriented terms. On sites with community users such as EastEx such waste products would all be listed under the broad category of chemical liquids. On other sites such wastes may not even have a category to list them under.

Another type of targeted industry exchange is the UK AggRegain Supplier Directory, which focuses on connecting business with recyclable material with buyers of recycled aggregate. The UK Netregs Waste Directory has a similar focus, connecting businesses with licensed waste contractors. A similar Australian waste exchange targeting construction and demolition waste is The Sydney Waste Exchange (<http://www.sydneywaste.com.au>). This site, however, appears to be run by a private company with links to the Sydney-based Concrete Recyclers (Group) Pty Ltd. It allows users to submit by email details of construction materials they have available or are seeking and the waste exchange company identifies likely candidates for exchange partners. There is no fee to register waste materials but it can be inferred that charges would apply when a successful material exchange is arranged.

Householders

In addition to government and industry developed waste exchange databases, there are several sites that are hosted by community groups, small businesses or individuals. These waste exchanges invariably target householders or community members as both a sources and re-users of materials. The supporting websites vary in design quality and usage. Of the Australian community websites, 'The Freecycle Network' (<http://www.freecycle.org/>) is the largest, with over 4,700 local groups across the globe including over 40 in NSW (The Freecycle Network 2008). Freecycle describes itself as "a grassroots and entirely nonprofit movement of people who are giving (& getting) stuff for free in their own towns. It's all about reuse and keeping good stuff out of landfills". The Freecycle network facilitates waste exchanges through local area email lists using the free Yahoo Groups email list provider. Users post an 'offer' email to the list and volunteers moderate the lists with guidance from the community developed moderator manual (Freecycle 2009).

Scoodi (<http://www.scoodi.com/>) is a newcomer to the community waste exchange space, it is still under development and testing but has 5,000 members and has a more sophisticated interface design than the Freecycle email list approach. Scoodi was developed by four Australian technology entrepreneurs as a small business aiming to serve the community (Scoodi 2007). The focus of the site is on local exchange and it uses an innovative site design to search items based on distance, letting the user define how far 'local' is for them for a particular search (Scoodi 2008). Other Scoodie design features include supporting videos and a blog.

Other examples of Australian community or independently developed waste exchanges are OzRecycle and Construction Connect Australia. OzRecycle (www.ozrecycle.com) is another Australian community recycling site, it is supported by advertising and user donations and has a fairly simple classifieds style user interface. Construction Connect Australia

(www.arnnetwork.com.au) is also a small business run site, but its target is the construction industry and construction materials.

Waste matching approach

Apart from hosting organisation, geographic area covered by the waste exchange and the target audience it is also useful to think about waste exchanges in terms of their user matching approach and objectives as described in the 1988 Canadian review of waste exchanges (Canadian Council of Resource and Environment Ministers 1988). This review introduced the categories 'passive', 'active', 'pro-active' and 'broker' to describe waste exchanges as explained in the descriptions below.

- | | |
|------------|--|
| Passive | A clearinghouse of information regarding the availability of waste materials. Inquiries which are generated by way of the exchange bulletin or newsletter are simply forwarded to the generator or potential user of the waste and the waste exchange plays no role in the transfer negotiations |
| Active | An exchange that actively attempts to match generations and potential users of waste, by way of listings in the exchange bulletin or through telephone solicitation. Some degree of follow-up is undertaken to encourage successful transfer of waste materials |
| Pro-Active | An exchange that, in addition to providing the above level of service, also offers technical expertise in waste management. Such an exchange may be involved in consulting with industry and recommending methods by which waste output may be cost-effectively reduced or reused |
| Broker | A profit-oriented private enterprise that acts as an agent or consultant for a waste generator or recycler, receiving either an up-front fee or a commission for wastes that are successfully sold. Such an operation frequently takes control of a waste product prior to its resale. |

These user matching approaches can be seen in the differing designs of current waste exchange databases. Waste exchanges without government funding generally take a passive approach to user matching; this is true of Freecycle and Ozrecycle which do not keep a record of successful transfers. Most government funded waste exchange databases use 'success stories' to illustrate successful waste transfers, which would be characterised as an 'active' approach. However, these are often minimally active, relying on asking users to report their stories, rather than having a high degree of follow up. This is the approach taken by the EastEx regional exchange and The Waste Exchange (NZ) amongst others.

The exchanges New York Wa\$te Match (USA) and Terra Nova's Waste Exchange (NZ) both list success stories but they also provide 'pro-active' consulting for businesses on how to reduce waste. Terra Nova describes its service as "rather than just listing materials available and materials wanted our co-ordinator visits businesses to assess their needs, and to advise them about waste materials that could be redirected to more productive uses." Similarly, New York Wa\$te Match has a technical assistance program which "can perform free waste stream assessments and recommend reuse and recycling options that reduce waste disposal costs". New York Wa\$te Match is coordinated by the City College of New York and also has a waste reduction research and development program.

The Sydney Waste Exchange can be classified as a 'broker' type waste exchange as it is run by a private company that takes commissions on successful exchanges and appears to be an agent for a recycling company.

Objectives of waste exchanges

The objectives of waste exchanges are not always explicit or clear. However, the CCREM (1988) review found three common objectives behind waste exchange projects. The programs reviewed were typically designed to:

- encourage cost-effective waste management,
- encourage transfer of information, and/or
- minimise hazardous wastes.

The review found that different programs prioritised different goals, which in turn shaped the evolution of their structure over time. While the specific objectives a waste exchange are not usually stated in these terms, it is helpful to think about different programs having different goals as discussed earlier in the context of users. For example, the dollar sign in the name of New York Wa\$te Match and the description “innovative waste solutions to boost your bottom line” show a focus on cost savings as the selling point of the service. By contrast, the RENEW program is targeted at industries, business and government units focused on the reuse or recycling of industrial wastes (Southwest Network for Zero Waste 2009); the Netregs Waste Directory focuses on information transfer; while Scoodi focuses on fostering local exchanges. A clear understanding of preferred user matching approach and the objectives of the Duck River exchange may help to identify the waste exchange projects that are most relevant to inform the development of this project.

Unmaintained and discontinued waste exchanges

While the above review shows that globally, waste exchanges are numerous and diverse, they are fairly new to Australia and there are no Australian examples of exchanges with a lifespan of five years or more. Australia has had several waste exchanges established which are apparently unmaintained by their host or have been discontinued. Examples of apparently unmaintained independent sites include "Waste Exchange" (<http://www.wasteexchange.com.au>) and "The Waste Exchange Web Page" (<http://pricom.com.au/waste/waste.html>). Waste Exchange describes itself as having "evolved out of a training exercise in the use of 'server side' programming" (Anon. 2004). This waste exchange was developed in 2004 and, despite the low number of entries and lack of support, the website was last updated in August 2006 and materials have been listed as recently as November 2007 by a number of different companies in different states. The Waste Exchange Web Page is very bare in terms of content and design and gives no indication of recent host support or site updates. In addition to these independent sites, there are at least three Australian waste exchange databases which had the support of an established organisation and appear to have been discontinued¹¹. These three sites were listed by the DECC NSW Resource Recovery Team at Sustainability Programs in Oct 2008 and are now do not appear to have an online presence, they are:

- The Tasmanian Waste Exchange Catalogue which was hosted by the Tasmanian Department of Primary Industries, Environment and Heritage;
- The South Australian City of Marion Waste Exchange Register which was last updated in 2007; and,

¹¹ These were listed by the DECC NSW Sustainability Program's Resource Recovery Team in Oct 2008 and are now have no online presence. The Resource Recovery Team provided screenshots of the website's front pages.

- The Noah's Ark Wildlife Coalition's Waste Exchange Network which shares the design features of www.wasteexchange.com.au

No record was found of the reasons for the discontinuation of these sites. From the screenshots provided by DECC these sites were all passive exchanges which were not the primary focus of the websites that hosted them. It is not clear what resources were put into supporting or promoting these sites. These unmaintained and discontinued sites show that there have been several unsuccessful attempts to establish simple waste exchange websites in Australia; this highlights the need to learn from successes overseas in developing an online waste exchange database.

Industrial Symbiosis projects

Reviews of industrial symbiosis programs suggest that program success in industrial symbiosis is difficult to achieve, difficult to quantify and dependent on a wide range of factors. This section is based on two reviews of industrial symbiosis programs; Mirata (2004) used a case-study format to review the three programs which formed the early stages of the national industrial symbiosis programme (NISP) in the UK, and Chertow (2007) who reviewed 17 industrial symbiosis programs looking for indicators of success. Both made recommendations regarding what they saw as the features of successful programs.

Both authors note that there is a low number of successful industrial symbiosis programs and that this had been identified by many authors. For example, after a review of 63 'eco-industrial' sites Gibbs et al. (2005, cited in Chertow 2007) concluded that "initiatives based upon the interchange of wastes and cascading of energy are few in number and difficult to organize". In summarising the reasons for this low success rate, Mirata (2004) concludes that it is the reliance on the alignment of so many different factors that makes success difficult.

These multiple factors also make it difficult to measure the success of IS programs. Mirata (2004) used a case-study format to review three NISP programs. Even amongst these programs which were located within one region, the differences in context, approach and stage of development were so different that Mirata (2004) found it difficult compare programs and measure success. Success across programs was measured by both Mirata (2004) and Chertow (2007) as the continued existence and development progress of a program and the presence of some exchanges rather than comparisons between programs about the number and scope of exchanges.

Mirata (2004) aided the understanding of IS program success by naming and categorising the factors that influence the development and operation of IS programs. Mirata (2004) found that the factors that influenced the progress of the industrial symbiosis programmes she studied were "the nature of companies' operations and industrial history in the regions, the extent of peer pressure, the positioning of the coordinating body in the region, and its approach to awareness raising and recruitment". Mirata developed these into a table featuring a broad grouping of the factors into categories, a list of elements of each factor and the potential areas of influence an IS network may have on factors.

It is notable from the table that while the IS program can have influence on the availability of information and attempt to foster motivation, many of these factors are beyond the control of the program design. It is unlikely that political factors such as the relevant state laws and regulations would be within the influence of an IS program. Other factors such as technical setting and organisational history should influence program design, but cannot be altered by it.

Uncovering existing cooperation and exchange

Chertow (2007) focused on the role of pre-existing cooperation and exchange between businesses as a factor in the success of industrial ecology projects. Chertow (2007) examined 17 industrial ecology projects¹² and compared a set of mostly unsuccessful government initiated projects with a selection of successful projects looking for reasons for success. A common link in the successful projects studied was that they 'uncovered' existing symbiosis between businesses and then supported strengthening these 'kernels' of successful exchange. Three ideas for government and business seeking to advance industrial symbiosis based on the 'uncovering' theory were put forward:

1. bring to light kernels of cooperative activity that are still hidden;
2. assist the kernels that are already taking shape; and
3. provide incentives to catalyse new kernels by identifying "precursors to symbiosis."

Chertow (2007) also argues that projects with 'much wishful thinking but no tangible kernels to roast' should not be supported by government funds.

A key step to 'uncovering' symbiosis is to map the patterns of exchange that already exist. It is also suggested that technical or financial assistance may be useful to facilitate exchanges that companies are already interested in. This may also involve creating NGO OR business associations to assist with this development.

Precursors to symbiosis can be seen in "many common environmentally related activities", according to Chertow (2007). These are activities which show there is pre-existing cooperation or exchange between businesses. Examples include resource sharing through co-generation, landfill gas or wastewater reuse or the existence of one successful material exchange.

Learning from the difficulties faced by the HISP project.

The Humber region industrial symbiosis programme (HISP) illustrates the difficulty of making IS projects successful. The project initially showed a lot of promise. Early studies in the Humber region found there were significant potential economic, environmental and social benefits of synergies in the region. There were also numerous companies showing interest in the project. Funding and staffing were made available, more than for some other successful projects. Yet the sense of commitment to the programme as well as the intensity of interaction among different companies was weak by the end of [the initial 2 year] period (Mirata 2004) and the project lost funding.

In contrasting HISP to the more successful West Midlands (WISP) and Mersey Estuary (MISP) programs, Mirata (2004) identified several factors behind the programs difficulties. The first were related to industry structure, which had low levels of integration among the businesses, was the result of relatively recent fragmented industrial development and faced technical constraints to integration and had decision centres outside the region (Mirata 2004, Table 3). This supports Chertow's (2007) theory that existing kernels of cooperation are a pre-requisite for successful industrial symbiosis.

Additional hurdles were faced because of the program's co-ordinating body was new to the region (Chertow 2007, p.980). This meant the organisation had very limited industry contacts and expended considerable effort raising awareness and building up contacts in the region with limited success. The HISP program held a launch day attended by 70 participants, contacted 150 companies over a period of 6 months holding one-to-one meeting with over

¹² including the Australian Kwinana and Gladstone projects.

70 of them, and formed a project advisory group with representatives from a mix of companies, however despite this very few companies returned the data collection forms.

By contrast, the WISP and MISP projects, initiated by an existing regional environmental business association and a private organisation with a long history in the region, both had a much easier time getting business to commit to the project because of their standing in the business community. The WISP project was able to establish a project advisory group at the official launch and engaged 20 companies without having an explicit active recruitment stage (ibid). Being coordinated by an established private company, the MISP also easily attracted participants. Participants in the MISP project were even happy to back their commitment with a financial contribution (ibid).

The 2003 HISP re-launch strategy learnt from the success of WISP and MISP. They judged that the influence of peer businesses was key and that their one-on-one approach had not given businesses the opportunity to meet others that were enthusiastic about the project (ibid). A business 'project champion' and detailed coverage of various synergistic partnerships operational in the region were incorporated into the re-launch. At the time of the 2004 review, these features appeared to have made the program more successful.

Kwinana Regional Synergies tool development

One of the best examples internationally of industrial symbiosis is the Western Australian Kwinana Synergies Project based in the Kwinana Industrial Area (KIA) located 40km south of Perth. The Kwinana Synergies Project is a project of the Centre for Excellence in Cleaner Production (CECP) at Curtin University WA developed in close collaboration with the Kwinana Industries Council. This prominent and diversified Australian mineral processing area has over 100 symbiotic exchanges. The diversity and extent of regional synergies developed in the Kwinana region places Kwinana among the leading examples of regional synergy development (Van Beers 2006).

The success at Kwinana supports Chertow's (2007) argument that industrial symbiosis requires pre existing kernels of collaboration and exchange (indeed the Kwinana project was cited in developing the theory). The CECP initial research confirmed that the Kwinana Industrial Area had a history of close collaboration and exchange (Van Beers 2006) and that existing regional synergies greatly exceeded 'business-as-usual'. That the project was developed in close collaboration with the Kwinana Industries Council supports the argument that industrial symbiosis networks are more successful when initiated by organisations with strong relationships with businesses in the region.

The CECP project has developed some tools to support the development of industrial symbiosis networks in other regions. The 'Synergy Screening Tool' has been designed to assess the sustainability contribution and ease of implementation of synergy opportunities. The project also designed a network facilitating structure to guide others interested in the development of structures or networks to support regional synergies. The key components of that structure are:

- Stage 1** To assess the relevant regional issues, identify key stakeholders and give ownership to key stakeholders by forming a steering group.
- Stage 2** To identify synergies by increasing the sharing of information between companies and to increase communication and collaboration.
- Stage 3** To screen synergy options and conduct feasibility assessments, and to provide support in the development of synergies
- Stage 4** To evaluate and communicate the success stories, build stronger relations with key stakeholders, remove barriers and increase collaboration.

This structure, and the guidelines supporting it, would be a key resource if an industrial symbiosis network was to be developed for the Duck Creek catchment.

NSW Industrial Ecology Network

A recent development in the field of industrial ecology in Australia has been the establishment of the NSW Industrial Ecology Network (IEN). Seeded through industrial ecology activities within the building products cluster of the NSW Department of Energy, Climate Change and Water (DECC) Sustainability Advantage Program, the network was formalised through the establishment of a NSW Industrial Ecology Network Working Group under the umbrella of the Waste Management Association of Australia (WMAA). The Working Group was formalised with industry endorsement at the Australasian Industrial Ecology Conference (30 – 31 July 2009) and seeks to bring government and industry together to create a platform for and foster broad scale industrial ecology.

The IEN has been recruiting members and requesting from them data on waste streams and 'wish list' materials sought through the Network. The Network is currently being established within NSW but the ultimate goal is to expand the network across Australia through establish a working group in each State and subsequently forming a National Division for Industrial Ecology.

At this early stage in its development it is not clear whether the network will adopt an industrial symbiosis or waste exchange framework. Material exchanges that have been used as case studies in the Sustainability Advantage Program could be classified as industrial symbiosis. However the ongoing development of the network appears to be moving towards developing an on line waste exchange database with formalised structures and support to facilitate (even broker) material transfers (Edge Environment, 2009). A key objective of the network and the database appears to be overcoming regulatory barriers to industrial ecology such as cumbersome processes for waste exemptions and licensing and disparities between state regulations while ensuring the Network database remains independent from government. As such WMAA will have the lead role in both the establishment of the working group and potentially the management of the database. In this sense the IEN is likely to take the form of an active waste exchange with some form of brokering.

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Table A- 4 Factors influencing the development and operational characteristics of IS networks (Mirata 2004)

Category	Elements constituting the factors	Potential areas of influence
Technical	Physical, chemical and locational attributes of in- and out-put streams	Number and diversity of potential symbiotic linkages
	Needs and capacities regarding processing, utilities (energy, water, waste management), logistics, and managerial resources	Extent of environmental, economic and social gains the synergies may provide
	Availability of reliable and cost efficient technologies to enable synergies	Extent of investment and effort required to develop and to maintain synergies
Political	Overarching environmental policies	Encourage development and adoption of environmentally desired technologies and practices (e.g. with strict demands but flexible in ways of compliance) [21], [22] and [23], and formation of symbiotic linkages [10] and [24].
	Nature and implications of relevant laws and regulations	
	Relevant taxes, fees, fines, levies, subsidies, and credits	Render synergies illegal (e.g. prescriptive regulations) or economically unfeasible (due to lose standards, or high transaction costs).
Economic and Financial	Costs of virgin inputs, economic value of waste and by-product streams, and the impact of political elements [5], [6] and [25]	Extent of economic advantage and competitiveness gained [6], [27] and [28]
	Cost saving, revenue generation potentials, payback time, return on investment (ROI) parameters	Decisions of private companies
	Size of capital investment and cost of maintaining synergies (including transaction [26] and opportunity [6] costs)	Necessity for alternative source of finance
Informational	Resistance to disclose information	Possibilities to identify synergies
	Availability of timely and reliable information from a wide spectrum of areas to the right parties	Possibilities to operationalise synergies
	An information management system that will systematically monitor changing dynamics and assess the desirability and feasibility of various options	Risk perception of companies

Category	Elements constituting the factors	Potential areas of influence
Organizational and motivational	Trust	Presence/creation of the necessary institutional framework for collaboration
	Openness to each other and to new ideas	Development of synergies
	Risk perception	Maintenance of synergies
	Level of social interaction and mental proximity [29]	
	Local availability of decision-making power	
	Organizational history	
	Nature of interaction among industry, policy makers, and regulators	

APPENDIX B RECENT RESEARCH INTO BUSINESS ATTITUDES TO WASTE & SUSTAINABILITY IN THE DUCK RIVER CATCHMENT

University of Western Sydney student research

Parramatta City Council collaborated with the University of Western Sydney to direct students in undertaking a number of research assignments. One particular assignment required students to contact a number of prominent local businesses to gauge their current activities in sustainability and their thoughts on the role of the local Council in supporting business sustainability.

A critical finding of the research was that the businesses interviewed were not aware of sustainability initiatives offered by PCC but were willing to work with the Council to address sustainability issues.

In relation to waste management, a number of businesses saw resource efficiency and recovery as a central aspect of business sustainability on account of its potential to deliver cost savings and reduced carbon emissions. Business suggestions included:

1. That Council provide collection of comingled recycling from businesses, presumably in a similar fashion to the residential recyclables collection service.
2. That Council provide a service to collect organic wastes from households and businesses for processing at their facility and/or encourage businesses to send their organic wastes to them.

General barriers to business adopting sustainable practices identified in the research included lack of understanding of terminology used in sustainability work, lack of awareness of government support programs and the economy of scale associated with being able to implement internal sustainability initiatives. Businesses were, however, motivated to 'do their bit' in relation to sustainability and were able to identify numerous enabling factors such as marketing advantages, reputation gain and potential cost savings.

Duck River Catchment business needs assessment

Earlier in 2009 ACC and PCC commissioned a business needs assessment as part of the Duck River *TBL* project. The assessment included an on line survey of 60 (out of a total 330 contacted) businesses, in-depth interviews with a subset of 30 businesses and a further 6 case studies. The online survey was distributed to businesses listed on the database referenced in section 5.1 that had provided an email address following initial contact by telephone.

Current waste management practices

The assessment found that businesses were reasonably well informed on issues related to environmental sustainability and many were proactive in responding to these issues. Waste was identified as the primary risk to the environment posed by their business activities. However, most businesses (61%) claimed to have a waste minimisation plan in place and many businesses were actively recycling what waste materials they could.

Of particular promise to the present waste exchange project is the fact that 63% of businesses surveyed had already been involved with the exchange or sale of waste materials and 51% had actually used recycled materials or reused materials. Indeed there are a number of documented cases of waste exchanges already taking place whereby businesses are using waste products from other industries and/or transfer their own wastes to other industries for reuse.

92% of respondents reused or recycled their paper and cardboard waste and almost half reuse or recycle metals. Plastic was recycled or reused by 39% of respondents. Many businesses independently pay a waste contractor to collect their recyclables. There are some instances where a street is serviced by several different contractors, which would suggest that businesses may benefit from at least a collectively-negotiated collection contract if not some form of collaborative recycling scheme.

While many businesses were paying to recycle their waste, some were making money (up to \$1,000 per month) from selling scrap metal. In the minority of survey respondents were businesses who felt that it was Council's responsibility to be providing waste collection services. Many companies on the other hand were taking the initiative to identify new technologies, products and suppliers to help improve their waste management practices.

Potential barriers and enablers to waste exchange

The needs assessment also uncovered a number of potential barriers to establishing a waste exchange program within the Duck River Catchment. A fundamental constraint to inter-business collaboration and waste exchanges is the physical divide between the Silverwater and Camellia/Rosehill precincts that is the Duck River, which already significantly restricts interactions between businesses of the two precincts. A second geographical barrier is the relatively poor traffic access to the Camellia/Rosehill peninsula that is said to constrain business productivity in the precinct and which could have ramifications for transport of waste materials in and out of the area. Encroachment of residential development on industrial land may also pose a problem to a waste exchange program in terms of planning and land use certainty for businesses and again for waste transport.

Businesses also identified two 'soft' barriers to inter-business collaboration that could potentially limit the effectiveness of a waste exchange program. The first was the perceived commercial risk of sharing information. Most businesses felt that there was limited or no information sharing within the Catchment business community, in part due to a perception amongst some businesses that information sharing could compromise their competitive position. The second was that most businesses felt that collaboration would require a coordinating third party, which would suggest that a waste exchange program would need to be supported and facilitated by a commercially independent body.

Counterbalancing the abovementioned barriers to waste exchange is a general acknowledgement amongst businesses of the benefits of sustainable business practices and a willingness to take steps to improve their sustainability. 75% of survey respondents felt that 'doing their bit' for the environment would have a positive effect on their image and reputation. Just over half of the respondents agreed that developing a shared vision for the area was important to the business community while 41% felt that a self-sufficient business community would be broadly beneficial. And despite current reluctance amongst businesses to share information, one third of respondents want to establish stronger bonds with other businesses and another 41% were at least open to the idea.

Council engagement and support

The primary recommendation to come from the business needs assessment was that the Councils actively engage businesses through waste management initiatives as 'waste seems to be the best leverage for immediate sustainability returns'. Specific recommended actions include:

- communication of best practice examples,
- providing networking opportunities,
- facilitation of collectively negotiated waste servicing contracts and
- encouraging recycling of food and other organic waste

All these actions can be directly addressed through the present waste exchange project.

APPENDIX C CONTEXT ANALYSIS

Institutional Stakeholders

Parramatta Chamber of Commerce

The Chamber encompasses a range of business and community interests and is involved with many issues which involve its members and the Parramatta business community as a whole. The Chamber 'strives to be the voice of its members, a business advocate and supporter of small business'.

Recent projects and services include¹³:

- Creating a regular newsletter for members - 'Business Parramatta'
- Lobbying Government (including local government) on local issues relevant to business – including transport and parking
- Presenting the Parramatta Business & Sustainability Expo in collaboration with Parramatta City Council
- The Business Helping hands program linking donations of food and volunteers with charity organisations in the local area
- Business After Five monthly functions – showcasing organisations and providing an opportunity to network
- Suncorp Parramatta Regional Awards for Business Excellence - Awards are offered in 12 areas of business practice (for more information on these awards see section below on resources and recognition)

Granville Chamber of Commerce

No information available.

Western Sydney Business Connection

The Western Sydney Business Connection (The Connection) is a business to business networking and development organisation representing a cross section of 75,000 businesses in the Greater Western Sydney region. The Western Sydney Business Connection includes: The Western Sydney Business Connection, Asia Business Connection and ConnectionX. Together, they form the largest independent not-for-profit group of business associations and regional development organisations in Western Sydney. The group's role ranges from business networking, the promotion of Western Sydney and investment attraction for Western Sydney, nurturing business leaders, and growing business opportunities within Asia. They host regular events advertised at <http://www.wsbc.org.au/>

Western Sydney Innovation Advisory Service

The Western Sydney Innovation Advisory Service is hosted by the Penrith Valley Economic Development Corp Ltd. They offer a range of services to help businesses make their ideas more marketable and profitable.

¹³ <http://www.parramattachamber.com.au/>

NSW Business Chamber

The NSW Business Chamber is a member based business advocacy organisation. They also provides information and tools to NSW business. The Chamber can be located at <http://www.nswbusinesschamber.com.au/>

Greater Western Sydney Economic Development Board

The Board represents the business, government and community interests of Greater Western Sydney's 14 local government areas. <http://www.gws.org.au/>

Industry associations

Parramatta is home to a number of industry associations including:

- Adhesives & Sealants Manufacturers Asscn Of Australia
- Aerosol Association of Australia
- Australian Chemical Specialties Manufacturers Asscn (NSW Division)
- Home-Based Business Association Of Australia (NSW)
- Logistics Association of Australia
- National Paper Council of Australia Ltd
- NSW Glass & Ceramic Silica Users Association Ltd
- N.S.W. Glass Merchants Asscn
- Plastics & Chemicals Industry Association (PACIA)

These organisations may be relevant as they offer various services to business, including for example:

- Trade exhibitions and 'overseas trade missions' to link industry to export opportunities
- Linking industry to government decision making, coordinating responses to regulatory reform¹⁴
- Representing and promoting the activities of the industry to key audiences such as politicians, government officials, the media, educators and community groups
- Providing industry linked publications on technical, regulatory, marketing etc. issues
- Identifying sector specific training needs¹⁵
- Hosting general meetings, seminars, conferences and social activities

Some of them offer sustainability programs or support - for example the Plastics & Chemicals Industry Association¹⁶ (PACIA) reports that it has a Sustainability Leadership

¹⁴ See for example the Plastics and Chemicals Industry Association
<http://www.pacia.org.au/Content/RegulatoryServices.aspx>

¹⁵ See for example Australian Manufacturing Technology Institute Limited
http://www.amtil.com.au/index.php?mode=projects_initiatives

Framework, a Design for Sustainability (D4S) program with Plastics (Quickstarts), Water & Energy Programs, Life Cycle Programs, Sustainability Leadership Implementation Council and Sustainability Awards.

Waste Organisations

Waste Management Association of Australia - WMAA

WMAA is Australia's peak association for waste management professionals. WMAA has a large network of state branches, national divisions and special interest groups that provide the opportunity for networking, communication and involvement in projects aimed to encourage sustainable waste management.

The Australian Council of Recyclers (ACOR)

ACOR represents companies involved in processing secondary, solid raw materials. ACOR's interest is to encourage all stakeholders to make optimal use of Australia's secondary materials through the removal of barriers that hinder effective recycling and reprocessing. Current ACOR membership spans the following sectors: aluminium, cardboard, computers, construction and demolition material, electronics, ferrous and non-ferrous metals, glass, paper, newsprint, plastics – HDPE, LDPE, LLDPE, PET, PVC, mercury, tyres, and whitegoods.

The Waste Contractors and Recyclers Association of NSW (WCRA)

The Waste Contractors and Recyclers Association of NSW (WCRA) is a registered industrial body of employers that addresses business issues relating to the waste and recycling industry on behalf of its constituent Members.

Government Organisations

Western Sydney Regional Organisation of Councils

WSROC is the Western Sydney regional Organisation of Councils. Auburn and Parramatta Councils are both members of WSROC. WSROC has a range of formally stated Natural Environment & Resources Strategic Goals. One of them is: 'Improved quality of the natural environment (air; water; biodiversity; land, energy and waste management) across greater Western Sydney through the development of local and regional environmental initiatives' (p 13 WSROC 2004-2008 Strategic Plan, 2006). An associated Long term Action is: Development of sustainable waste management processes across the region. (p 13 WSROC 2004-2008 Strategic Plan 2006)

Western Sydney Business Advisory Service (Department of State and Regional Development)

¹⁶ The Plastics and Chemical Industry Association (PACIA) was formed in 1994 through the amalgamation of the Plastics Industry Association (PIA), and the Australian Chemical Industry Council (ACIC) and the Chemical Importers and Exporters Council of Australia (CIECA). The Adhesives and Sealants Manufacturers Association of Australia (ASMAA) became part of PACIA in 1996. Source: <http://www.cas.com.au/pacia.htm>

The Western Sydney Business Advisory Service is operated by the Business Advisory Service (BASIS) on behalf of the Department of State and Regional Development (DSRD), providing business information and advice to promote business and organisational improvement. DSRD has a number of industry assistance programs to help companies become internationally competitive. Relevant events include: Western Sydney Manufacturing Week which is an annual celebration highlighting the strength of manufacturing in Western Sydney with forums, seminars and site visits in key locations, other small business events which are advertised at <http://wsmw.events.smallbiz.nsw.gov.au/>

Greater Western Sydney Economic Development Board

The Greater Western Sydney Economic Development Board is supported by the NSW Department of State and Regional Development. It works in partnership with government agencies, councils, and other regional organisations to facilitate employment growth and economic and community development initiatives in Greater Western Sydney. It aims to advise government agencies on issues relating to employment growth and economic development within Greater Western Sydney, and to deliver activities through regional partnerships. The Board represents the business, government and community interests of Greater Western Sydney's 14 local government areas. <http://www.gws.org.au/>

NSW Department of Environment, Climate Change and Water (DECCW)

DECCW is a regulator of waste, is currently exploring several avenues to tailor info to assist SME's, and has the Sustainability Advantage program to assist larger businesses run more sustainably.

Other

Edge Environment

Edge Environment is a facilitator for the DECC Sustainability Advantage Building Products cluster of 24 businesses, and is coordinating the roll out of industrial ecology across all clusters in the Sustainability Advantage program.

Sustainability Programs

Many programs are working with business on sustainability – these may not relate to the target geographical area, nor focus on waste but may be useful contacts for learning about engagement approaches generally.

Business Treading Lightly

Business Treading Lightly (BTL) has been developed, with State Government (Environment Trust) funding, to assist targeted businesses in the Illawarra, Southern Highlands and South Coast to reduce their ecological footprint by operating more sustainably. The program also works with the seven member councils of Southern Councils Group in the mapping, development and implementation of strategies to enable councils to become business leaders for sustainability in their communities¹⁷.

¹⁷ <http://www.btl.net.au/>

BTL supports business in reviewing their operations in the areas of strategic planning, risk management, waste, water, energy, biodiversity, stakeholder engagement, and supply chains; using specifically tailored diagnostic software and the advice from technical experts. BTL involves the development and implementation of strategies and provision of training/mentoring, to assist businesses to embed sustainability organisation-wide.

The program began by targeting aged care facilities, followed by clubs and hotels (service clubs), and then small business sectors identified by each participating council for example, one council is focusing on manufacturing, another on wineries.

The program has involved a Sustainability Officer to act as a 'one stop shop' for businesses, to lead them through other programs and resources, and keep them engaged. As part of this project they have developed their own tool for smaller businesses (based on similar concepts to Sustainability Advantage). They also encourage all businesses to participate in the DECC SA 'Resource Efficiency' module, as they believe it is highly practical and helps answer questions that business have about what tangible changes they can make to their operations and how they can use resources more efficiently¹⁸.

Reverse Garbage

Reverse Garbage is a not for profit co-operative, that accepts 'industrial and commercial discards, off-cuts and over-runs' and makes them available to the public via a large warehouse style retail outlet. It also accepts E-waste – computers, printers, scanners etc – in any condition, and refurbish or adaptively recycle¹⁹. Located in Marrickville, the centre is popular education, child care, community and arts sector workers because of the large variety of diverse (and frequently changing) materials available²⁰. The Centre also runs educational workshops and offers waste consultancy services to business and government.

The Bower

The Bower is an inner-City reuse centre located in Marrickville, NSW, which collects and accepts donations of used goods (for example furniture, timber, bicycles, electrical equipment) and sells them at low-price to the general public. The centre is a community run not-for-profit organisation, operating as a cooperative, which also provides a referral service to people wishing to recycle materials or items that they do not receive. The recycling referral service the Bower offers, is funded by 11 councils in the adjoining regions. The Bower is different to other re-use centres which are commonly associated with landfill (dump) sites; instead it targets the 'hard waste collections' of inner city councils to collect items from the street, and will collect materials directly from people's homes if required²¹.

Zero Waste

Zero Waste is a not-for-profit, non-government organisation, formed to 'support all tiers of industry in achieving environmentally and economically efficient and sustainable systems in all spheres of their activity'. Zero Waste Australia and the international Zero Waste Network of organisations (ZWIA: Zero Waste International Alliance) use and advocate for the following approaches to work towards their objectives: Industrial Ecology; Life-Cycle Assessments; Design for the Environment; Systems Mapping; Green Chemistry; Full Cost

¹⁸ Pers com. Business Treading Lightly staff, April 2009.

¹⁹ <http://www.reversegarbage.org.au/ewaste.html#about>

²⁰ Source: <http://www.reversegarbage.org.au/>

²¹ Source: <http://bower.org.au/Whatwedo.html>

Accounting; Product Stewardship; Waste Exchanges; and Environmental Management Systems²².

City of Sydney Green Clean Chinatown Program

An outreach and education campaign to reduce littering, illegal dumping, increase recycling & and to remind businesses of their waste responsibilities in the Sydney Chinatown precinct. Local community and business groups were closely engaged to assist the delivery of the program. A range of tactics were employed to achieve the objectives of the program including face-to-face consultation, education kits (including an educational video, calendar) and publicity campaigns such as posters and media releases. The program was successful in reaching out to over 60 small businesses in the precinct

²² <http://www.zerowasteaustralia.org/about>

APPENDIX C STAKEHOLDER CONTACT DETAILS

The following list of people and organisations may be useful in subsequent stages of project development

Organisation	Name & Role	Contacts
Australian Council of Recyclers - ACOR	Anne Price Chief Executive Officer	02 9907 0883
Australian Industry Group		Sydney Office 51 Walker Street, North Sydney NSW 2060 Postal Address: PO Box 289 North Sydney NSW 2059 Tel: 02 9466 5566 Fax: 02 9466 5599 Free Call: 1800 648 859
Business Treading Lightly, Southern Councils Group	Katrina Skellern Sustainability Officer	(02) 4232 4702 0401 674 760 kskellern@btl.net.au www.btl.net.au
Boomerange Alliance	Dave West	westd@iprimus.com.au
The Bower	Coordinator, The Bower	info@bower.org.au
Camellia Business Group	Chris King	chris.king@abmauri.com.au
Department of Environment, Climate Change and Water NSW	Business Partnerships/Sustainability Advantage	Tel: 02 8837 6004, rod.clare@environment.nsw.gov.au
	Rod Clare Waste Reform Unit	Tel:02 9995 5623, Email: steve.hartley@environment.nsw.gov.au
	Steve Hartley Head Waste Reform Unit	
	Phil Molyneaux Senior Project Officer Resource Recovery Sustainability Programs Division	Ph: 02 8837 6001 Fax: 02 8837 6099 phillip.molyneaux@environment.nsw.gov.au
City of Sydney	Kath McLaughlin Working on Chinatown SME focused resource recovery project	kmclaughlin@cityofsydney.nsw.gov.au
Department of State	John Scilly, Mangela	john.scilly@business.nsw.gov.au ,

and Regional Development	Srinivasan Experience with supporting businesses in the area	mangala.srinivasan@business.nsw.gov.au
Edge Environment	Tom Davies Sustainability Consultant	51 Whistler Street Manly NSW 2095 M: 0432 400 060 P: 02 8962 2644
Local Government and Shires Association (LGSA)	Bob Verhay	Robert.Verhey@lgsa.org.au
	Rebecca Jones Facilitates Business Educator network for LGSA	Rebecca.jones@lgsa.org.au
Mark Glover	independent consultant with experience in western sydney waste board and various relevant projects - name suggested by Dave West of Boomerang Alliance	
NSW State Chamber/ABL	John Pierson	
NSW Business Chamber	Anny Joseph NSW Business Chamber's Sustainable Development Project Manager	13 26 96 anny.joseph@nswbc.com.au
Parramatta Chamber of Commerce	Roman Dechnicz President	Phone : 9890.5466 Fax 9630.9200 roman@radconsulting.com.au http://www.parramattachamber.org.au/
	Paula Roden Executive Officer	Phone: 9683.6655 paula@parramattachamber.com.au mob: 0417891145 Fax 9683.6644
Plastic and Chemicals Industry Association (PACIA)	Maree Lang, Director, Industry Development - Sustainability	03 9426 3833 mlang@pacia.org.au
	Krista Imberger, Manager Sustainability Projects - Lifecycle & Materials	(03) 9426 3815 (03) 9426 3808 hmillicer@pacia.org.au
	Helen Millicer, Manager	http://www.pacia.org.au/

	Sustainability Projects - Water and Energy	
GM, Reverse Garbage	Narelle Mantle General Manager	narelle.mantle@reversegargabe.org.au 02 9569 3132
Smith Family	Cathy Bray Chief Executive Officer for the Commercial Enterprise, Smith Family	cathy.bray@thesmithfamily.com.au nicole.day@thesmithfamily.com.au Care of: Nicole Day CE Office Manager The Smith Family No.2 Birmingham Avenue, Villawood, NSW 2163 PO Box 1000, Villawood, NSW 2163 ph 02 97546341
Transpacific Harvest recycling	Darrell Hart Earthpower experience in the project area	'Darrell.Hart@transpac.com.au'
Total Environment Centre	Sarah Van Erp	sarahve@tec.org.au
The Waste Contractors and Recyclers Association of NSW (WCRA)	Tony Koury Executive Director	tony@wcra.com.au 02 9604 7206,
WSROC	Colin Berryman Program Coordinators: Natural & Built Environment & Development	colin@wsroc.com.au
Western Sydney Innovation Advisory Service (at PVEDC)	Michael Todd Western Sydney Innovation Advisory Centre	Penrith Valley Economic Development Corp Ltd Allen Arcade, 140-142 Henry Street PENRITH 2750 Phone: 4731 5711 Fax: 4731 5799 Email: innovations@pvedc.com.au
Waste Management Association of Australia - WMAA	Val Southam Executive Director	02 8746 5011, vsoutham@wmaa.asn.au

Western Sydney Business Connection		Phone: (02) 9687 2788 Fax: (02) 9687 2789 Postal: PO Box 4032, PARRAMATTA NSW 2124 Email: connection@wsbc.org.au
Western Sydney Innovation Advisory Service	Michael Todd	
Zero Waste Queanbeyan	Gerry Gillespie	

APPENDIX D OUTCOMES FROM THE INSTITUTIONAL STAKEHOLDER WORKSHOP

Workshop background and objective

This workshop was an invitation only stakeholder workshop for government, business group and local government representatives with expertise in resource recovery, business engagement and waste exchange. It was held between 9-12.30pm, 10 June 2009 at the Institute for Sustainable futures at UTS.

This workshop aimed to harness the experience of selected organisations that are involved with promoting industrial ecology, resource recovery and sustainability, particularly at the level of SMEs. It was designed to map contemporary activities in the field of industrial ecology in NSW and achieve a common understanding of where this project sits in relation to other activities and how the broader benefits of the project can be maximised.

Workshop attendees

The workshop was attended by Viviane Clement (Edge Environment), Danyelle Carter, Phil Molyneaux (NSW Department of Environment and Climate Change, DECC), Rebecca Jones (Local Government and Shires Association), Colin Berryman (Western Sydney Regional Organisation of Councils), Karina Tanos (The Bower Reuse and Repair Centre Co-operative Ltd), Phillip Lane (Lubrizol International, Inc. on behalf of NSW Business Chamber), Isaac (AB Mauri), Jeff O'Neil (Granville Business Chamber), Darrell Hart (Transpacific Industries Group Ltd.), Damien Giurco (Institute for Sustainable Futures), Wendy Read (Parramatta City Council), Amanda Carroll and Sophie Peacock (Auburn City Council).

Apologies were received from Glenn Meehan (Auburn City Council), Terry Johnson (Parramatta City Council), Val Southam (Waste Management Association of Australia), Trevor Oldfield (Parramatta Chamber of Commerce), Gerry Gillespie (Zero Waste), Dave West (Boomerang Alliance), Cheryl Walker (Leichhardt Municipal Council), Keren Lavery (Western Sydney Business Connection), Cathy Bray (Smith Family) and Narelle Mantle (Reverse Garbage).

The workshop featured presentations from Danyelle Carter, Viviane Clement and Wendy Read. Danyelle presented the results from waste auditing of the commercial and industrial sector, Wendy presented the activities of the 'TBL: A model for industrial sustainability in the Duck River Catchment' project and Viviane spoke about current industrial ecology programs in NSW.

Key questions and workshop outputs

The workshop was intended to consult stakeholders on six key considerations in the development of the waste exchange program:

1. Range of possible forms or models of waste exchange that we should consider
2. Regulatory and structural risks and constraints and how they might be overcome
3. Engaging businesses and maintaining relationships
4. Meeting specific Small-Medium Enterprise (SME) needs
5. What might be the 'low hanging fruit' in terms of waste stream/ business types/ exchange types in Camellia and Silverwater
6. Which areas are already 'covered' ie. Which waste streams or business types are covered by existing programs?

This section summarises the outputs from the workshop categorised according to the above considerations. The workshop outputs will also be used to inform the context analysis which

will be prepared by ISF and presented to Parramatta and Auburn Councils as part of the Duck River Waste Exchange Program study.

Range of possible forms or models of waste exchange that we should consider



The lack of precedent of waste exchanges in Australia and waste exchanges that involve SMEs means that consultation with industry stakeholders will be essential to determining the form and scope of the waste exchange program. The following options were suggested over the course of the workshop.

- Provision of a recycling directory to connect businesses with available waste recovery and recycling services
- Council provides a warehouse space for a repository where businesses can leave waste products (for example e-waste) for a certain length of time to allow pick-up by other businesses. If the waste is not removed within the given time period the source business is obliged to remove and dispose of the waste appropriately
- Identify free pick-up services and disseminate the contact information
- Provide a service to collect certain target waste streams from SMEs using specially designed and sized bins
- Coordinated collection days (e.g. a business clean-up day similar to chemical clean-up day)
 - Council-owned space to store collected material that can also be a venue for 'meet and swap' interactions
- One-stop shop that saves time on *sourcing* exchange opportunities
 - Up-to-date listings of waste products by form, quantity etc.
 - Transport information – where is it located and where do you usually take it?
 - Postings must provide contact numbers
 - List of free services for pick-up (e.g. oil, paper etc.)
 - Wiki-style database which is predominantly administered by users

Regulatory and structural risks and constraints and how they might be overcome

Initiating and running a waste exchange program will present risks to the Councils behind the program and the businesses that participate in the program, which may impact the program design and its operation. As well as risk barriers, there are other constraints that may influence the success or otherwise of the program. Some primary risks and constraints identified in the workshop are described below.

Program / Councils

It has been observed elsewhere that waste exchange networks and programs often have a very limited lifespan. It is important to consider strategies to ensure not only participation in the program but also its longevity.

Perception amongst businesses of the waste exchange program as being a regulatory tool (as opposed to its actual role as a support tool) was seen as a potential barrier to

recruitment to the program. Promotion of the program thus needs to emphasise that the tool is not regulation-based and will have no bearing on operating licenses. Confidentiality is again an issue as businesses may not want to participate in the program for fear exposure to (waste) regulators.

A major constraint to participation is likely to be expenditure of time, money and resources, particularly for smaller businesses. A critical focus of the program, if it is to work for SMEs, must be to make the process as straight forward and easy as possible for participants.

The reach of the program may be limited by competition from 'cowboy' waste handlers that provide very cheap waste removal and disposal services. Again, the simplicity of the process is critical.



Business

A concern for businesses could be the risk of commercial exposure whereby the release of operational data to other waste exchange participants may potentially result in loss of competitive advantage. In this sense managing confidentiality must be a critical element in the collection and handling of data. Some form of standard confidentiality agreement may need to be drawn up that can be offered to businesses during data collection.

Central to the success of a waste exchange is the accuracy of contamination reporting. Significant costs could be incurred to a receiving party if contamination is worse than reported, which is the experience of the EarthPower facility at Camellia (and Transpacific Industries). Contamination can arise from a number of sources including incorrect usage of waste repositories designated for specific recycling streams and external parties using waste facilities illegally. Contamination of segregated streams may occur if staff are not properly informed of waste procedures, but is perhaps more commonly a problem with subcontractors such as cleaners who are less likely to be aware of or willing to adhere to waste procedures, particularly when sub-contractors change.

While hazardous wastes were thought to be unlikely waste streams to be considered for exchange, there remains the risk of cross-contamination of other segregated waste streams by hazardous waste products which could raise significant occupational health and safety risks.

Space is a key constraint to businesses storing and handling wastes, which may affect their ability to participate in an exchange.

Engaging businesses and maintaining relationships

Central to the successful inauguration of a waste exchange program is raising awareness amongst the broader business community and encouraging business involvement. The majority of the ideas listed below were generated in the first open discussion session of the workshop, which was dedicated to the topic of business engagement. However further suggestions were made through the later stages of the workshop as well.

Business motivation

- While the bottom line is obviously important to businesses, it is important not to underestimate a business' sense of corporate social responsibility and 'doing their bit'
- A lot of businesses do engage in sustainability-oriented waste management activities but use different terminology to describe those activities than that is used by other experts and practitioners in the field. They do care about the environment, their staff, and their businesses reputation and are prepared to act accordingly
- Legacy issues of toxic waste dumping (e.g. chromium) could be a motivation for businesses
- Need to tap into an awareness that already exists - a unifying concern or rallying call such as 'our Duck River'
- Capturing a local history and pointing to what will be in the Duck River Catchment in the future
- Rising costs of waste disposal helps drive innovation



Communication

- Precedents are powerful communication tool - use stories and figures from case studies to reinforce the benefits of waste exchange
- Emphasise the fact that Councils are providing a new and unique service/support to local business
- Going to the business regularly with a bilingual translator worked well for an outreach program in City of Sydney that engaged culturally and linguistically diverse businesses. They didn't respond to email and phone; they need personal connections that came to them.
- Avoid using negative experience and focus on looking at 'how far we've come'
- Use leaders/respected colleagues within the community to set an example
- Convince businesses to look at examples via website or DVD
- Avoid the use of and connotations associated with the term 'climate change'
- Need to use industry-specific messages
- Need to assess how much businesses want to get together and hear about one another's activities
- Use existing forums – e.g. business breakfast
- Use a unique or innovative format to promote the program
 - Audio
 - Visual
 - Mapping on Google maps

- YouTube
- Calendar with educational information

Business Networks

- Experience with the Sustainability Advantage program has shown that industrial ecology activities within business have been enabled significantly by the networking and relationship building opportunities presented by the program. The program also helps create the 'mindset' for industrial ecology ideas and, importantly provides institutional support to those involved.
 - Existing business networks are useful for promoting the waste exchange program; attending and presenting to local business network meetings could be useful

Other avenues for engagement

- Organise site visits by invitation to demonstrate how waste exchanges can work
- Hold an 'expo' with local business (Auburn Gardens as a venue)

Meeting specific SME needs

The focus of the waste exchange program is to provide support to SMEs that typically have less capacity to undertake resource recovery activities and often fall through the net of other government waste and sustainability programs. The following are suggestions from workshop participants as to how to cater to SMEs in the design of the waste exchange program.

- Making waste management easy is critical to successful resource recovery and particularly so for SMEs. [Smaller] businesses are time poor and will need a program that explicitly sets out to make waste exchanges easy.
- If the waste exchange tool or database is to be used by businesses it must be easy to access and use
- Involvement must be cost-effective
- The program needs to offer a one-stop shop that saves time on sourcing and negotiating exchange opportunities
- Limit the need for businesses to hold/store waste for extended periods
- The program should be culturally applicable and communicable – community leaders should be used to champion the program
- The program should build on existing business networks
- Communication of the functionality of the program is critical and depending on the approach taken may need a facilitator or a clear demonstration of how it works (based on simplicity and/of case studies)
- No-cost solution – to be attractive a waste exchange must show immediate benefits such as removing or greatly reducing transport fees

What might be the 'low hanging fruit' in terms of waste stream/ business types/ exchange types in Camellia and Silverwater

Generating case studies as a basis for promoting the program will require identifying waste exchange opportunities that present strong examples of the economic and other benefits of waste exchange. This may involve identifying target waste streams, target business types, existing exchanges and motivated businesses (with wastes to exchange). The following suggestions came out of the workshop.

- Targeting manufacturing and processing, which make up more than a third of Auburn and Parramatta LGA's businesses
- Targeting food scraps (normally disposed of in plastic bags to landfill)
- Timber waste has a variety of different takers but nothing [consistently] reliable as yet. One workshop participant was currently making contacts for alternative end-of-life timber products which may help the waste exchange program.
- AB Mauri is currently seeking potential consumers of waste activated sludge from their wastewater treatment system
- Packaging as both a source of waste and a option for reuse
- Partnering with University and TAFE for waste auditing and other opportunities

Which areas are already 'covered' i.e. Which waste streams or business types are covered by existing programs?

- Precedent of success for waste (mineral) oil
- Transpacific Industries provide a waste management service with 'Harvest' bins designed to make recycling easier and less costly for SMEs. This service has offered food waste collection for processing at the Earth Power facility in Camellia.
- Waste exchanges arising from Sustainability Business advantage for the construction and demolition industry addresses building by-products such as timber waste, fibre cement, clays and shales, carbon blocks, used oils and carpet materials. These were the big disposal issues from companies.
- NSW Industrial ecology working group currently under development (WMAA) with the aim of developing a state-wide database for waste materials. Likely to be most beneficial to larger industries.
- There are some existing food collection services in the region although these are currently on hold
- DECC is moving towards creating an online recycling guide for business.

Workshop conclusions

The workshop provided interesting complimentary perspectives from government (with both a regulatory and education and support role), waste and recycling contractors and business representatives. The tangible experience of participants has resulted in some detailed and constructive suggestions that will inform the design of this program.

It was suggested that this waste exchange has the potential to provide a model for other councils/LGAs with industrial areas to replicate and create their own SME waste networks. To do this it will be critical to engage effectively with business in a way that is locally relevant, easy to access and understand, cost-neutral and targets priority waste streams.

APPENDIX E OUTCOMES FROM BUSINESS WORKSHOP 1

Workshop background & objective

The workshop was held between 10 am – 1 pm at Dooleys, Silverwater on 20 August 2009 and was attended by 18 businesses. The objective of the workshop was to bring together businesses with an interest in a Waste Exchange, to share experiences to date and scope possibilities for future waste exchange opportunities in the local area. The workshop enabled a common understanding among attending businesses of what a Waste Exchange might look like (in form and function) and where it sits in relation to other environmental activities.

The workshop was intended to consult businesses on four key considerations in the development of the waste exchange program:

1. Business waste exchange needs
2. Desirable forms or models of a waste exchange for the Duck River Catchment area
3. Explore regulatory and structural risks, constraints and opportunities of a waste exchange
4. Discuss incentives for businesses to become involved and how the broader benefits of the waste exchange program can be maximised for and by local businesses

Workshop attendees

The following local businesses were present Any Shape Plastics, Downer EDI Works, Screengraphics Printing, Sterling Electrical, Bluglass, R.E. Batger, Merel's Foods Australia, EarthPower, Concrete Recyclers, Classic Resources, Packforce, Lubrizol, AB Mauri, Sydney Turf Club, Shell Refining (Australia), Cumberland Industries and Alliance Network International.

Key questions and workshop outputs

What is waste exchange?

Waste exchange is where the waste product of one businesses process becomes the raw materials for another business process. Exchange can be in the form of a 1-way or 2-way exchange between or among businesses and works on the concept that one person's waste is another's resource. Waste exchange contributes to reduction of waste to landfill, creates opportunities for saving money through re-using low cost materials in a secondary process, reduces landfill levy costs, reduces CO₂ emissions by substitution of raw materials and by reducing transportation of waste, and improves inter-business community relationships. All of these benefits sit alongside environmentally responsible outcomes. The waste exchange could also seek to generate a critical mass of a waste type for coordinated recycling collection in the Duck River Catchment.

What are the waste exchange drivers and needs for businesses in the Duck River Catchment?

A major constraint to participation in a local waste exchange will include expenditure of time, money and resources, particularly for smaller businesses without an in-house sustainability or environmental manager. As such a critical focus of the program must be to make the process as straight forward and easy as possible for participating businesses.

Businesses cited the following drivers for their interest in a waste exchange:

- Reputational drivers (e.g. venue is branded as a sustainable venue, company sells 'eco' products, shareholder expectation, commitment to the voluntary schemes such as the packaging covenant, need to be seen to 'walk the sustainability talk')
- Could assist with meeting National Greenhouse and Energy Reporting Systems (NGERS) requirements
- It's a local initiative
- Might reduce cost of engaging contractors to take waste away / treat waste
- Provides an opportunity for cost effective environmental inputs into processes
- It's good for the environment

Current waste generation/collection issues and barriers for businesses include:

- Cost of disposal and transport (e.g. landfill levy and gate fees)
- Generation of too small or too large waste quantities to contract waste recycling (further compounded by inconsistency of waste streams and types)
- Lack of knowledge of what disposal, recycling and reuse options are available
- Lack of education regarding on-site segregation methods
- Lack of access to centralised information on regulation and legislation
- Perception of conflicting Council and Government waste codes and standards
- Norms; 'we will continue the way we have always done it'
- Lack of manufacturers (who may be more likely to use waste products)
- Problem with identifying methods for responsible disposal/recycling of E-Waste



Businesses cited the following as their waste exchange needs:

- Make waste management easy; as businesses (particularly smaller businesses) are time poor and will need a program that explicitly sets out to make waste exchange easy and manageable with incentives
- The program needs to offer a one-stop shop that saves time on sourcing and negotiating exchange opportunities
- The program needs to limit the need for businesses to hold/store waste for extended periods
- Involvement should represent a no-cost solution – the waste exchange should have immediate benefits such as removing or reducing transport fees
- If the waste exchange uses a web-based tool or database it must be easy to access and use

- The program should build on existing business networks
- A change of attitudes is needed to support the program: Consumer perceptions of 'recycled' or sustainable products (e.g. unbleached tea bags are not a desirable look); Government/ resident concern/ objection to depots; EPA 'red tape' discourages reusing waste.

Range of possible forms or models of waste exchange that should be considered

There are only a small number of successful waste exchanges in operation in Australia. As such, ideas from Duck River Catchment businesses are essential to determining the form and scope of this waste exchange program. The following options were suggested over the course of the workshop:

Forms:

Web-based waste directory (an exchange register tool)

- 'One-stop shop' that saves time on *sourcing* exchange opportunities.
- Includes up-to-date listings of industries and waste products by form/classification, quantity, consistency, contact numbers
- Listings of free services for pick-up (e.g. oil, paper, pallets etc.)
- Ability to link businesses with recyclable waste streams for coordinated collection services
- May take the form of a 'waste ebay'
- Spatially referenced
- Centralised information on regulations and legislation covering different wastes

Centralised Waste Exchange Depot

- Council to designate an area for waste storage, separation, pick-up and exchange.
- Generally participants agreed that the project should initially trial the web-based tool, and with economies of scale, they may benefit from an exchange depot in the future.

Participants felt that the exchange would benefit from support such as:

- Provision of some free/subsidised pick-up and exchange collection/drop off services (one way and two way exchanges)
- Provision of a service to collect certain target waste streams from businesses using specially designed and sized bins (to achieve quantities of scale for pick up by recyclers/contractors etc)
- Common collection point and celebrations e.g. Waste 'swap meets' (businesses and collectors meet on a designated site)
- Dedicated staffing resources to facilitate exchange matches, manage exchange logistics and maintenance of the site
- Increased supplier packaging agreements / extended producer responsibility
- Social marketing to engender community involvement and education
- In-house business environmental management systems (EMS), sustainable procurement policies, staff engagement, awareness and training
- A community celebration event/showcase

Regulatory and structural risks and constraints and how they might be overcome

Initiating and running a waste exchange program will present risks to the Councils and the businesses that participate in the program, which may impact program design and operation. Some primary risks and constraints identified in the workshop are described below.

Regulatory and structural risks and constraints	Why it's a risk/constraint and how it can be overcome
Perception that the exchange is a regulatory tool	This perception is opposed to its actual role as a support tool- is seen as a potential barrier to business recruitment to the program. Promotion of the program thus needs to emphasise that the tool is not regulation-based and will have no bearing on operating licenses.
Confidentiality	Confidentiality may be an issue as businesses may not want to participate in the program for fear exposure to (waste) regulators.
Competitive advantage	Competitive advantage may be a concern for businesses with the risk of commercial exposure whereby the release of operational data to other waste exchange participants may potentially result in loss of competitive advantage. In this sense managing confidentiality must be a critical element in the collection and handling of data. Some form of standard confidentiality agreement may need to be drawn up that can be offered to businesses during data collection.
Limited lifespan	Limited lifespan has been observed elsewhere that waste exchange networks and programs often have a limited lifespan. It is important to consider strategies to ensure participation can be sustained.

Engaging businesses and maintaining relationships

Central to the successful inauguration of a waste exchange program is raising awareness amongst the broader business community and encouraging business involvement. The majority of the ideas listed below were generated in an open discussion session during the workshop.

Communication and engagement

- Precedents are powerful communication tool - use local case studies to reinforce the benefits of the waste exchange and put a human face to the practicality of how it will work
- Bring businesses together to talk about their 'good news' stories and opportunities
- Utilise the power of one-on-one face-to-face engagement (undertaken by the waste exchange administrator)

- Actively promote incentives for participation (Potential for cost savings #1, Helping the environment #2) use simple language when talking about the exchange, what it is, and what can be achieved through involvement.

Business motivation and drivers

- While the bottom line is obviously very important to businesses, it is important not to underestimate a business' sense of CSR and 'doing their bit' for the environment
- Need to tap into an awareness that already exists - a unifying concern or rallying call to action that taps on the most appealing drivers to be involved e.g. Rising costs of waste disposal helps drive innovation and helps the environment

Business networks

- Tap into existing business networks for promoting the waste exchange program; attending and presenting to local business network meetings/ e.g. Camellia Business Group
- Utilise a business reference group for the waste exchange project and use exchange 'champions' to spread the message.

Other avenues for engagement

- Hold a waste exchange 'expo' and 'look and learn' tours with local businesses to demonstrate how waste exchanges can work
- Use a waste stream analysis as a precursor engagement tool to involvement in the exchange / Use a waste survey as an engagement tool.
- Utilise school / community links e.g. local school projects that increase likelihood of children discussing waste with their parents ('pester power')

Workshop conclusions

Most businesses seemed to agree that a Duck River Catchment waste exchange has the potential to assist their businesses in a variety of ways pending the involvement of more businesses.