

Summary: Intervention & Options

Department /Agency: Environment Agency	Title: Impact Assessment of a Quality Protocol for the Production of Cullet from Waste Flat Glass	
Stage: Consultation	Version: 2	Date: 23 June 2006
Related Publications: Quality Protocol; Technical Report; Risk Assessment.		

Available to view or download at:

<http://www.environment-agency.gov.uk>

Contact for enquiries: Suzanne Laidlaw

Telephone: 01179156233

What is the problem under consideration? Why is government intervention necessary?

Uncertainty over what constitutes 'waste' has inhibited the development and marketing of materials produced from waste, including flat glass, which could be used beneficially without damaging human health and the environment. This has led to uncertainty and concerns over quality among buyers of flat glass cullet especially amongst flat glass manufacturers, who require very high standards of material. There is also some lack of awareness of the techniques of collecting waste flat glass to minimise contamination. Both supply of and demand for flat glass cullet is being constrained.

What are the policy objectives and the intended effects?

The objective is to introduce a Quality Protocol that sets the point of full recovery as being when flat glass cullet leaves the flat glass cullet producer's site. It is intended that this will help to convince buyers that compliant flat glass cullet is a consistent and excellent product; encourage an increase in the amount of off-cuts collected by window manufacturers and supplied to flat glass manufacturers; lead to less rejection of these off-cuts by flat glass manufacturers; increase the supply of quality assured cullet from the demolition sector.

What policy options have been considered? Please justify any preferred option.

Two options are considered in this assessment:

1. Business-as-usual, or 'do nothing'
2. Introduce a Quality Protocol for cullet produced from waste flat glass.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

18 months after implementation

Ministerial Sign-off For Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:

.....Date:

Summary: Analysis & Evidence

Policy Option: 2	Description: Introduce Quality Protocol for the Production of Cullet from Waste Flat Glass
-------------------------	---

COSTS	ANNUAL COSTS	Description and scale of key monetised costs by 'main affected groups' Reduction in landfill disposal costs for producers of waste glass (-£1.38 m); reduced energy costs for flat glass manufacturers from using flat glass cullet as opposed to raw materials (-£0.11 m)				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 2px;">One-off (Transition)</td> <td style="width: 40%; text-align: center; padding: 2px;">Yrs</td> </tr> <tr> <td style="padding: 2px;">£ 0</td> <td></td> </tr> </table>		One-off (Transition)	Yrs	£ 0	
	One-off (Transition)		Yrs			
	£ 0					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 2px;">Average Annual Cost (excluding one-off)</td> <td style="padding: 2px;">£ -189 k</td> </tr> </table>	Average Annual Cost (excluding one-off)	£ -189 k				
Average Annual Cost (excluding one-off)	£ -189 k					
Total Cost (PV)		£ -1.49 m				
<p>Other key non-monetised costs by 'main affected groups' Fall in waste regulation compliance cost, though they are likely to be very minimal; increase in supply costs for processors; there are expected to be costs of complying with the protocol; fall in profits for producers of virgin substitute materials.</p>						

BENEFITS	ANNUAL BENEFITS	Description and scale of key monetised benefits by 'main affected groups' Increase in the value of sales for glass recyclers from processing an extra 10,000 tonnes of waste glass by 2017.				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 2px;">One-off</td> <td style="width: 40%; text-align: center; padding: 2px;">Yrs</td> </tr> <tr> <td style="padding: 2px;">£ 0</td> <td></td> </tr> </table>		One-off	Yrs	£ 0	
	One-off		Yrs			
	£ 0					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 2px;">Average Annual Benefit (excluding one-off)</td> <td style="padding: 2px;">£ 275 k</td> </tr> </table>	Average Annual Benefit (excluding one-off)	£ 275 k				
Average Annual Benefit (excluding one-off)	£ 275 k					
Total Benefit (PV)		£ 2.2 m				
<p>Other key non-monetised benefits by 'main affected groups' Improvement in the quality of collected waste glass as a result of the QP.</p>						

Key Assumptions/Sensitivities/Risks The most important assumption reflects the impact of the QP on demand and it's timing. The best estimate is that the QP increases demand by 10,000 tonnes per annum. the increase is spread evenly over the assessment period. The upper estimate assesses the impact if the increase happens more quickly; the lower estimate applies if a lower price for glass cullet is received by recyclers.

Price Base Year 2007	Time Period Years 10	Net Benefit Range (NPV) £ 1.71 m - £4.81 m	NET BENEFIT (NPV Best estimate) £ 3.66 m
-------------------------	-------------------------	--	--

What is the geographic coverage of the policy/option?	England & Wales				
On what date will the policy be implemented?	September 2008				
Which organisation(s) will enforce the policy?	Environment Agency				
What is the total annual cost of enforcement for these organisations?	£ N/A				
Does enforcement comply with Hampton principles?	Yes				
Will implementation go beyond minimum EU requirements?	N/A				
What is the value of the proposed offsetting measure per year?	£ N/A				
What is the value of changes in greenhouse gas emissions?	£ 253k reduction				
Will the proposal have a significant impact on competition?	No				
Annual cost (£-£) per organisation (excluding one-off)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 2px;">Micro Unknown</td> <td style="width: 25%; padding: 2px;">Small Unknown</td> <td style="width: 25%; padding: 2px;">Medium Unknown</td> <td style="width: 25%; padding: 2px;">Large Unknown</td> </tr> </table>	Micro Unknown	Small Unknown	Medium Unknown	Large Unknown
Micro Unknown	Small Unknown	Medium Unknown	Large Unknown		
Are any of these organisations exempt?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 2px;">No</td> <td style="width: 25%; padding: 2px;">No</td> <td style="width: 25%; padding: 2px;">N/A</td> <td style="width: 25%; padding: 2px;">N/A</td> </tr> </table>	No	No	N/A	N/A
No	No	N/A	N/A		

Impact on Admin Burdens Baseline (2005 Prices)		(Increase - Decrease)
Increase of £ 0	Decrease of £ 0	Net Impact £ 0

Key: Annual costs and benefits: Constant Prices (Net) Present Value

Evidence Base (for summary sheets)

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

1. Introduction

- 1.1 This Financial Impact Assessment (FIA) examines the potential impacts on industry of the introduction of the Quality Protocol for the production of cullet from waste flat glass.
- 1.2 The FIA does not investigate the costs and benefits for the regulatory agencies. The Quality Protocol is unlikely to deliver significant benefits or costs for the regulatory agencies. While the Environment Agency will benefit from stepping back from regulation this benefit needs to be set against the fall in income from reduced receipts from license charges etc. Charges for waste management licences etc are set at a level to recover processing costs.
- 1.3 A Technical Advisory Group (TAG) made up of different industry representatives supported the development of this FIA. Although the TAG provided evidence and expert opinion which aided the development of this FIA, they may not all agree with every conclusion of the analysis. See Annex B for a list of the TAG members.
- 1.4 This document focuses on the costs and benefits of a Quality Protocol accruing to those working in the recycling and reprocessing sector, and, as far as possible, the users of reprocessed materials and their substitutes. As such, the effects on producers of substitute products landfill operators are not considered.
- 1.5 Appendix B Quality Protocol for Processed Cullet from Waste Flat Glass states that the protocol will apply to Bricks and Ceramics, Abrasives, and Flat Glass. This document focuses only on Flat Glass, primarily because the other two consume much smaller quantities of recycled flat glass, though also due to data availability.

2. Rationale for Government intervention

- 2.1 Uncertainty over what constitutes 'waste' for purposes of the EU Waste Framework Directive 2006 (as amended) has inhibited the development and marketing of materials produced from waste which could be used beneficially without damaging human health and the environment.
- 2.2 There is uncertainty and concerns over quality among buyers of flat glass cullet especially amongst flat glass manufacturers, who require very high standards of material. There is also some lack of awareness of the techniques of collecting waste flat glass to minimise contamination. Both supply of and demand for flat glass cullet is being constrained. By increasing the quality and consistency of flat glass cullet, and providing assurance of its quality, the quantity of flat glass cullet sold in end markets should increase¹.

¹ Discussions with the Technical Advisory Group (TAG).

- 2.3 At present the Environment Agency holds the view that flat glass cullet is waste until it is reincorporated into its final use product/application (Reference 2). This contrasts with many in the industry who consider flat glass as a non waste. Some in industry maybe uncertain of where the point of full recovery actually lies. Annex B outlines of the Environment Agency's current regulatory position.

3. The market for recycled flat glass

3.1 Waste flat glass arisings

3.1.1 There are no published data available concerning arisings of waste flat glass in the UK. Accurate estimates of arisings are difficult to make because (Reference 4):

- there are data relating to the area (in square metres) of flat glass produced, exported and imported but no tonnage information;
- even if data on the tonnage were available, current production does not relate to current waste arisings as flat glass may be in use for several decades before being scrapped and entering the waste stream.

3.1.2 The theoretical **potential** for waste flat glass arisings in 2003 from post-consumer applications were estimated at (reference 4):

- 400,000–500,000 tonnes per year from architectural sources (construction and demolition of buildings. This includes window refurbishment/replacement);
- approximately 80,000 tonnes per year from motor vehicles (ELVs and car windscreen replacement).

3.1.3 Added to this is the process scrap of 190,000 tonnes per year generated by companies involved with the manufacture of glazing for both buildings and cars (breakages, rejects, waste from off-cuts, etc.). Process scrap forms the main input to recycled flat glass.

3.1.4 This gives a total of 670,000–770,000 tonnes per year (Reference 4).

Process scrap in flat glass manufacturing

3.1.5 Flat glass manufacturers produce large sheets which they supply to car and building glazing manufacturers. In addition to the inevitable breakages and reject material, there is inherent wastage from off-cuts during flat glass manufacturing. This waste remains in the factory and is generally 100 per cent recycled. If the cullet is contaminated and unsuitable for remelting within flat glass production, it is segregated and collected by others as a feedstock for fibre glass or glass container manufacture (Reference 4).

Window manufacturers

3.1.6 Flat glass manufacturers also use flat glass cullet from external sources. The majority of external cullet used is sourced from window manufacturers. Manufacturing off-cuts and rejects are produced during the production of window units. As flat glass manufacturers require the highest quality cullet, it is important that contamination is kept to a minimum. Sites usually collect two separate streams of cullet – mixed and clear. The clear stream originates from the manufacturing off-cuts and the mixed stream from reject sealed units.

Domestic window waste

3.1.7 In some cases, post-consumer windows are recovered from the site by the window fitter and returned to base. Here the glass or sealed unit is removed from the frame and collected in a dedicated skip. This practice is subsidised by the collection of PVC-U frames for the Recovinyl scheme.²

Car windscreen manufacturers

3.1.8 The two largest car windscreen manufacturers collect their off-cuts and return them to the flat glass manufacturers for possible recycling. Some of the off-cuts are rejected by flat glass manufacturers because of contamination; they are sent to container and fibre glass manufacturers for possible recycling.

Replacement windscreen companies

3.1.9 Replacement windscreen companies collect old windscreens in dedicated skips for recycling.

End-of-life vehicles

3.1.10 Around 2 million end-of-life vehicles (ELVs) arise in the UK each year. On average, each vehicle contains approximately 3 per cent glass by weight (Reference 2).

3.1.11 Two types of glass are used by the automotive industry – toughened and laminated.

- Toughened glass is easy to remove from vehicles after shattering, but it needs to be recovered carefully to avoid contamination.
- Laminated glass does not shatter and has to be removed manually, which is time-consuming. Laminated glass requires further processing, which is estimated to cost anything from £42 to £210 per tonne (Reference 5).

3.1.12 The value of glass in each vehicle is estimated to be £0.48 (Reference 6), making it uneconomical to recover the glass using current methods. In the UK, the majority of ELV glass is sent to landfill and only a small proportion is recycled.

Construction and demolition waste

3.1.13 Around 594,000 tonnes of flat glass waste are generated during demolition activities in the UK each year (Reference 2). Flat glass manufacturers obtain only a tiny amount of flat glass cullet from this source because it is mostly too contaminated. A small amount is sourced from supervised deconstruction (quantity unknown) but, in general, it is only economical to process it for use in aggregates. The value of the flat glass plus the avoided disposal costs are not sufficient to pay for the additional costs of sorting and collection.

3.1.14 The introduction of mandatory Site Waste Management Plans in England and Wales for all construction projects over £250,000 in April 2008 is likely to result in an increase in the amount of flat glass recycled from the construction and demolition sector (Reference 2).

3.2 Recycling and key markets for recovered flat glass

² See <http://www.recovinyl.com/>

3.2.1 Figure 1 shows the estimated quantities of flat glass arisings, disposal and recovery in the UK together with the links between source and end use. Table 1 compares waste arisings, collection and recycling levels for flat glass and container glass in 2002.

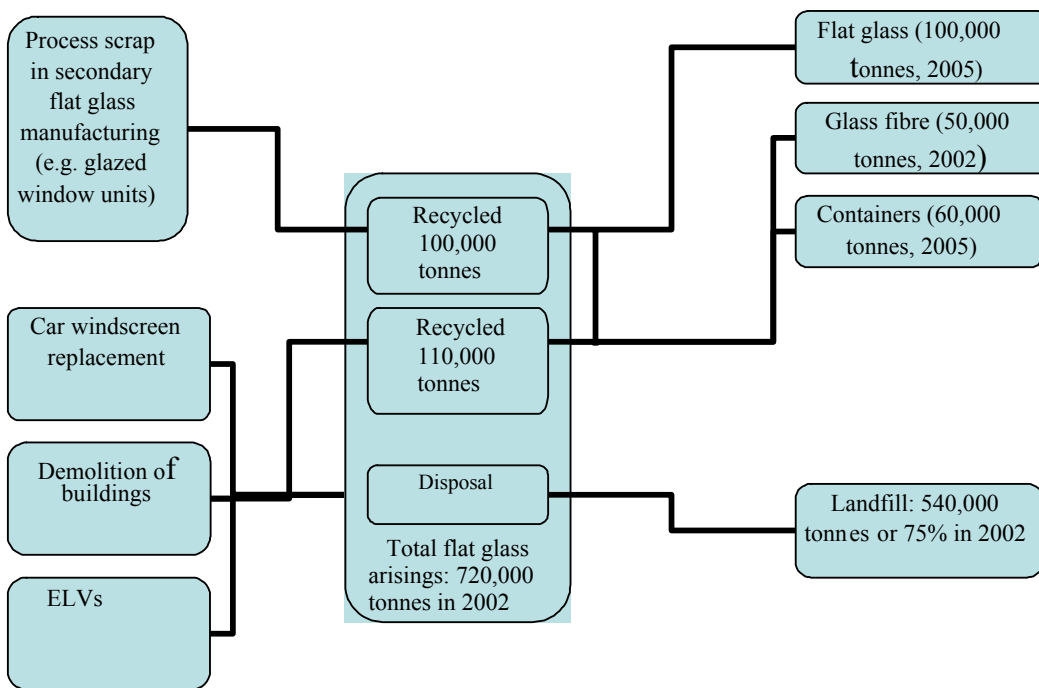
Table 1 Estimated waste glass arisings and recycling by type, 2002

Glass type	Arisings (tonnes)	Collection (tonnes)	Recycling rate
Container	2,200,000	747,000	34%
Flat	720,000	180,000	25%

Source: WRAP 2004 (Reference 4)

3.2.2 It is estimated that around 180,000 tonnes of flat glass were recycled in 2002, representing a 25 per cent recycling rate based on the WRAP estimated arisings (Table 1). WRAP also found that a high proportion of the recycled glass is process scrap from secondary processing companies rather than from recovered post-use glass (Reference 4).

Figure 1 Estimated flat glass waste arisings, disposal and recovery in the UK in 2005



Source: Data from WRAP 2004 (Reference 4) and WRAP 2007 (Reference 7)

Note 1: The tonnes recycled plus the tonnes landfilled don't equal the total for arisings because the figures for recycled includes totals for 2005. the total for arisings is for 2002.

3.2.3 Recycled flat glass was used as feedstock in the manufacture of:

- glass containers (60,000 tonnes in 2005 – Reference 7);
- flat glass (100,000 tonnes in 2005 – Reference 7);
- insulation fibre glass (50,000 tonnes in 2002 – Reference 4).

3.2.4 Assuming the amount of recycled flat glass used in fibre glass manufacture was the same in 2005 as in 2002 (i.e. 50,000 tonnes), then it is estimated that the total amount

recycled in 2005 was 210,000 tonnes. The evidence collected within the current consultation process (see Section 4.3) supports these figures.

3.2.5 The vast majority of the glass recycled in the UK is container glass. Recycling of this type of glass increased from 34 per cent in 2002 to 50 per cent in 2005 (Reference 7).

Flat glass manufacturing

3.2.6 There are three UK flat glass manufacturers in the UK producing approximately 750,000 tonnes of flat glass each year (Reference 2).

3.2.7 The consultation responses and research (Reference 2) suggest that flat glass manufacturers use between 0 per cent and 30 per cent recycled flat glass cullet in their production process. Of this, the proportion of externally sourced cullet varies from as little as 10 per cent to as much as 60 per cent. Contamination is the main constraint on increases in the percentage of cullet sourced externally.

3.2.8 The three flat glass manufacturers have different policies with regards to the use of external cullet. These are summarised below:

- No external cullet is used for flat glass manufacture.
- External cullet used is from window manufacturers in the form of off-cuts. It is processed for use on-site.
- External cullet used is supplied by cullet processors.

3.2.9 Externally sourced cullet comes from known sources such as a manufacturer's own customers. Manufacturers will not, in most cases, consider using glass from other source such as merchants due to the risk of contamination.

3.2.10 One manufacturer expressed some optimism about the use of flat glass cullet in float production and has recently increased the target quantities to be used in 2007 by almost 30 per cent because of the advantages this offers. These advantages include:

- cost savings compared with using only virgin raw materials;
- energy savings (over raw material use), in particular helping to meet the manufacturer's Climate Change Agreement (CCA) targets;
- the resulting increase in furnace life;
- benefits relating to marketing and sales of increasing the recycled content of the final product.

3.2.11 For flat glass manufacturers, the choice between flat glass and virgin raw materials is based on price. Price is taken as a function of raw materials, energy savings, CCA commitments, furnace life, carbon trading on EU Emissions Trading Scheme II (EU ETS II), etc.

3.2.12 If more flat glass of sufficient quality and at a competitive price could be supplied, then it would certainly be used.³

3.2.13 The flat glass manufacturers use some of the clear off-cuts from window and car windscreen manufacturers. The flat glass from this source represents the premium quality material in the market for cullet. Some is rejected and, along with mixed cullet

³ View of the TAG.

derived from rejected sealed units, is offered to container glass and fibre glass manufacturers.

Fibre glass manufacturing

3.2.14 There are three main glass fibre manufacturers in the UK. Typically glass fibre contains up to 25 per cent recycled flat glass cullet.

3.2.15 The total use of cullet in fibre glass manufacturing increased by 50 per cent over the previous two years to around 150,000 tonnes in 2005 (Reference 8). However, the majority of this increase was container glass. Earlier quality concerns over the use of container glass have been overcome and fibre glass manufacturers have registered as reprocessors under the Packaging Waste Regulations to gain revenue from Packaging Recovery Notes (PRNs).⁴

3.2.16 It is estimated that up to 50,000 tonnes of the total cullet used in fibre glass manufacturing in UK each year is flat glass cullet (Reference 2). Fibre glass manufacturers use mixed colour container glass cullet because they do not want to pay the higher price for clear cullet. There is an excess of mixed colour waste container glass in the UK primarily due to significant imports of green and brown wine bottles. The majority of container glass production in the UK is of clear glass and so requires clear glass cullet. Thus there is plenty of mixed colour container glass cullet available for fibre glass manufacturers.

3.2.17 Technically, flat glass cullet has two main advantages over container cullet for fibre glass manufacture (Reference 2):

- It provides a cheap source of magnesium oxide (MgO), which is important for glass fibre manufacture.
- It has less pyro-ceramic contamination. Fragments of pyro-ceramic melt at a higher temperature than glass; hence they do not melt in the furnace and block the small holes in the spinners which form the fibres.

3.2.18 The consultation responses suggest that, technically, the optimum is to mix quantities of flat and container glass within the glass fibre/ wool production process. Market prices drive the exact quantities used. The availability of PRNs for container glass often makes it economically favourable.

3.2.19 Of the fibre glass manufacturers consulted, one company stated that the value of PRNs had resulted in a recent fall in the percentage of flat glass used in its process.

Container glass manufacturing

3.2.20 The six container glass manufacturers in the UK operate 30 furnaces across 13 sites (Reference 2). Container glass manufacturers can use both flat and container glass cullet.

3.2.21 Flat glass cullet is generally used for flint glass and sometimes amber. The batch recipe requires adjustment to accommodate its high iron content, which affects the colour quality. Flat glass cullet is only used to produce lower specification products such as milk bottles.

⁴ Communication with Andy Dawe, WRAP

3.2.22 Historically only one manufacturer has used flat glass cullet to produce container glass. Table 2 shows the wide variation in the use of flat glass cullet over the past four years. The consultation responses suggest that this is due to a number of reasons including:

- the availability of flint and amber container cullet;
- the fact that flat glass has a high iron content and is not suitable for some processes.

Table 2 Flat glass cullet used in container glass manufacture

Year	Amount (tonnes/year)
2003	110,000
2004	100,000
2005	55,000
2006	80,000

Source: Glass Technology Services 2007 (Reference 2)

3.2.23 Price information about cullet is regarded as confidential, but the consultation suggests that the price of flat glass cullet is around £25–35 per tonne. It was suggested that container cullet costs around £40–42 per tonne. But if the value of the PRNs is taken into account, the cost of container glass falls significantly. (The price of glass PRNs was £22–27 for April 2007 and £25–27 for May 2007.⁵) So despite a technical preference for flat glass cullet over container glass, the competitive price of container glass cullet means that flat glass cullet is not used as widely.

3.2.24 There is a shortage of clear container glass cullet and an excess of coloured container glass cullet in the UK. Clear container furnaces could take at least another 300,000 tonnes per year if the quality was high enough.⁶ If more flat glass cullet could be supplied to the market, then it would certainly be used. The shortage of clear container glass cullet does not currently translate into higher prices sufficient to drive the supply of flat glass cullet.

3.3 *Alternative markets*

Aggregate

3.3.1 Flat glass cullet rejected by flat glass manufacturers, container glass manufacturers and fibre glass manufacturers can be used as an aggregate. Currently 23 per cent of UK aggregates production is from recycled sources, though the exact contribution of glass to this figure is unknown (Reference 9). It has been estimated that in 2005 274,000 tonnes on container glass cullet was used in this and other alternative markets.⁷

3.3.2 Glass can be used as either an unbound aggregate or combined with bitumen. Most glass cullet used is container glass due to its PRN advantage.

Glass beads

3.3.3 Two companies currently manufacture glass beads in the UK. Melting 100 per cent clear glass cullet produces glass beads. Container cullet is the preferred feedstock due to the associated PRN advantage, but some flat glass cullet is used due to the shortage of

⁵ <http://www.letsrecycle.com/prices/pmPrices.jsp>

⁶ Communication with Oakdene Hollins Ltd

⁷ Andy Dawe WRAP

quality clear container cullet. The amount of glass cullet used could be around 25,000 tonnes per year.⁸

Foam glass

3.3.4 No flat glass is currently used in foam glass manufacture in the UK, although this application is expected to develop.

Abrasives

3.3.5 Several companies currently manufacture abrasives from recycled glass. These are usually produced using container glass rather than flat glass, although flat glass is also suitable.

Bricks and ceramics

3.3.6 Only a small amount of flat glass has been used in trials. Flat glass cullet is not currently used on a commercial scale and most of the work carried out has focused on container glass.

Water filtration

3.3.7 A very small amount of flat glass has been used for water filtration media on a trial basis. Container glass is mainly used.

Sports turf

3.3.8 Trials by WRAP have shown that cullet can be used in sports turf applications (Reference 10). This work has focussed on container glass, although flat glass should be equally suitable.

3.4 *Substitute materials*

3.4.1 Remelting cullet uses 25 per cent less energy than making glass from raw materials and each tonne of cullet saves 1.2 tonnes of raw materials from being extracted (Reference 7). Cullet can also be purchased at a lower price than virgin material. However, there are also collection, transport and processing costs to take into account and, in some cases, these can make use of virgin materials economically preferable.

3.5 *Barriers to increasing sales of flat glass in end markets*

3.5.1 A survey was conducted for WRAP on the main barriers to more collection, processing and segregation of flat glass (Reference 8). The barriers identified included:

- health and safety considerations;
- cost of collection;
- value of the material;
- level of contamination;
- quality of post-use flat glass available;
- need for education on the quality and levels of contamination of the product and how to reduce contamination;
- the waste classification.

⁸ Communication with the Technical Advisory Group

PRNs and container glass

- 3.5.2 A major constraint to the use of flat glass cullet in end markets is the relative attractiveness of container glass. Reprocessors using container glass cullet can sell PRNs whereas reprocessors using flat glass can not.
- 3.5.3 Evidence from industry indicates that, in the manufacture of fibre glass, container cullet is more economically attractive than flat glass (Reference 7). Although flat glass can be used in all the alternative markets for recycled container glass, the PRN advantage of using container glass makes it unlikely that use of flat glass will increase significantly in these sectors.

Contamination

- 3.5.4 Flat glass manufacturers require very high quality cullet. It is difficult to remove contaminants from post-consumer flat glass sufficiently for their needs. Of the 100,000 tonnes of flat glass cullet estimated to be reused by flat glass manufacturers in 2005, most of this was sourced from downstream processing plants rather than post-consumer glass (Reference 7).
- 3.5.5 The level of contamination in all sources other than window manufacturing off-cuts makes processing expensive. Glass manufacturers are reluctant to accept cullet from any other source as contamination has led to losses of 3–7 days production and costs £300,000–350,000 (Reference 11). Better awareness and education for those responsible for collection and segregation could reduce the level of contamination.

Value of flat glass

- 3.5.6 If more flat glass could be supplied at a competitive price, then it would certainly be used. One of the barriers to supplying more flat glass cullet is that the value of flat glass plus the avoided disposal costs to landfill is insufficient to pay for the additional costs of sorting and collection.⁹

Difficulty sourcing flat glass in sufficient quantity

- 3.5.7 One company consulted noted that they no longer use flat glass cullet as it is too difficult to source quality glass in sufficient quantities given its geographical location. This highlights the high cost of transport and collection of flat glass due to the dispersed nature of the sources.

4. Methodology and options

- 4.1 The options assessed within the financial impact assessment are:

- Option A – Business As Usual (BAU);
- Option B – introduce the Quality Protocol.

4.2 Option A – Business as Usual

- 4.2.1 This is the baseline. Under this option no Quality Protocol would be introduced.

- 4.2.2 There would continue to be uncertainty:

⁹ Communication with David Fitzsimmons (Oakdene and Hollins Ltd)

- over the point at which recycled flat glass cullet ceases to be waste;
- among some purchasers over the quality and consistency of the recycled flat glass cullet available.

4.2.3 Under this option, a significant increase in the collection and recycling of waste flat glass is unlikely unless regulatory drivers are introduced. Significant increases in flat glass recycling would entail recovery of glass from the construction and demolition sector. However, concerns over contamination levels would continue to be a barrier to recovery from this sector.

4.2.4 It is assumed that the quantities going into flat glass, fibre glass and container glass manufacturing increases by 2% a year in the baseline over the assessment period. Changing the assumed increasing recycling rate in the baseline will not change the results of the analysis.

4.3 *Option B – Introduce the Quality Protocol*

4.3.1 The proposal is to produce a voluntary Quality Protocol for the collection, production and use of flat glass cullet that is recognised by, and produced with, the support of industry. The Quality Protocol is a formalised quality control procedure and has three main purposes (Reference 1):

- to provide users with confidence that the processed cullet they purchase conforms to agreed quality standards comparable with equivalent materials of a non-waste origin;
- to protect the environment and human health by setting standards for the use of processed cullet derived from flat glass in market applications;
- to ease the regulatory burden by defining when waste flat glass ceases to be waste and no longer needs to be subject to regulatory control.

4.3.2 The Quality Protocol sets the point of full recovery as being when flat glass cullet (produced in line with approved specifications defined by the Quality Protocol) leaves the flat glass cullet producer's site. Companies downstream of that point will no longer be subject to the requirements of the waste regulatory regime or the risk of future requirements should elements of the regulatory regime be applied differently in the future. In general, flat glass cullet is classified as a waste¹⁰ and stops being waste when it is reincorporated into its final use (product/application) (Reference 2). See Annex C for more details of the current waste regulations relating to the use, transport and processing of flat glass cullet.

4.3.3 The end markets currently covered by the proposed Quality Protocol include: flat glass manufacturing; abrasives; sports turf; brick and ceramics.

4.3.4 The Quality Protocol should:

- help to convince buyers that compliant flat glass cullet is a consistent and excellent product;

¹⁰ Waste is any substance or object that the holder discards, intends to discard, or is required to discard. There have been a number of judgements by the European Court of Justice (ECJ). A summary of these judgements, which are legally binding, is available on the Defra website (<http://www.defra.gov.uk/environment/waste/topics/ecj-definition.pdf>). A dossier on key environmental judgements by the ECJ published by the European Commission in March 2004 is available on its website (http://www.europa.eu.int/comm/environment/law/cases_judgements.htm).

- encourage an increase in the amount of off-cuts collected by window manufacturers and supplied to flat glass manufacturers;
- lead to less rejection of these off-cuts by flat glass manufacturers;
- increase the supply of quality assured cullet from the demolition sector.

- 4.3.5 Any increase in the use of flat glass cullet by flat glass manufacturers as a result of the Quality Protocol is likely to be modest. It will take some time to convince them that the supply is consistent and of high enough quality for flat glass production.
- 4.3.6 Most recyclers are likely to comply with the Quality Protocol. Many will already be undertaking the quality control procedures required to comply with the Quality Protocol¹¹
- 4.3.7 It is uncertain whether the Quality Protocol would lead to an increase in the price of recycled flat glass cullet since both the supply of, and demand for, recycled flat glass cullet is likely to increase. The analysis assumes that the Quality Protocol has no effect on the price of flat glass cullet sold to flat, container and fibre glass manufacturers. For flat glass manufacturers, the choice between flat glass cullet of sufficient quality and virgin alternatives is driven by many factors (see Section 3.2.11). The price of flat glass cullet is a function of the price of substitute raw materials so it is assumed that price will not change.

Assumptions used in option B

- 4.3.8 The model illustrates what the benefits could be for different assumed increases in sales of flat glass cullet to flat glass manufacturers. The future is very uncertain. The analysis sets out what may happen.
- 4.3.9 The model uses a price of £50 per tonne¹² of flat glass cullet sold to flat glass manufacturers. It is assumed that there is no increase in price as a result of the Quality Protocol in real terms. Prices increase in line with inflation. These prices include the cost of transport to the manufacturers.
- 4.3.10 The lower rate of the landfill tax is applicable to glass and set at £2.5 per tonne in 2007/2008. It is assumed it will remain at this level in nominal terms up to 2017. In the analysis, the landfill tax is deflated using the HM Treasury GDP deflator forecasts up to 2011 and the Bank of England Target rate thereafter.
- 4.3.11 The average landfill gate fee is assumed to be £30 per tonne (Reference 15) and is assumed to stay constant in real terms.
- 4.3.12 VAT is applicable to both the landfill tax and gate fee and is included in this analysis.
- 4.3.13 The model assumes that in 2017 10,000 tonnes per year¹³ more flat glass is diverted from disposal to landfill than would be the case in the baseline and sold to flat glass manufacturers. The model assumes a gradual diversion in recycling rates between the baseline and option B.

4.4 Consultation

¹¹ Communication with Andy Dawe, WRAP

¹² E-mail 3rd Oct 2007 from Mark Pudner (Glass Technology Services Ltd)

¹³ E-mail (3rd Oct 2007) from Mark Pudner, Glass Technology Services Ltd. He contacted people in the GTS and an increase in cullet use by 10,000 tonnes a year is not unreasonable.

- 4.4.1 Initial consultation during the development of this FIA was confined mainly to the TAG. Details of the TAG members are highlighted in annex B. These members cover a cross section of stakeholders including:
- Industry representatives
 - Consultants
 - Environment Agency
 - WRAP
- 4.4.2 TAG meetings occurred at regular intervals throughout development of the Quality Protocol.
- 4.4.3 Near the beginning of the project a small consultation was conducted with a number of companies operating at different points within the supply chain for flat glass cullet. The aim was to improve the understanding of the possible impacts of the Quality Protocol.
- 4.4.4 Table 4 shows the number of each type of operator consulted and the number that responded.

Table 4 Operators contacted as part of the consultation

Type	Number contacted	Number responding
Container glass manufacturer	6	6
Fibre glass manufacturer	2	2
Flat glass manufacturer	3	2
Recycler/merchant	3	2
Other	3	1

4.5 Methodology

- 4.5.1 The method used to assess the financial impact of the Quality Protocol for flat glass cullet involved comparing option A (baseline) with option B.
- 4.5.2 The quantifiable benefits and costs of the Quality Protocol were calculated for each year over a 10 year period. They were then discounted at 3.5 per cent (following Green Book guidance; Reference 12) and summed to provide the total present value (PV) benefit or cost. A 10-year time horizon was chosen in line with recent Regulatory Impact Assessments (RIAs) by the Department for Environment, Food and Rural Affairs (Defra), with the financial year 2008/2009 used in year 1. The assessment period runs to 2017-18. All benefit and cost flows were assumed to stay constant in real terms, i.e. they rise in line with inflation. The analysis is in 2007 prices. In order to make a comparable assessment, landfill tax was deflated using Green Book Guidance.
- 4.5.3 For example, the additional total market value attributable to the Quality Protocol was calculated by subtracting the annual market value for option A from the annual market value for option B. This was repeated for each year over the 10-year assessment period. These additional market values were then discounted (using a 3.5 per cent discount rate) and summed to provide the increase in market value as a result of the Quality Protocol.
- 4.5.4 There is obviously a huge amount of uncertainty when predicting what may happen if the Quality Protocol is introduced. The analysis here attempts to give a picture of the potential benefits of the Quality Protocol.

5. Costs and benefits to industry of the quality protocol

- 5.1.1 This section sets out the costs and benefits of the Quality Protocol to industry. This includes both quantifiable and non-quantifiable elements.
- 5.1.2 Values for monetised costs are summarised in Table 5. Page two (Analysis and Evidence) also summarises these costs.
- 5.1.3 Note that cost decreases are equivalent to benefits. Following convention, these are listed and described under the cost section rather than benefits.
- 5.1.3 This assessment was completed using:
- available data sources;
 - information provided by the Technical Advisory Group for flat glass;
 - information gathered through the consultation with individual operators.
- 5.1.4 A simple model was developed to analyse the effects of a possible increase in the level of recycling of flat glass as a result of the Quality Protocol. See table 5. The estimates will vary depending on the assumed values of the input variables. Section 5.3 below examines the sensitivity of the results to variations in the values of the input variables.
- 5.1.5 In table 5 above doubling the assumed increase in recycling doubles the benefits. The model used is linear. No account is taken of possible economies of scale.
- 5.1.6 The analysis assumes that the uptake and impact of the Quality Protocol occurs gradually and linearly over the assessment period. This may be unrealistic and there may be a big uptake in the first couple of years and then the momentum tails off. If this did occur then the benefits would be greater than in tables 5 but not significantly. See the sensitivity analysis below.

Table 5 Estimated benefits for firms along the recycled flat glass supply chain of the Quality Protocol

	Net Present Value (10 years, 3.5% discount rate)	Average Value (constant prices)
Additional Market Value	£2,169,000	£275,000
Reduced Landfill Disposal Costs	£1,383,000 <i>(55,000 tonnes over 10 years)</i>	£175,000
Reduced energy costs	£112,000	£14,000
CO ₂ savings	£253,000 <i>(£240,000 - £266,000)</i>	£32,000 <i>(£31,000 - £34,000)</i>
	<i>(11,000 tonnes over 10 years)</i>	

Note 1: Assumes prices received by recyclers selling flat glass into the sector are £50/tonne flat glass manufacturing¹⁴. Price includes the transport costs to deliver to end users. Assumes prices stay constant over the assessment period in real terms. Added value derived from the increase in sales not price rises. Uses 2007 prices.

Note 2: Assumes carbon savings of 0.2 tonnes per tonne of flat glass cullet used instead of virgin materials.¹⁵

Note 3: Carbon savings (£) derived by applying the shadow price of carbon (social cost of carbon of £25.5 for 2008 in 2007 prices and increase by 2% a year. The range is calculated using a 5% increase or decrease in this price.

Note 4: Period of assessment is 2008 to 2017.

Note 5: Landfill tax is £2.5 per tonne in 2007/2008. The average gate fee used is £25 per tonne. Both are subject to VAT.

Note 6: 322 KWh gas energy saving from melting a tonne of cullet relative to raw materials. Applying 0.8pence per KWh gives a cost saving of £2.58 per tonne of cullet used. Source: Mark Pudner (Glass Technology Services Ltd E-mail 3rd Oct 2007).

5.2 *Benefits of the Quality Protocol*

Note 6: Although an increase in recycling of flat glass should increase revenue to flat glass recyclers, if the recycled flat glass cullet is displacing raw material substitutes there will be a loss to suppliers of the raw materials. A reduction in landfill disposal costs will mean a fall in gate receipts for operators of landfill sites and fall in tax receipts.

- 5.2.1 The added market value of the Quality Protocol reflects revenues rather than profits, which is a preferred measure. Although revenue to flat glass recyclers is increasing so is cost as the supply of flat glass cullet is increasing. The gains in profits could not be estimated for reasons of confidentiality.
- 5.2.2 The use of a Quality Protocol, which sets out how to effectively collect flat glass cullet, will result in less contamination. The consultation responses suggest that there is confidence among some operators that the Quality Protocol would result in a reduction in the levels of contamination.
- 5.2.3 The consultation exercise suggests that key stakeholders would welcome the Quality Protocol. It would provide clarity to operators who may be currently confused by the regulatory regime. One company pointed out that it spends a lot of time explaining the regulations to its customers in order to encourage them to recycle their flat glass off-cuts. The uncertainty over the licensing requirements has tended to scare some companies off recycling.
- 5.2.4 If there are any savings in raw material use, there could also be environmental benefits gained mainly through the replacement of primary raw materials (Reference 11).
- 5.2.5 The encouragement to use additional flat glass cullet is likely to lead to additional use of recycled glass overall as opposed to displacing container glass, which has the advantage of PRN revenue. There is currently a shortage of container cullet.¹⁶
- 5.2.6 Although not included in the analysis, the smaller alternative markets are also likely to expand with the introduction of the Quality Protocol. All markets are expanding and it is expected that glass collected through the Quality Protocol would be able to find a market relatively easily.¹⁷
- 5.2.7 If the Quality Protocol were to result in any increased demand for flat glass cullet to replace the use of traditional raw materials, the CO₂ saving will vary greatly depending on the use and transport requirements. Of these, re-melting glass to form new glass products has the greatest CO₂ reduction benefit due to the lower temperatures required to re-melt glass compared to those needed to melt the raw material. An estimate is that

¹⁴ 3rd Oct 2007 e-mail from Mark Pudner (Glass Technology Services Ltd)

¹⁵ 3rd Oct 2007 e-mail from Mark Pudner (Glass Technology Services Ltd)

¹⁶ Communication with Andy Dawe, WRAP

¹⁷ Communication with Andy Dawe, WRAP

CO₂ is reduced by 200 kg per tonne¹⁸ of recycled flat glass used instead of virgin materials. The Shadow price of carbon¹⁹ is applied to derive the value of the CO₂ saving.

5.3 *Costs of the Quality Protocol*

- 5.3.1 The costs will fall on those recyclers of waste flat glass who opt to follow the (voluntary) Quality Protocol. The flat glass recycler must comply with all the requirements of an approved standard or specification. To ensure compliance with the specifications a visual inspection must be carried out on every input load and every finished product. The recyclers must also keep records to show compliance including a record of each load delivered to site, records of all flat glass cullet leaving the site and records of all testing carried out for compliance with the standards. All records must be available to the customers and must be retained for a minimum of 3 months. See the Quality Protocol documentation for further information. It is likely that most of these practices are already being undertaken and so the costs of complying with the Quality Protocol will be minimal. In many cases there may be a small amount of extra recording keeping required. Further information on the costs of complying with the Quality Protocol was sought during public consultation. However, there was a very low response to this request, though it was suggested that costs will be minimal given that many of the requirements are already being undertaken.
- 5.3.2 If the Quality Protocol leads to an increase in the recycling of flat glass, then the total landfill disposal costs will fall.
- 5.3.3 The avoided costs, for purchasers of Quality Protocol compliant flat glass cullet, of complying with waste regulations are minimal. Flat glass manufacturers are not required to purchase waste management licences²⁰ (WMLs) anyway because they are either covered under Pollution Prevention and Control (PPC) regulations (manufacturing companies) or can register for WML exemptions (paragraph 11 and 17, which are simple exemptions and so there is no charge). They would no longer need to register as waste carriers (£96 every 3 years) and/or comply with Duty of Care requirements. Although the time and cost avoided are not large, the removal of the need to comply would be welcomed.
- 5.3.4 Complying with regulations also incurs additional costs to business. These costs include the time spent filling in forms, hiring consultants, and so on, and are referred to as 'admin burdens'. In common with 5.2.9, a lack of data on existing compliance activities means that it has not been possible to estimate these costs.
- 5.3.5 Glass manufacturers that use flat glass cullet instead of raw materials will face reduced energy costs. Using a tonne of flat glass cullet instead of raw materials saves 322 KWhs and applying a cost of 0.8 pence per KWh gives a cost saving of £2.58 per tonne of cullet used.²¹ Glass manufacturers will be weighing up the energy saving and possibly lower price of flat glass cullet versus the greater risk of contamination. The price of cullet may be slightly lower than raw materials providing a financial saving.

¹⁸ 3rd Oct 2007 e-mail from Mark Pudner (Glass Technology Services Ltd)

¹⁹ The Shadow Price of carbon is £25 per tonne of CO₂ released for 2007 and in 2007 prices. It increases by 2% a year (reference 16)

²⁰ Since the time of writing, the waste management licensing regime has been brought into Environmental Permitting Regulations (EPR). However, the above analysis and conclusions still apply.

²¹ 3rd Oct 2007 e-mail from Mark Pudner (Glass Technology Services Ltd)

- 5.3.6 If the diversion from landfill of flat glass cullet results in flat glass manufacturers using less virgin material or substitutes (e.g. container glass), then those companies providing these materials will suffer a loss in revenue possibly equivalent to the added market value for the recycled flat glass supply chain.
- 5.3.7 If there is less disposal to landfill, then waste management companies managing landfill sites will experience a fall in gate fee receipts and the Government will receive lower landfill tax receipts.
- 5.3.8 To reiterate paragraph 5.2.1, affected parties will experience increased supply costs if the process more material, though the value of supply costs was not available to this analysis.

5.4 *Sensitivity Analysis*

- 5.4.1 The benefit estimates in tables 5 above are sensitive to the assumptions made in the analysis. Certain variables in the model were changed and the new values for the benefits were derived.
- 5.4.2 If the uptake of the Quality Protocol is front loaded then the increase in annual recycling as a result of the Quality Protocol may not be linearly increasing to 2017. Assume that the Quality Protocol results in an increase (above the baseline) in the use of flat glass cullet by flat glass manufacturers of 3,000 tonnes in 2008 and a further 2,000 tonnes in 2009 and then the rate of increase falls such that 10,000 tonnes a year more is recycled in 2017. This produces benefits over 10 years of: £2.8m added market value; £1.8m reduced landfill disposal costs; reduced energy costs of £0.15m; carbon savings of £0.33m. Front loading would increase the benefits.
- 5.4.3 If all the prices of recycled flat glass cullet supplied into flat glass recycling change by +/- x% then the added market value benefit will change by +/- x%. All other benefits would be unaffected.
- 5.4.4 Clearly the key input variables effecting the benefits results are the level of prices for flat glass cullet supplied into the end markets and the projected extra amount of waste flat glass recycled as a result of the Quality Protocol. The latter impacts on all the benefits while the former only impacts on the possible added market value. The size of the latter is obviously very uncertain.
- 5.4.5 The analysis assumes that the price of flat glass cullet received by recyclers is £50 per tonne²². If this price were changed, the market value would be affected by an equal proportion. For example. Brinkler (Reference 17) suggests that the price of flat glass cullet received by recyclers could be as low as £5 per tonne (90% lower)z If this were the case, increased market value would fall to £217,000 (NPV, 3.5%).

5.5 *Summary*

- 5.5.1 The overall costs and benefits, including the effects of key sensitivities, is summarised in table 6.
- 5.5.2 This table excludes the value of CO2 savings. This is because Financial Impact Analysis is not primarily concerned with environmental and social impacts.

²² 3rd Oct 2007 e-mail from Mark Pudner (Glass Technology Services Ltd)

Table 6 Summary of Financial Costs and Benefits (NPV, 3.5%)

	Range	Best Estimate
Additional Market Value	£216k - £2,169k	£2,169,283
Reduced Landfill Disposal Costs	£1,383k - £1,819k	£1,383,457
Reduced energy costs	£111k - £147k	£111,761
Overall	£1,712k - £4,815k	£3,664k

6. Enforcements, sanctions and monitoring

- 6.1 Where the Quality Protocol is not complied with (e.g. the flat glass cullet is not produced to the approved standard), the user must comply with the correct waste regulatory controls and may be committing an offence if they do not do so.
- 6.2 Even if the Quality Protocol is complied with, the material may become waste again and subject to regulatory waste controls if, for example it is at any stage:
- Disposed of;
 - Stored indefinitely with little prospect of being used;
 - Used in a way that poses a risk to human health or the environment.
- 6.3 There could be costs of deregulation, loss of income and costs of the Quality Protocol process to the Environment Agency and related partners. However, depending on the regulatory arrangement for introducing and monitoring the Quality Protocol there could also be less work for the Agency to do and therefore lower costs. The charges for waste regulation are set to cover the costs and it could be argued that there would not be any significant net costs to the Agency.
- 6.4 Following the introduction of the Quality Protocol, it will not be necessary for businesses to comply with existing waste regulations if the materials they are using meet the required standards. Thus, the protocol is a form of deregulation and compensatory simplification measures are not relevant to the analysis.

7. Small firms impact test

- 7.1.1 The Quality Protocol is a form of deregulation for end users of flat glass. Regulations tend to impact disproportionately on small businesses so the deregulation of the Quality Protocol is likely to disproportionately benefit smaller end users.
- 7.1.2 Compliance costs can be disproportionately higher for smaller businesses but the Quality Protocol compliance costs will be very small relative to the normal operating and capital costs, even for the smaller operators. It will benefit recyclers enabling them to sell a product not a waste. Their activity should increase. The costs of compliance can be avoided by choosing not to comply.
- 7.1.3 It has not been possible to quantify the costs per firm due to a lack of available data.

8. Competition assessment

- 8.1 The key market affected by the introduction of the Quality Protocol for the production of cullet from waste flat glass is the flat glass recycling industry. Annex C outlines the answers to the competition filter questions.
- 8.2 The Quality Protocol would not create any barriers to entry into this market and is unlikely to reduce the number of recyclers. Any costs of compliance are likely to be very small relative to the normal capital and operating costs. Many of those who choose to comply will already be operating to near or at the standard required. Existing firms will face the same compliance costs as a new entrants. Firms can avoid the cost by choosing not to follow the Protocol and still operate in the market., although if most end users start to demand Protocol compliant material it will become more difficult to avoid compliance.

9. Conclusions

- 9.1 The primary barriers to the reuse of flat glass are:
- contamination – especially when used in flat glass manufacturing (concerns over contamination are greatest with post-consumer flat glass);
 - cost-related (container glass is often more attractive mainly due to PRNs).
- 9.2 The Quality Protocol should raise awareness of how to avoid contamination in collection, etc. and provide assurance of quality and consistency to end users. This should increase the quantity of flat glass recycled resulting in benefits for firms along the recycled flat glass supply chain including reduced landfill disposal costs and increased sales in end markets. If the increased use of flat glass substitutes raw material then there will be CO2 emission savings and reduced energy costs for end user glass manufacturers. End user firms may benefit from savings if the flat glass cullet is cheaper than the replaced raw materials. If the Quality Protocol results in an increase the sales of flat glass to flat glass manufacturers of 10,000 tonnes a year by 2017 then the estimated benefits over 10 years would be: added market value of £2.2m; reduced landfill disposal of 55,000 tonnes; reduced landfill disposal cost of £1.4m; reduced energy costs of £0.11m; CO2 savings of 11,000 tonnes with a value of £0.25m. This is the upper limit of what could realistically be achieved.
- 9.3 The avoided waste regulation compliance cost as a result of the Quality Protocol are likely to be relatively small. Flat glass manufacturing companies (the largest users of recycled flat glass cullet) do not require a Waste Management Licence as they operate under the PPC regulations and many, if not all, other users are exempt from waste management licensing. Therefore little cost saving can be expected from the removal of waste regulation requirements.
- 9.4 The main benefits identified by consultation respondents in support of the Quality Protocol were:
- clarification of the regulatory position for smaller operators;
 - possible reductions in the levels of contamination if the Quality Protocol were to result in handlers of used flat glass changing their perception regarding this material from one of a waste to one of a valuable raw material.
- 9.5 Although an increase in recycling of flat glass should increase revenue to firms in the flat glass recycling supply chain, if the recycled flat glass cullet is displacing raw material substitutes there will be a loss to suppliers of the raw materials. A reduction in landfill

disposal costs will mean a fall in gate receipts for operators of landfill sites and a fall in tax receipts for the Government. The overall gain to society mainly stems from the reduced use of energy.

- 9.6 Further information on the costs of complying with the Quality Protocol was sought during public consultation. However, there was a very low response to this request, though it was suggested that costs will be minimal given that many of the requirements are already being undertaken.

10. References

1. Environment Agency and WRAP, 2007 *The Quality Protocol for the Production of Processed Cullet from Waste Flat Glass*.
2. Glass Technology Services, 2007 *Technical Report on the Production of Cullet from Waste Flat Glass*.
3. Akerlof G A, 1970 The market for 'lemons': quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, Vol. 84, No. 3, pp. 488-500.
4. WRAP, 2004 *Recycled Glass Market Study and Standards Review – 2004 Update*. Available from: <http://www.wrap.org.uk/downloads/GlassMktStudy2004.4b9b662f.pdf> [Accessed 4 September 2007].
5. Kasper A, 2006 Recycling of cullet into flat glass melting furnaces. In *66th Conference on Glass Problems. Ceramic Engineering and Science Proceedings*, Volume 27, Issue 1, June 2006.
6. Brinkler, K, 2004 *CARE Report on Automotive Glass Recycling. 2004 Update*. Available from: http://www.caregroup.org.uk/Glass_Report_2004.doc [Accessed 4 September 2007].
7. WRAP, January 2007 *Realising the Value of Recovered Glass*. Available from: http://www.wrap.org.uk/downloads/GlassMrktSitRpt_final.78df600b.pdf [Accessed 4 September 2007]
8. WRAP, 2006 *Assessment of the Quantity of Flat Glass being Collected for Recycling and the Processing Infrastructure in place in the UK – Year 2 Report*.
9. Quarry Products Association, 2005 *Sustainable Development. Building our Strategy*. Available from: http://www.qpa.org/downloads/sust_devA4.pdf [Accessed 4 September 2007].
10. WRAP, 2005 *The Use of Glass Derived Sands in the Sports Turf Industry – Ongoing Monitoring of Trials*. Available from: http://www.wrap.org.uk/downloads/Sports_Turf_Research_Institute.e7e84771.pdf [Accessed 4 September 2007].
11. Technical Advisory Group, 2007 *Technical Report on the Production of Cullet from Waste Flat Glass*.
12. HM Treasury, 2003 *The Green Book. Appraisal and Evaluation in Central Government*. 3rd edn. Available from: <http://greenbook.treasury.gov.uk/> [Accessed 4 September 2007]

13. Environment Agency, 2007 *Environment Agency Guidance on Low Risk Waste Activities*. June 2007. Version 24. Available from: http://www.environment-agency.gov.uk/commondata/acrobat/appendixa_june07_1762944.pdf [Accessed 4 September 2007].
14. Glass Technology Services, 2004. *A Study of the balance between furnace operating parameters and recycled glass in glass melting furnaces*.
15. Defra, 2006. *Partial Regulatory Impact Assessment of England's Waste Strategy*
16. Defra 13th Aug 2007. *How to use the Shadow Price of Carbon in Policy Appraisal. Interim Guidance*
<http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm>
17. Brinkler, 2005, CARE Report on automotive glass recycling – 2004.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	<i>Results in Evidence Base?</i>	<i>Results annexed?</i>
Competition Assessment	Yes	Yes
Small Firms Impact Test	Yes	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	No
Other Environment	No	No
Health Impact Assessment	No	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	Yes	No

Annexes

Annex A:

Technical advisory group membership

Name	Company	Type of member
Suzanne Laidlaw	Environment Agency	TAG member
Michelle Steer	Environment Agency	TAG member
Dominic O'Neill	Environment Agency	TAG member
Andy Dawe	WRAP (Waste & Resources Action Programme)	TAG member
Sarah Clayton	WRAP (Waste & Resources Action Programme)	TAG member
Sabrina Rubio	Veolia	TAG member
John Stockdale	British Glass Federation	TAG member – can not attend 1st meeting
Mark Pudner	British Glass Federation	Attending on behalf of John Stockdale
Ian Chisholm	Glass & Glazing Federation	TAG member
Andrew Smith	CERAM Building Technology	TAG member
Gilli Hobbs	BRE	TAG member (invited for 2nd and 3rd TAGs)
Amanda Conroy or Caroline Weeks	BRE	Attending TAG2 on behalf of BRE
Dave Dolton	GTS	TAG member - attending TAG 3
Nick Davison	Viridor	TAG member - attending TAG 3
Neil Vincent	Guardian	TAG member - attending TAG 3
Clare McCallan	Environment Agency	Correspondence member
Jonathan Hofton	Environment Agency	Correspondence member
John Harris	SEPA (Scottish Environment Protection Agency)	Correspondence member
Kathryn Harriss	Environment Agency	Correspondence member
Chris Holcroft	GTS	Correspondence member

Annex B:

The current regulatory position in the UK

A number of regulations are relevant to recyclers and processors of flat glass cullet. These relate to the handling, storage and processing of waste flat glass cullet and include:

- a PPC permit;²³
- a Waste Management Licence (WML);²⁴
- an exemption from the need for a Waste Management Licence.

All glass manufacturing sites with a melting capacity greater than 20 tonnes per day require a PPC permit as defined within the PPC regulations. This rule covers all container, flat and fibre glass producers having this capacity or greater. They are regulated by either the Environment Agency (in England and Wales) or their local authority depending on the class of installation.

Where glass manufacturing sites are not covered by the PPC regulations, they often do not require a WML to use and store cullet as they are covered under the following exempt activity:

- *The use of waste glass as part of an activity within Part B of Section 3.3 (the manufacture of glass and glass fibre) of Part 1 of Schedule 1 to the PPC Regulations 1 or Part 1 of the 1990 Act if no more than 600,000 tonnes of waste glass is used in any 12 month period.*
- *The storage of waste intended for that use.*

WML exemptions (as per paragraphs 11 and 17 of the Waste Management Licence Regulations 1994 (as amended)) permit:

- the storage of less than 5,000 tonnes of waste glass pending recovery;
- the storage, crushing and washing of up to 1,000 tonnes a week of waste glass.

Companies operating within these confines do not require a Waste Management Licence.

The Environment Agency's Low Risk Approach

If an activity is considered low risk, it means the Environment Agency takes the view that it would not be in the public interest to require a Waste Management Licence for the activity although legally one is required. The Low Risk Approach (Reference 13) relates only to Waste Management Licences. It does not relate to PPC activities or other requirements such as the Duty of Care or the registration of waste carriers.

The Environment Agency takes a low risk approach for:

- the manual sorting of uncontaminated glass, cans, cardboard, paper, textiles, plastics, waste food and drink cartons at the site of production pending collection for recovery;
- the sorting and deconstruction of waste windows and doors for the purpose of recovery.

This does not cover the recovery, storage or processing of flat glass. It is therefore concluded that the Low Risk Approach does not apply in the case of recycled flat glass past the point of recovery.

²³ See <http://www.environment-agency.gov.uk/business/1745440/1745496/298441/>

²⁴ See <http://www.environment-agency.gov.uk/business/444217/590750/590821/wml/>

Annex C:

Competition assessment filter questions²⁵

The following competition filter test questions originate from the Cabinet Office Guidelines for RIAs and can be found here: http://www.cabinetoffice.gov.uk/regulation/ria/ria_guidance/competition_assessment.asp

The answers below relate to flat glass recyclers

Question

Answer Yes/No

Q1: In the market(s) affected by the new regulation, does any firm have more than 10% market share?

Yes

Q2: In the market(s) affected by the new regulation, does any firm have more than 20% market share?

yes

Q3: In the market(s) affected by the new regulation, do the largest three firms together have at least 50% market share?

Yes

Q4: Would the costs of the regulation affect some firms substantially more than others?

No.

Q5: Is the regulation likely to affect the market structure, changing the number or size of firms?

No

Q6: Would the regulation lead to higher set-up costs for new or potential firms that existing firms do not have to meet?

No

Q7: Would the regulation lead to higher ongoing costs for new or potential firms that existing firms do not have to meet?

No

Both existing firms and new firms would both have to face the same cost of Protocol compliance if they choose to comply.

Q8: Is the sector characterised by rapid technological change?

No

Q9: Would the regulation restrict the ability of firms to choose the price, quality, range or location of their products?

No

The Quality Protocol could enable recyclers to sell flat glass cullet into a greater range of end applications.

²⁵ Communications with Mark Pudner (Glass Technology Services Ltd)

ANNEX C: IMPLEMENTATION AND DELIVERY PLAN

ANNEX D: POST IMPLEMENTATION REVIEW