

Waste Wise Armadale

Project Evaluation

SISTech

January 2008

Table of contents

Table of contents.....	1
1 Introduction.....	2
1.1 Overview.....	2
2 Assessment Methodology.....	3
2.1 Waste collection regime in Armadale.....	3
2.2 ACORN analysis of Armadale.....	3
2.3 Selection of sample area.....	5
2.4 Selection of control area.....	5
2.5 Assessment methods.....	6
3 Waste tonnage assessment.....	8
3.1 Overview.....	8
3.2 Practical issues and difficulties.....	8
3.3 Assessment of data.....	9
3.4 Assessment of the Grey bin data.....	9
3.5 Assessment of the Blue bin data.....	12
3.6 Assessment of the Brown bin data.....	14
3.7 Assessment of the campaign effect.....	16
3.8 Discussion.....	20
4 Door to door survey assessment.....	22
4.1 Overview.....	22
4.2 Practical issues and difficulties.....	22
4.3 Assessment of data.....	24
4.4 Analysis of results.....	26

1 Introduction

1.1 Overview

SISTech were involved from the early stages of what would become the Waste Wise Armadale project in a project evaluation role. SISTech was required to draw on previous assessment work on projects such as stepchange to develop and undertake a project assessment methodology and to report on the results of this.

The assessment approach finally adopted was based on two key methods, namely:

- Collecting data from West Lothian Council on the quantities of waste being collected from households in the target and control areas before, during and after the main intervention phase of the project
- A door-to-door survey in the target and control areas to examine public awareness and understanding carried out before and after the main intervention phase of the project

This work was carried out between February and November of 2007 and the methodology and results are detailed in this report.

This report should be read in conjunction with the main Waste Wise Armadale final report.

2 Assessment Methodology

2.1 Waste collection regime in Armadale

West Lothian Council currently operates a three-bin collection regime for the majority of households in Armadale. The structure is:

Table 2-1 West Lothian Council collection regime

	Waste type	Collection frequency
Blue bin	Dry recyclates – paper, card, cans, plastic bottles	Fortnightly
Brown bin	Garden waste	Monthly (summer only)
Grey bin	All residual waste	Fortnightly

Waste is collected in Armadale on a range of different routes or “beats” which collect a different type of waste on different days. Householders are kept informed of the type of waste being collected in any given week by means of a calendar distributed to them at the start of the year.

The majority of Armadale is covered by Beat 9, which collects waste on a Tuesday, Wednesday, Thursday and Friday. These four collection days account for around 85% of all households in Armadale with the rest being served by other collection beats.

The collection beats for the three types of bin are common – meaning that the same households are served for each of the Beat 9 days regardless of which bin is being collected in any particular week. This factor was key in the selection of Armadale as the target town as it allows for the collection of waste tonnage data for a distinct group of houses for grey, blue and brown bin waste arisings.

2.2 ACORN analysis of Armadale

For the purposes of the project it was necessary to select a number of sampling groups for the assessment of waste collection quantities and for the door-to-door survey work. Clearly in all cases it was desirable that any given sample should closely reflect the population of Armadale as a whole.

Assessment of the demographic breakdown within Armadale was carried out using a socio-demographic database called ACORN. ACORN operates by classifying households of the UK into various Categories, Groups and Types based on their postcode. For the purposes of this project consideration and selection of households was based only by considering Categories and, to a lesser extent, Groups. Previous experience has shown that selecting households based on Types can be impractically difficult.

The Categories and their respective Groups are:

- Category 1 – Wealthy Achievers
 - Group A – Wealthy Executives
 - Group B – Affluent Greys
 - Group C – Flourishing Families
- Category 2 – Urban Prosperity
 - Group D – Prosperous Professionals

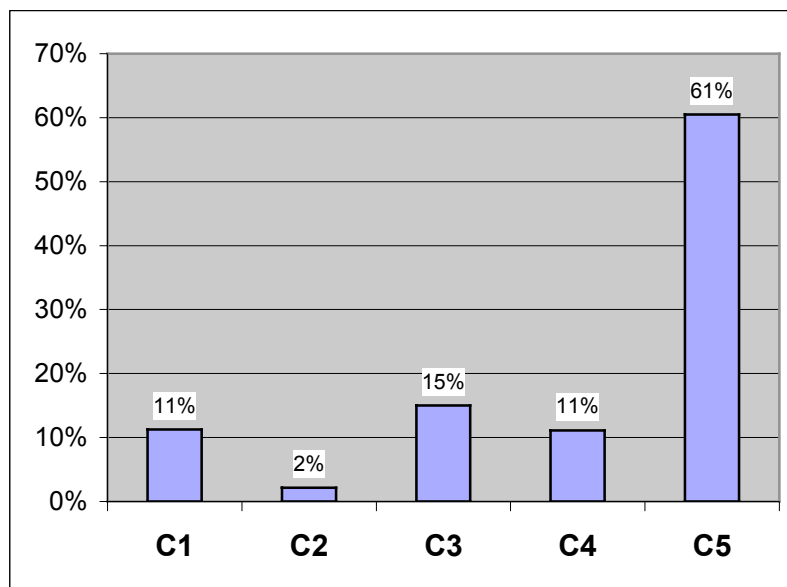
- Group E – Educated Urbanites
- Group F – Aspiring Singles
- Category 3 – Comfortably Off
 - Group G – Starting Out
 - Group H – Secure Families
 - Group I – Settles Suburbia
 - Group J – Prudent Pensioners
- Category 4 – Moderate Means
 - Group K – Asian Communities
 - Group L – Post-Industrial Families
 - Group M – Blue-collar Roots
- Category 5 – Hard-Pressed
 - Group N – Struggling Families
 - Group O – Burdened Singles
 - Group P – High Rise Hardship
 - Group Q – Inner City Adversity

As can be seen the Categories move from the most affluent in Category 1 to the least affluent in Category 5.

A list of households in Armadale was provided to the project team which listed 4,780 addresses. The ACORN classification for each address was established based on the postcode. The following breakdown across Armadale was determined.

Table 2-2 Armadale ACORN breakdown

	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Total
Total	537	102	717	532	2,892	4,780
Percentage	11%	2%	15%	11%	61%	100%



This breakdown across the categories can be thought of as what we are aiming for in samples and can be considered as the “ACORN target” for Armadale. It can be seen that the majority of the Armadale population falls into Category 5 with the other categories represented to lesser degrees.

2.3 Selection of sample area

As stated previously the majority of waste in Armadale is covered by four collections – those of Beat 9 on Tuesday, Wednesday, Thursday and Friday. Each of these collections covers between 750 and 1150 households.

It was decided that a single one of these collection routes would be suitable as the sample area – it was considered that a sample of around 1000 households would be a practical size. The next step was to identify which collection beat would be most suitable.

The collection route for Beat 9 on a Friday was found to contain a number of areas where there was ongoing construction of new properties – and some areas in which streets were still to be named. This meant that it was difficult to establish an ACORN breakdown of this area and so it was discounted.

An ACORN analysis was carried out on each of the three remaining collection routes to identify which most closely represented the breakdown across Armadale as a whole. This analysis produced the following results:

Table 2-3 ACORN breakdown of Armadale collection routes

	Category 1	Category 2	Category 3	Category 4	Category 5
Beat 9 Tuesday	3%	0%	0%	15%	61%
Beat 9 Wednesday	0%	1%	4%	15%	80%
Beat 9 Thursday	15%	7%	10%	13%	55%
ACORN Target	11%	2%	15%	11%	61%

Although an exact match was not available – it can be seen that Beat 9 Thursday was the only collection which offered a distribution which contained representation from all categories. Beat 9 Thursday also offered an overall distribution more representative than the others. For these reasons it was selected as the target area for the campaign and surveying.

2.4 Selection of control area

For the purposes of the project it was necessary to identify an alternative area which could be used as a control group. The additional area needed to be used to fulfil two control group functions:

1. A door-to-door survey, similar to that carried out in Armadale, to be used in the control area in order to attempt to establish any background changes in awareness and behaviour
2. Waste collection tonnages to be used from the control group in order to provide a baseline against which any change in Armadale may be determined

A number of areas were suggested as potential control groups, which included nearby towns/areas called Broxburn, Deans and Ladywell. An ACORN analysis similar to that for

Armadale was carried out on these areas. Ladywell was found to contain households which fell almost exclusively into categories 4 and 5 and as such was disregarded.

Broxburn was examined and was found to consist of three collection beats, namely Beat 6 Tuesday, Wednesday and Thursday. These three beats, along with that for Deans, were all assessed for their ACORN breakdown as was done previously for Armadale.

Table 2-4 ACORN breakdown of potential control group areas

	Category 1	Category 2	Category 3	Category 4	Category 5
Broxburn Beat 6 Tuesday	1%	6%	2%	17%	74%
Broxburn Beat 6 Wednesday	23%	17%	43%	4%	12%
Broxburn Beat 6 Thursday	1%	0%	58%	3%	38%
Deans	20%	0%	8%	54%	17%
ACORN Target	11%	2%	15%	11%	61%

It can be seen that none of the four beats analysed was a suitable match for the ACORN target for Armadale. It was found, however, that combining the Broxburn beats for Tuesday and Wednesday gave the following results:

Table 2-5 ACORN breakdown for selected control area

	Category 1	Category 2	Category 3	Category 4	Category 5
Combined Tue and Wed	12%	11%	23%	11%	43%
ACORN Target	11%	2%	15%	11%	61%

While not being an exact match for Armadale it was felt that the match was suitably close to allow these two areas within Broxburn to be used as the control group.

2.5 Assessment methods

Two different assessment methods were selected in order to assess the impact on the target area of the intervention and campaign within Armadale – and also to assess impact in the control area over the same period. These were the use of **collected waste tonnage analysis** and also the use of **door to door surveying**.

2.5.1 Tonnage Analysis

Through discussion with West Lothian Council it was established that the tonnages of waste collected on each collection beat could be collected by examination of the weighbridge records over the course of a month. This data is collected by local authorities as a matter of course to allow them to report on levels of waste production and recycling.

Over the course of several months a system was developed which allowed the tonnages for each collection area to be collated and sent through to SISTech for analysis.

The expectation was that over a period of time before, during and after the campaign it might be possible to discern a change in the tonnages of waste collected and, ideally, that any change in Armadale would be greater than any change in Broxburn over the same period.

2.5.2 Door to door surveying

On top the tonnage analysis it was also decided to carry out a door-to-door survey in the target area in Armadale, and also in Broxburn. The aim was to survey a representative sample (again based on the ACORN target group) in both areas and to ask a series of questions covering a number of areas including:

- knowledge and understanding of the waste hierarchy;
- means by which waste production can be minimised through reduction and reuse
- current levels of recycling
- knowledge and uptake of schemes like the Mail Preference Service and real nappies
- obstacles to recycling and waste minimisation

Again, the hope was that a difference would be observed within Armadale which was significantly different to any change seen in Armadale.

3 Waste tonnage assessment

3.1 Overview

The waste tonnage assessment was intended to provide a quantitative analysis of the levels of waste being collected by West Lothian Council in Armadale and, for comparison, a control area in Broxburn.

As has been stated previously, Armadale is covered by a number of waste collection beats – the main four being Beat 9 on a Tuesday, Wednesday, Thursday and Friday. It should be noted that on any given collection day (irrespective of the colour of bin) the same houses are collected from. This means that it is possible to assess the cumulative waste being collected from a distinct set of households – that is the contribution from all three of their bins.

Through discussion with West Lothian Council a system was developed whereby the tonnages of waste collected on each of the collection days, for each of the three coloured bins, was recorded and supplied to SISTech for analysis.

3.2 Practical issues and difficulties

A number of issues were identified relating to the waste tonnage data both during the course of the project, and during the post-campaign analysis process.

There were some minor technical difficulties in the process of collating waste tonnage data – however this was largely due to recent changes on the reporting system within West Lothian Council. Over the course of the project these were resolved and towards the end of the assessment process the system was well developed and operating smoothly.

The actual waste data collected, however, had a number of issues relating to it. Waste data is, by its nature, highly variable. This variability, however, is compounded by a number of practical issues relating to waste collection. Although there is a nominal arrangement of collection routes on particular days often these are compromised by practical difficulties. Issues can include vehicle breakdowns and maintenance, poor weather and staff issues. Collection regimes can also be affected by public holidays. This kind of issue can lead to various types of error in the waste data. In some cases waste will be collected on another day of the week. Alternatively in some cases the waste will rollover until the next scheduled collection date.

Practical issues such as these mean that in some cases there are gaps in the waste data set. These issues can also manifest themselves as uncharacteristically high or low tonnages for a particular day. There also appeared to be some issues relating to the recording of tonnages – in some weeks, particularly in the Broxburn data set, there would simply be no tonnage data for a particular week. These issues are discussed further later in the report.

Another significant issue that occurred was where the collection regime for the blue bins changed within the period of assessment. Prior to Spring 2006 the summer months saw an alternate blue and brown bin collection every two weeks – in the winter months the brown bin collection was dropped, and the blue bin was collected every two weeks. After the spring of 2006, however, West Lothian Council opted to continue the fortnightly collection of blue bins throughout the year – meaning that over the summer months there would be a collection of blue bins every fortnight, and brown bins every 4 weeks. While this change to the collection

regime was unfortunate from the project monitoring point of view it was a necessary fact to be dealt with.

An additional complicating factor identified during the course of the project was the ongoing construction of new residential properties in Armadale. Clearly any tonnage analysis would be affected by a change in the number of properties being measured and the resulting increases in waste collection. The situation is complicated by the fact that new houses may be constructed but may remain unoccupied for a period after this. Unfortunately it has not been possible to establish realistic estimations of the number of new and occupied properties in Armadale over the period under consideration however it has been established that there was no significant construction within the area covered by Beat 9 Thursday. This allows more reliance to be given to the set of figures in the target group – but there is less accuracy in the figures for the larger area of Beat 9 as a whole.

3.3 Assessment of data

Data on the tonnages of waste collected on different collection routes in Armadale and Broxburn was available from around the start of April 2006 through until the end of October 2007 – a period of approximately 18 months.

A range of analysis approaches for the tonnage data were considered – however due to the considerable fluctuations within waste data (as discussed previously) a relatively simple before and after analysis was carried out. This analysis examined the quantities of waste collected over the same eight-week periods in 2006 and 2007. This approach, however, needed to consider that the target eight-week periods may contain un-representative data points. In order to examine where this may be the case the target periods were considered against the preceding periods of waste collection for comparison.

3.4 Assessment of the Grey bin data

3.4.1 Assessment of tonnage collection

The Grey bin is the residual bin for materials not suitable for the blue or brown collection bins. Contents of grey bins are largely sent for disposal at landfill and as such are a key target for local authorities.

In general the data set for the grey bin within Armadale was strong and consistent over the course of the assessment period. The data set for Broxburn, however, was less strong towards the end of the period with gaps frequently appearing.

Assessment of changes to the tonnages of grey bin waste collected was based on a comparison of two eight-week periods – one from 2006, before the campaign (Phase 1), and one from 2007 post-campaign (Phase 2). The comparison was made between three areas:

- Armadale Beat 9 Thursday (Target Group)
- Armadale Beat 9 Complete (Armadale Beat 9)
- Broxburn Beat 6 Wednesday and Thursday (Control Group)

Table 3-1 Grey bin waste before and after campaign

	Total Grey bin collection (tonnes)		
	Phase 1		
W/C	Target Group	Armadale Beat 9	Control Group
31 Jul 06	24.82	137.50	48.44
14 Aug 06	24.78	104.00	68.78
28 Aug 06	24.96	114.60	51.42
11 Sep 06	24.96	113.78	42.88
	Phase 2		
30 Jul 07	23.78	115.66	48.68
13 Aug 07	23.44	110.22	50.90
27 Aug 07	19.00	109.98	51.00
10 Sep 07	24.10	123.20	48.54

The first stage in the analysis process was to consider whether the data returned for these periods is representative, or whether any of the values might be erroneous. This is done by comparing the data points for these periods to preceding collections (usually checking the previous 16 weeks). The full tonnage data can be viewed in the Appendix.

Examination of the data in Table 3-1 shows that in the Target Group and Armadale Beat 9 the tonnages were roughly at expected levels, however in the Control Group the value of 68.78 tonnes seems unusually high. Comparison with the preceding 16 weeks showed that this value was around 35% higher than other collections. It was decided at this stage that a cut-off should be determined to identify suspect tonnages – in the case of the grey bin it was taken as being +/- 30%. On this basis the value of 68.78 tonnes was disregarded and the mean tonnage per fortnight was based on the remaining three values.

The changes in grey bin tonnage before and after the campaign were determined, along with the estimated change per household per week, and are shown in Table 3-2.

Table 3-2 Changes to grey bin tonnages before and after campaign

	Target Group	Armadale Beat 9	Control Group
Number of households	1,160	4,062	2,559
Phase 1 Mean tonnes per fortnight	24.88	117.47	47.58
Phase 2 Mean tonnes per fortnight	22.58	114.77	49.78
Tonnes/fortnight change	-2.30	-2.71	+2.20
% change before and after	-9.24%	-2.30%	+4.62%
Phase 1 Mean kg per hh per week	10.72	14.46	9.30
Phase 2 Mean kg per hh per week	9.73	14.13	9.73
Change per household per week (kg)	-0.99kg	-0.33kg	+0.43kg

3.4.2 Discussion of results

An examination of the results shows that a reduction of waste in the grey bin was seen in the target area. Similarly a decrease was seen in Armadale as a whole, but to a lesser extent. In the control area there was an overall increase in the grey bin tonnage between one year and the next.

It is again important, however, to check the reliability of these estimates. As has been stated previously, waste tonnages fluctuate considerably from one week to another partly through seasonal effects but also through random changes in behaviour. A useful exercise is to examine the tonnages in preceding eight-week blocks in order to assess how reliable the sample selected is. It should be noted that there were a number of gaps in data for the Phase 2 Control Group grey bin collection and so values are estimates based on available data.

Table 3-3 Grey bin tonnage change for eight week periods

Eight-week period commencing:	Grey bin % tonnage change year to year		
	Target Group	Armadale Beat 9	Control Group
09/10 April	-9.17%	-0.56%	+8.13%
04/05 June	-6.93%	-4.74%	-2.15%
30/31 July (sample periods)	-9.24%	-2.30%	+4.62%

It can be seen that the year-to-year changes vary across the three areas, and between eight-week periods. While this might be seen to diminish the results from the specific eight-week period under examination a number of points should be highlighted.

1. As mentioned above, the data for the Control Group is fragmented in the first two periods. The period under consideration, however, has a strong set of data which is more likely to be accurately representative.
2. The middle period, commencing 04/05 June, is the period containing the majority of the school summer holidays and so may be subject to seasonal fluctuations not seen elsewhere
3. The data for the target area, while fluctuating, shows a consistent reduction year on year

It is difficult, however, to consider how the data could have been collected more rigorously and as such the assessment over the eight-week period under consideration is the strongest estimation we have of the annual grey bin changes.

Aside from the percentage changes in grey bin tonnages, some consideration should also be given to the absolute quantities of waste produced per household (seen in Table 3-2). The larger improvement in the target area is even more significant than Armadale Beat 9 when it is considered that the target area households were already starting from a lower level of grey bin waste production (10.72 kg/hh as opposed to 14.46 kg/hh).

3.5 Assessment of the Blue bin data

The blue bin is the main dry recyclates collection bin and householders can use it for the following materials:

- Aluminium and steel food and drinks cans
- Paper – newspaper, magazines, catalogues, junk mail etc
- Lightweight cardboard – cereal boxes, washing powder boxes etc
- Plastic bottles

A notable exception from the dry recyclate collection is glass. Although collected by many local authorities in their kerbside collection this is not the case in West Lothian.

A key issue with the collection of the blue bin data was a change to the collection regime during the course of the project. Originally the blue bin waste collected every four weeks in summer and two weeks in winter. West Lothian council decided, however, to continue with fortnightly collections after the winter of 2006/07. In effect this means that the data for the blue bin is more frequent in the post-campaign phase.

It is still possible, however, to consider the total tonnages of blue bin waste collected in the relevant eight-week periods. These are detailed below:

Table 3-4 Blue bin waste before and after campaign

	Total Blue bin collection (tonnes)		
	Phase 1		
W/C	Target Group	Armadale Beat 9	Control Group
07 Aug 06	9.82	55.44	24.78
21 Aug 06	-	-	-
04 Sep 07	13.64	57.65	24.37
18 Sep 07	-	-	-
	Phase 2		
06 Aug 07	8.04	36.72	14.62
20 Aug 07	7.50	35.40	15.12
03 Sep 07	7.78	35.29	20.78
17 Sep 07	6.90	32.08	14.80

In a similar fashion to the grey bin collection the values for the blue bin in this period were compared to preceding periods in order to identify any possible spurious values. In this case the 20.78 tonnes value for the Control Group in Phase 2 was identified as being substantially higher than other collections – around 40% higher – and so it was disregarded for the computation of means.

On this basis the annual changes in blue bin contents were as follows:

Table 3-5 Changes to blue bin tonnages before and after campaign

	Target Group	Armadale Beat 9	Control Group
Number of households	1,160	4,062	2,559
Phase 1 Mean tonnes per fortnight	5.87	28.27	12.29
Phase 2 Mean tonnes per fortnight	7.56	34.87	14.80*
Tonnes/fortnight change	+1.69	+6.6	+2.51
% change before and after	+28.82%	+23.34%	+20.83%
Phase 1 Mean kg per hh per week	2.53	3.48	2.40
Phase 2 Mean kg per hh per week	3.26	4.29	2.89
Change per household per week (kg)	+0.73kg	+0.81kg	+0.49kg

* adjusted to exclude the 20.78 value

3.5.1 Discussion of results

In this case it can be seen that all three areas have seen an improvement in the quantities of recyclates being collected in the blue bin. Probably the most significant factor in this is the increase in the frequency of collections from four-weekly to fortnightly in the summer months (indeed, the decision to increase collections is with the aim of increasing tonnages).

Again it is worth considering the collection of recyclates in preceding weeks from one year to the next. Similarly to before we can examine the two eight-week blocks preceding that under consideration.

Table 3-6 Blue bin tonnage change for eight week periods

Eight-week period commencing:	Blue bin % tonnage change year to year		
	Target Group	Armadale Beat 9	Control Group
16/17 April	+39.29%	+22.45%	+21.03%
11/12 June	+12.02%	+19.42%	+26.73%
06/07 August (sample periods)	+28.82%	+23.34%	+20.83%

In all three areas there are consistent increases in the level of recycling using the blue bin. While some of this change may be attributable to the Waste wise campaign, it will also be attributable to other ongoing campaigning and promotion work. As with the grey bin all three areas see a dip in the middle period (possibly due to containing the start of the summer school holidays).

Consideration should again be made of the absolute levels of recycling. The target area in Armadale and the control area both have roughly similar levels of recycling prior to the campaign – it is noticeably higher, however, in Armadale as a whole. The increase for the target group, however, is larger than that for the control.

It is almost certain that the Wastewise campaign led to an increase in the levels of recycling within the target group, and within Armadale as a whole. Although recycling was not the main focus of the campaign clearly the campaign contributed to wider awareness and participation in recycling.

3.6 Assessment of the Brown bin data

In similar fashion the data collected for the brown bin can be assessed. The brown bin is collected fortnightly in the summer months and householders can use it for all garden waste including grass cuttings, hedge cuttings, flowers, plants, weeds etc.

The quantities of waste collected in the brown bin fluctuate considerably week to week and year to year. This is largely due to the unpredictable nature of garden waste production. It is affected considerably by the prevailing weather conditions both in the short term (where a spell of good weather may increase how much time people spend gardening) and in the longer term (where a summer of particular weather may affect the growth of gardens and hence the amount of waste generated).

The tonnages collected within the relevant periods were as follows:

Table 3-7 Brown bin waste before and after campaign

	Total Brown bin collection (tonnes)		
	Phase 1		
W/C	Target Group	Armadale Beat 9	Control Group
31 Jul 06	-	-	31.78
14 Aug 06	13.50	63.72	-
28 Aug 06	-	-	28.46
11 Sep 06	13.12	59.22	-
	Phase 2		
30 Jul 07	No information	55.23	36.98
13 Aug 07	-	-	-
27 Aug 07	9.96	62.73	34.97
10 Sep 07	-	-	-

A clear issue with the Brown bin data was that there was a missing data point in the target Area. Data returns from West Lothian council showed no brown bin tonnage for the collection period starting on 30 July 2007. In this case the only option available is to base the collection for the period on the single tonnage from the period starting 27 Aug 07.

On this basis the annual changes in the brown bin were as follows:

Table 3-8 Changes to brown bin tonnages before and after campaign

	Target Group	Armadale Beat 9	Control Group
Number of households	1,160	4,062	2,559
Phase 1 Mean tonnes per fortnight	6.66	30.74	15.06
Phase 2 Mean tonnes per fortnight	4.98	29.49	17.99
Tonnes/fortnight change	-1.68	-1.25	+2.93
% change before and after	-25.17%	-4.05%	+19.44%
Phase 1 Mean kg per hh per week	2.87	3.78	2.94
Phase 2 Mean kg per hh per week	2.15	3.63	3.51
Change per household per week (kg)	-0.72kg	-0.15kg	+0.57kg

3.6.1 Discussion of results

The target area saw the largest reduction in the brown bin tonnage, with a smaller reduction in Armadale, and an increase in the control area. This is what would be expected from a campaign promoting home composting rather than disposal through the brown bin. However, it should be noted that the brown bin is particularly susceptible to fluctuation due to external effects. That said, there appears to be a significant improvement in the target area which is not seen elsewhere to the same extent.

As in previous analyses it is useful to consider how representative the values under consideration are in the context of previous weeks. This is especially important given the lack of data for the target area.

Table 3-9 Brown bin tonnage change for eight week periods

Eight-week period commencing:	Brown bin % tonnage change year to year		
	Target Group	Armadale Beat 9	Control Group
30 Apr / 01 May	-33.53%	-8.83%	+15.00%
25/26 June	-25.78%	-21.02%	+16.30%
20/21 August	-25.17%	-4.05%	+19.44%

Examining these figures it can be seen that in the period being examined the year on year reduction in Armadale was roughly in line with the reductions seen in previous months. At best this suggests that the estimation based on the single tonnage value for this period is valid and representative. The control group has seen increases across all periods year on year. The only exception in the data is for Armadale as a whole which saw what appears to be a significant drop in brown bin tonnage for the middle period. Unfortunately there is no apparent explanation for this effect.

3.7 Assessment of the campaign effect

3.7.1 Assessment across all bin types

The data collected for the three bin colours in the target period can be aggregated into a single table, as seen below.

Table 3-10 Change in tonnage for grey, blue and brown bins

	Target Group	Armadale Beat 9	Control Group
Grey bin change per hh per week	-0.99kg	-0.33kg	+0.43kg
Blue bin change per hh per week	+0.73kg	+0.81kg	+0.49kg
Brown bin change per hh per week	-0.72kg	-0.15kg	+0.57kg
Net change per household per week	-0.98kg	+0.33kg	+1.49kg

This table shows the net change in household waste per week for each of the three bin types, and the net increase or decrease in household was from all three bins.

The results are as would be expected as a result of the campaign. A decrease of 0.98kg/week was seen in the area with the highest level of intervention and subject to the doorstepping process. A lesser effect, but still a decrease in household waste, was observed in Armadale as a whole. The control group saw an increase in the weekly household waste production.

These results should be considered in light of the other issues raised in the analysis process. Increases were seen in blue bin collection tonnages across all areas, and part of this increase will be attributable to the change in collection regime from four-weekly in summer to fortnightly.

The brown bin tonnage should also be considered with caution as this is particularly susceptible to short and long term fluctuations due to either random or unknown effects.

The grey bin contents, however, have seen a greater reduction in the target area in Armadale than in Armadale as a whole, and in the control group in Broxburn.

Also useful is to examine the proportion of recycling for each area, and whether that has changed before and after the campaign. In this case the proportion of recycle is the weight of blue and brown waste compared to the weight of all waste collected.

Table 3-11 Proportion of recyclate to total waste collected

	Target	Armadale 9	Control
	Mean waste per household per week (kg)		
Phase 1			
Grey	10.72	14.46	9.30
Blue	2.53	3.48	2.40
Brown	2.87	3.78	2.94
Blue + Brown	5.40	7.26	5.34
Proportion of blue/brown to total waste	33.5%	33.4%	36.5%
Total waste collected	16.12	21.72	14.64
Phase 2			
Grey	9.73	14.13	9.73
Blue	3.26	4.29	2.89
Brown	2.15	3.63	3.51
Blue + Brown	5.41	7.92	6.4
Proportion of blue/brown to total waste	35.7%	35.9%	39.7%
Total waste collected	15.14	22.05	16.13
Change in waste collected			
Change in proportion of recyclate	+2.2%	+2.5%	+3.2%
Change in total waste collected	-0.98kg	+0.33kg	+1.49kg
	-6.1%	+1.5%	+10.2%

As can be seen all three areas saw an increase in the proportion of recyclate to grey bin waste. The largest increase in recyclate was seen in the control area, where it rose by around 3.2%. The smallest increase was seen in the target area with an increase in proportion of 2.2%. These effects are largely due to the fact that while all three areas saw an increase in blue bin waste, in relation to the brown bin there were reductions in the target area and in Armadale whereas there was an increase in the brown bin in Broxburn.

It is also interesting to compare these levels of recycling to wider behaviour in Scotland as a whole. SEPA's Waste Data Digest for 2005/06 state that total household waste collection amounted to 2,093,922 tonnes, and total recyclate collection from households was 797,034 tonnes. This amounts to a recycling rate of 38%. It can be seen that this is roughly in line with what is being observed in these areas however it should be noted that the kerbside collection in West Lothian does not include glass, a heavy recyclate, and so these recycling rates are perhaps more significant than in Scotland as a whole.

3.7.2 Assessment against project criteria

The results of the tonnage analysis can now be compared to the strategic aims as detailed at the outset of the project, namely:

1. To divert 190 tonnes of household waste from landfill over one year – a reduction of 1kg per week for every household in Armadale
2. A 7% overall reduction in household waste on the Thursday beat
3. A 2% reduction for the rest of the community

3.7.3 Aim 1 – diversion of 190 tonnes across Armadale

The stated aim was to divert 190 tonnes from landfill. The waste qualifying for this comes from the grey bin – this waste is generally disposed of to landfill.

Examining the results of the grey bin tonnage analysis for the whole of Beat 9 in Armadale showed the following tonnages for the eight week period in question:

Table 3-12 Grey bin tonnage for Armadale before and after campaign

	Target area grey bin tonnage
W/C	Phase 1
31 Jul 06	137.50
14 Aug 06	104.00
28 Aug 06	114.60
11 Sep 06	113.78
Total	469.88
	Phase 2
30 Jul 07	115.66
13 Aug 07	110.22
27 Aug 07	109.98
10 Sep 07	123.20
Total	459.06

For the eight week period in question there was a reduction of 10.82 tonnes from the first year to the second.

To estimate the total reduction over the course of a year it is important to consider whether there may be any seasonal effects at work which may make the weight of tonnage collected in this period significantly different to the mean waste collected over the course of the year. In order to avoid this possible effect the approach taken was to measure the ratio of the collection for the 2006 period against the total waste collected for the year 2006/07.

The waste collected in the target area between 1 April 2006 and 31 March 2007 was **2,987.5 tonnes**. The ratio of the eight week period in question to the annual tonnage is equal to

$$469.88 / 2987.5 = 0.157$$

This multiplier can be applied to the 2007 values as follows:

$$459.06 / 0.157 = 2923.94$$

This approach leads to a suggested diversion across the period of a year of

$$2987.50 - 2923.94 = \underline{\underline{63.56 \text{ tonnes}}}$$

Clearly this is considerably short of the 190 tonne target. It should be noted, however, that Beat 9 represent only around 85% of houses in Armadale. As a result this value should be scaled up, and gives an estimated reduction of **74.8 tonnes**.

Mention has been made of the issues relating to ongoing house construction within Armadale. While we have no accurate data for this feedback from the planning department within West Lothian Council gave estimates of 54 new houses in Armadale and 45 in Broxburn. These numbers are relatively small compared to the size of the areas under consideration so should it can be expected that they have not significantly impacted on the quantities of waste being collected.

3.7.4 Aim 2 – 7% reduction in household waste on the Thursday beat

For clarity the phrase “household waste” is taken to mean the total waste collected in the three bins.

For this assessment we add the tonnages from all three bins for the before and after eight-week periods. However, there is the issue over the missing data point for the brown bin. As an estimate the total brown bin collection is taken to be twice the value of the single data point.

Table 3-13 Grey bin tonnage for target area before and after campaign

	Before campaign	After campaign
Grey bin	99.52	90.32
Blue bin	23.46	30.22
Brown bin	26.62	19.92
Total tonnage	149.60	140.46

The difference in total waste collected between the two periods is 9.14 tonnes equivalent to a reduction of **6.11%**. This level falls short of the target 7% although it is relatively close.

3.7.5 Aim 3 – 2% reduction in the rest of the community

Again the “reduction” is taken to mean a reduction in the combined waste tonnage from the non target areas within Armadale.

The tonnages for the non-target area are calculated by subtracting the tonnage for the target area from the whole Armadale Beat 9 area.

Table 3-14 Grey bin tonnage for Armadale, excluding target area

	Armadale Beat 9	Target Group	Difference
Phase 1			
Grey bin	469.88	99.52	370.36
Blue bin	113.09	23.46	89.63
Brown bin	122.94	26.62	96.32
Total	705.91	149.60	556.31
Phase 2			
Grey bin	459.06	90.32	368.74
Blue bin	139.99	30.22	109.77
Brown bin	117.96	19.92	98.04
Total	717.01	140.46	576.55

Assessing the difference in tonnage before and after we can see that the overall tonnage from the non-target section of Armadale has actually increased from 556.31 to 576.55 tonnes, a difference of +20.24 tonnes and equivalent to a **3.6% increase**.

This increase, however, is almost entirely due to the higher levels of recyclate collected in the blue bin. The change in the grey bin in this section of Armadale is a very small reduction, of around 0.5%.

3.8 Discussion

3.8.1 General outcomes of the project

While the achievement of the strategic project aims has been limited in its success there are a number of positive messages which can be taken from the data.

1. There was an overall reduction in total waste seen in the target group greater than that seen elsewhere
2. A greater reduction in the contents of the grey bin was seen in the target area than the control area
3. This indicator is especially important when it is noted that the increases in blue bin contents for the target and control areas were roughly similar indicating that the change in grey bin is not solely attributable to higher levels of recycling, but also waste reduction
4. The target area saw a greater increase (proportionally) in the blue bin than other areas

It should also be noted that there are a number of limitations to the tonnage analysis carried out – many of which there is limited scope to manage.

Firstly it should be noted that waste data is always subject to large fluctuations – both random changes in the amount of waste produced by households and also due to operational factors. This means that given a relatively small sample for the “after” case (in

this case only around 3 months of data) there is limited scope to extract highly robust statistics.

A second issue is that the tonnage analysis was based on the weight of waste collected. An interesting issue to consider is that the waste reduction and re-use campaign literature focused on a number of items which are lightweight – for example plastic containers and plastic bags. Being light in weight the reduction and reuse of these items is unlikely to be picked out clearly from data already established as being changeable and “noisy”.

Other items included in the campaign may also have eluded measurement within the tonnage analysis, or been negligible. While disposable nappies contribute significantly to municipal waste tonnages it was seen from the door-to-door survey work (Section 4) that few households in the target area (at least of those who took part in the survey) had children who required nappies – and so any positive benefit from a change in behaviour may have been negligible when considered in terms of the total waste tonnages. The waste data also did not take account of large and bulky items such as carpets and white goods. We have no way of knowing whether the levels of these items changed as a result of the campaign.

4 Door to door survey assessment

4.1 Overview

The aim of the door-to-door survey was to gain a greater understanding of how well key messages from the campaign were taken up by the community in Armadale, and how this compared to the control group in Broxburn.

The survey was designed to interview a representative sample in both areas prior to the campaign, and then to revisit the same set of houses after the conclusion of the campaign. The survey was carried out on those houses covered by the Thursday Beat 9 collection. The breakdown of ACORN classification across the target area was as follows:

Table 4-1 ACORN breakdown for target area

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Number of households	168	85	121	151	635	1160
Percentage	15%	7%	10%	13%	55%	100%

The survey questionnaire was developed through discussions between SISTech, Changeworks, West Lothian Council and the Scottish Waste Awareness Group. The survey was intended to cover a number of subjects to do with the waste hierarchy but was also designed to gather some information of use to West Lothian Council, for example barriers to recycling.

The first phase of the survey was carried out between 17th April and 4th May 2007. The second phase consisted of revisiting those houses which had completed a survey in the first phase, and had agreed to being revisited. This second phase was carried out between October 29th and November 16th 2007.

4.2 Practical issues and difficulties

The single greatest issue faced in the door-to-door survey was the number of successful responses collected by the survey team and the time required to maximise the number of responses.

During the first phase of surveying the target number of households for surveying was 250 in each of the survey areas. Based on the ideal ACORN breakdown this meant the following number of houses was required from each category:

Table 4-2 Number of households required for survey

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Target number of households	28	5	38	28	151	250

The final number of houses sampled in each area was as follows:

Table 4-3 Phase 1 number of households surveyed

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Armadale	30	1	28	28	134	221
Broxburn	21	7	34	19	127	208

Surveying was not continued beyond this point as most of the remaining potential households had been visited on more than one occasion and had either been empty or had declined to take part.

The second phase of surveying was carried out in October and November 2007 and a number of difficulties were found. The final number of completed surveys for phase 2 was less than envisaged, as shown below:

Table 4-4 Phase 2 number of households surveyed

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Armadale	11	1	10	10	58	90
Broxburn	8	0	16	4	42	70

Feedback from the survey team identified a number of reasons why the completed values for phase 2 were lower than expected.

1. The survey was limited to households who had completed the survey previously – meaning the effective survey pool in Armadale was 221 as opposed to 1160 in phase 1
2. The timing of the phase 2 survey meant that late afternoons and evening suffered from poor weather and getting dark earlier. There was considerable feedback that apparently occupied houses didn't open doors once it was dark and that several householders declined to take part if it meant standing with their front door open for five minutes
3. In a relatively small number of cases householders complained that they had already had a number of conversation regarding their household waste over the previous six months

It is useful to consider what lessons may be learned from the surveying methodology as it was in this case. In particular it may have been more suitable to carry out a follow up survey a full year after the first phase – this may have provided better weather, would have seen lighter evenings and also would have allowed a period of time after the conclusion of the campaign.

4.3 Assessment of data

The survey contained a number of questions (as can be seen from the attached questionnaire in the Appendix). Key results from the survey are summarised below.

Question: Which of these three options do you think is the most effective? To reduce the amount of waste you produce, to reuse items instead of throwing them away or to recycle waste?								
	Armadale				Broxburn			
	Before		After		Before		After	
Reduce	36	16.3%	19	21.1%	25	12.2%	11	15.7%
Reuse	16	7.2%	9	10.0%	16	7.8%	10	14.3%
Recycle	169	76.5%	62	68.9%	164	80.0%	49	70.0%

Question: Have you heard of the waste hierarchy – reduce, reuse, recycle?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	57	25.8%	44	48.9%	68	32.9%	31	44.3%
No	164	74.2%	46	51.1%	139	67.1%	39	55.7%

At this stage the respondents were asked if they could list any examples of actions they take to **reduce** the amount of waste they produce. Responses were grouped into six categories:

- Composting and gardening
- Packaging related
- Junk mail and paper
- Other reuse activities (e.g. giving to charity, repair, libraries etc)
- Other disposal activities (e.g. feeding scraps to animals, burning waste etc)
- Recycling actions
- Don't know

A count was made of the number of categories which respondents identified options within:

	Armadale				Broxburn			
	Before		After		Before		After	
No sections identified	45	20.4%	11	12.2%	26	12.7%	9	12.9%
1 section identified	47	21.3%	35	38.9%	63	30.7%	36	51.4%
2 sections identified	3	1.4%	9	10.0%	7	3.4%	7	10.0%
3 sections identified	1	0.5%	0	0.0%	1	0.5%	2	2.9%
Recycling actions	153	69.2%	50	55.6%	153	74.6%	31	44.3%

Respondents were then asked a series of questions about particular ways of reducing waste.

Question: Have you heard of the Mail Preference Service?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	115	52.0%	49	53.3%	105	50.7%	36	52.2%
No	106	48.0%	41	46.7%	102	49.3%	33	47.8%
Question: And if so, have you registered for the Mail Preference Service?								
Yes	52	45.2%	27	55.1%	43	40.6%	17	48.6%
No	63	54.8%	22	44.8%	63	59.4%	18	51.4%

Question: Are you aware that you can opt out of the Royal Mail's door-to-door service?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	54	24.4%	30	33.3%	53	25.6%	23	33.3%
No	167	75.6%	60	66.7%	154	74.4%	46	66.7%
Question: And if so, have you opted out of the Royal Mail's door-to-door service?								
Yes	18	32.7%	9	31.0%	14	25.5%	5	21.7%
No	37	67.3%	20	69.0%	41	74.5%	18	78.3%

Question: Have you heard of Home Aid?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	116	52.5%	54	60.0%	92	44.4%	31	44.9%
No	105	47.5%	36	40.0%	115	55.6%	38	55.1%
Question: And have you ever donated any items to Home Aid?								
Yes	76	65.5%	31	57.4%	54	56.8%	17	54.8%
No	40	34.5%	23	42.6%	41	43.2%	14	45.2%

Question: Of those families with young children – have you heard of the 'Real Nappy Project'?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	7	41.2%	3	60.0%	12	52.2%	9	81.8%
No	10	58.8%	2	40.0%	11	47.8%	2	18.2%
Question: Of those families with young children - do you currently use washable nappies?								
Yes	1	5.9%	0	0.0%	2	8.7%	2	18.2%
No	16	94.1%	5	100.0%	21	91.3%	9	81.8%

Respondents were then asked questions about campaign literature in an attempt to identify how well the Wastewise campaign had penetrated into the community.

Question: Have you been aware of any campaign or literature promoting the “reduce, reuse, recycle” message in the last three months?								
	Armadale				Broxburn			
	Before		After		Before		After	
Yes	64	29.0%	57	63.3%	86	41.5%	36	52.2%
No	157	71%	33	36.7%	121	58.5%	33	47.8%
Question: Of those who answered ‘Yes’ – when asked, unprompted, what it was about?								
Recycling	33	14.9%	21	23.3%	52	25.4%	20	28.6%
Composting	0	0.0%	3	3.3%	4	2.0%	0	0.0%
Wastewise Armadale	0	0.0%	14	15.6%	0	14.6%	1	1.4%
Don’t know	32	14.5%	29	32.2%	30	14.6%	11	15.7%

4.4 Analysis of results

In general the results of the door-to-door survey do not show any particularly large increase in the key areas where it may have been expected – however there are some minor indications of the difference in Armadale as a result of the campaign.

An important consideration, however, is the potential error which can occur in this type of sampling – and care must be taken in interpretation of the statistics. In both Armadale and Broxburn the final sample sizes were less than 100. This effectively reduces the confidence we can have in any of the sample results – with the result that the “real” or representative answer in any sample may be as much as 10% more or less than that obtained by the survey. With this in mind it is important to appreciate that any difference between the results in Armadale and the results in Broxburn need to be large before we can have confidence that there is a difference in actuality (and before we can attribute any change to the campaign).

When asked the general question about which of the three main options – reducing, reuse or recycling – was the most effective there were shifts in both the target and control areas away from recycling and to the other two options. During the survey design it was decided that this question would provide a relatively easy question to start with (‘easy’ in terms of it being a selection from pre-defined options). The main feeling behind the question was that the recycling message has been well promoted and supported (especially through the introduction of kerbside collection) but that waste reduction and reuse are less well understood. The number of people who selected “reduction” from the options increased in the target area by 4.8%, and in the control area it increased by 3.5%. While there is a small increase in this it is not sufficiently large for us to have confidence in.

The increase in those who had heard of the waste hierarchy, however, was larger in the target group than in the control area. In Armadale there was an increase of 23.1% compared to an increase of 11.4% in Broxburn. These levels do certainly suggest that there has been an increase of knowledge in *both* areas. It is also fair to consider that the increase in Armadale looks like being significantly more than the increase in Broxburn.

The next phase of the survey was intended to ask people about their current waste reduction activities. In many cases individuals did not differentiate between *recycling actions* and *waste reduction* actions. One interesting outcome from this analysis was the number of participants who could identify **no** waste reduction activities. In Armadale this proportion reduced by 8.2% whereas in Broxburn this proportion barely changed between the two survey phases. This level of change is just at the boundary of where we could consider that there has been a significant change in Armadale compared to Broxburn. The interpretation would be that householders in Armadale have been made aware of a range of reduction activities that were not known before the campaign.

Respondents were then asked about three specific waste reduction methods or schemes, namely:

- Mail Preference Service – a system allowing householders to be removed from mailing lists
- Royal Mail door-to-door opt out – a system whereby householders can be removed from the Royal Mail's direct mail service
- Home Aid – a local charity which takes unwanted household items for redistribution among social groups in need

The questionnaire asked whether householders had *heard* of each of these, and then asked those who answered “Yes” whether they had made use of them.

In the case of the Mail Preference Service both areas saw an increase in awareness and in registration however this was of similar magnitude in both areas.

In the case of the Royal Mail opt-out service there was again a similar increase in awareness in both areas and a slight decrease in uptake (however it must be remembered that both these results are within the established error across the whole sample and so the perceived decrease may be due to sampling error alone).

In the case of Home Aid there was an approximate 7.5% increase in Armadale compared with a 0.5% increase in Broxburn. This margin is within the established error of the sample and so cannot be identified as being significant.

Householders were also asked about the use of real nappies in families with children of suitable age. However the number of such families who took part in the survey was low – only 5 were identified in Armadale in Phase 2 – and so there are no conclusions which can be drawn on such a small sample.

Finally the questionnaire asked about awareness of campaign material in relation to the waste hierarchy and whether householders could identify, unprompted, what it related to. Both areas saw an increase in participants who could remember a campaign or literature – an increase of 34.3% in Armadale and 10.7% in Broxburn. The increase in Armadale is significantly larger than that in Broxburn suggesting that the campaign penetrated well into the community in Armadale. Of those questioned in Armadale 15.6% identified the Wastewise Armadale campaign unprompted – again reinforcing the awareness in the Armadale community as a result of the campaign.

5 Review of methodology and further work

After completion of the assessment process it is worth considering any lessons learnt from the methodology adopted. A number of practical issues have been mentioned within the document, some of which are discussed here.

In general the single issue that may have improved the assessment methodology, for both the tonnage and door-to-door work, would have been a longer gap between the end of the campaign and the follow up work. It is felt that the door-to-door assessment may have yielded higher numbers of returns had it been carried out in the spring rather than in the winter. This may also have reduced the sense of fatigue in householders who, by the second round of surveying, were experiencing their third waste conversation within a few months. Extending the follow up survey to the spring may also have allowed for a greater assessment of whether longer term lessons had been learnt from the campaign.

The tonnage analysis always had its limitations in application particular to the project and its aims. As stated previously many of the target materials for the campaign are light in weight, and so are difficult to pick up in this type of analysis. However, the period available for tonnage analysis after the end of the project was limited, only around three months. It may have been more useful, again, to carry out a longer term tonnage analysis to establish any long-term effects of the campaign.