Appendix 1

The Waste (England and Wales) Regulations 2011 (Amended 2012)
Review of Waste Collection Arrangements - TEEP

1. Introduction

1.1 The Waste (England and Wales) Regulations 2011 (Amended 2012) are designed to implement the requirements of the EU Waste Framework Directive, Article 4, with regard to the handling and processing of certain recyclable materials. The aim is to ensure that materials collected as recyclables are in fact recycled and not disposed of in another way. The Directive is therefore concerned with the quality of materials collected and the ability of materials processors to sort materials and provide high quality materials for subsequent reprocessing and use.

1.2 However, the Directive considers this requirement from the starting point that Waste Collection Authorities should collect recyclable materials, and in particular paper, glass, plastic and metals, as separate waste streams. At first sight, therefore, this appears to preclude commingled collections as made by the Royal Borough.

1.3 The London Borough of Hammersmith and Fulham elected to operate commingled collections because of their suitability and effectiveness. Residents do not need to be issued with a multitude of containers, there is no need for complex and time consuming kerbside sorting at the point of collection, collection timings and vehicle waiting times are minimised, and it has been demonstrated that commingled collections result in higher levels of participation and greater recycling performance.

1.4 However, the EU Directive, as indicated above, is targeting the final product rather than the style of collection as a result of concerns that the quality of collected materials is often poor and that high contamination leads to them being rejected.

1.5 The Directive and the Regulations which translate that into law have therefore introduced what is known as TEEP (Technically, Environmentally and Economically Practicable) and, in forming a judgement about the type of collection methodology that should be used, a TEEP analysis has to be undertaken to demonstrate that it is not 'Technically, Environmentally and Economically Practicable' to collect the four described waste streams separately.

1.6 Although DEFRA has not issued guidance on how Councils should approach TEEP and the need for assessment, earlier this year the Waste and Resources Action Programme (WRAP) published a tool giving advice on how to navigate the TEEP process on behalf of a working group comprising members of local authority waste networks, the London Waste and Recycling Board (LWaRB) and WRAP itself. The TEEP process is extremely complex and must be carefully undertaken, since all local

authorities using commingled collections or considering their introduction must satisfy themselves that they have considered the requirements of the Directive and the Regulations and, in the event that commingled collections continue or are introduced, can demonstrate their rationale for doing so.

1.7 Enforcement of the new Regulations, which will become effective on 1 January 2015, will be the responsibility of the Environment Agency, although any legal challenge to the Council's collection arrangements is probably more likely to come from a local resident or association. On the definition of high quality recycling, the Agency points to guidance published by the European Commission which implies that high quality 'means the standard that can be achieved by separate collection'. The Agency has also outlined how it will take account of local circumstances when judging the compliance of any service, conceding that different solutions may be practicable in different neighbourhoods and stating "It is clear that practicable solutions will vary according to the type, size and make-up, etc. of each waste collection authority. We will expect to see that the collection authority has thoroughly reviewed the issue based on evidence and can present a clear audit trail of their decisions. 'Practicability' is intended to be a high hurdle. 'Impracticable' does not just mean difficult, inconvenient, more expensive or unpopular."

1.8 As a result of the complexity of this process, most local authorities seem to be commissioning independent, technical advice on this matter. However, officers have attempted to undertake the process in-house, using the guidance published by WRAP.

1.9 Decisions about whether co-mingled collections are justifiable need to be taken locally, based on the particular circumstances in each area and each Local Authority will need to carry out its own assessment. To assist with this decision making process the Waste and Resources Action Programme (WRAP) has produced a 'Route Map' to help waste authorities assess whether their waste collection services are compliant.

1.10 The Council is required to make its own assessment for those materials it collects and this has been done using the 'Steps' set out in the Route Map, a copy of which is attached as Appendix A.

2. Step 1: What Waste is Collected and How

2.1 The tonnages of the principle commodities collected for reuse, recycling or energy recovery by the Council are shown in Table 1 below.

Table 1: Household waste composition (data taken from WRWA waste analysis - Oct. 2009)

Material	Tonnes	%
Paper/card	14587.43	27.68%
Glass	7982.70	15.15%
Plastic	4466.51	8.48%
Metals	1710.58	3.25%

Fines	522.68	0.99%
Hazardous	237.58	0.45%
Misc. Combustible	3468.67	6.58%
Misc. Non-combustible	1948.16	3.70%
Garden waste	3563.70	6.76%
Textiles	1758.09	3.34%
WEEE	237.58	0.45%
Putrescibles	12211.63	23.17%
TOTAL	**52695.31**	**100.00%**

2.2 The collection methods for the principle commodities collected for reuse, recycling or energy recovery by the Council are shown in Table 2 below.

Table 2: Collection methods for each material

Collection method	Materials	Tonnes*	Total Gross Cost of Collections 2014/15
Kerbside refuse (domestic & commercial)	Residual waste	59,635	£2,488,046
Containerised refuse			
Kerbside commingled recycling	Paper, card, glass, metals, plastic	12,769	£1,396,684
Estates commingled recycling (containerised)			
Bring sites commingled recycling (containerised)			
Separately collected (kerbside)	Bulky waste	48	£80,982
	WEEE	30	
	Garden waste	0	n/a

*Tonnage data taken from 2013/14

2.3 The disposal costs for the principle commodities collected for reuse, recycling or energy recovery by the Council are shown in Table 3 below.

Table 3: Materials collected separately and commingled

Waste type	Collection channel	Tonnes*	Collected separately from refuse?	Collected separately from other recyclate?	Collected in sub-streams?	Cost per tonne sent for treatment/ recycling**	Total cost (per annum)
Paper & card	Kerbside	12769.00	Yes	No	No	£25.00	£319,225.00
Glass							
Plastic							
Metals							
Paper & card	Estates		Yes	No	No		
Glass							
Plastic							
Metals							
Paper & card	Bring		Yes	No	No		
Glass							
Plastic							
Metals							
WEEE	Kerbside	30.00	Yes	Yes	No	£48.00	£1,440.00
TOTAL							**£320,665.00**

*Tonnage data taken from 2013/14
** 2014/15 costs

2.4 An assessment of the output of the principle commodities collected for reuse, recycling or energy recovery by the Council from the Materials Recovery/Reclamation Facility (MRF) at Western Riverside Waste Authority (WRWA) is provided in Table 4 below.

Table 4: MRF output assessment (data provided by WRWA)

Sold as	% of output	Purity of output	Recycled (%)	High quality recycling (%)
News & PAMS	17.17	Meets specification	94.85-100%	94.85-100%
Mixed paper	32.57	Meets specification	90-100%	90-100%
Card	9.99	Meets specification	95-100%	95-100%
Tetrapak	0.71		No samples taken	No samples taken
Mixed Glass	32.42		No samples taken	No samples taken
Aluminium	0.61		88-92%	88-92%
Steel	1.28		78-90%	78-90%
Mixed plastics	1.03		No samples taken	No samples taken
PET	2.69	Meets specification	71-90%	71-90%
HDPE	1.54	Meets specification	85-95%	85-95%
HDPE (coloured)	Included in 1.54% above		46-60%	46-60%
SRF	0.00	Not applicable		
TOTAL	100			

2.5 Details of the types of households in the borough are shown in Table 5 below.

Table 5: Household types

Ward	Household types			
	No. of standard kerbside	No. of high rise	No. with difficult/narrow access	Total
Addison	5151	841	0	5992
Askew	5781	790	0	6571
Avonmore and Brook Green	5381	661	0	6042
Collage Park and Old Oak	3585	190	0	3775
Fulham Broadway	4298	1002	0	5300
Fulham Reach	3832	913	0	4745
Hammersmith Broadway	4323	1088	0	5411
Munster	4674	314	0	4988
North End	4484	1168	0	5652
Palace Riverside	3055	372	0	3427
Parsons Green and Walham	4709	280	0	4989
Ravenscourt Park	4467	382	0	4849
Sands End	5728	912	0	6640
Shepherds Bush Green	4467	1221	0	5688
Town	3924	966	0	4890
Wormholt and White City	2892	2371	0	5263

2.6 The numbers of households by type and collection method are provided in Table 6 below.

Table 6: Number of households by type and collection

Recycling collection type	Household types				
	Standard kerbside	High rise	No. with clearway/stopping restrictions	No. with limited storage	Total
Kerbside separate	0	0	n/a	n/a	**0**
Kerbside commingled	70,751	0	0	70751	**70,751**
Kerbside special (narrow access)	0	0			
Near access commingled	0	13,471		0	**13,471**
No service	0	0	n/a	n/a	**0**
TOTAL	**70,751**	**13,471**	**0**	**70,751**	**84,222**

3. Step 2: How Collected Materials are Treated and Recycled

3.1 Table 7 below shows how the commodities collected are processed.

Table 7: Types of waste and collection covered (data provided by WRWA)

Material	Initial destination	Mixed with other waste after collection y/n	Position on hierarchy 1 = prevention 2 = reuse 3 = recycling 4 = other recovery 5 = disposal	Quantity produced by WRWA's MRF (%)	Purity of the separated stream produced (%)	How is recycling reprocessed, e.g. how much of it feeds in to 'closed loop' processes?	EfW incinerator efficiency	Gate fee for each treatment	Do prices change depending on tonnage or a market index?
Paper	WRWA's MRF	Yes	3	100	95-100	Estimated 95% closed loop	Net Calorific Value (NCV) = 9.6MJ/kg so 89.4t/hr x 9.6MJ/kg (x 1000 = /ton) / 3600 = 89.4 x 9600 / 3600 = 238.4MW @100% Maximum Continuous Rating (MCR). Gross Electrical Output/Efficiency Factor at the terminals @ 100% MCR (guarantees) = 71.8MW/238.4 = 30.11%.	£25.00	Both - the contract is between Cory and reprocessors
Glass						Estimated 65% closed loop			
Plastic						Estimated 50% closed loop			
Metals						Estimated 40% closed loop			
Card						Estimated 95% closed loop			
Fines	WRWA's bulking facility	Yes	4/5	n/a	n/a	n/a		£142.00	n/a
Furniture	LRN	No	2	n/a	n/a	Reused		£0.00	n/a
Hazardous	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a
Mattresses	LRN	No	2	n/a	n/a	n/a		£0.00	n/a
Misc. combustible	WRWA's bulking facility	Yes	4	n/a	n/a			£142.00	n/a
Misc. non-combustible	WRWA's bulking facility		5	n/a	n/a				
Sanitary	WRWA's bulking facility		5	n/a	n/a	n/a			
Soil	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a
Garden waste	WRWA's bulking facility	No	3	n/a	n/a	n/a		£78.48	Both - the contract is between Cory and reprocessors
Textiles	WRWA's MRF	No	2/3	n/a	n/a	Reused and estimated 0% closed loop		£25.00	
WEEE	HWRC	No	2/3	n/a	n/a	Estimated 50% closed loop		£0.00	
Wood	WRWA's bulking facility	Yes	4	n/a	n/a	n/a		£107.50	n/a

4. Step 3: Apply the Waste Hierarchy

4.1 None of the waste types collected by the Council go to landfill. All waste is recovered, recycled or reused.

4.2 The only waste type to go for recovery is Residual Waste that cannot be recycled.

4.3 The Council encourages the reuse of white goods and furniture via the London Re-use collection scheme which runs alongside the Council's own bulky waste collection service. Some small Waste Electrical and Electronic Equipment (WEEE) is also sent for reuse but WRWA's third sector partners have generally found it uneconomic to prepare this material for reuse and so it is mostly recycled. In addition, textiles are pulled out of the mixed recyclables (in which they are one of the major contaminants) delivered to WRWA and sent for reuse or recycling, depending on their condition.

4.4 All other items are recycled.

5. Step 4: Decide Whether Separate Collection of the Four Materials is required

5.1 The Council has been operating a commingled collection service since 2003 and currently collects glass, metal, paper and plastic in commingled form from its households.

5.2 The Council needs to assess whether or not separate collection is necessary to facilitate or improve recovery (the Necessity Test) and then whether it is Technically, Environmentally and Economically Practicable (TEEP) to collect separately (the Practicability Test).

6. The Necessity Test

6.1 To determine whether or not the separate collection of glass, metal, paper and plastic is necessary, the Route Map suggests two questions to examine the quantity and quality of materials collected. The first question is: *Is it clear that separate collection will lead to an increase in either the quantity or quality of material collected?*

6.1.1 LBHF is a densely populated urban area with a highly transient population and little or no available space to house waste and recycling containers. Experience gained over the last 11 years suggests that separate collection would not lead to an increase in the quantity of material collected and would, in fact, most likely lead to a reduction.

6.1.2 Contamination, where waste that should be put into the residual waste stream is placed out for collection as recycling, generally occurs either by accident, where the 'offender' is unaware that they are in fact trying to recycle an unwanted item, or deliberately, where the offender is using

the recycling bag provided by the Council for their residual waste instead of purchasing their own black refuse bags. There is no evidence, however, to suggest that separate collection would lead to a reduction in contamination and an improvement in the quality of material collected.

6.2 The second question is: *Is it clear that separate collection will lead to an increase in either the quantity or quality of recycling?*

6.2.1 The quantity of recycling is firstly limited to that which is separated by the public. If that material is collected without sorting, irrespective of whether it is collected separately or not, all the material collected (including the contamination) will be sent for recycling.

6.2.2 Sorting can either be done by hand or mechanically. Hand sorting, if properly resourced, will produce a high quality recycling product. Hand sorting is generally done at the point of collection with operatives removing any obvious contaminants. However this will slow the collection process significantly and is more suited to low rise properties that have sufficient off street storage space to keep the required number of containers rather than high rise properties that will have large communal containers.

6.2.3 Mechanical sorting is unlikely to be able to match the quality of a good hand sort but, given the volume of material collected by the Council and WRWA's other constituent councils, is unlikely to be either practicable or cost effective at WRWA's MRF.

6.2.4 As Table 8 below shows, the MRF at Smugglers Way generally sorts materials effectively with the proportions of outgoing materials generally corresponding well with the incoming sampling results. There will be some discrepancies in the percentages of outgoings as a result of onsite stock levels but glass does appear to have a proportion of other materials included in it following the sorting process.

Table 8: MRF sorting efficiency (data provided by WRWA)

Material	Sampled Incoming	Actual Outgoing	Difference
Paper	52.1%	50.3%	-1.8%
Glass	21.2%	27.5%	6.4%
Cans	2.7%	1.9%	-0.8%
Plastic	6.7%	4.6%	-2.1%
Cartons	0.9%	0.0%	-0.9%
Total Acceptable	83.6%	84.3%	0.8%
Textiles	0.9%	0.3%	-0.6%
Electricals	0.6%	0.1%	-0.4%
Total Objectionable	1.5%	0.4%	-1.1%
Total Prohibited	15.0%	15.3%	0.3%
Total	**100.0%**	**100.0%**	**0.0%**

6.2.5 As the percentage of incoming and outgoing prohibited material, i.e. contamination, is almost identical, we can be confident that good

recyclate is not unintentionally ending up in the residual waste stream and the quantity of recycling is not therefore being compromised by not having separate collection.

6.2.6 It is also important to consider that all of the Council's residual waste, including the contamination removed via the sorting process at the MRF, is sent for energy recovery at Riverside Resource Recovery Limited's (RRRL) Energy from Waste (EfW) Facility at Belvedere in the London Borough of Bexley. Any metals and glass contained within the residual waste stream therefore end up in the bottom ash from that process, with metals ultimately removed for recycling and the ash, including any glass, being recycled into aggregate for use in the construction industry.

6.2.7 Higher quality recyclate is important as it will improve the public's confidence and therefore their participation in recycling, improve resilience in the recyclate market and ensure that materials are suitable for reprocessors within the UK as well as for export.

6.2.8 There is no simple definition of "high quality" recycling but, in June 2014, the Environment Agency published draft guidance on the Regulations in which it points to guidance published by the European Commission which implies that high quality 'means the standard that can be achieved by separate collection'.

6.2.9 There is currently very little information on the actual quality standards being achieved as there is no standardised method by which quality is assessed. However, it is hoped that the Environmental Permitting (England and Wales) (Amendment) Regulations 2014, whereby all MRFs will need to routinely sample and test the composition of their input and output materials from 1st October 2014, will help address this.

6.2.10 Most output sampling is currently carried out by the reprocessors themselves and the Council does not have access to those results. WRWA's contractor, Cory Environmental, has carried out some limited output sampling itself and the results in Table 9 below are representative.

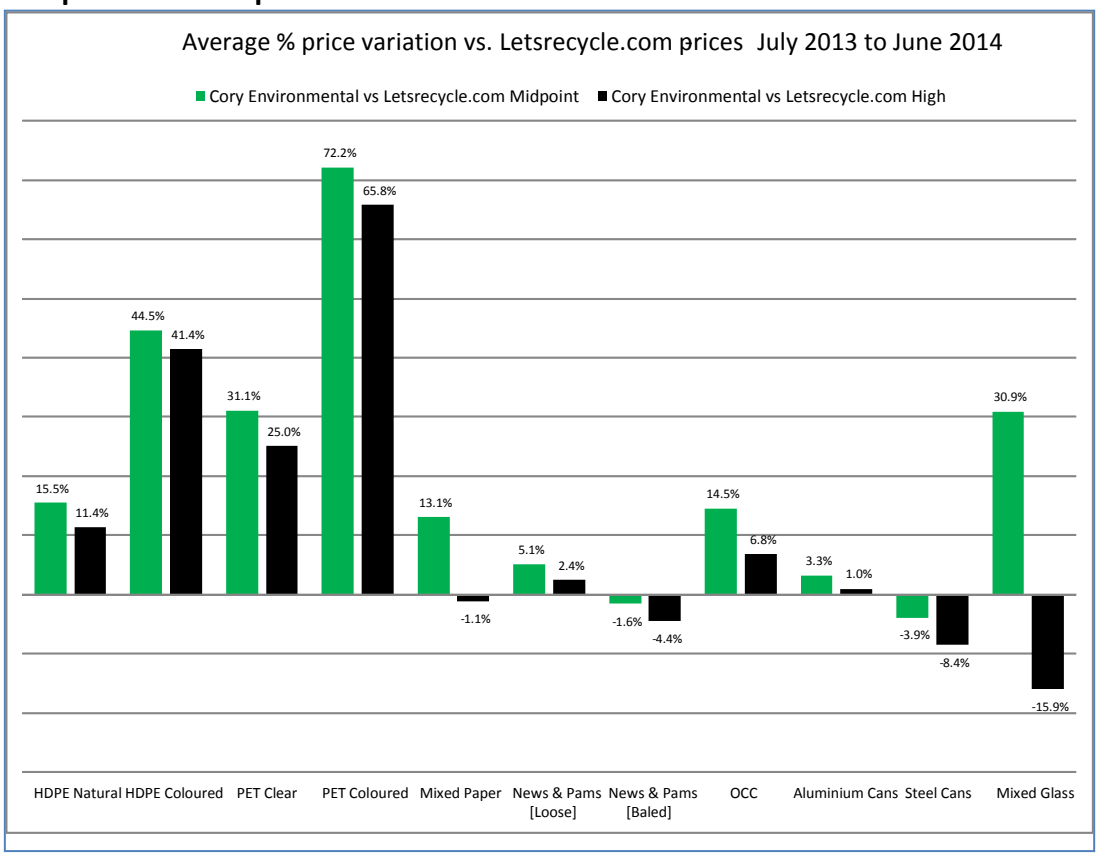
Table 9: MRF output sampling (data provided by WRWA)

Material	Contamination
Newspapers and Magazines	<5%
Cardboard	<1%
Mixed Paper and Card	5%
Aluminium Cans	<10%
Steel Cans	<25%

6.2.11 It has to be remembered that reprocessors themselves will further sort individual commodities and therefore require that the material to them falls within a specification determined by the technology they have in place. Due to economies of scale, it is unlikely that individual suppliers would individually have sufficient tonnage to economically invest in such technology themselves.

6.2.12 Another measure of quality is the price received for a commodity on the open market. Letsrecycle.com, a well known online publication for the waste management industry, publishes a monthly guide as to prices that may be paid for collected materials. Graph 1 below compares the actual prices achieved by the Authority's MRF with the prices published by Letsrecycle.com.

Graph 1: material prices achieved



6.2.13 It can be seen that the prices achieved by the MRF generally exceed the highest figures quoted on Letsrecycle.com by a significant margin. It should be noted that News and PAMS (newspapers and magazines) are generally only baled when there is a problem with sending the material loose and baled materials represent less than 2% of outputs.

6.2.14 Steel cans from the Authority's MRF are not achieving premium market values (reflecting the contamination rate of up to 25%) but they are still being recycled without any difficulty. As mentioned earlier, all metals (including cans) in the residual waste are also recovered for recycling.

6.2.15 The quality of glass from WRWA's MRF means it does not attract premium prices but around 90% of it is recycled for re-melt, i.e. to be made into new glass bottles and jars, as opposed to aggregate for the construction industry.

6.2.16 All recyclate collected is being recycled and the evidence would suggest that separate collection would lead to a reduction in the tonnage collected. On the basis of this evidence the Council would argue that, perhaps with the exception of glass, the Necessity Test indicates that separate collection is not required.

6.2.17 However, while the Route Map does highlight that particular issues have been raised regarding the inclusion of glass within a dry recycling mix, Graph 1 above shows that the MRF is achieving good prices for all materials, including paper and cardboard (OCC), which would strongly indicate that the inclusion of glass is not affecting the quality of other commingled materials.

7. The Practicability (TEEP) Test

7.1 If the Necessity Test shows that separate collection is required for any material then the Practicability Test should be applied, whereby separate collection still has to prove 'technically, environmentally and economically practicable' (TEEP). If separate collection of the material(s) concerned fail(s) any one of these elements then commingled collection of the material(s) is permissible.

7.2 Whilst overall the Necessity Test indicates that separate collection is unnecessary for paper, plastics and metals, it is considered prudent to also apply the Practicability Test to glass for additional assurance given that it is the weakest output, in terms of quality, from the MRF.

7.3 *Technically Practicable*

Questions to consider when undertaking this test are:

1. Have you previously collected the material separately?
2. Is separate collection used by any authority with similar relevant characteristics?
3. Does your area have unusual characteristics that make separate collection impracticable?

7.3.1 The answer to both questions 1 and 2 above is 'No'.

7.3.2 The answer to question 3 above is 'Yes', for the following reasons:

a) heavy traffic/congestion
b) density of population
c) lack of household waste storage (both internal and external)
d) twice weekly collections are required in some areas

7.4 *Environmentally Practicable*

Questions to consider when undertaking this test are:

1. Would separate collection for recycling achieve a net environmental benefit?
2. Does an alternative collection approach yield a better environmental outcome?

7.4.1 Currently, all glass collected, whether for recycling or as residual waste, is recycled as all the glass in the residual waste stream ends up being

recycled for aggregate use as part of the Bottom Ash from the EfW facility.

7.4.2 Collecting glass specifically for recycling (whether separately or co-mingled) means that it is used for re-melt purposes, which is environmentally preferable. On the other side of the equation, WRWA's MRF uses energy to sort glass that is collected in commingled form.

7.4.3 There is a large question mark, however, over the environmental impact of separate collections of glass in the sense that evidence suggests that these are likely to produce significantly lower collected weights and will therefore be environmentally inferior in that respect.

7.4.4 An alternative collection approach will also have negative environmental implications in the sense that a separate collection round will result in additional vehicle emissions, a possible increase in traffic congestion and the likely manufacture of separate containers.

7.5 *Economically Practicable*

Questions to consider when undertaking this test are:

1. Would separate collection result in excessive costs in comparison with alternatives?
2. Are any extra costs proportionate to the environmental benefits? Does an alternative collection approach yield a better environmental outcome?

7.5.1 Unless one of the two existing recycling collection days was designated a day for glass only, separate collections of glass would require the deployment of additional vehicles and crews at significant cost. It is also most likely that the Council would need to supply residents with additional receptacles for the collection of glass. It has already been established that such an approach is unlikely to yield any significant environmental benefit.

7.5.2 The Council pays a gate fee into WRWA's MRF of £25 per tonne for recyclate but receives 80% of the commodity income, above £51 per tonne, that the sorted commingled recyclables achieve. Conversely the gate fee for residual waste is £142 per tonne.

7.5.3 As glass is a relatively low value commodity it depresses the commodity values received by WRWA and therefore the Council. Using these values, Table 10 below shows (using an average separated cullet value of £27/tonne) that losing all the 16,000 tonnes of glass from WRWA's MRF would, under the commodity share mechanism, result in an increase of income to be shared amongst WRWA's constituent councils of around £320,000 per annum.

Table 10: Recycling and recovery costs for glass (data provided by WRWA)

MRF Tonnes	Cullet Tonnes	EfW Tonnes	MRF Gate Fee (£)	MRF Income (£)	Cullet Income (£)	EfW Cost (£)	Total (£)	Difference (£)
16,000	0	0	400,000				400,000	

	16,000	0		- 320,000	- 432,000	-	- 752,000	- 1,152,000
		16,000		- 320,000		2,272,000	1,952,000	+ 1,552,000
	9,184	6,816	-	- 320,000	- 247,968	967,872	399,904	- 96

7.5.4 If all 16,000 tonnes of glass were separately collected as cullet and the constituent councils received an income of £27 per tonne for it they would make an overall saving, collectively, of around £1.15 million per year in their charges from WRWA. However the constituent councils would need to be able collect, bulk and transport those 16,000 tonnes to reprocessors for less than £72 per tonne to achieve an overall saving. This would again most likely yield an inferior environmental outcome.

7.5.5 The cost of operating a weekly collection of glass from every property currently receiving commingled collections would be in excess of £0.5m per annum. However, this is only a very rough estimate and a full costing exercise would be necessary should the Council wish to pursue such a course of action. It should be mentioned here, however, that noise levels are likely to be of major concern to residents.

7.5.6 Conversely if all 16,000 tonnes of glass were to go into the residual waste stream the constituent councils would end up with an overall additional cost of £1.55 million. Table 10 shows that if around 6,000 tonnes (43%) of the cullet were to be lost to the residual waste stream, as might be likely with separate collections of glass, then the constituent councils would effectively lose all of the savings from the Authority but would be incurring the additional collection costs and overall running at a loss whilst yielding a significantly inferior environmental outcome.

8. Conclusion

8.1 Following application of the Necessity Test, it is evident that there is **no requirement for the Council to separately collect paper, plastics and metals.** With an element of doubt about the collection of glass, the Practicability Test was also applied to this material.

8.2 Where the Necessity Test indicates a need to collect a material separately, commingled collection of that material is only allowable where it can be demonstrated that separate collection is not practicable. However, separate collection must meet all three elements of the Practicability Test to be required, i.e. be "technically, environmentally and economically practicable" (TEEP). If it fails any one of them then commingled collection is permissible.

8.3 The TEEP assessment undertaken suggests that for reasons of both technical and environmental impracticability **it is considered unnecessary for the Council to collect glass separately.**

8.3 The TEEP assessment and associated documentation will need to be retained in order to demonstrate compliance with Regulation 13 of the Waste Regulations and to facilitate subsequent TEEP assessments.