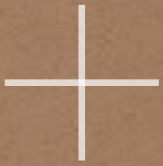


A PRACTICAL GUIDE TO

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# REDUCING WASTE ON BUILDING AND CONSTRUCTION SITES





OUTLINE





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# 1.0

## Waste minimisation pays off

The 3 Rs – Reduce Re-use Recycle – are increasingly being applied on construction and demolition sites in Victoria. The industry recognises and captures the economic and business benefits of diverting waste. Innovative approaches to minimising waste have also emerged from growing awareness of the environmental impact of landfill.



## 1.1

### Environmental benefits

By diverting waste from landfill, the following environmental benefits can be achieved:

- + Reduced greenhouse gas emissions by avoiding methane emissions from the breakdown of wood, paper and organic waste
- + Reduced heavy metals and toxic substances in leachate (liquid that seeps into the ground from landfill areas). Leachate can be contaminated by plastics, electronics, batteries and household chemicals
- + Reduced likelihood of polluting ground water due to leachate
- + Reduced landfill by implementing strategies, such as reducing the use of plastic bags
- + Creation of secondary resources as an alternative to using virgin material products.

## 1.2

### Business benefits

As landfill capacity diminishes, landfill levies will increase. These increased costs, along with the environmental awareness of landfill, will encourage change. However, there are other economic benefits to recycling, including:

- + Reduced material cost through the re-use of materials onsite
- + Lowered cost of tipping fees by diverting waste from landfill
- + Rebates for waste material delivered to recycling facilities
- + Products for secondary resource reprocessing and manufacturing.

There are additional benefits to recycling that are emerging in the Australian construction industry. Construction and demolition waste recycling is recognised in various building sustainability assessment tools, such as GreenStar, which companies now strive to achieve.

The value of going green and reducing waste is gaining momentum. Sustainability Victoria has an online guide to recycling services, which can be accessed from [www.sustainability.vic.gov.au](http://www.sustainability.vic.gov.au).

Information to help companies reduce the environmental impact of their operations and capture the economic benefits are listed in the **'Further Information and Resources'** section of this guide.



## RECYCLING OPPORTUNITIES

### CONCRETE AND BRICKS

Concrete and masonry waste accounts for 82% of construction and demolition waste. There is an opportunity to recycle concrete and masonry waste to reduce landfill.

There is a Guide to the use of Recycled Concrete and Masonry Material, which is available for purchase from Standards Australia [www.saiglobal.com](http://www.saiglobal.com)

## WASTE IN VICTORIA

Australian data suggests we are increasing our recycling rate yet landfill is still growing.

Victoria is diverting approximately 60% of waste from landfill. Of the waste going to landfill, over 40% originates from the construction and demolition of buildings.



# 2.0

## Reaping the benefits – get started

### 2.1 Set recycling targets

The first step to any waste management plan is to audit the waste stream. Once you know what is being generated, a plan can be developed to minimise and manage the waste.

Setting targets, focuses attention on recycling and provides a framework for establishing strategies to reduce waste and measure the outcomes of those strategies. A key aspect of the waste management plan is to enlist the support of management to drive the strategy.

The waste targets should be communicated at the outset of the project in tendering documents. This highlights the importance of recycling and establishes responsibility from the outset.

The Victorian 'Towards Zero Waste Strategy' set a state target of 80% for construction and demolition waste by 2014. A recent study of recycling practices on Melbourne construction sites identified waste recovery rates in excess of 80%, suggesting that the long-term target is feasible.

### 2.2 Plan to minimise waste

The waste management plan will identify opportunities for minimising waste on construction sites and should:

- + Minimise packaging brought onto site, through contractual requirements with subcontractors
- + Require material suppliers to assume responsibility for waste by requesting reduced packaging or a 'take-back' agreement
- + Have sub-contractors re-use off-cuts wherever possible, contractually or through awareness campaigns
- + Encourage subcontractors not to over-order materials
- + Practice 'just-in-time' delivery of construction materials to avoid waste from damage prior to use.



### BEST PRACTICE TIP

Set an 80% minimum on-site recycling target.



### MELBOURNE CASE STUDY

Setting targets focuses attention of managers and people on site. Recycling achieved by Melbourne projects.

PROJECT	ORIGINAL RECYCLING TARGET	RECYCLING ACHIEVED*
AXA Docklands	85%	98% – Jan. 2007
CBW	80%	88% – Jan 2007
MCC	80%	92% – Jan 2007
Waterfront City	60%	96% – Mar 2007
500 Collins Street	80%	96% – March 2007
55 St Andrews Place	80%	90% – March 2007

\* Based on latest monthly report when the 'Recycling Practices in Major Construction Sites in Melbourne' was undertaken.



As the environmental performance expectations of the construction industry grow, projects will increasingly look beyond waste minimisation to innovative methods of reducing waste. Construction companies should consider the following:

- + Absorbing waste in buildings by re-using materials from onsite demolition in the construction process
- + Using materials with a recycled content
- + Taking a proactive approach to re-using materials for construction site infrastructure, such as site sheds, hoarding and concrete formwork.

## 2.3 Identify savings and potential earnings

There are many economic benefits to diverting waste from landfill. By viewing waste as a resource, rather than a problem, extra value can be obtained. Opportunities for savings should:

- + Engage waste contractors who provide rebates to the primary contractor for either the transport cost or the amount of recyclable material delivered, or both
- + Arrange with product manufacturers to collect specific waste streams from site for re-use in their products
- + Arrange with product suppliers to move to stackable, returnable and reusable packaging
- + Capture recyclable demolition materials to be sold for re-use
- + Divert waste from landfill to save landfill levies.



## MELBOURNE CASE STUDIES

### REDUCE FIRST – THEN RECYCLE

*The primary contractors at MCC, CBW, 500 Collins Street, and Waterfront City all contractually required sub-contractors to minimise the packaging brought onto site, and to re-use off-cuts, wherever possible.*

*The contractors at Waterfront City also encouraged contractors to practice 'just-in-time' ordering of materials to reduce wastage from materials damaged prior to use.*

*Brookfield Multiplex, the contractor at MCC and CBW, has an on-site 'Reduce at the Source' waste minimisation program. They required sub-contractors and suppliers to analyse waste sources prior to commencing work, so that ways of avoiding waste at the source can be identified.*

### ADDING VALUE TO DEMOLISHED MATERIALS

*Re-use of materials recovered from demolition was applied to a high degree at 55 St Andrews Place. Around 90% of door frames, glass, walls and work stations were re-used for the fit-out.*

### MAKING MONEY FROM WASTE

*At 55 St Andrews Place, carpets were removed free-of-charge by a carpet company. This saved time, space and transportation fees. The waste contractor delivered recyclable material from this project to the recycling company. The recycling company then provided the construction consultant with receipts, showing the type and volume of materials recycled. This ensured that the materials did not end up in landfill. Schiavello, the primary contractor, received rebates from the profits made from the sale of the recycled materials.*

*At AXA Docklands, Grocon secured an agreement with CSR Gyprock to collect plaster waste. Grocon provided the bin, but CSR Gyprock, collected the bin two-to three-times a week and took it to an Altona depot where gypsum was recovered.*



## BEST PRACTICE TIPS

Include a requirement to minimise waste in subcontractor contracts by requesting reduced packaging or requiring the use of off-cuts where possible.

Prior to commencement of demolition, develop a list of materials to be salvaged and identify possibilities for re-use.

View waste as a valuable resource. Construction and demolition waste streams are on average 85% recyclable, reusable and reprocessible.



# Reaping the benefits – get started

CONTINUED

## 2.4 Identify who does what

It is important to nominate an on-site waste management team. Site-wide waste management plans that include recycling targets are recommended. The primary contractors can then require major subcontractors to prepare waste management plans for their scope of work.

The approach to waste minimisation on construction sites should include:

- + A waste audit to establish a baseline for measuring against recycling figures
- + Preparation and continual review of the waste management plan and budget
- + Monitoring and reporting against the waste management plan, including cost tracking
- + Management of the waste management plan, including training
- + Site management including waste sorting
- + Contracts with subcontractors.



### MELBOURNE CASE STUDY

#### IDENTIFY WHO IS GOING TO DO WHAT

*The contractors at 500 Collins Street (Bovis Lend Lease), at CBW and the MCC (Brookfield Multiplex), and 55 St Andrews Place (Montlaur), required their major sub-contractors to provide waste minimisation and management plans that were consistent with the waste management plan for the site before commencement of the project.*



### BEST PRACTICE TIP

Reducing waste is everyone's responsibility.



Detailed below is an example of who may be responsible for each of the roles within the waste management plan.

	PRIMARY CONTRACTOR/ PROJECT MANAGER	SITE SUPERVISORS	SUB CONTRACTORS	WASTE MANAGEMENT CONTRACTOR
Training workers	√	√		
Preparation and continual review of a waste management plan at site level	√			√
Preparation of trade specific waste management plan			√	
Effective management and implementation of waste management plan including waste sorting		√		
Participation in waste management strategies		√	√	
Contracts with subcontractors	√			
Waste removal contracts	√			√
Waste recycling reporting				√

+ 3.0

## On site procedures

### 3.1

#### Identify and overcome site constraints

One of the main issues on construction sites is the availability of space for waste sorting and pick-up. Often contractors are limited to one bin for all construction waste. In those circumstances consider:

- + Providing a large bin for all construction waste to be collected and sorted off-site
- + Placing smaller bins in staff areas for kitchen recyclables, food waste and office paper recycling
- + Providing short-term additional bins for specific materials
- + Determining what opportunities exist on-site, for innovative approaches to waste collection, sorting and recycling.



#### BEST PRACTICE TIP

Where space is tight, provide short-term recycling bins for work involving specific materials, such as plasterboard or concrete.



## 3.2 Get staff engagement

Worker support and engagement is integral to the success of a waste management plan. Construction workers frequently move between construction sites, spending time on sites that have recycling practices and those that don't. Establishing consistent site practices in an inconsistent industry is an issue for projects aiming for best practice outcomes.

Commitment to waste recycling starts with senior management and is implemented on-site.

It can be challenging to motivate workers to change their behaviour. To engage workers in waste wise practices:

- + Have workers participate in a site induction, which includes information on the environmental objectives of the project, and the waste management practices required of workers
- + Require workers to sign a formal agreement to abide by waste sorting requirements
- + Communicate the monthly performance outcomes against the project targets to workers via signage, workplace meetings and celebratory functions
- + Have a dedicated person checking bins for cross contamination
- + Introduce incentives for workers and sub-contractors who achieve or exceed recycling targets, or exhibit creativity and innovation in waste minimisation
- + Share the rewards of recycling with the workers by using financial savings for staff events

## 3.3 Demolish or deconstruct?

The approach to demolition of a building determines how effectively an individual material can be re-used or recycled. In theory, a systematic deconstructive approach to demolition provides the greatest opportunity to remove materials so they can be either re-used without refining or recycled as a base material. However, the feasibility of such an approach to demolition depends on factors, such as the age of the building, the type of construction and building access. For example, a systematic deconstructive approach may be more cost effective in a newer low-rise building, than in an older high-rise building.

Where possible the approach to demolition should include the following:

- + Develop a list of potential materials, which can be harvested from the building. (Use Sustainability Victoria's online recycling services database to identify companies that will take demolished material.) [www.sustainability.vic.gov.au](http://www.sustainability.vic.gov.au).
- + Use manual labour, where necessary, to effectively remove materials from buildings
- + Prioritise deconstruction of materials that can be re-used or recycled without refining
- + As a minimum, remove non-structural components for re-use or on-sale



### BEST PRACTICE TIPS

Establish rewards for site workers linked to recycling outcomes and cost savings.

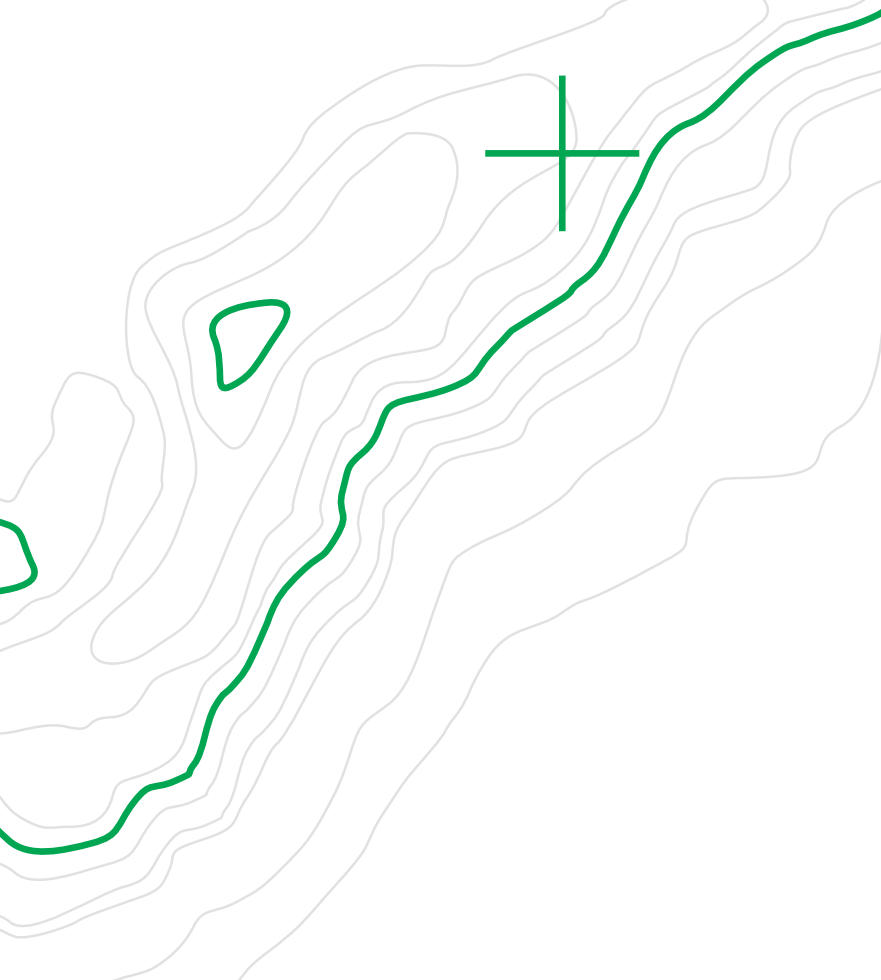
Use manual labour where necessary to effectively remove materials that can be re-used or recycled without refining.



### MELBOURNE CASE STUDIES

#### DECONSTRUCTING THE VALUE

*In 500 Collins Street, there was little material that was appropriate for re-use, so a more conventional demolition was applied. However, in a more recent refurbishment project in Canberra undertaken by the Kador Group, owners of 500 Collins Street, significant material was recovered because the building was much newer than the 30-year old 500 Collins Street.*



The potential to reclaim value through recycling is enhanced if waste can be sorted prior to leaving site. While there may be site constraints on some sites, there are also innovative solutions to sorting that can arise from limited space.



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## MELBOURNE CASE STUDY

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### THINK OUTSIDE THE SQUARE

*Despite its CBD location, construction company Schiavello applied lateral thinking to sort waste on-site. Instead of using bins, waste materials were sorted into neat stockpiles. When a pile reached an economic quantity for transport; the waste contractor collected it and delivered it to the National Recycling Group's depot.*

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### APPLY A STAGED PENALTY SYSTEM

*At the MCC, an intermediate pre-penalty step has been applied several times, which has helped drive recycling habits from employees. This intermediate step is the Non-Conformance Report (NCR) served on sub-contractors whose employees have been found mixing up waste. A sub-contractor who receives an NCR is required to sort the mixed-up bin on-the-spot, before the bins are transferred to the main recycling compound. So far, four NCRs have been issued and according to the Brookfield Multiplex site manager, one sub-contractor who initially ignored the sorting requirement repeatedly, is now the 'best recycler' among the on-site sub-contractors."*

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## 3.4 Sorting waste

To facilitate on-site sorting and minimise mixing of waste consider the following:

- + Negotiate with the waste contractor a reduced fee for separated waste
- + Establish a dedicated recycling area where recycling and waste contractors can efficiently remove the material from site
- + Locate smaller dedicated bins conveniently throughout the site, so workers can sort as they work, then remove these bins to the recycling area, where the waste is dumped into larger bins
- + Colour code bins to assist the contractors to easily locate the appropriate bin for the material they are working with
- + Establish a system where sub-contractors label their own bin at collection points throughout the site. This highlights individual responsibility for sorting and removing waste to the recycling area.

To facilitate off site re-use and recycling of materials, sorting into the following categories is recommended:

- + Concrete
- + Metals, including steel and copper wires
- + Timber
- + Cardboard
- + Plastics
- + Putrescible.



## 3.5 Clarify arrangements with waste contractor

A conventional approach to waste disposal involves a contractor hiring a mixed waste bin. This is then hauled away for disposal. A best practice approach may involve four individual bins at a central collection area that are organised and uncluttered to facilitate efficient vehicle access.

Recycling waste contractors will reject waste that is mixed, or has been contaminated by putrescible waste, such as food waste. An audit of waste bins prior to pick up, avoids potential rejection of a bin due to contamination.

The cost of transporting waste is a major influence on the cost of disposal. To maximise benefits from recycling, clarify arrangements with waste contractors. Consider requiring them to identify in their tenders any reduced fees or rebates available for recyclable waste, such as cardboard or steel.

Many waste contractors now have mobile waste crushers, which can crush various waste materials on site, including concrete, timber, brick and steel. By crushing waste on site, the volume of waste is reduced, which improves transportation efficiency. However, there is also the opportunity to deliver the crushed waste directly to the point of re-use, cutting out the transportation to and from a recycling facility to process.



### BEST PRACTICE TIPS

Establish a dedicated recycling area with colour coded bins for organised waste stream separation.

Require waste contractors to identify in tenders any reduced fees or rebates available for recycling waste.



### MELBOURNE CASE STUDIES

#### EASY IDENTIFICATION OF WASTE STREAMS

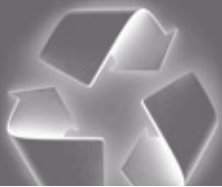
*The sorting procedure at the MCC involved sub-contractors stenciling their names to the appropriate bins, and when a bin is full, they are collected and taken into the recycling compound where they are again dumped into larger, colour-coded bins.*

*A Brookfield Multiplex analysis of waste movement and recycling during a three month period in 2006 has delivered an estimated \$8,000 in net gain for the MCC project, generated from transport and product rebates, plus savings earned from not sending material to landfill.*

# 4.0

## Reporting procedures

It is important to keep track of the amount of waste being produced, the quantity of material being re-used on site and the quantity of materials being diverted to recycling facilities.



### BEST PRACTICE TIP

Keep records of waste diverted from landfill and link contractual payments to achieving recycling targets

Primary contractors should require waste companies to provide monthly reporting on recycling, which would include the following:

- + Type and volume of waste materials that has left the site
- + Volume of waste recycled
- + Volume of waste that goes to landfill
- + Value of any rebates as an outcome of recycling.

Part of the reporting process involves an audit of waste management contractors. This can be undertaken by a Master Builders Association of Victoria representative. However the site environmental manager, should also periodically visit recycling facilities to view the processes and progress.



Sample recycling report from Best Practice Waste Reduction Guidelines for the Construction and Demolition Industry, 2000, Commonwealth Department of Environment and Heritage.

**ORGANISATIONAL/PROJECT TEMPLATE:**

Monthly environmental/waste reports are necessary to aggregate performance information and determine areas needing improvement. This monthly waste template and similar monthly reports for other environmental issues should be completed and compared with company policies and targets.

PROJECT MONITORING

**WASTE REDUCTION/RESOURCES RECOVERY: MONTHLY REPORT**

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_

Month: \_\_\_\_\_ Date: \_\_\_\_\_ Prepared: \_\_\_\_\_

Specify measure..... Either volume (cubic metres) or weight (kilograms)

MATERIAL	RESUED		RECYCLED		DUMPED		TOTALS	
	Measure	%	Measure	%	Measure	%	Measure	%
Concrete Bricks								
Timber								
Tiles								
Steel								
Other Metals								
Glass								
Plastics								
Paper/Cardboard								
Soil								
Other								

Template 9: Monthly Waste Reduction Report

Waste Recycle Report from Recycling Practices in Major Construction Sites in Melbourne report, 2007, Business Outlook Evaluation.

**WASTE RECYCLING REPORT**

Hansen Yuncken B1 South March 07

Material	Total quantity generated	Total quantity generated	Total recycled	Total disposed of	Method & location of disposal
Bricks and roof tiles		Metre3	tonnes	tonnes	
Virgin Excavated Natural Material		Metre3	tonnes	tonnes	
Concrete	26.00	Metre3	39.00 tonnes	39.00 tonnes	39.00 tonnes
Asphalt		Metre3	tonnes	tonnes	tonnes
Vegetation Waste		Metre3	tonnes	tonnes	tonnes
Timber	58.00	Metre3	17.40 tonnes	17.40 tonnes	17.40 tonnes
Fill (Demo and Inert)	10.00	Metre3	16.00 tonnes	16.00 tonnes	16.00 tonnes
Glass		Metre3	tonnes	tonnes	tonnes
Plasterboard		Metre3	tonnes	tonnes	tonnes
Plastic	37.00	Metre3	6.40 tonnes	6.40 tonnes	6.40 tonnes
Metal	38.00	Metre3	34.20 tonnes	34.20 tonnes	34.20 tonnes
Cardboard	49.00	Metre3	4.90 tonnes	4.90 tonnes	4.90 tonnes
Polystyrene		Metre3	tonnes	tonnes	tonnes
Insulation		Metre3	tonnes	tonnes	tonnes
Mixed Waste	18.00	Metre3	5.40 tonnes	5.40 tonnes	5.40 tonnes
<b>Total</b>	<b>236.00</b>	<b>Metre3</b>	<b>123.30 tonnes</b>	<b>117.90 tonnes</b>	<b>123.30 tonnes</b>
Recycle %	95.62%				



**MELBOURNE CASE STUDY**

**THE IMPORTANCE OF MEASURING RECYCLING OUTCOMES**

*At 55 St Andrews Place each subcontractor was required to submit a certified monthly report on the amount of materials recycled and re-used. Periodic contractual payments are made only if the sub-contractors achieved the recycling target.*

# 5.0

## Pushing the boundaries

Achieving high levels of construction and demolition waste recycling is feasible within current industry practices. There is no reason why you cannot be innovative and push the boundaries.

Each site will have individual constraints unique to the project. Project managers and contractors should aim to actively involve site supervisors, sub-contractors, waste contractors, and workers in seeking ways to minimise waste.

**Capture the lessons of what does and does not work and remember the three R's – Reduce Re-use Recycle.**



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### BEST PRACTICE TIP

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Engage workers through regular workplace meetings

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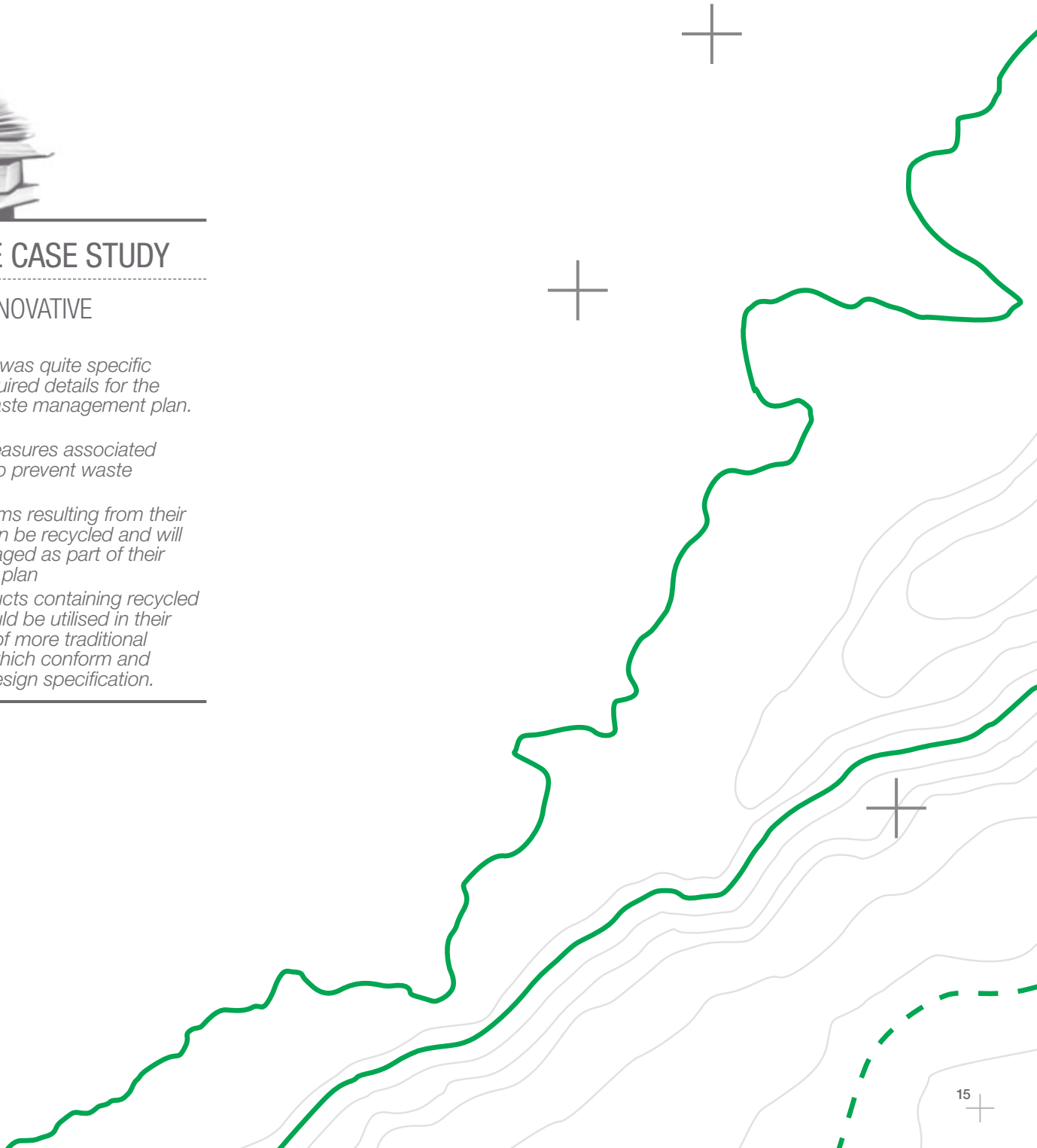
## MELBOURNE CASE STUDY

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### ENCOURAGE INNOVATIVE APPROACHES

*Bovis Lend Lease was quite specific in some of the required details for the subcontractors waste management plan. These included:*

- + *two practical measures associated with their work to prevent waste entering the site*
  - + *two waste streams resulting from their works, which can be recycled and will be actively managed as part of their waste reduction plan*
  - + *alternative products containing recycled material that could be utilised in their works, in place of more traditional materials, and which conform and meet with the design specification.*
- 



## Further information and resources

*Guide to the use of Recycled Concrete and Masonry Material* – Standards Australia (HB155-2002) Available for purchase from <http://www.saiglobal.com/shop/>

*Best Practice Waste Reduction Guidelines for the Construction and Demolition Industry*, 2000, Commonwealth Department of Environment and Heritage

*WasteWise Construction Program – Handbook Techniques for reducing construction waste*, Department of the Environment, Water, Heritage and the Arts. Available from <http://www.environment.gov.au/settlements/industry/construction/wastewise/handbook/index.html>

*Construction Waste Minimisation Plan*, Ecorecycle. Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*Demolition Waste Minimisation Plan*, Ecorecycle. Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*Guidelines for Preparing Waste Reduction Strategy for Construction*, Ecorecycle. Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*Model Contract Clauses*. Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*Draft Industry Standard For Recycled Construction & Demolition Materials*, 2005, Worksafe Victoria Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*The Resource Efficient Builder*, 2004, MBA and Ecorecycle. Available from Sustainability Victoria website <http://www.sustainability.vic.gov.au/www/html/1940-how-to-minimise-construction-demolition-waste.asp>

*onSITE* – website dedicated to construction and demolition waste minimisation – <http://onsite.rmit.edu.au/>

*Online waste exchange database*  
<http://www.wasteexchange.net.au/>

*Buy Recycled Business Alliance*  
<http://www.brba.com.au/>

*Sustainability Victoria online guide to recycling services*. Available from <http://www.sustainability.vic.gov.au/www/html/1676-recycling-services-in-victoria.asp>

*For tips on how to make your business more resource smart, visit –*  
[www.resourcesmart.vic.gov.au](http://www.resourcesmart.vic.gov.au)

