Milton Keynes Council

Best Practical Environmental Option

Collection Options BPEO

July 2005

Entec UK Limited

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Report for

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Executive Summary

Milton Keynes Council is currently engaged in the development and evaluation of long term options to treat and dispose of residual waste arisings. An Options Appraisal was commissioned in partnership with Buckinghamshire County Council, in which 12 options comprising various treatment technologies were evaluated by Jacobs Babtie. The evaluation determined recycling performance and biodegradable municipal waste (BMW) diversion from landfill. Milton Keynes Council commissioned Entec to undertake a BPEO appraisal on these options. Milton Keynes Council then commissioned work on nine collection options. Jacobs Babtie undertook the performance evaluation and Entec was commissioned to complete a BPEO appraisal of these nine options. The collection BPEO is the subject of this Report.

This study adopted the same methodology as that used in the residual treatment BPEO report.

In the residual treatment BPEO appraisal the derivation of assessment criteria and the subsequent weightings given to these criteria was undertaken by the Milton Keynes Waste Forum. This independent body comprised representatives from local and parish councils, local pressure groups, academic institutions and waste management companies. Two workshops were held, one to debate the appraisal indicators, the second to weight the relative importance of those indicators.

The life cycle assessment (LCA) software WISARD was used to evaluate the potential environmental impacts associated with the waste management options. All other data was taken from the evaluation undertaken by Jacobs Babtie. Results for each indicator were subsequently transposed into a score between 0 and 1, with 1 allocated to the option with the best performance for that criterion and 0 allocated to the collection option with the worst performance. All other options were given a score between 0 and 1 based on their relative performance between this established range. The weights allocated by the Forum were applied to the indicator scores, thus producing a "weighted performance score". These weighted scores were summed allowing the options to be ranked according to their performance against the evaluation criteria and the importance with which these criteria were viewed.

The top four performing options were:

Option 3a	Weekly collection of dry recyclables (paper, card, drinks cartons, glass, cans and plastic), weekly collection of organics (kitchen and garden) fortnightly collection of residual waste
Option 3	Weekly collection of dry recyclables (paper, card, drinks cartons, glass, cans and plastic), weekly collection of organics (kitchen and garden) weekly collection of residual waste
Option 2a	Weekly collection of dry recyclables (paper, glass), weekly collection of organics (kitchen and garden) fortnightly collection of residual waste
Option 3b	Weekly collection of dry recyclables (paper, card, drinks cartons, glass, cans and plastic), weekly collection of organics (kitchen and garden) fortnightly collection of residual waste (9 months chargeable)

A number of assumptions have been used in this assessment. These assumptions are necessary to enable the completion of the assessment, and an indicative ranking to be formed. However the rankings should not be taken to sanction a particular option; rather their relative positions should identify a need to the Council to evaluate some schemes in greater detail, while others can be removed from consideration.

Options which maximize the collection of dry recyclables (Option 3, 3a and 3b) perform well, all appearing amongst the top four ranked options. In addition two of the top four collection options reflect a fortnightly collection of residual waste, and all three options considering fortnightly collections are in the top five options.

On this basis it is recommended the Council further investigate the practicalities of delivering a maximised dry recyclables collection, with the collection of residual waste on to a fortnightly basis.

Contents

1. Introduction

1.1 Project Brief

In June 2005 Milton Keynes Council commissioned Entec UK Ltd to complete a Best Practical Environmental Option (BPEO) appraisal on nine collection options. As part of this assessment Entec was required to develop environmental performance data using the Environment Agency's life cycle assessment tool WISARD. Entec was not engaged to develop the performance and economic data; this was provided by Milton Keynes Council[1].

This report presents the BPEO evaluation of the nine collection options.

1.2 Pre-amble

Milton Keynes Council is currently engaged in the development and evaluation of long term options to collect, treat and dispose of waste arisings. As part of this process, Milton Keynes Council, in partnership with Buckinghamshire County Council engaged consultants to undertake an "Options Appraisal" to evaluate suitable treatment technologies for Municipal Solid Wastes (MSW) in the medium to long term. The results from this study were published in February 2005.

Subsequent to this Options Appraisal the Council commissioned Entec to undertake a BPEO assessment. The scope and direction of this work was based on assessing different residual treatment options. The methodology was developed focusing on residual treatment options. This work was reported to the Council in Entec Report 05223 Residual Best Practical Environmental Option (BPEO) Assessment. This report also presents background information on the concept of BPEO and its application.

Milton Keynes Council then commissioned work on nine collection options. Jacobs Babtie undertook the evaluation of the recycling and BMW diversion, and Entec completed the BPEO appraisal. As such, this report evaluates a range of collection options and frequencies, and acts as an addendum to the previous work commissioned by Milton Keynes Council. The approach adopted is identical to that in Entec Report 05223.

[1] Milton Keynes Council commissioned Jacobs Babtie to undertake the performance and economic modelling.

2. Methodology

2.1 Defining the approach

The same principals as adopted in the residual treatment BPEO were required to be adopted for this study to allow the Council to "match" collection options to the disposal options. However it should be noted that collection and a disposal options can't directly be summed and compared as this will lead to errors in tonnage. The BPEO on residual treatment options considered one kerbside recycling scenario which generated a single mass of residual waste. This tonnage was then evaluated through the different disposal routes. The different collection options and frequencies of collection give rise to different tonnages of materials captured at the kerbside. This will therefore mean that different collection options generate not only different tonnages of recyclables but also of residual waste.

The BPEO of collection systems looked at all aspects of the recycling system, from collection to reprocessing.

The first stage of the BPEO assessment was to define the approach to be adopted. The approach followed the ODPM guidelines but focused on issues relevant to evaluating residual treatment options. A brief outline the ODPM guidance and WISARD tool is present below. For full details the reader is referred to Entec Report 05223.

2.2 BPEO Treatment methodology

2.2.1 ODPM Guidance

The Office of the Deputy Prime Minister (ODPM) has issued guidance on delivering BPEO assessments. The guidance was tested and refined through a detailed case study with the North West RTAB (Regional Technical Advisory Board), the results of which were published as the guidance document. It is this methodology that has been used as a basis for both the Milton Keynes BPEO assessments.

The ODPM guidance proposed the following approach:

1. Identifying and Agreeing Appraisal Criteria;
2. Developing Strategic Waste Planning Options;
3. Data Collection;
4. Appraising Strategic Waste Planning Options;
5. Ranking and Valuing Performance;
6. Weighting Indicators.

In both studies points 2 and 3 have largely been completed as part of the Options Appraisal and no additional data has been collated for the purpose of this assessment, with the exception of the WISARD analysis.

The Appraisal Criteria were agreed at the first Waste Forum workshop, held in December 2004. The Waste Forum met again in January to assign weightings to the indicators.

The additional modelling and marking of the indicators was undertaken. For each indicator, these marks were translated into scores between 0 and 1, with 1 being the best performance, and a 0 score allocated to the worst performance. In this manner it was possible to sum the performance of an option across a range of indicators, allowing for comparison of all options. However this approach assumed that all the indicators are of equal importance. In practice though, decision makers are likely to attach a greater importance to certain criteria than to others. The relative importance of the indicators can be reflected through applying "weightings" to each performance score.

Once identified, scores were multiplied by the weighting indicators to give a weighted score. The weighted scores were summed; the option having the highest score being the better performing option.

However requirements to conduct a BPEO will be superseded in the future by the requirements to conduct a "Strategic Environmental Assessment" or "SEA". At the time that preparatory work was being undertaken for this consultation the guidance in place was to complete a BPEO.

2.2.2 The Waste Forum

Milton Keynes Council supports a Waste Forum, which meets regularly to discuss waste issues. The Waste Forum is an informed group of individuals including representatives from Council Officers, Council Members, Parish Councillors, the Open University, the Environment Agency, pressure groups (e.g. FoE, PALs- People Against Landfills) and also from local waste management industries.

The Council proposed the Waste Forum as a platform to discuss and agree the Appraisal Criteria and also undertake the weighting exercise. The Waste Forum consented to participate in this study.

The latter requirement to evaluate collection options was not envisaged and therefore the Forum debated the appraisal criteria with respect to the evaluation of residual treatment options. Their deliberations focused on what was considered important and relevant to disposal options.

2.3 WISARD

WISARD (Waste: Integrated Systems Analysis for Recovery and Disposal) is a waste management software tool developed for the Environment Agency and launched in England in 1999.

The software employs a life cycle assessment (LCA) approach to forecasting the potential environmental impacts associated with the waste management options. Although the software can address potential impacts stemming from all stages in the management and processing of waste, including waste collection, transport, treatment and disposal activities, this particular assessment has focused on the treatment and disposal activities. Impacts considered include the

direct emissions from management activities themselves (e.g. transport, composting, incineration, landfill etc.), those associated with the provision of infrastructure (e.g. bins, vehicles, construction of facilities etc.) and the avoided impacts associated with materials and energy recovery (e.g. offset virgin paper production or electricity generation from coal).

WISARD utilises the "avoided burden" methodology for calculating environmental burdens. This is to say it incorporates into the assessment the avoided environmental impacts of an activity or process not having to take place. For example, recycling of steel cans avoids the requirement to smelt additional iron. Thus credits are allocated to recycling activities by calculating the energy and raw materials associated with the production of that product.

2.4 Evaluation Criteria

Discussions at the 1st meeting held with the Waste Forum focused on defining the evaluation criteria to be used in the BPEO process. This was in the context of residual waste treatment and disposal options.

The agreed evaluation criteria were:

- Resource depletion;
- Emissions of greenhouse gases;
- Emissions injurious to public health;
- Eutrophication;
- Extent of water pollution;
- Overall costs & Best Value;
- Likelihood of implementation within required timescales;
- Percentage of material recovery;
- Reliability of technology;
- Minimise hazardous discharge to land;
- Ability to cope with change.

The derivation of the indicators, as detailed above, was undertaken for the residual treatment options. Some of these indicators are not relevant to waste collection and for some indicators there could be no distinction between the options, and these are as follows:

- Percentage of material Recovered: recovery is part of a disposal option, would be dependant upon which disposal option is adopted post collection;
- Minimise hazardous discharge to land: related to the landfilling of Air Pollution Control residues from thermal treatment processes. Therefore this indicator was not applicable to evaluation of collection options;
- Likelihood of implementation within required timescales: unlike the residual treatment options there is no significant time lag between option selection and full

implementation, and as all options require the use of a MRF, all the options would have the same implementation timeframe;

- Reliability of technology: the options include the use of various levels of automation within the MRF. However Milton Keynes Council have experience of complex MRF technology and found this to be no less reliable than their previous experience of less complex MRF's. All collections options would therefore be as reliable as each other;

- Ability to cope with change: this indicator mainly referred to the long time frame of residual treatment options (contract time of 25 years) and the level of flexibility that technologies have in adapting to possible changes with respect to waste generation. Collection contracts are generally over much shorter time frames and within any 25 year disposal period the collection fleet would be renewed no less than three times. This in itself brings an element of flexibility into collection options. It was agreed that changes would affect all collection options equally.

In these instances each option will score 0. This is necessary as the identified weightings equate to 1 (or 100%), and, to allow direct comparison between with the residual treatment BPEO.

3. Collection Options

Milton Keynes Council derived three collection scenarios, and three collection frequencies. Thus, in total, there were nine collection options to model. Table 3.1 presents the collection options and frequencies.

Table 3.1 Collection Options

Option	Kerbside Recycling		Organics		Residual
	Materials	**Frequency**	**Materials**	**Frequency**	**Frequency**
Option 1	Paper, Cardboard	Weekly	Garden Kitchen	Weekly	Weekly
Option 2	Paper Glass	Weekly	Garden Kitchen	Weekly	Weekly
Option 3	Paper Cardboard Drinks Cartons Glass Cans Plastic	Weekly	Garden Kitchen	Weekly	Weekly
Option 1a	Paper, Cardboard	Weekly	Garden Kitchen	Weekly	Alternate Week
Option 2a	Paper Glass	Weekly	Garden Kitchen	Weekly	Alternate Week
Option 3a	Paper Cardboard Drinks Cartons Glass Cans Plastic	Weekly	Garden Kitchen	Weekly	Alternate Week
Option 1b	Paper, Cardboard	Weekly	Garden Kitchen	Fortnightly 9 months chargeable Weekly separate caddy	Weekly
Option 2b	Paper Glass	Weekly	Garden Kitchen	Fortnightly 9 months chargeable Weekly separate caddy	Weekly
Option 3b	Paper Cardboard Drinks Cartons Glass Cans Plastic	Weekly	Garden Kitchen	Fortnightly 9 months chargeable Weekly separate caddy	Weekly

4. Data Requirements

4.1 WISARD Requirements

To complete the WISARD modelling data on the number of collection receptacles, transport mileage and recycling tonnages were required.

4.2 Recycling Tonnages

The tonnages of materials collected by the respective collection options were provided to Entec by Milton Keynes Council. This data derived from a previous assessment.

4.3 Transport

The mileage associated with each collection option was estimated based on current vehicle mileage, vehicle fleet and round sizes. Information pertaining to current collection mileage etc was provided by Milton Keynes Council. Transport mileage used in the WISARD assessment is presented in Table 4.1.

Table 4.1 Transport Mileages

Option	Collection	Mileage per year
Option 1	Recycling (one-pass)	253,000
	Residual	196,000
Option 2	Recycling (one-pass)	275,000
	Residual	196,000
Option 3	Recycling (one-pass)	308,000
	Residual	196,000
Option 1a	Recycling (one-pass)	253,000
	Residual	132,000
Option 2a	Recycling (one-pass)	275,000
	Residual	132,000
Option 3a	Recycling (one-pass)	308,000
	Residual	132,000
Option 1b	Organic	84,000
	Recycling & Residual (one-pass)	275,000

Option	Collection	Mileage per year
Option 2b	Organic	84,000
	Recycling & Residual (one-pass)	297,000
Option 3b	Organic	84,000
	Recycling & Residual (one-pass)	333,000

4.4 Collection Receptacles

Data in the previous treatment BPEO assessment was based on a 25 year average. To estimate the number of collection receptacles required by the different schemes per year, the total number for the 25 years contract was calculated and then divided by 25. Estimated receptables numbers are presented in Table 4.2

Table 4.2 Number of receptacles required, 25 year average

Receptacles	25 yr average
Wheelie Bin	10,018
Box	13,798
Bag	6,693,893

5. Appraisal and Scoring Indicators

5.1 Appraisal Methods

The indicators were appraised by one of three methods:

- Use of quantitative assessment tools (WISARD);
- Use of generic data on the performance of options;
- Use of professional judgement to assess the performance of options.

Table 5.1 presents the method by which each indicator was assessed.

Table 5.1 Appraisal methods for each indicator

WISARD	Generic Data	Professional Judgement
Resource Depletion	Percentage of waste recovered (N/A)	Extent of water pollution (N/A)
Emission of Greenhouse Gases	Percentage of waste recycled/ composted	Likelihood of implementation within required timescales (N/A)
Eutrophicaton	Overall cost & Best Value	Reliability of technology (N/A)
Emissions injurious to human health	Minimise hazardous discharge to land (N/A)	Ability to cope with change (N/A)

Those indicators marked with (N/A) are not being evaluated in this assessment for the reasons stated in section 2.4.

5.2 Appraisal Results

5.2.1 WISARD Assessment

Four indicators were assessed using the WISARD LCA tool, using data provided by Milton Keynes Council. The data was derived from a previous assessment. The Arisings data used in the WISARD modelling exercise is provided in Appendix A. The following provides a brief description of each WISARD indicator.

Greenhouse gas emissions

The global warming potential of a waste management system is currently dominated by the generation of methane and carbon dioxide emissions. Methane is a far more potent greenhouse gas than carbon dioxide and consequently is a significant consideration in waste management options (in general terms, landfill gas comprises between 40-65% methane). Thus the global warming potential of each scenario is linked to the methane emissions, which is dependant upon the amount of biodegradable waste disposed to landfill. The next significant source of green

house gases is the combustion of waste, as this will produce carbon dioxide. If it is assumed that there is energy recovery from this combustion, then WISARD off-sets emissions that would otherwise have been incurred through the combustion of coal at coal fired power stations.

The model evaluated all emissions associated with the option, from the emissions of gases associated with the combustion of waste together with the off-set emissions of not having to combust coal for the production of additional materials (in the case of recycling) or electricity / energy (in the case of using waste as a substitute fuel).

Resource Depletion

The world contains finite resources in terms of minerals and fossil fuels. The rate at which these resources are consumed is important when assessing the sustainability of any activity. The model evaluates the consumption of all raw materials for a particular option. Recycling of metals and plastics preserves both the mineralogical value of the item as well as its intrinsic energy content e.g. the energy consumed in production of the material.

Emissions injurious to public health

Emission injurious to public health can be to all media, air; waters, and land. Human toxicity is a measure of the potential risk to health from waste treatment facilities. Those options with combustion were the poorest performers, with emissions proportional to the amount of material combusted. Those options without any form of combustion performed well, and the increased recycling from the autoclaving treatment process made this option perform best.

Eutrophication

Eutrophication is a natural process, occurring where there is an increase of mineral and organic nutrients in a water body (principally nitrogen and phosphorous). The enrichment promotes both plant growth and microbial activity which, providing an unlimited nutrient supply, eventually results in the de-oxygenated of the water body, De-oxygenation of a water body results in fish kills and an alteration to the ecology of the system.

As anthropogenic activities increase the nutrient loading to surface waters (through direct discharges such as sewage effluent and indirect discharges such as fertiliser run-off) so the occurrences and magnitude of this natural process escalates. Costs are not confined to the ecosystem, but arise from loss of amenity value; damage to commercial fishing, increased costs for water treatment and additional costs required to mange the systems.

The appraisal results for each indicator, as discussed above, are presented in Table5.2.

Table 5.2 Appraisal results for each indicator

Indicator	Option 1	Option 2	Option 3	Option 1a	Option 2a	Option 3a	Option 1b	Option 2b	Option 3b
Resource depletion (yr^{-1})	5,259	-999	-478,572	19,911	-6,418	-535,812	28,087	-4,028	-497,722
Emissions of greenhouse gases (g eq CO_2)	-5.61E+08	-1.67E+09	-7.05E+09	4.93E+07	-1.96E+09	-6.44E+09	-4.45E+08	-2.34E+09	-6.23E+09
Emissions injurious to public health (g eq.1,4-DCB)	1.62E+08	6.78E+07	-6.23E+06	1.07E+08	4.12E+07	-7.58E+07	1.45E+08	8.94E+07	2.73E+07
Eutrophication (g eq.PO_4^{3-})	-1,888,864	-2,245,742	-6,074,853	-1,962,085	-2,699,265	-7,263,058	-1,532,141	-2,272,068	-6,106,531
Extent of water pollution	0.1	0.65	0.53	0.56	0.79	0.72	0.39	0.51	0.36
Overall costs & Best Value (NPV £/T)	38.82	43.01	51.36	33.02	32.9	48.31	48.93	45.33	54.98
Likelihood of implementation within required timescales	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Percentage of material recycled/composted	40,487	44,736	48,196	43,060	47,593	51,237	33,361	37,610	41,070
Percentage of material recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reliability of technology	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimise hazardous discharge to land (tonnes)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ability to cope with change	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

5.3 Scoring Indicators

The results from the appraisal exercise present the performance of each option against an indicator and this score is presented in the units used to quantify or measure the impact. Thus to "sum" the relative scores between options will require these appraisal result to be standardised to a scoring system that can allow for comparison. This can be achieved through scoring all outputs on a scoring system between 0 and 1. For each indicator, the best performing appraisal result is given the score of 1, the worst performing appraisal result 0. All the other results are given a score between 0 and 1 based on their relative positioning between the highest and lowest performing options. For example in the case of Resource Depletion, Option 4, the poorest performer scores 0. Option 1d, the highest performer scores 1. All other options are awarded a score dependent on their respective position between the scale established by Option 4 and Option 1d. The relative performance of the Options is calculated using the following equation:

$$y_i = (x_i - \text{Min}[x_1,x_2\ldots x_n]) / (\text{Max}[x_1,x_2\ldots x_n] - \text{Min}[x_1,x_2\ldots x_n]$$

By adopting this scoring system the relative difference between option performances is retained for each indicator, whilst allowing the performance of the options against all indicators to be put on a common scale.

Scoring results have been calculated for each indicator in this manner and are presented in Table 5.3.

Table 5.3 Appraisal scores for each indicator

Indicator	Option 1	Option 2	Option 3	Option 1a	Option 2a	Option 3a	Option 1b	Option 2b	Option 3b
Resource depletion (yr^{-1})	0.040	0.052	0.898	0.014	0.061	1.000	0.000	0.057	0.932
Emissions of greenhouse gases (g eq CO_2)	0.086	0.242	1.000	0.000	0.283	0.914	0.070	0.337	0.885
Emissions injurious to public health (g eq.1,4-DCB)	0.000	0.397	0.708	0.233	0.508	1.000	0.071	0.306	0.567
Eutrophication (g eq.PO_4^{3-})	0.062	0.125	0.793	0.075	0.204	1.000	0.000	0.129	0.798
Extent of water pollution	0.000	0.797	0.623	0.667	1.000	0.899	0.420	0.594	0.377
Overall costs & Best Value (NPV £/T)	0.732	0.542	0.164	0.995	1.000	0.302	0.274	0.437	0.000
Likelihood of implementation within required timescales	0	0	0	0	0	0	0	0	0
Percentage of material recycled/composted	0.399	0.636	0.830	0.543	0.796	1.000	0.000	0.238	0.431
Percentage of material recovery	0	0	0	0	0	0	0	0	0
Reliability of technology	0	0	0	0	0	0	0	0	0
Minimise hazardous discharge to land (tonnes)	0	0	0	0	0	0	0	0	0
Ability to cope with change	0	0	0	0	0	0	0	0	0

6. Weighting Indicators

6.1 Weighting Workshop

The second Waste Forum BPEO workshop was held on the 18th January at Milton Keynes Council Offices. The purpose of the workshop was to assign a weighting to each indicator, against which the scores from the evaluation stage would be multiplied.

Without weightings, all the indicators are of equal importance. In practice though, decision makers are likely to attach more importance to certain indicators than to others. The relative importance of the indicators can be reflected through applying "weightings" to each performance score. A simple approach is to provide decision makers with a number of points (100 for simplicity, as this can easily be translated into a percentage) and ask that these are distributed between indicators to reflect their relative significance.

Details of how the weighting was determined at the workshop are in Entec Report 05223.

Table 6.1 presents the finalised weightings for the BPEO exercise.

Table 6.1 Finalised Weightings

Indicator	Weighting (%)
Resource Depletion	8.74
Percentage of Material Recycled/Composted	8.74
Emission of Greenhouse Gases	10.12
Eutrophication	2.76
Extent of Water Pollution	3.68
Percentage of Material Recovery	5.98
Minimise Hazardous Discharge to Land	5.98
Overall costs and best value	12.3
Likelihood of implementation within required timescales	9.7
Reliability of technology	11.4
Ability to cope with change	10.6
Emissions injurious to public health	10.0

7. BPEO Results

7.1 Results from scoring and weight exercises

Table 7.1 presents indicator scores and weighted scores, and Table 7.2 presents the Options ranked according to their weighted score.

Table 7.1 Indicator Scores and Weighted Scores

		Option 1	Option 2	Option 3	Option 1a	Option 2a	Option 3a	Option 1b	Option 2b	Option 3b
Resource Depletion	Score	0.040	0.052	0.898	0.014	0.061	1.000	0.000	0.057	0.932
Weighting: 0.0874	Weighted score	0.004	0.005	0.079	0.001	0.005	0.087	0.000	0.005	0.081
% Material Recycled /Composted	Score	0.399	0.636	0.830	0.543	0.796	1.000	0.000	0.238	0.431
Weighting: 0.0874	Weighted score	0.035	0.056	0.073	0.047	0.070	0.087	0.000	0.021	0.038
Emission Greenhouse gasses	Score	0.086	0.242	1.000	0.000	0.283	0.914	0.070	0.337	0.885
Weighting: 0.1012	Weighted score	0.009	0.024	0.101	0.000	0.029	0.092	0.007	0.034	0.090
Europhication	Score	0.062	0.125	0.793	0.075	0.204	1.000	0.000	0.129	0.798
Weighting: 0.0276	Weighted score	0.002	0.003	0.022	0.002	0.006	0.028	0.000	0.004	0.022
Extent of Water Polln	Score	0.000	0.797	0.623	0.667	1.000	0.899	0.420	0.594	0.377
Weighting: 0.0368	Weighted score	0.000	0.029	0.023	0.025	0.037	0.033	0.015	0.022	0.014
% Material Recovery	Score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Weighting: 0.0598	Weighted score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Min Haz discharge to land	Score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

		Option 1	Option 2	Option 3	Option 1a	Option 2a	Option 3a	Option 1b	Option 2b	Option 3b
Weighting: 0.0598	Weighted score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Overall cost & Best Value	Score	0.732	0.542	0.164	0.995	1.000	0.302	0.274	0.437	0.000
Weighting: 0.1230	Weighted score	0.090	0.067	0.020	0.122	0.123	0.037	0.034	0.054	0.000
Likelihood of delivery within timescales	Score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Weighting: 0.097	Weighted score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Reliability of technology	Score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Weighting: 0.114	Weighted score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ability to cope with change	Score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Weighting: 0.106	Weighted score	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Emissions injurious to public health	Score	0.000	0.397	0.708	0.233	0.508	1.000	0.071	0.306	0.567
Weighting: 0.1000	Weighted score	0.000	0.040	0.071	0.023	0.051	0.100	0.007	0.031	0.057
Total weighted score		**0.139**	**0.224**	**0.388**	**0.221**	**0.320**	**0.465**	**0.063**	**0.170**	**0.301**

Table 7.2 Ranked Options According to Weighted Score

Option	Weighted Score	Rank
Option 3a	0.465	1
Option 3	0.388	2
Option 2a	0.320	3
Option 3b	0.301	4
Option 1a	0.221	5
Option 2	0.224	6
Option 2b	0.170	7
Option 1	0.139	8
Option 1b	0.063	9

8. Conclusions

A number of assumptions have been used in this assessment. These assumptions are necessary to enable the completion of the assessment, and an indicative ranking to be formed. However the rankings should not be taken to sanction a particular option; rather their relative positions should identify a need to the Council to evaluate some schemes in greater detail, while others can be removed from consideration.

Options which maximize the collection of dry recyclables (Option 3, 3a and 3b) perform well, all appearing amongst the top four ranked options. In addition two of the top four collection options reflect a fortnightly collection of residual waste, and all three options considering fortnightly collections are in the top five options.

On this basis it is recommended the Council further investigate the practicalities of delivering a maximised dry recyclables collection, with the collection of residual waste on a fortnightly basis.

Appendix A
WISARD INPUT DATA

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	Option 1	25 yr average Option 2	Option 3	Option 1a	Option 2a	Option 3a	Option 1b	Option 2b	Option 3b
Dry recycling - kerbside collected									
Paper/Card	16049	16,049	16,278	17,012	17,012	17,255	16,049	16,049	16,278
Dense Plastic			1,127			1,195			1,127
Glass		6,200	6,281		6,573	6,659		6,200	6,281
Ferrous Metal			1,419			1,505			1,419
Non Ferrous Metal			428			454			428
Organic waste - kerbside collected	21,222	21,222	21,222	22,858	22,878	22,858	14,096	14,096	14,096
Garden	13,587	13,587	13,587	14,561	14,561	14,561	6,461	6,461	6,461
Food	7,635	7,635	7,635	8,297	8,317	8,297	7,635	7,635	7,635
Dry recycling - banks									
Paper/Card	423	389	766	397	366	719	423	389	766
Dense Plastic	0	0	18	0	0	18	0	0	18
Glass	2682	847	620	2,682	735	539	2,682	847	620
Ferrous Metal	1	1	29	1	1	28	1	1	29
Non Ferrous Metal	0	0	8	0	0	8	0	0	8

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