How has your project contributed in improving the environmental impact of waste within your project priority area?

Introduction

This project initially focused on the creation of a Builder Waste Initiative at the Vale Residential Development in the Swan Valley. Prior to the trial commencing, extensive industry and stakeholder discussions were held, research into previous programs conducted and relations with large home builders established. Trials were carried out which were used as a basis to create a waste management program that could be used at the Vale and replicated at other developments. The main purpose of this work was to reduce the environmental impact of construction waste arising from new residential developments in the Perth Metropolitan area.

The model selected by EarthCare, was based on an earlier SWIS funded project, where it was determined the most effective model was for a large residential development to locate on site waste transfer station (WTS) with sorting carried out predominately at source by the builder’s subcontractors. The WTS provided an opportunity to enable smaller sorted loads to be removed from the building site before contamination from other trades occurred. The second component is education and training of all individuals working on the building site in order to raise awareness, provide purpose, give responsibility and show how each person could help make a positive difference. EarthCare provided training that was given to builders and their sub contractors to show how the waste material could be segregated and collected in different areas on site.

Trials then took place with Five (5) different large volume builders on 8 sites at Vale to determine their current waste management practices and look to implement the new EarthCare model. The builders and their subcontractors managed their waste on site where quantities of material were accumulated in separate piles. The waste material was then collected and in latter stages of the trial, taken to a Transfer station, the developer Multiplex built at Vale. This material was then transported to the most appropriate recycling routes - Bricks to Midland Brick; Wood to EMRC, Sand back into development for use as fill; Metal, Plastic and Cardboard to recyclers.
Overall, it was found that different house build styles produced different quantities of waste materials. The most favoured house building methods used in WA are the double brick with steel roof and timber frame and the double brick with clay roof tile and steel frame. Obviously these different building systems produce different quantities of waste material. The averages of all the houses built within this program can be seen on charts 1 and 2.

Chart 1.

The average waste per house (in tonnes) found during trials at the Vale for houses built using double brick, timber frame with steel roof.
The overall recycling rate for the program was about 37%. However during the program it was realised that whilst 37% is a reasonable start and certainly better than those levels achieved without a suitable waste management program (often 0%), it would be possible to increase this figure to at least 75% by overcoming a number of issues and carrying out further research in a number of different areas, as described later in this document. If this was replicated throughout the building industry, some 150,000 tonnes of builders materials currently going to landfill will be diverted.

Key Objectives Achieved
This program has provided a key link enabling both large developers and large home builders to achieve effective and efficient waste management. It has also provided a system capable of diverting significant amounts of construction waste material away from the waste stream and into recycling initiatives. This material can be recycled and reused within the construction sector and back into the development process. An example where this can be achieved is the recovery of waste concrete and bricks that can be recycled into road base used in the building of roads, drainage and driveways.

The success of this program is demonstrated by Australia’s largest land Developer seeking to engage EarthCare’s waste management services within its residential developments in Perth – commencing in 2009 with the launch of a larger trial taking place at their Forestdale site.

Within the key objectives there have been many specific achievements as can be seen below.

- **Supply Chain Development**
  - Constructed and used a Waste Transfer station within large sub divisional project at the Vale Multiplex development
  - Undertook a pilot project at Vale with 5 of Perth’s leading home builders – Dale Alcock Homes, Celebration Homes, BCG Residential, Plunkett Homes and Ross North Homes.
Australia's largest land developer – Stockland is in discussion with EarthCare with the potential for all its development sites within Perth Metropolitan region.

EarthCare is currently looking to develop a business plan to cater for up to a quarter of all homes built in Perth per year. This will account for some 50,000 tonnes of material currently destined for landfill that could be diverted.

Commenced a case study, undertaking waste recycling at Commercial Building sites with Badge Constructions at Royal Flying Doctor Service, supported by the Master Builders Association.

Investigated potential logistic synergies of waste material being taken to recyclers from the development and recycled product being brought back from recyclers for use in the development, in order to maximise efficiencies of transportation.

**Use of Recycled Material**

- Successfully obtain an agreement from the City of Swan to trial the use of recycled road base on 6 roads within the Vale development.
- Develop a system of reuse for sand otherwise removed from development sites. In this way sand is diverted from landfill waste stream and is reused back onsite as fill.

**Research**

- An investigation with leading building companies was carried out to ascertain their needs regarding building waste.
- Initial research in Life Cycle Analysis (LCA) was undertaken, of building materials and recycled materials i.e. road base.
- Investigations commenced into reuse opportunities of building waste materials including Bricks at Midland brick, Cement Bags and Plasterboard at the Regional Resource Recovery Centre in Canning Vale, Wood at the EMRC recycling depot, Plastics with Claw Environmental, and Steel with SIMS metal.
- Data was collected from the pilot scheme that has strengthened the case for recycling within the development and construction industry in general.
- Research data was generated from the pilot program that is leading to a potential expansion to 5000 lots per year.
- Investigations have commenced into both Ecological and Carbon footprints, whereby a full ecological, energy usage and carbon comparison of landfill and use of virgin material can be made against the use of this material into recycling initiatives.

**Conferences**

- EarthCare representatives presented 3 conference articles;
  - A paper was presented at the 2007 Waste Conference in Fremantle
  - A poster at the Sustainable Building Conference in Melbourne 2008
  - A paper delivered to Green Building conference in Canada 2007
  - A paper was delivered by Curtin University on LCA research from EC in February at the LCA conference in Melbourne 2009

**Industry Support**

- Development of support from leading industry bodies such as Housing Industry Association (HIA), Master Builders Association (MBA) & Urban Development Institute of Australia (UDIA).
- Development of support from Perth’s leading home builders – including Dale Alcock group and BGC residential.
- Support from C & D industry groups and key waste recycling and reprocessing initiatives.
- Held discussions with key building material and producers regarding potential reuse of the waste material arising from their supply.
- Developed good understanding and support from leading waste companies including
Cleanaway and Multiskip bins.
• Developed excellent relationships with leading commercial builders Diploma and Badge construction – leading to offer for Smart Builders to carry out Waste Management Plan on certain sites.

• Marketing – Education
  o Created brand design and marketing support.
  o Secured several articles in newspapers, including 2 in the West Australian (Attached).
  o Developed and enhanced the profile with the building and waste industry whereby it is now recognised as a key player in the recycling industry.
  o Developed a suite of education flyers and regular newsletters.
  o Developed and purchased a range of promotional products for use on site with builders – caps, stubbie holders & stickers.
  o Held education and awareness session at C & D Recycling to major builders, their supervisors and bobcat operators.
  o Developed a Communication Plan.

• Training
  o Created a behaviour change method to enable to encourage builders and their contractors to adopt waste management systems on site.
  o Designed and developed on site signs for use by builders and sub contractors – providing information on sorting types and placement.
  o Attended and assisted HIA in their new Waste Training course.

• New Initiatives
  o Commenced a case study into the Commercial building market with a leading Perth Architect and Builder.
  o Developing a case study for waste management of the Commercial building industry.
  o Commenced initial investigation of LCA into building materials and recycled road base versus quarried limestone.

In addition to the above, two of the research initiatives are described in more detail below.

Life Cycle Analysis
During the operation of the program an initial Life Cycle Analysis (LCA) was carried out by EarthCare and Curtin University of Technology. This was used to ascertain how much energy could be saved (and therefore how much greenhouse gases and carbon could also being saved) by reusing the waste building materials, rather than sending them to landfill. These initial studies showed that there was an energy saving of at least 4%, which may appear small but considering that it is estimated that 0.75 million tonnes of construction and demolition (C+D) waste enters landfill sites in WA alone, per year, then 4% applied to this becomes a sizeable amount. It was recognised that a larger study needs to be carried out incorporating the offset potential for recycled product to be used in place of virgin materials, for example in the instance of waste concrete and bricks they could be used to replace mined virgin limestone in the production of road base. This was not taken into account in the initial trial but would be incorporated into any subsequent LCA research and therefore it is likely that greater energy and carbon savings are being achieved when using the waste management program, than has been shown in the initial research.

Novel Recycling Techniques
Some preliminary research has also been carried out to find recycling routes for those materials, such as plasterboard and cement bags, which do not have developed recycling routes currently available in WA. Whilst it is possible that mulching of these materials might indeed add to some soil conditions, due to the alkalinity associated with these products, further in depth study needs to be
carried out. EarthCare has discussed further trials together with the Regional Resource Recovery Centre in Canning Vale.

EarthCare has concentrated on developing a waste management system that will encourage and reward good practice rather than dictate and punish. In the main this has worked well. However it has been found that some builders are more committed than others and so it has been necessary to add additional penalties to the system, such as back charging for any extra work and or charges for having to take contaminated material to landfill, in order to ensure that all parties aim for overall success of the system.

This program has shown that a waste management program can and has been developed that enables builders waste from residential house building developments to be removed from the waste stream destined for landfill. Instead this material can be recycled and used, in many cases, back into the construction industry. The system is flexible and therefore can be used for small or large residential developments. In addition a case study carried out on a commercial development at the Royal Flying Doctors Service Building redevelopment at Jandakot shows that this waste management program can be easily modified and applied to the commercial building development sector too.

At the conclusion of the program, a business plan has been created and evaluated. This is currently being used to establish an EarthCare waste management division – to be called EarthCare Recycling - that will initially apply the system to one development in Perth (owned by a reputable large land developer) commencing in June 2009. It is expected that EarthCare’s waste management division will then work with other developments to ensure that effective waste collection and recycling is maintained.

**Was your project successful in the way you expected? If not, why not?**

This project has been successful in a number of different ways. It has achieved the primary aim of creating a waste management plan capable of removing waste material from residential development sites and recycling these materials rather than sending them to landfill sites. The recycling of these materials not only uses material otherwise being sent to landfill, it also creates a new product that can be used to replace of newly mined or manufactured material. Whilst EarthCare will not actually recycle the material (there are already a number of reputable recycling companies already in existence in Perth many of which are also funded by the Strategic Waste Initiative Scheme), it will increase the volume of material being sent to the recyclers, which will aid the recycling businesses, increase the amount of recycled construction waste product available to Perth and WA and also reduce the amount of material entering landfill from the construction sector.

The system promotes the education and training of those people involved and helps develop a sense of commitment, ownership and responsibility for the waste material. This helps to provide a basis for long term change towards environmental stewardship and sustainability.

The program has shown that it is possible to have an effective waste management system for residential building developments that should cost no more than current practise. Indeed, if the landfill tax levy is increased to levels comparable to those in some Eastern States, then it may be possible for the system to actually be cheaper than existing practise.

The program has many interested parties, including builders, manufacturers, recyclers, trade associations and other land developers. The program has been promoted on a number of different occasions by The West Newspaper.
This program has provided an opportunity to investigate the residential development waste management in order to develop a system that can be turned into a profitable business, whilst achieving the primary environmental aims. This success goes beyond the initial expectations for the program.

What lessons were learned through the project? Please describe any strengths or weaknesses of the project and what, if anything, you would do differently if you were to do the project again

The program has provided much opportunity for learning. Perth’s waste management arising from residential housing development has largely been carried out on an ad hoc basis where little or no material is removed from the landfill waste stream and recycled. This program has allowed EarthCare to investigate current systems, identify areas for improvement and develop a new system that permits increased recycling of the associated waste.

The lessons have been multiple. It was found that what appears to be a simple issue was in fact a complex one that required careful investigation and consideration. There were many different layers of operation within the system, each requiring careful deliberation. An example of this would be – how could the material be collected on site – on the ground (this has associated health and safety issues in some instances), in a skip (cost implications), wire cage, or any combination of the three – In reality the most appropriate answer would be to have a flexible system capable of operating all or some of these collection methods, dependant on the plot size, ease of access and development facilities.

It was found that in order to maximise the transportation aspect of the system, a waste transfer station would be necessary to accumulate and store the waste material. Once sufficient quantities have been accumulated, a large truck can collect solely from the waste transfer station and deliver this material to the recycling facilities, thereby removing the excessive transport issues found on many residential developments and reducing associated dust issues and noise pollution.

EarthCare investigated the possible synergies of material handling to and from the development and believes that in many instances the trucks can be back filled. That is to say, trucks coming in to collect the waste product could also bring material into the development as well. This would ensure that the trucks are always laden which reduces the amount of empty trucks on the road, thus potentially reducing the amount of wasted fuel being burnt and associated carbon release into the atmosphere.

EarthCare personnel have found that many people within the housing development sector were keen to help recycle more material but did not know how to achieve this. Equally it was found that some people had their own personal reasons why they did not want to change and were negative towards the program. These two diverse groups of people needed different handling although the education and training were the same. Ultimately it did become necessary to add a financial charge for non-conformity for those who absolutely didn’t want to change.

The strengths of the program include its versatility and flexibility. With small changes the system can be used on small housing developments and clusters, large housing developments and commercial developments.

A potential strength and weakness of the program focuses on the people within the system. Specifically the concept of commitment. In order to create a successful system, all key people must be committed to its success. This means that commitment needs to come from top management at the head offices of the developers, builders and suppliers through to the most junior person on site. When this is achieved then everyone works together to create a successful system. When there is no commitment the system fails. Therefore one of the most important
aspects of this work has been and will continue to be the development of education and training packages that encourage people to commit to the success of waste management in the residential house building sector. Overall the system functions well when all those within it are committed and strive for success. As with all systems, when there are those who are negative towards the system’s success, this can compromise the whole system. This issue has been largely addressed but is likely to remain a weakness, unless legislation enforces the concept as in Europe.

Another weakness of any waste management program in Western Australia is the artificially low landfill tax levels, when compared to many other states in Australia. The effect of the low landfill tax has meant that it is very difficult to compete financially with those companies that simply send all C+D waste to landfill. This waste management system still needs to be at the very least cost neutral, in order to be economically viable and recycling & reprocessing these materials can be costly by nature. Therefore, whilst the landfill taxes remain low, could be further reduced or even abolished the recycling companies will struggle to make money from their products, even though they are environmentally proactive and actively working towards the Government’s Zero Waste Initiative.

EarthCare maintains that it is happy with the way the project proceeded and would not wish to change its methodology if it were to commence the project again.

**How did you acknowledge the Strategic Waste Initiatives Scheme funding you received? Was any promotional material produced? (if so, please attach copies)**

EarthCare ensured that it advised that the program was funded by the Strategic Waste Initiatives Scheme.

There have been several promotional documents produced such as flyers and newspaper articles which have been attached to this document in the appendix.

**Were you able to complete your project in the approved timeframe? If there were variations, what were the cause(s)?**

The program ran for two years and was completed within 6 weeks of the designated timeframe.

**Did any opportunities or ideas arise during the project? Do you now have ideas for other projects?**

There were several opportunities and ideas that arose during the program. The LCA was initiated in order to gain a better understanding of the waste materials and associated recycling routes. It is hoped that the initial research can be used as a basis for a larger scale future LCA project. As part of EarthCare’s recent success in being awarded a 1 year SWIS grant, funding is available for additional LCA research. This research will require at least one further year, but the funding and scope will be resolved during 2009.

EarthCare identified those waste materials that cannot currently be recycled in Perth and has recently submitted an application for further funding to find novel recycling routes for these materials.

As a result of the program, EarthCare is currently in negotiation with a large land developer in order to provide waste management for one of their developments. This opportunity is based around a larger trial, that also requires additional funding to establish. However EarthCare is
confident that a viable business case can be developed over the next couple of years. This opportunity would not have occurred without the SWIS funding.

### APPLICANT FEEDBACK

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### Additional comments

The timing for this grant has coincided with an increase awareness of environmental issues and changing of market conditions allowing for greater interest and involvement from builders and their contractors. The opportunity to research the residential development waste industry and to develop a system capable of collecting this material and sending it to recycling initiatives where it can be made into new product rather than sending it to landfill, is a result purely of having the time and resources provided by the SWIS grant.

Furthermore, the tying in of Builder waste reuse to the proposed Carbon Trading Scheme via Life Cycle Analysis research has attracted greater interest and attention of large project developers and home builders.