North West of England Commercial and Industrial Waste Survey 2009

For The Environment Agency

March 2010

Report Produced for:
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Final Report

Executive Summary

Headlines:

- **Totals 7,631,158 tonnes regional arisings (including "micro" 1-4 employee companies), 7,079,803 tonnes (excluding "micro" companies)**
- **Estimated tonnage 6% down on 2006 survey**
- **Of this, Industrial waste 3.2 million tonnes (down 14.25% 0n 2006), commercial waste 3.9 million tonnes (up 2.5%).**
- **Non-metallic wastes (eg. Plastics, paper, card, wood, textile) most popular waste streams (2.63 million tonnes), followed by mixed wastes (2.0 million tonnes).**
- **1.43 million tonnes landfilled (20.2%) with 4.23 million tonnes recycled (59.8%).**
- **Of landfilled waste 0.2 million recyclable, 1.12 million potentially recyclable (ie. after further separation), 1.1 million tonnes recoverable, 0.12 million tonnes potentially recoverable**

The commercial and industrial waste arisings survey for the North West of England, originally delivered in 2006, has been repeated to collect data for the 2008-9 financial year.

Data was collected via face to face surveys from a total of 1,000 companies throughout the region, with companies selected in a statistically valid manner to represent the waste arisings of the 71,270 companies in the region (with 5 or more employees).

The grossing of the data collected in the survey was augmented by waste arisings data from the more significant waste producers from pollution inventory (PI) data supplied by the Environment Agency, plus data from large retail stores supplied directly by the store operators. The following conclusions are therefore based upon the grossed results from a total of 1,017 companies, with over 5,000 individual waste streams recorded.

Arisings estimates (including 1-4 employee micro companies)

Even though micro companies (ie those employing 1-4 people) were excluded from the survey (on the basis that it is more likely that their waste will enter the municipal waste stream, either via household collections or at HWRCs) we have made estimates of arisings for this group of companies based upon the data we did collect from the survey. This allows us to estimate total C&I waste arisings for the region.

The grossed collected data, including estimates for 1-4 employee companies, estimates the total waste arising within the region to be **7,631,158 tonnes**. By sector, those producing the most waste include retail & wholesale (1.97 million tonnes) and Other Services (1.66 million tonnes). The majority of the data presented in this report excludes this 1-4 employee estimate.

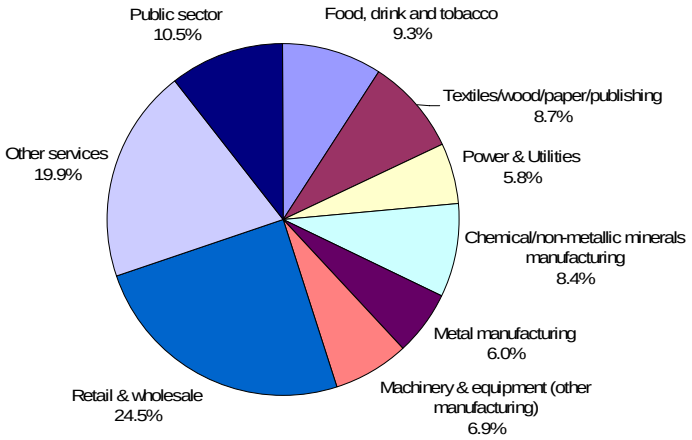
	Employee Sizebands							
SIC Description	**0-4**	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250 +**	**Total**
Food, drink and tobacco	1,219	2,895	7,006	162,744	38,776	104,941	338,815	**656,395**
Textiles/wood/paper/pub	3,409	2,862	32,708	98,191	154,157	286,372	42,782	**620,481**
Power & Utilities	464	517	2,188	7,269	53,741	65,672	278,635	**408,486**
Chemical/non-metallic	4,688	5,354	43,482	54,471	80,065	196,183	214,650	**598,894**
Metal manufacturing	34,517	32,016	11,852	61,998	108,447	51,230	161,304	**461,366**
Machinery & equipment	9,969	9,109	43,226	31,595	78,943	157,725	171,345	**501,913**
Retail & wholesale	234,980	224,488	335,806	394,767	226,055	171,965	384,510	**1,972,570**
Other services	246,994	140,717	236,193	302,778	280,455	123,388	324,990	**1,655,515**
Public sector	15,116	25,140	37,534	128,718	115,382	148,672	284,978	**755,539**
Total	**551,356**	**443,098**	**749,996**	**1,242,531**	**1,136,021**	**1,306,148**	**2,202,009**	**7,631,158**

Arisings estimates (from survey)

The grossed collected data, excluding the estimates for 1-4 employee companies, estimates the total waste arising within the region to be **7,079,803 tonnes**. By sector, those producing the most waste include retail & wholesale (1.74 million tonnes) and Other Services (1.41 million tonnes).

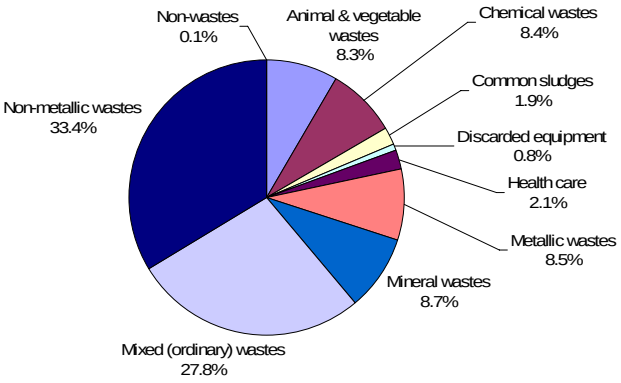
In total, industrial waste is estimated at 3.2 million tonnes, commercial waste 3.9 million tonnes.

	Employee Sizebands						
Sector Description	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250 +**	**Total**
Food, drink and tobacco	2,895	7,006	162,744	38,776	104,941	338,815	**655,175**
Textiles/wood/paper/publishing	2,862	32,708	98,191	154,157	286,372	42,782	**617,072**
Power & Utilities	517	2,188	7,269	53,741	65,672	278,635	**408,022**
Chemical/non-metallic minerals manufacturing	5,354	43,482	54,471	80,065	196,183	214,650	**594,206**
Metal manufacturing	32,016	11,852	61,998	108,447	51,230	161,304	**426,848**
Machinery & equipment (other manufacturing)	9,109	43,226	31,595	78,943	157,725	171,345	**491,943**
Retail & wholesale	224,488	335,806	394,767	226,055	171,965	384,510	**1,737,591**
Other services	140,717	236,193	302,778	280,455	123,388	324,990	**1,408,521**
Public sector	25,140	37,534	128,718	115,382	148,672	284,978	**740,423**
Total	**443,098**	**749,996**	**1,242,531**	**1,136,021**	**1,306,148**	**2,202,009**	**7,079,803**



Estimates by waste type

Results show non-metallic wastes (eg. Plastics, paper, card, wood, textile) to be the most popular waste streams (2.63 million tonnes), followed by mixed wastes (2.0 million tonnes).

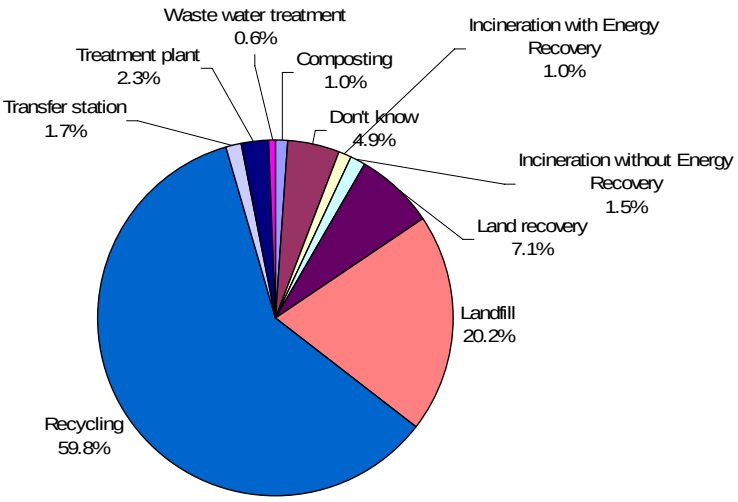


Of the non-metallic wastes recorded, the majority was paper and card (1.7 million tonnes) followed by plastics (0.3 million tonnes)

SOC Sub Group	Grossed Weight (Tonnes)
glass	136,833
paper&card	1,653,101
rubber	34,277
plastic	288,262
wood	214,553
textile	35,365

Estimates by waste management method

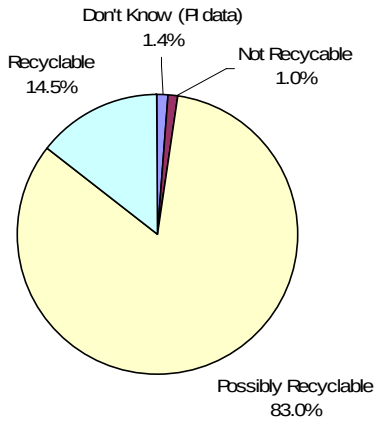
Estimates show that 1.43 million tonnes of C&I waste is landfilled within the region (20.2%) with 4.23 million tonnes (almost 60%) recycled.



Opportunities to recycle

As part of the survey questionnaire, each recorded waste stream was assessed in terms of its potential to be recycled. This assessment was based upon fixed criteria: waste streams deemed "recyclable" could be readily recycled directly ie. a separated or uncontaminated waste stream; those deemed "potentially recyclable" needed additional work to recycle, such as separation of recyclable materials in a materials recovery facility (MRF).

The survey revealed that of the material not already recycled, a total of 2.12 million tonnes was recyclable or potentially recyclable. Looking at landfilled waste in isolation, 0.2 million tonnes was identified as recyclable, 1.12 million as potentially recyclable, as summarised in the chart following.

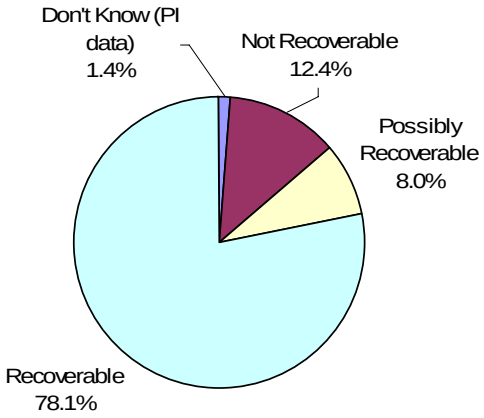


Opportunities to recover energy

Similarly, the potential for waste streams to be used as a fuel for energy recovery was also recorded for each waste stream surveyed, based upon defined criteria using calorific values and form of the particular waste. As before, "recoverable" indicates material which can be directly energy recovered, "potentially recoverable" waste which needs additional work to recover eg. drying to remove excess water.

Estimates indicate that of the material not already energy recovered, 4.95 million tonnes is classed as either recoverable or potentially recoverable. Looking only at landfilled waste, 1.1 million tonnes is deemed recoverable, 0.12 million tonnes potentially recoverable. This is summarised in the chart below.

Clearly there is considerable overlap between the recyclable and recoverable material identified from landfilled wastes.



Waste destination

The survey results show that of the waste streams recorded, the majority (70%) is dealt with (ie. disposed of, recycled or recovered) within the North West region, with Greater Manchester and Lancashire being the most popular destinations. Of that exported, most is destined for other regions of England, with small proportions for the rest of the UK, or outside the UK.

Comparison to the previous survey (2006)

The 2006 survey recorded total waste arisings for the region of 7.53 million tonnes, rising to 8.12 million tonnes when estimates are included for companies employing 4 people or less.

Comparing the results of the two surveys at high level:

1. Total waste for the 2008-9 survey is 6.0% down on the 2006 survey

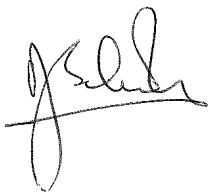
2. The biggest reduction is seen in the industrial sectors where total waste is 14.25% down over the period whereas the commercial sector figure is 2.5% greater than 2006, with the largest increase in retail & wholesale.

3. The landfill figure is 62% of 2006 at 1.43 million tonnes. Figures for "don't know" and "transfer station" are significantly down too. All these factors may have contributed to recycling being up to 4.2 million tonnes (+60%) mostly in service sectors of retail & wholesale and public services.

4. In terms of waste types, animal & vegetable and non-metallic wastes are up on the previous survey (22% and 16% respectively) where as mixed wastes is around the same level as 2006. Big reductions are in industrially associated wastes, chemical, sludges, metallic wastes.

Data confidence

Confidence in the grossed up data is ±10.8% at 95%



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REPORT

1 Introduction

The main aims of this project were to determine how much waste was produced from industrial and commercial businesses in the North West of England region, by waste type and sector, and how that waste was managed in the 2008/09 financial year. Information obtained during the survey was also used to determine in particular the amount of waste being landfilled and the amount available for diversion from landfill to other options such as recycling or energy recovery. This data provides additional useful information on waste practices of businesses, and their overall environmental performance.

The main objectives of this work were:

- To review the methodology and results of the 2006 C&I waste survey to ensure that the methodology for this work was compatible and that the results would be comparable.

- To develop and agree with the Environment Agency a methodology for a survey that would provide estimates of C&I waste arisings in the North West region.

- To agree a sample frame in liaison with the Environment Agency. This involved using the initial summary data from the Office of National Statistics (ONS) on population of Commercial and Industrial waste businesses in the North West region.

- To provide the final sample frame and to help the Environment Agency complete the documentation to obtain the list of companies from ONS to sample in the survey.

- To create a database with queries to gross up the raw survey tonnage figures to produce sub-regional and all North West level final figures.

- To complete a survey with the pre-determined sample frame of businesses in the North West region of England and achieve the required response level from companies and the provision of quality assured data within the required timescales.

- To design the data capture system, to produce the final quality assured survey data (in tonnages) from the database.

- To gross up the survey data taking into account quality assurance issues and interpretation of results following this process.

- To produce the final report for this commercial and industrial waste survey within the required timescales.

- To produce a survey database with a user friendly front end.

1.1 Study area

The 'study area' included North West England, with waste data from businesses provided at a sub-regional level for:

- Cumbria
- Lancashire
- Halton
- Greater Manchester
- Merseyside
- Cheshire East and Cheshire West and Chester
- Blackburn with Darwen
- Blackpool
- Warrington

The sectors included in the survey are comparable to the previous North West C&I surveys. As in previous surveys, the sectors not included are agriculture, mining and quarrying and construction.

1.2 Previous surveys

This survey was intended to update that delivered in the region in 2006-7, collecting data from the calendar year 2006. This survey was delivered by Urban Mines Ltd, and is described in the relevant report "Study to fill Evidence Gaps for Commercial & Industrial Waste Streams in the North West Region of England" May 2007[1]. The data generated from this survey has been used for delivery of a number of ancillary projects including:

- "Joint West Development Plan Needs Assessment" delivered by Urban Mines for the Greater Manchester Geographical Unit, 2007
- "Nationally, Regionally And Sub-Regionally Significant Waste Management Sites" delivered by Urban Mines for NWRA and 4NW, 2008
- "Commercial and Industrial waste data analysis of the North West region" delivered by Urban Mines for the Environment Agency, 2008

The collected raw data was also modelled for application outside of the North West:

[1] Available at http://www.cheshire.gov.uk/NR/rdonlyres/67EDC2B4-BB98-442D-9D02-7F72209408BE/0/north_west_c_and_i_survey_report1.pdf

- "Assessment Of Organic C&I Waste Arisings in Yorkshire & Humberside" delivered by Urban Mines for Resources Action Yorkshire (now CO2Sense), 2008
- "National Study into Commercial and Industrial Waste Arisings" delivered by ADAS for EERA, 2008

Previous to this surveys were carried out at national level by the Environment Agency in 1998/99 and 2002/3. Whilst these surveys achieved a precision of +/- 5% at a 90% confidence level for total commercial and industrial waste, users were advised to treat the information provided as the best estimate from a range and should not, for example, read too much into small differences between sectors or detailed comparisons with results from the previous (1998-9) survey.

The 2002/3 survey showed a 13% reduction in the total C&I waste for the 4 year period (a fall of 23% in industrial wastes and a slight increase in commercial wastes of 3%) at the national level. However, the survey had insufficient detail and the categorisation used did not readily translate into the type and scale of new waste management facilities which may be needed.

1.3 Project management

Throughout the development and delivery stages, the project was managed and mentored on behalf of the funders via a Steering Group consisting of the following representatives:

Josie Martin, Environment Agency (Project Manager)
Peter Greifenberg, 4NW Technical Consultant
Frazer Kearney, North West Development Agency
Martin Andrews/Ian Stephenson, Envirolink North West
Campbell Latchford, Lancashire County Council

plus representatives of the deliverers, Black & Veatch plc and Urban Mines Ltd. This group met regularly to review progress and approve key project aspects such as methodology, and received weekly email progress reports.

2 Survey methodology and delivery

2.1 Introduction

The survey was delivered under the Environment Agency's NEECA 2 framework consultancy programme, by a consortium of consultancies with the following roles:

Black & Veatch plc, Chester	Overall project management and client liaison
Urban Mines Ltd, Halifax	Project delivery management, methodology development, statistics, training, survey management & data collection software, data cleanup and grossing
Groundwork Pennine Lancashire, Blackburn	Delivering face to face surveys
Arête Business Services, Bradford	Booking of appointments for face to face surveys

The survey methodology was based upon a stratified sampling scheme. Companies were selected throughout the North West Region, based upon a developed survey sample matrix of company sector against employee sizeband, to give a representative sample from which regional estimates could be calculated. This sample frame was developed from company population data provided by the Office of National Statistics (ONS).

Companies (as "local units") were recruited by telephone to fill this sample matrix. Data was collected via a laptop based structured survey questionnaire, delivered in a face to face interview with the company representative, followed by a tour of the company's site to identify any wastes missed by the interviewee. The collected data was transferred to a central server by email within 2 days of collection, where quality checks were carried out and any identified outliers checked.

Once the survey of 1,000 companies was complete, the data was thoroughly quality checked before grossing to provide regional and sub-regional estimates.

This section of the report describes these key steps in delivery of this survey in more detail, supported by additional detail provided in a number of appendices.

2.2 Questionnaire development

The survey questionnaire was developed ensuring:

- Its design met the data collection requirements of the survey
- Its structure was comparable with that of the previous 2006 survey so that data could be compared
- It could be effectively and efficiently delivered via a face to face survey

The structure agreed with the Steering Group is given in Appendix 1. It allows data collection for individual waste streams, by waste type, waste form (hazardous or non-hazardous), annual quantity, waste management method used for that particular waste stream (fate), and where that method was carried out (destination).

The questionnaire also allowed the recording of the source of the recorded waste quantity data (ie from written records or calculated) and whether the given waste stream could be recycled or energy recovered, against a fit set of criteria.

The questionnaire used Substance Orientated Classification groups and sub-groups for describing individual waste stream types, as shown in Appendix 4.

The structure was translated into relevant screens in the data collection software EVSurvey.

The software included routines to calculate tonnages where direct written evidence was not available. These calculations used in-built data such as standard container types (detailed in Appendix 5) to estimate volumes, conversion factors to translate volumes into weights (as Appendix 6) and standard waste item weights (as in Appendix 7) for individual items. Note that the data structure used for the survey retains all this calculation data, so that should conversion factors need revision, new weight data can be calculated from the originally collected raw data.

2.3 Data sample preparation

The recruitment of businesses for this survey was based upon the sample matrix developed using "local unit" business data from the Office for National Statistics (ONS). The aim of delivering the survey was to produce waste arisings data from a range of business types (sectors) and sizes (employee numbers) in a statistically valid manner (i.e. matching as close as possible the distribution described in the sample matrix) from which grossed up regional and sub-regional totals could be produced.

The development of this sample frame is explained in detail in Appendix 2.

The businesses to survey were selected and recruited at random based upon the sample matrix. To do this, business contact data was secured from ONS, based upon a random selection of businesses in proportion to their relevance in the sample matrix, to drive the telephone recruitment process.

Unfortunately the ONS data, based on VAT and PAYE records, contained only a small number of phone numbers, a number of duplicates and also some records of businesses we subsequently found were no longer trading. We therefore needed to do a significant amount of data clean-up before this dataset could be used.

Data security

Steps were taken to ensure the integrity and confidentiality of the business and personal details in the ONS dataset. Both the tele-bookers and surveyors accessed the business contact data they needed via an internet link into a restricted area of one of the Urban Mines servers. Neither group had access to the ONS dataset and a single copy of the dataset was retained on the server with access only by the Urban Mines data manager. Each business in the dataset was issued a unique code which allowed identification of waste stream records and their positioning in the sample matrix for grossing up. Only Urban Mines held a copy of the unique code - business name table for data checking, and this, along with the original ONS dataset, was deleted on completion of the project. This method of data management met the requirements of ONS. Urban Mines is also registered under the Data Protection Act to handle personal data.

During the survey when waste data was transferred from the surveyor the business unique code table was not supplied with the data. It was therefore impossible for recipients to trace back a particular waste stream to an individual business. This degree of confidentiality and anonymity had been guaranteed to all the businesses taking part in the survey.

2.4 Tele-booking process

Tele-operators from Arête Business Services were trained on the developed conversational call script for this survey. All staff were already familiar with Urban Mines' proprietary call management system, EVCall, which they used remotely, working from their own offices, connected to the Urban Mines servers.

Appointment booking was clustered around the home locations of the Groundwork surveyors involved in data gathering, to minimise travel time and road miles. Surveyors were spread around the region to allow a reasonable coverage. Urban Mines' proprietary software "EVCall" presented the tele-operators with businesses selected at random, cycling through the sample matrix "bricks" to ensure a reasonable spread of bricks within each sub-region. Bricks were closed off once the brick target, plus an overbooking margin to take care of cancellations, had been achieved.

Once a business had agreed to participate in the survey, the tele-operator made an appointment. EVCall offered the operator a selection of dates and time slots, presenting the nearest surveyor at the top of each list. Clustering visits geographically allowed us to maximise the number of visits per day for each individual surveyor. Each business being surveyed received a confirmation email and an information pack on the day the booking had been made. The surveyors retrieved their booked appointments diary by logging onto the Urban Mines server.

2.5 Checking business data

To make sure that the information held in the ONS database was correct, as each booking was made, operators checked SIC (business type) code and number of employees, and business address details. Previous surveys reported problems with ONS data in this respect. This data was also checked directly with the company representative during the survey interview. A significant number of errors in the ONS data were identified, particularly with company employees sizebands but also in some cases with company SIC code/sector.

2.6 Survey visit

The chosen surveyor visited each business with whom they had an appointment booked in person. The survey visit consisted of an initial discussion to explain the reason for the survey again and also to "break the ice". Following this, the survey was completed using Urban Mines' proprietary survey software "EVSurvey" on the surveyor's laptop.

Surveyors tried to collect as much data as possible from written records, such as waste collection or disposal invoices, transfer or consignment notes and internal electronic records. If necessary, the surveyor would prompt the business contact by suggesting the types of records which might be available.

An innovation included in the data collection software for this survey, was the ability to check collected data against averages and ranges expected for companies of a similar size and sector, using data from the previous 2006 survey. This check was carried out at the end of the survey process so as to not influence the data collected. This gave the opportunity to spot significant outliers or data errors during the survey interview, and to re-test collected data with the company representative. This, coupled with built-in routines to trap data entry errors, produced significantly less outliers and data errors in this survey compared to previous surveys.

After completion of the interview stage, the surveyor asked to be taken on a brief tour of the business's facilities, to check the data already collected and to spot other waste streams which the business representative may have forgotten. Surveyors were trained to look for office and canteen waste which is often overlooked. In a significant number of cases, additional waste streams were identified this way.

To complete the visit, the surveyor thanked the business representative for their involvement, and handed over literature for Netregs and other Environment Agency supported initiatives.

2.7 Data collation

After a series of visits, the surveyors used the export function in EVSurvey to export completed datasets and email to Urban Mines. Surveyors were asked to do this within 2 days of data collection so that any errors could be checked promptly. On arrival the data was checked and appended to the main survey database. To ensure data security, the only business specific identification data exported and associated with the individual waste stream data was the unique code. This proved to be an effective and reliable process.

2.8 Field trials

The survey bookings and survey visits were "road tested" before the full survey was started. This consisted of selecting a sub-set of businesses at random, and then testing:

- the call flow script and EVCall software use
- confirmation paperwork
- survey methodology plus software
- data entry and collation

A total of 8 businesses were booked and visited for these trials, by surveyors from Urban Mines and Groundwork. These trials also identified minor problems and were used as part of the training process for the surveyors.

2.9 Surveyor and tele-booker training

Day sessions were held with tele-bookers from Arête and three day sessions with the survey team from Groundwork (plus those providing cover during periods of absence) to introduce the survey and give specific software and survey methodology training. Particularly for the surveyors, training included explanation of the process of recording data, for handling and selecting waste types and weight conversions, and for interpreting responses. Guidance was also given for answering the "recyclable" and "recoverable" and other questions on the survey sheet, and real examples in the form of case studies were reviewed. Survey packs were also provided to surveyors, including a detailed user guide, which re-emphasised all the areas covered during training, and provided a reference during survey visits. During the same session, all required software was installed on the surveyors' laptops.

A review session one week into the survey was carried out with the surveyors, which tackled problems and issues, and resulted in some minor changes to the survey software and backup.

2.10 Monitoring performance

Throughout the survey, the project and data managers at Urban Mines monitored call statistics, brick completion and business cancellation rates via remote access to a set of Excel pivot tables linked live to EVCall.

During the initial booking phase, and whenever the booking strategy was changed, Arête and Urban Mines staff monitored the tele-bookers' performance and that of the call script, by monitoring calls directly on site.

As the surveyors picked up details of future bookings from their diaries in EVCall, they also registered the outcome for previous visits. When data from visits was received this too was registered by EVCall.

As well as handling booking and business data, the EVCall call software package also produced a number of performance indicators allowing project managers at Urban Mines to monitor:

- success rate per individual tele-booker i.e. surveys booked per hour
- cancellation rate (i.e. % cancelled surveys compared to the number booked)
- survey visit calls per day per surveyor, and "no show" rate
- distance travelled by the surveyor per day (including CO_2 impact)
- delivered visits and data, and % completing of each brick in the sample matrix

At periods throughout the survey, both tele-bookers and surveyors were directly monitored to check performance and correct any problems. For the tele-bookers, adherence to script was checked by listening into calls, and changes made if appropriate.

For survey visits, Urban Mines made unannounced joint visits with each of the Groundwork surveyors, both to check that the surveying methodology was being adhered to and delivered consistently across the surveyor group, and to identify problems, if any, with the data logging software. Minor issues were identified and actions taken.

Concurrently, Urban Mines also carried out a telephone "mini-survey" of a sub-set of businesses who had been visited by the surveyors, as a further check of performance and to ascertain what the business representative thought of the experience from booking to the survey delivery. A number of businesses were called at random for each surveyor. This was not intended to be a statistically valid survey of responses, it was just another check that the surveys were progressing satisfactorily and that the businesses involved were happy with how they were treated.

Of those contacted, 97% agreed that they were happy with the tele-booking process, 97% responded "Yes" to the question "Did the Surveyor record a fair and accurate

representation of site's waste production?" and 100% responded "Yes" to "If contacted, would you be happy to take part in another similar survey in the future?". Some issues were identified during these calls which resulted in minor changes to the call script and to confirmation mailings.

2.11 PPC businesses

To assist with the delivery of surveys, the Environment Agency supplied waste data from the Pollutions Inventory (PI) for the businesses in the region that provided PI returns for 2008, on the basis that through random sampling, a proportion of these would be visited during the survey process. Using this data allowed the surveyors to be prepared pre-visit, and meant that what could be a lengthy visit at a major waste producer was made more efficient by being focussed on an already established waste arisings list. However, the PI data does not include all wastes (non-wastes, office wastes for instance).

2.12 Checking for outliers

All data received was reviewed electronically to identify any outliers, i.e. those data points that lay outside of the expected range. Once identified, these were further checked, re-confirmed and changed, if necessary, by the surveyor. These checks were meant to pick any errors in data entry or calculation as well as incorrect classifications.

STATA, a statistical package, was used to check and identify outliers. Outliers were considered as any points with values that lay more than three standard deviations (±3) away from the mean, using the r (mean) scalar. The analysis was run several times, each time dropping those points identified as outliers to ensure that all such points were identified and re-checked.

From the example below, points 2328, 7818, 1436, 7400, 5294, 7562, 1775 and 7910 were considered as possible outliers in the data.

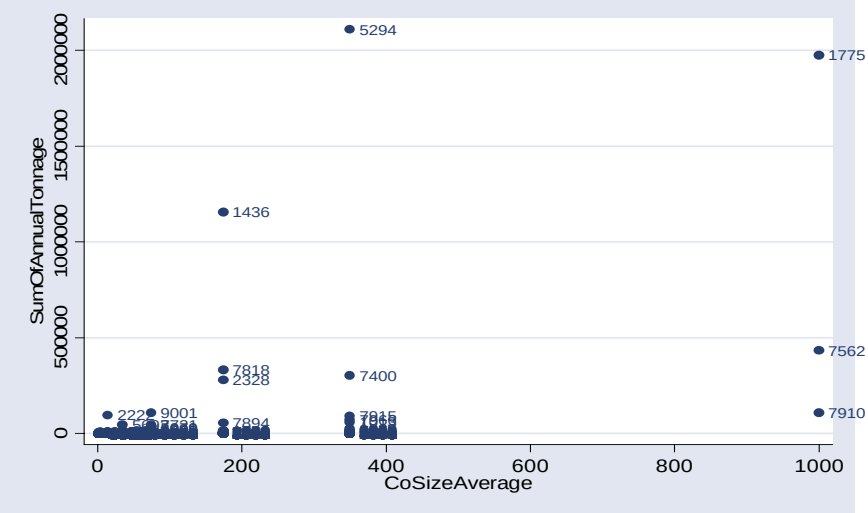

Figure 1: Example of an outlier check using STATA

2.13 Survey completion – data cleanup and grossing

On completion of the survey, the final survey data was collated and final outliers checks run so that residual data could be checked with the surveyors. Over 5,000 separate waste stream data lines had been collected.

The aggregated dataset was then grossed for the first time using the methodology described in Appendix 8. Grossing the data by individual waste stream line allowed the secondary checking of data via:

- Comparison to the previous 2006 survey, to identify and check major differences

- Sensitivity Analysis – all waste streams were identified which had a significant impact once grossed on the estimated waste totals (regionally or by waste type, waste management method, sector, etc)

All highlighted data was checked by Urban Mines directly with the company from which the data was originally collected. All data with more than a 0.5% impact on the final grossed estimates was checked in this way.

In parallel, the company sector and size data was comprehensively checked, in particular where the ONS data did not agree with that recorded, or changed by the telephone operator and/or the surveyor.

After extensive checking, final amendments were made and the resultant dataset used for grossing to give regional and sub-regional waste arisings estimates, again using the methodology described in Appendix 8.

Two additional data sources were used to augment the grossed survey data:

1. Supermarkets – we have found from previous experience that it is common that managers of large retail stores, including supermarkets, do not know the amount of waste their stores produce as all waste and recyclate is taken away by the same trucks that deliver new produce. Therefore to fill data gaps with particularly large retail stores, data obtained directly from 4 major supermarket chains was used.
2. PPC data – data for a small number of regionally significant sites was included in the final data where the sites themselves had not been visited as part of the surveys, where we felt this would risk a significant underestimate for that particular sector, or where there were gaps in the data collected.

How this data was incorporated into the final dataset is explained in detail in Appendix 8.

3 Survey results and analysis

The following tables present the grossed up data estimates for commercial and industrial waste arisings in the North West region for the financial year 2008-9.

What was surveyed

- 1,000 industrial and commercial business sites
- Businesses across the size range (in terms of number of employees) from those with 5 employees to >250 employees
- All wastes produced on site i.e. outgoing wastes and waste disposed of (but not recycled or re-used) on site
- Hazardous and non-hazardous wastes
- "Non-Wastes" such as blast furnace slag and virgin timber
- The waste management method used to dispose of, recycle or recover the waste, and where that process was carried out
- The potential for the waste to be recycled or energy recovered

What was NOT surveyed

- Businesses involved in agriculture, mining and quarrying; construction
- Businesses involved in waste management and recycling (to avoid potential double counting)
- Waste recycled or re-used on the same site it was produced
- Waste sent to waste water or effluent treatment on site
- Micro-companies (ie. 1-4 employees)

Company sector

A full description of Industrial Sector descriptions used is given in Appendix 3. These can be summarised as:

Sector	Description	C or I*
Food, drink and tobacco	Food, drink and tobacco manufacturers	I
Textiles/wood/ paper/publishing	Includes manufactures of textiles, wearing apparel, luggage, handbags and footwear; also wood and wood products, pulp, paper and paper products, publishing and printing	I
Power & Utilities	Production of gas, electricity, oil and water	I
Chemical/non-metallic minerals manufacturing	Manufacture of chemicals and chemical products, cleaning products, manmade fibres, rubber and plastic products, and non-metallic mineral products	I
Metal manufacturing	Manufacture of basic metals and fabricated metal products	I

Sector	Description	C or I*
Machinery & equipment (other manufacturing)	Manufacturing of machinery and equipment, of computers, electrical and communication equipment, including medical and optical instruments. Also manufacturers of motor vehicles, and of furniture and other manufacturing	I
Retail & wholesale	Retail and wholesale including of motor vehicles and fuel	C
Other services	Includes hotels, catering, transport, storage, communications, travel agents, finance, estate agents, IT related activities, and other business	C
Public sector	Includes public administration, social work, and education	C

* C=Commercial, I=Industrial sector

Figure 2: Summary industrial sectors descriptions

Waste type

The SOC (Substance Orientated Classification) nomenclature is used for waste classification, as explained in Appendix 4. This can be summarised as:

Waste Group	Included Wastes
Chemical Wastes	Solvents, acids/alkalis, used oil, catalysts, wastes from chemical preparation, residues and sludges
Healthcare	Healthcare wastes
Metallic Wastes	Metallic wastes
Non-Metallic Wastes	Glass, paper & card, rubber, plastic, wood, textiles
Discarded equipment	End of life vehicles (ELV) , batteries, waste electronics (WEEE) other discarded equipment
Animal & Vegetable Wastes	Food, manure, other animal and vegetable wastes
Mixed (ordinary) wastes	Household, undifferentiated wastes and sorting residues
Common Sludges	Sludges (common) and dredgings
Mineral Wastes	Combustion residues, contaminated soils, solidified mineral wastes, other mineral wastes
Non-Wastes	Those materials recently declassified as wastes ie. Blast furnace slag or virgin timber

Figure 3: Summary waste classification descriptions

Survey locations

The companies surveyed were located around the region, in approximate reflection of the distribution of companies throughout the region. The spread of companies surveyed is shown in the map in Figure 4.

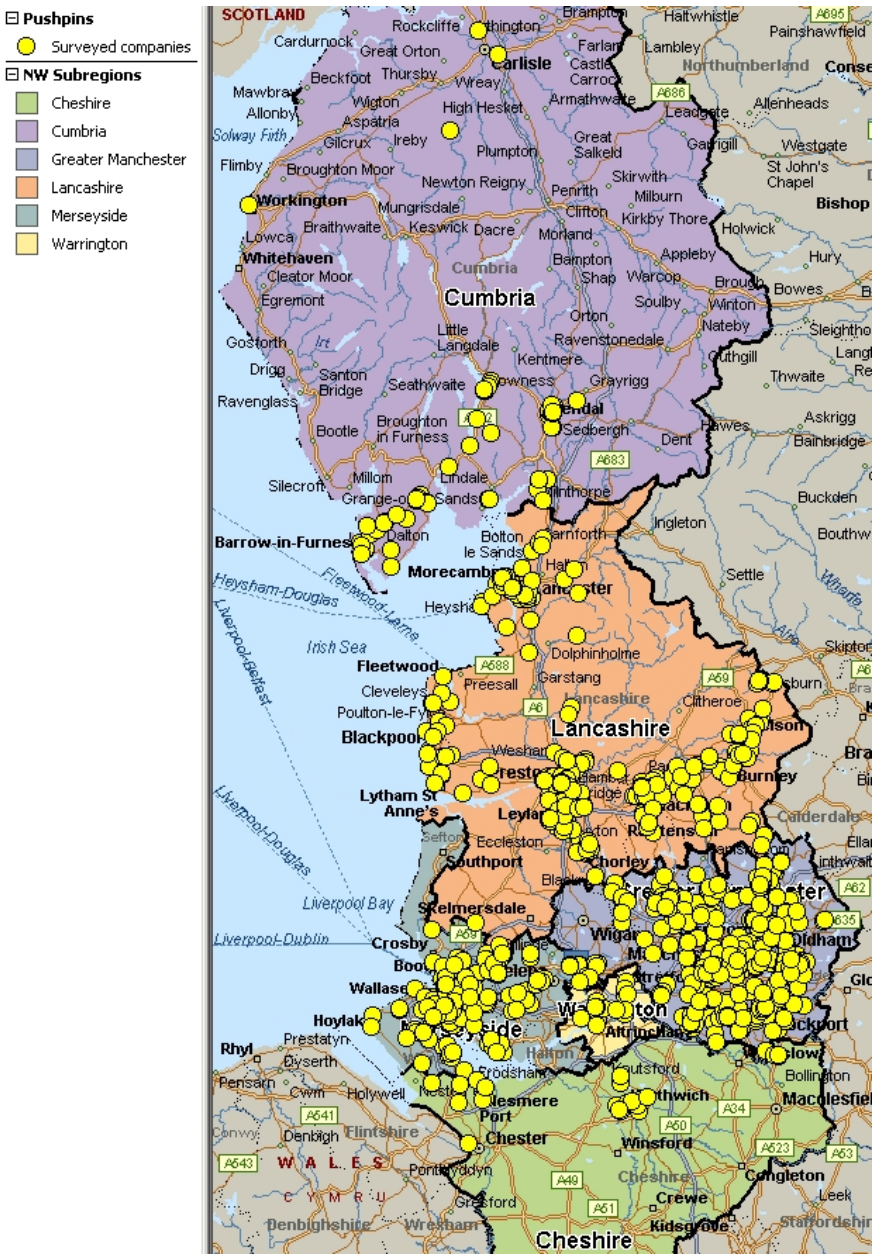

Figure 4: Location of surveyed companies

Waste arisings estimates

The estimates of waste arisings regionally and sub-regionally are summarised in the following tables:

3.1 North West Region

	Employee Sizebands						
Sector Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	2,895	7,006	162,744	38,776	104,941	338,815	**655,175**
Textiles/wood/paper/publishing	2,862	32,708	98,191	154,157	286,372	42,782	**617,072**
Power & Utilities	517	2,188	7,269	53,741	65,672	278,635	**408,022**
Chemical/non-metallic minerals manufacturing	5,354	43,482	54,471	80,065	196,183	214,650	**594,206**
Metal manufacturing	32,016	11,852	61,998	108,447	51,230	161,304	**426,848**
Machinery & equipment (other manufacturing)	9,109	43,226	31,595	78,943	157,725	171,345	**491,943**
Retail & wholesale	224,488	335,806	394,767	226,055	171,965	384,510	**1,737,591**
Other services	140,717	236,193	302,778	280,455	123,388	324,990	**1,408,521**
Public sector	25,140	37,534	128,718	115,382	148,672	284,978	**740,423**
Total	**443,098**	**749,996**	**1,242,531**	**1,136,021**	**1,306,148**	**2,202,009**	**7,079,803**

Figure 5: Estimate of North West England C&I Waste Arisings, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SICDescription	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	408,583	51,223	47,713	277	30	2,568	25,809	69,113	49,860	0	655,175
Textiles/wood/paper/publishing	0	167,951	33,438	141	82	18,668	1,276	91,485	303,491	540	617,072
Power & Utilities	374	50,571	3,572	631	4	12,129	297,239	35,071	8,431	0	408,022
Chemical/non-metallic minerals manufacturing	10,023	218,152	21,681	293	87	15,361	90,573	119,719	118,316	0	594,206
Metal manufacturing	7	16,094	8	87	27	156,240	169,523	63,379	21,483	0	426,848
Machinery & equipment (other manufacturing)	20	15,283	912	2,931	131	290,585	1,238	116,502	58,926	5,414	491,943
Retail & wholesale	30,298	17,629	110	33,561	896	41,172	6,718	501,440	1,105,766	0	1,737,591
Other services	126,205	59,581	27,173	4,426	17,683	65,573	11,494	566,111	530,275	0	1,408,521
Public sector	8,633	191	0	17,239	132,041	1,933	10,136	402,169	168,083	0	740,423
Total	**584,144**	**596,677**	**134,607**	**59,586**	**150,982**	**604,228**	**614,005**	**1,964,990**	**2,364,630**	**5,955**	**7,079,803**

Figure 6: Estimate of North West England C&I Waste Arisings, by sector and waste type (in tonnes)

	Waste Management Method										
SICDescription	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Waste water treatment	Total
Food, drink and tobacco	40,958	9,385	2,317	2,819	162,456	42,873	356,778	10	37,580	0	**655,175**
Textiles/wood/paper/publishing	473	8,649	148	3,181	192,792	100,274	297,726	11,079	2,751	0	**617,072**
Power & Utilities	6,781	130	20,998	7	3,221	88,247	281,719	413	6,508	0	**408,022**
Chemical/non-metallic minerals manufacturing	19,610	19,781	4,329	22,361	9,924	190,212	256,262	9,247	62,479	0	**594,206**
Metal manufacturing	0	4,990	5,328	190	130,821	15,143	266,905	15	3,456	0	**426,848**
Machinery & equipment (other manufacturing)	0	6,860	321	397	286	85,726	381,613	8,330	3,433	4,978	**491,943**
Retail & wholesale	2,660	96,590	6,520	3,803	0	329,318	1,272,797	19,331	6,572	0	**1,737,591**
Other services	1,277	140,437	17,199	2,622	0	344,208	846,870	8,097	8,083	39,727	**1,408,521**
Public sector	792	56,903	15,329	69,380	0	233,399	272,917	60,631	31,072	0	**740,423**
Total	**72,552**	**343,724**	**72,488**	**104,759**	**499,500**	**1,429,400**	**4,233,587**	**117,153**	**161,935**	**44,705**	**7,079,803**

Figure 7: Estimate of North West England C&I Waste Arisings, by sector and waste management method (in tonnes)

	Waste Management Method										
Waste Description	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Waste water treatment	Total
Animal & vegetable wastes	33,116	3,250	2,128	4,208	111,451	8,453	384,187	0	37,351	0	584,144
Chemical wastes	24,656	15,095	27,378	22,684	173,049	62,557	146,617	873	79,063	44,705	596,677
Common sludges	0	26,751	229	0	82,653	5,203	16,625	0	3,145	0	134,607
Discarded equipment	0	832	12	0	0	994	57,604	15	129	0	59,586
Health care	0	13,502	28,931	70,437	0	3,244	29	14	34,825	0	150,982
Metallic wastes	0	326	40	131	0	100	603,476	41	114	0	604,228
Mineral wastes	734	21,121	444	9	132,061	127,275	328,105	0	4,257	0	614,005
Mixed (ordinary) wastes	21	251,828	7,684	208	286	1,180,219	417,054	106,357	1,333	0	1,964,990
Non-metallic wastes	14,026	11,018	5,643	7,081	0	41,357	2,273,935	9,853	1,719	0	2,364,630
Non-wastes	0	0	0	0	0	0	5,955	0	0	0	5,955
Total	**72,552**	**343,724**	**72,488**	**104,759**	**499,500**	**1,429,400**	**4,233,587**	**117,153**	**161,935**	**44,705**	**7,079,803**

Figure 8: Estimate of North West England C&I Waste Arisings, by waste type and waste management method (in tonnes)

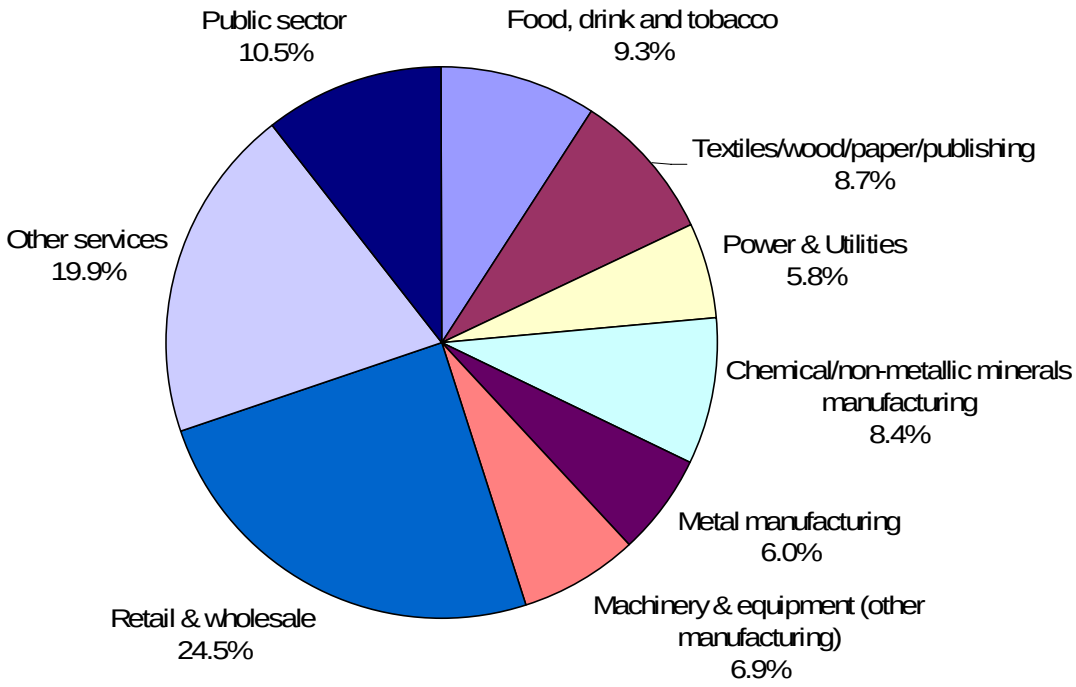

Figure 9: North West England C&I Waste Arisings, by sector (% of total)

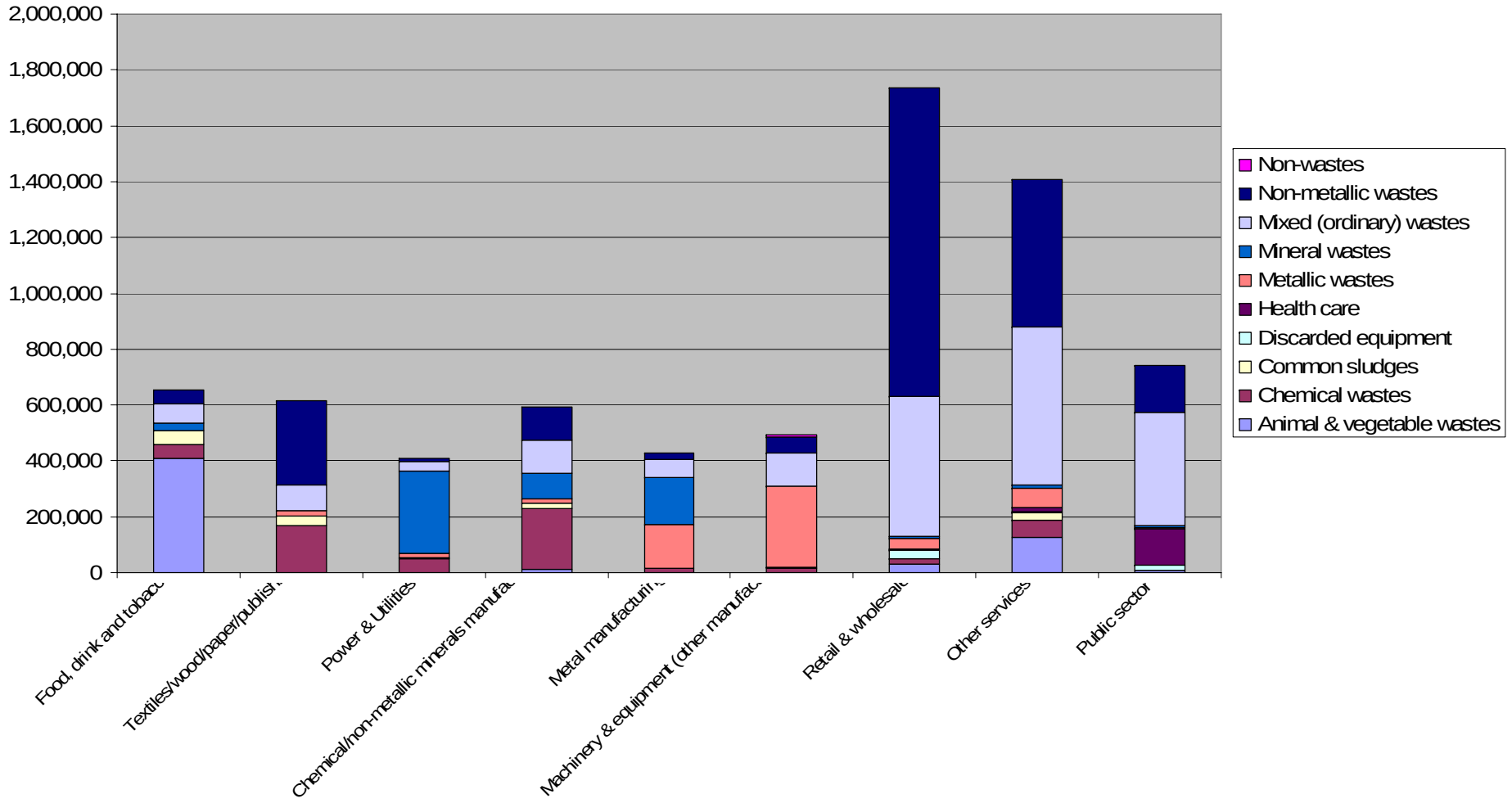

Figure 10: : North West England C&I Waste Arisings, by sector and waste type (stacked bar chart)

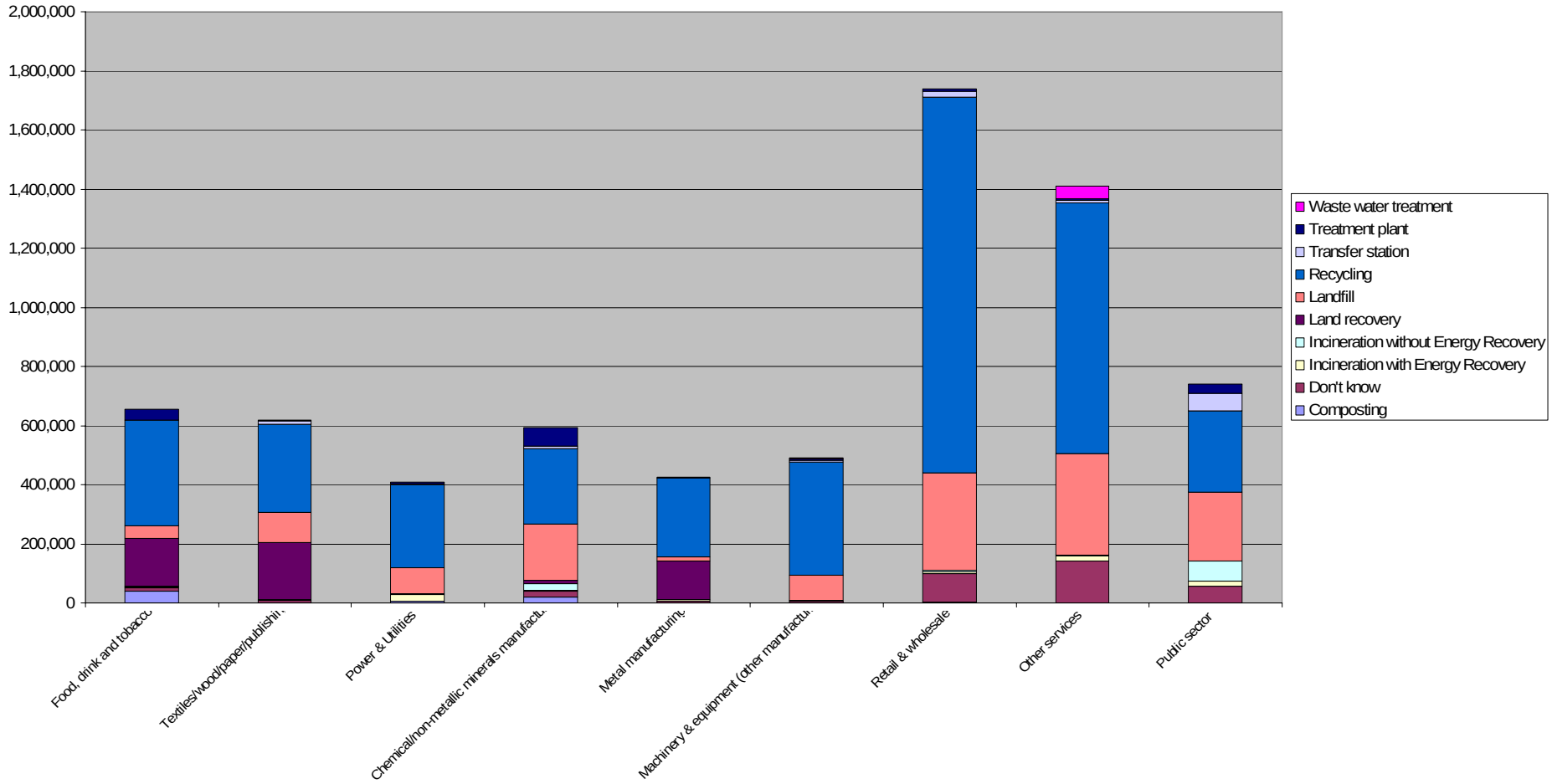

Figure 11: North West England C&I Waste Arisings, by sector and waste management method (stacked bar chart)

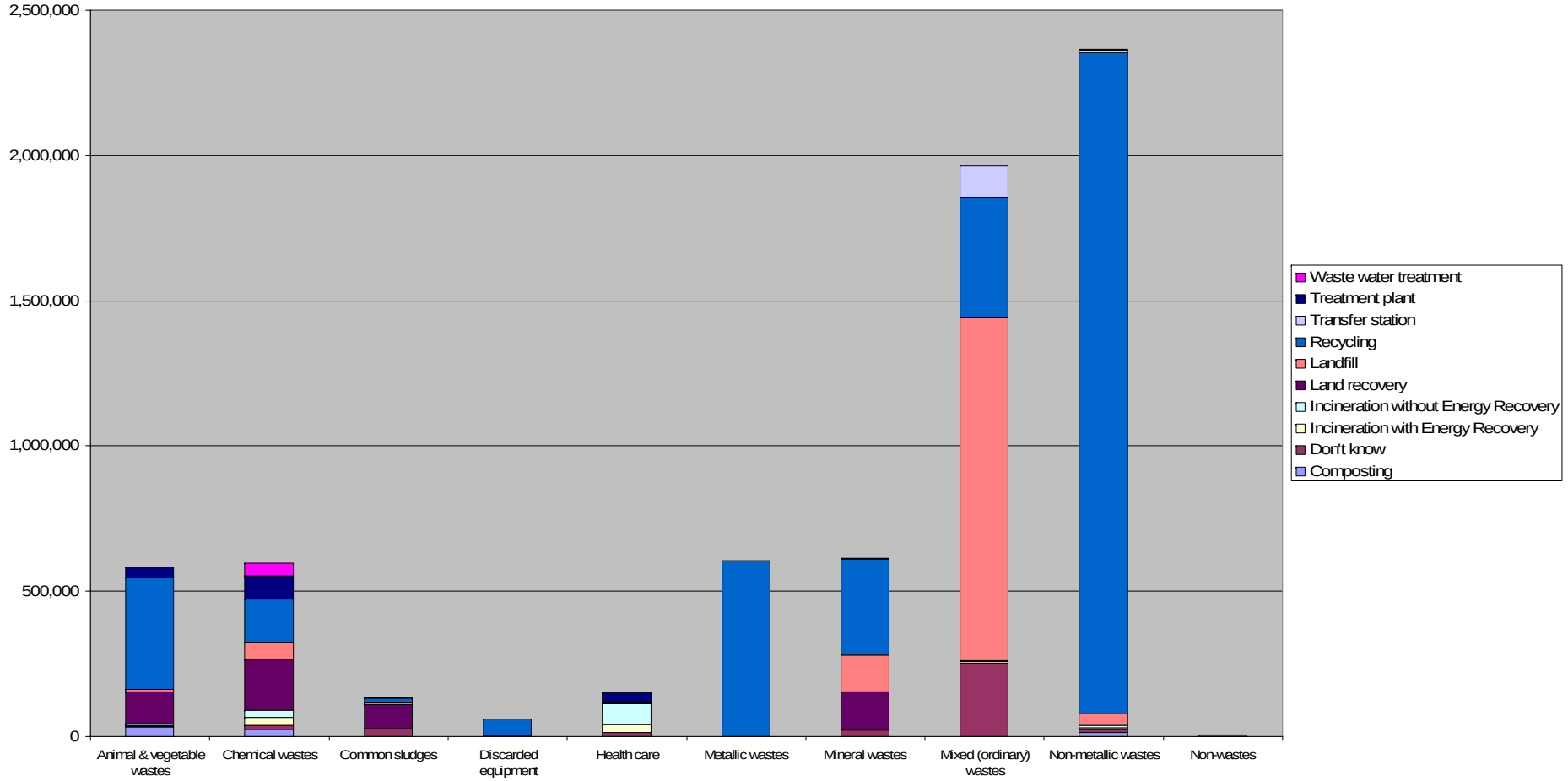

Figure 12: North West England C&I Waste Arisings, by waste type (SOC group) and waste management method (stacked bar chart)

3.2 Cumbria

	Employee Sizebands						
Sector Description	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250 +**	**Total**
Food, drink and tobacco	184	412	19,529	9,272	36,803	19,391	**85,590**
Textiles/wood/paper/publishing	161	2,245	5,101	3,303	14,622	8,556	**33,989**
Power & Utilities	14	547	1,982	0	0	0	**2,543**
Chemical/non-metallic minerals manufacturing	412	2,999	3,514	2,084	7,007	23,850	**39,865**
Metal manufacturing	1,525	545	3,936	14,145	5,123	130,987	**156,261**
Machinery & equipment (other manufacturing)	450	1,478	679	4,155	18,927	14,279	**39,968**
Retail & wholesale	21,042	31,145	32,543	15,957	9,051	25,077	**134,815**
Other services	12,909	21,772	24,217	19,587	5,515	7,558	**91,558**
Public sector	2,587	3,934	9,819	6,623	8,544	17,811	**49,319**
Total	**39,283**	**65,076**	**101,322**	**75,127**	**105,591**	**247,509**	**633,908**

Figure 13: Estimate of C&I Waste Arisings in Cumbria, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	**Animal & vegetable wastes**	**Chemical wastes**	**Common sludges**	**Discarded equipment**	**Health care**	**Metallic wastes**	**Mineral wastes**	**Mixed (ordinary) wastes**	**Non-metallic wastes**	**Non-wastes**	**Total**
Food, drink and tobacco	37,198	4,961	14,575	41	3	237	4,297	7,372	16,906	0	**85,590**
Textiles/wood/paper/publishing	0	806	2,056	16	5	1,735	254	9,511	19,578	28	**33,989**
Power & Utilities	0	338	0	35	1	68	353	1,503	246	0	**2,543**
Chemical/non-metallic minerals manufacturing	311	15,875	774	21	5	1,019	6,835	7,178	7,846	0	**39,865**
Metal manufacturing	0	985	8	7	2	13,308	135,849	4,321	1,781	0	**156,261**
Machinery & equipment (other manufacturing)	2	1,263	66	164	7	27,164	91	6,781	4,243	185	**39,968**
Retail & wholesale	2,144	1,396	9	2,842	69	3,315	475	40,166	84,399	0	**134,815**
Other services	3,395	2,016	2,488	292	600	5,722	1,051	38,838	37,156	0	**91,558**
Public sector	530	12	0	1,023	8,775	119	633	27,214	11,012	0	**49,319**
Total	**43,579**	**27,653**	**19,977**	**4,442**	**9,468**	**52,687**	**149,839**	**142,883**	**183,167**	**213**	**633,908**

Figure 14: Estimate of C&I Waste Arisings in Cumbria, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Description	**Composting**	**Don't know**	**Incineration with Energy Recovery**	**Incineration without Energy Recovery**	**Land recovery**	**Landfill**	**Recycling**	**Transfer station**	**Treatment plant**	**Waste water treatment**	**Total**
Food, drink and tobacco	18,648	1,032	248	294	16,003	4,616	41,237	0	3,513	0	85,590
Textiles/wood/paper/publishing	16	451	13	218	2,307	10,622	19,209	893	259	0	33,989
Power & Utilities	175	6	13	0	0	667	1,675	7	1	0	2,543
Chemical/non-metallic minerals manufacturing	2,168	1,070	113	2,295	301	11,125	17,382	615	4,797	0	39,865
Metal manufacturing	0	589	95	17	130,806	1,384	23,093	15	261	0	156,261
Machinery & equipment (other manufacturing)	0	256	27	27	6	5,294	32,992	700	251	415	39,968
Retail & wholesale	186	8,238	455	292		25,651	98,080	1,412	502	0	134,815
Other services	104	11,009	446	198		23,954	54,006	588	329	924	91,558
Public sector	53	4,473	957	4,331		16,146	17,648	3,789	1,922	0	49,319
Total	**21,350**	**27,123**	**2,367**	**7,672**	**149,424**	**99,458**	**305,322**	**8,020**	**11,834**	**1,339**	**633,908**

Figure 15: Estimate of C&I Waste Arisings in Cumbria, by sector and waste management method (in tonnes)

3.3 Lancashire

	Employee Sizeband						
SICDescription	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	459	1,236	39,058	2,783	6,814	149,501	**199,852**
Textiles/wood/paper/publishing	564	6,413	16,578	29,731	147,459	8,556	**209,302**
Power & Utilities	42	547	1,322	0	21,891	0	**23,802**
Chemical/non-metallic minerals manufacturing	1,153	8,996	8,786	10,420	35,033	23,850	**88,238**
Metal manufacturing	6,708	2,043	10,825	28,290	15,369	15,159	**78,395**
Machinery & equipment (other manufacturing)	1,687	7,389	5,775	14,542	37,854	57,115	**124,363**
Retail & wholesale	38,098	53,963	63,672	37,233	29,415	58,512	**280,893**
Other services	22,038	34,536	40,257	34,723	17,922	22,674	**172,149**
Public sector	4,109	7,190	22,462	16,732	19,652	46,309	**116,454**
Total	**74,859**	**122,315**	**208,735**	**174,455**	**331,408**	**381,676**	**1,293,447**

Figure 16: Estimate of C&I Waste Arisings in Lancashire, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	159,327	13,617	2,175	35	5	608	2,163	15,272	6,650	0	**199,852**
Textiles/wood/paper/publishing	0	110,559	13,907	30	17	2,899	255	22,032	59,511	91	**209,302**
Power & Utilities	0	1,876	0	84	0	1,164	14,078	5,381	1,218	0	**23,802**
Chemical/non-metallic minerals manufacturing	1,520	29,150	3,872	41	14	2,312	14,416	19,363	17,550	0	**88,238**
Metal manufacturing	3	5,471	0	28	6	42,492	10,107	14,484	5,804	0	**78,395**
Machinery & equipment (other manufacturing)	6	4,650	196	600	29	78,769	318	24,326	14,542	926	**124,363**
Retail & wholesale	5,030	2,847	18	5,556	145	6,689	1,083	81,510	178,015	0	**280,893**
Other services	9,459	4,665	4,247	574	1,469	9,363	1,713	72,872	67,789	0	**172,149**
Public sector	1,262	31		2,566	19,897	298	1,647	64,332	26,421	0	**116,454**
Total	**176,608**	**172,865**	**24,414**	**9,514**	**21,582**	**144,594**	**45,780**	**319,572**	**377,500**	**1,017**	**1,293,447**

Figure 17: Estimate of C&I Waste Arisings in Lancashire, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Desription	**Composting**	**Don't know**	**Incineration with Energy Recovery**	**Incineration without Energy Recovery**	**Land recovery**	**Landfill**	**Recycling**	**Transfer station**	**Treatment plant**	**Waste water treatment**	**Total**
Food, drink and tobacco	22,310	1,906	527	756	74,912	9,233	80,256	0	9,951	0	**199,852**
Textiles/wood/paper/publishing	223	2,184	21	624	122,610	22,793	58,546	1,811	490	0	**209,302**
Power & Utilities	118	24	13	0	0	14,396	9,195	56	0	0	**23,802**
Chemical/non-metallic minerals manufacturing	2,168	3,533	557	2,427	1,507	30,159	38,942	1,834	7,111	0	**88,238**
Metal manufacturing	0	1,249	2,490	40	4	4,073	69,831	0	708	0	**78,395**
Machinery & equipment (other manufacturing)	0	1,199	107	117	52	18,148	99,937	2,262	882	1,659	**124,363**
Retail & wholesale	428	15,788	1,034	614		53,560	205,282	3,137	1,049	0	**280,893**
Other services	182	19,716	1,343	338		45,318	100,851	1,036	594	2,772	**172,149**
Public sector	126	9,496	2,488	9,738		37,513	42,603	9,852	4,637	0	**116,454**
Total	**25,556**	**55,094**	**8,579**	**14,654**	**199,087**	**235,193**	**705,443**	**19,989**	**25,422**	**4,431**	**1,293,447**

Figure 18: Estimate of C&I Waste Arisings in Lancashire, by sector and waste management method (in tonnes)

3.4 Halton

	Emolyee Sizeband						
SIC Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	46	206	0	0	6,814	0	**7,066**
Textiles/wood/paper/publishing	40	321	1,275	3,303	0	0	**4,940**
Power & Utilities	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	165	1,499	1,757	8,336	7,007	0	**18,764**
Metal manufacturing	305	272	984	0	0	0	**1,561**
Machinery & equipment (other manufacturing)	225	739	1,359	4,155	0	0	**6,478**
Retail & wholesale	3,433	5,859	6,367	3,989	4,525	8,359	**32,533**
Other services	2,210	4,054	5,347	5,342	4,136	7,558	**28,646**
Public sector	396	633	2,421	1,394	2,563	3,562	**10,970**
Total	**6,819**	**13,584**	**19,510**	**26,520**	**25,045**	**19,479**	**110,957**

Figure 19: Estimate of C&I Waste Arisings in Halton, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	1,210	2	1,877	16	1	14	2,145	840	960	0	7,066
Textiles/wood/paper/publishing	0	139	0	1	1	58	0	668	4,064	7	4,940
Power & Utilities	0	0	0	0	0	0	0	0	0	0	0
Chemical/non-metallic minerals manufacturing	1,193	4,167	774	11	3	550	1,996	5,227	4,843	0	18,764
Metal manufacturing	0	52	0	0	0	842	0	545	121	0	1,561
Machinery & equipment (other manufacturing)	0	87	18	115	3	1,990	7	3,195	970	93	6,478
Retail & wholesale	602	312	2	553	17	732	124	9,068	21,124	0	32,533
Other services	2,922	1,202	428	97	398	1,148	192	11,688	10,572	0	28,646
Public sector	138	3	0	219	2,131	25	127	5,963	2,365	0	10,970
Totals	**6,065**	**5,964**	**3,099**	**1,011**	**2,554**	**5,359**	**4,592**	**37,193**	**45,020**	**100**	**110,957**

Figure 20: Estimate of C&I Waste Arisings in Halton, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Description	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Waste water treatment	Total
Food, drink and tobacco	0	153	44	0	1,877	448	4,519	0	26	0	**7,066**
Textiles/wood/paper/publishing	4	207	0	31	0	545	4,072	62	18	0	**4,940**
Power & Utilities	0	0	0	0	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	0	1,191	180	73	1,192	6,820	8,175	347	785	0	**18,764**
Metal manufacturing	0	14	0	2	0	87	1,417	0	42	0	**1,561**
Machinery & equipment (other manufacturing)	0	117	0	4	12	2,534	3,707	52	51	0	**6,478**
Retail & wholesale	55	1,625	127	68	0	6,088	24,081	370	119	0	**32,533**
Other services	23	2,728	417	48	0	7,236	17,028	151	90	924	**28,646**
Public sector	12	882	192	1,182	0	3,577	3,891	758	477	0	**10,970**
Total	**95**	**6,917**	**960**	**1,409**	**3,081**	**27,335**	**66,889**	**1,741**	**1,607**	**924**	**110,957**

Figure 21: Estimate of C&I Waste Arisings in Halton, by sector and waste management method (in tonnes)

3.5 Greater Manchester

	Employee Sizebands						
SIC Description	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250 +**	**Total**
Food, drink and tobacco	1,011	2,267	45,568	8,348	34,069	111,750	**203,013**
Textiles/wood/paper/publishing	1,270	13,468	47,183	46,249	65,801	8,556	**182,527**
Power & Utilities	28	547	2,643	32,245	21,891	0	**57,354**
Chemical/non-metallic minerals manufacturing	1,977	17,243	23,721	27,092	77,072	47,700	**194,805**
Metal manufacturing	13,721	5,449	26,571	33,006	15,369	15,159	**109,275**
Machinery & equipment (other manufacturing)	3,711	18,473	13,249	35,317	63,090	71,394	**205,234**
Retail & wholesale	79,850	123,345	160,595	90,422	74,669	158,819	**687,700**
Other services	55,298	87,390	123,510	119,305	50,320	166,274	**602,097**
Public sector	8,491	12,210	46,268	43,922	57,247	106,867	**275,006**
Total	**165,358**	**280,391**	**489,309**	**435,905**	**459,528**	**686,519**	**2,517,010**

Figure 22: Estimate of C&I Waste Arisings in Greater Manchester, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	**Animal & vegetable wastes**	**Chemical wastes**	**Common sludges**	**Discarded equipment**	**Health care**	**Metallic wastes**	**Mineral wastes**	**Mixed (ordinary) wastes**	**Non-metallic wastes**	**Non-wastes**	**Total**
Food, drink and tobacco	122,469	17,775	11,545	112	11	1,027	10,750	25,245	14,079	0	**203,013**
Textiles/wood/paper/publishing	0	3,899	9,251	48	35	7,436	258	29,341	131,999	260	**182,527**
Power & Utilities	0	4,393	0	183	1	2,831	34,240	12,725	2,981	0	**57,354**
Chemical/non-metallic minerals manufacturing	3,936	62,864	8,518	91	32	5,230	29,590	43,928	40,616	0	**194,805**
Metal manufacturing	3	6,381	0	33	11	57,850	11,783	25,125	8,088	0	**109,275**
Machinery & equipment (other manufacturing)	8	6,375	374	1,287	55	120,043	516	49,584	24,677	2,314	**205,234**
Retail & wholesale	12,148	6,969	45	12,864	355	16,167	2,714	196,605	439,834	0	**687,700**
Other services	63,536	31,457	10,680	1,844	8,659	25,110	4,357	235,439	221,016	0	**602,097**
Public sector	3,269	71		6,527	49,200	728	3,801	148,802	62,607	0	**275,006**
Total	**205,368**	**140,186**	**40,413**	**22,989**	**58,359**	**236,422**	**98,009**	**766,793**	**945,896**	**2,573**	**2,517,010**

Figure 23: Estimate of C&I Waste Arisings in Greater Manchester, by sector and Waste Type (in tonnes)

	Waste Management Method										
SIC Description	**Composting**	**Don't know**	**Incineration with Energy Recovery**	**Incineration without Energy Recovery**	**Land recovery**	**Landfill**	**Recycling**	**Transfer station**	**Treatment plant**	**Waste water treatment**	**Total**
Food, drink and tobacco	0	3,111	869	1,010	48,623	15,872	119,776	9	13,744	0	203,013
Textiles/wood/paper/publishing	129	3,739	60	1,310	9,503	32,496	129,610	4,614	1,066	0	182,527
Power & Utilities	295	56	13	0	0	34,530	22,333	127	1	0	57,354
Chemical/non-metallic minerals manufacturing	4,337	7,939	1,276	4,916	3,909	67,246	86,072	3,638	15,473	0	194,805
Metal manufacturing	0	1,628	2,522	72	5	5,551	98,098	0	1,399	0	109,275
Machinery & equipment (other manufacturing)	0	2,928	134	165	120	36,442	158,507	3,436	1,428	2,074	205,234
Retail & wholesale	1,082	37,100	2,640	1,528		130,196	504,515	7,962	2,677	0	687,700
Other services	511	56,075	8,602	1,071		141,490	365,208	3,412	5,403	20,326	602,097
Public sector	293	20,381	5,749	26,267		85,986	101,863	22,736	11,729	0	275,006
Total	**6,647**	**132,956**	**21,865**	**36,339**	**62,160**	**549,809**	**1,585,981**	**45,934**	**52,920**	**22,400**	**2,517,010**

Figure 24: Estimate of C&I Waste Arisings in Greater Manchester, by sector and Waste Management Method (in tonnes)

3.6 Merseyside

	Employee Sizeband						
SIC Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	689	1,442	26,039	2,783	6,814	38,782	**76,549**
Textiles/wood/paper/publishing	383	5,131	12,752	9,910	14,622	8,556	**51,355**
Power & Utilities	195	273	661	10,748	0	0	**11,877**
Chemical/non-metallic minerals manufacturing	741	7,497	8,786	23,797	35,033	23,850	**99,704**
Metal manufacturing	5,184	1,907	10,825	14,145	5,123	0	**37,184**
Machinery & equipment (other manufacturing)	1,350	6,281	4,756	8,310	12,618	14,279	**47,593**
Retail & wholesale	37,322	55,813	58,012	38,562	22,627	58,512	**270,850**
Other services	21,398	41,743	51,893	44,517	20,680	60,463	**240,694**
Public sector	5,326	7,597	25,152	28,933	35,032	67,682	**169,722**
Total	**72,588**	**127,685**	**198,876**	**181,705**	**152,548**	**272,125**	**1,005,528**

Figure 25: Estimate of C&I Waste Arisings in Merseyside, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	45,976	9,077	2,152	30	5	415	2,157	11,324	5,414	0	**76,549**
Textiles/wood/paper/publishing	0	1,087	2,056	19	10	1,885	254	11,677	34,297	70	**51,355**
Power & Utilities	0	998	0	43	0	567	6,795	2,858	617	0	**11,877**
Chemical/non-metallic minerals manufacturing	1,817	40,656	3,872	43	14	2,335	13,559	19,285	18,122	0	**99,704**
Metal manufacturing	0	1,344	0	9	4	18,876	5,045	9,268	2,639	0	**37,184**
Machinery & equipment (other manufacturing)	2	1,339	103	314	16	25,283	129	13,513	6,108	787	**47,593**
Retail & wholesale	4,742	2,759	16	5,321	139	6,417	1,097	78,855	171,504	0	**270,850**
Other services	23,313	9,934	4,141	745	3,235	11,371	1,932	96,757	89,266	0	**240,694**
Public sector	1,997	44		4,228	30,176	466	2,407	91,338	39,066	0	**169,722**
Total	**77,845**	**67,237**	**12,341**	**10,751**	**33,598**	**67,614**	**33,376**	**334,875**	**367,033**	**857**	**1,005,528**

Figure 26: Estimate of C&I Waste Arisings in Merseyside, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Description	**Composting**	**Don't know**	**Incineration with Energy Recovery**	**Incineration without Energy Recovery**	**Land recovery**	**Landfill**	**Recycling**	**Transfer station**	**Treatment plant**	**Waste water treatment**	**Total**
Food, drink and tobacco	0	1,509	374	505	4,639	7,006	55,798	0	6,719	0	76,549
Textiles/wood/paper/publishing	39	1,015	13	498	2,307	12,669	33,495	1,018	300	0	51,355
Power & Utilities	80	12	6	0	0	7,104	4,648	27	1	0	11,877
Chemical/non-metallic minerals manufacturing	2,267	3,421	1,668	3,455	1,804	30,649	39,374	1,581	15,484	0	99,704
Metal manufacturing	0	672	95	30	2	1,813	34,028	0	545	0	37,184
Machinery & equipment (other manufacturing)	0	975	27	40	43	9,621	35,326	794	353	415	47,593
Retail & wholesale	407	15,409	1,043	589		51,382	198,197	2,836	986	0	270,850
Other services	209	23,559	3,163	455		58,903	144,959	1,279	776	7,391	240,694
Public sector	177	12,481	3,643	16,044		52,383	63,374	14,400	7,219	0	169,722
Total	**3,179**	**59,053**	**10,033**	**21,615**	**8,795**	**231,528**	**609,199**	**21,936**	**32,383**	**7,806**	**1,005,528**

Figure 27: Estimate of C&I Waste Arisings in Merseyside, by sector and waste management method (in tonnes)

3.7 Cheshire East and Cheshire West and Chester

	Employee Sizeband						
SIC Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	230	824	19,529	12,807	13,628	19,391	**66,409**
Textiles/wood/paper/publishing	262	2,565	10,202	58,356	21,934	0	**93,319**
Power & Utilities	224	0	661	0	21,891	33,276	**56,051**
Chemical/non-metallic minerals manufacturing	659	2,999	2,636	6,252	21,020	71,550	**105,115**
Metal manufacturing	2,439	545	4,921	9,430	5,123	0	**22,458**
Machinery & equipment (other manufacturing)	956	5,172	3,058	6,232	6,309	14,279	**36,006**
Retail & wholesale	27,466	39,470	41,033	21,276	15,839	41,795	**186,878**
Other services	16,863	28,830	37,426	30,271	13,097	30,232	**156,719**
Public sector	2,313	3,120	13,450	10,458	14,525	21,373	**65,240**
Toal	**51,411**	**83,526**	**132,915**	**155,082**	**133,365**	**231,895**	**788,194**

Figure 28: Estimate of C&I Waste Arisings in Cheshire East and Cheshire West & Chester, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	30,558	4,951	15,159	39	3	252	4,297	6,971	4,178	0	**66,409**
Textiles/wood/paper/publishing	0	50,472	3,084	9	7	2,234	2	7,689	29,766	56	**93,319**
Power & Utilities	187	21,838	1,847	153	1	3,814	18,857	7,402	1,951	0	**56,051**
Chemical/non-metallic minerals manufacturing	932	46,441	2,323	62	11	2,663	16,784	16,005	19,893	0	**105,115**
Metal manufacturing	0	955	0	6	2	11,564	3,369	4,976	1,585	0	**22,458**
Machinery & equipment (other manufacturing)	1	1,203	62	246	12	19,081	108	10,004	4,641	648	**36,006**
Retail & wholesale	3,080	1,897	11	3,728	97	4,477	664	54,141	118,784	0	**186,878**
Other services	11,969	5,428	3,259	494	1,737	7,876	1,390	64,571	59,993	0	**156,719**
Public sector	805	16		1,541	12,076	160	760	35,301	14,580	0	**65,240**
Total	**47,532**	**133,203**	**25,744**	**6,279**	**13,947**	**52,122**	**46,230**	**207,061**	**255,372**	**704**	**788,194**

Figure 29: Estimate of C&I Waste Arisings in Cheshire East and Cheshire West & Chester, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Description	**Composting**	**Don't know**	**Incineration with Energy Recovery**	**Incineration without Energy Recovery**	**Land recovery**	**Landfill**	**Recycling**	**Transfer station**	**Treatment plant**	**Waste water treatment**	**Total**
Food, drink and tobacco	0	1,082	249	253	16,402	4,125	40,899	1	3,398	0	**66,409**
Textiles/wood/paper/publishing	44	589	20	249	52,730	8,942	29,095	1,371	278	0	**93,319**
Power & Utilities	3,041	22	10,391	1	1,610	19,106	18,437	93	3,350	0	**56,051**
Chemical/non-metallic minerals manufacturing	6,503	1,526	332	6,881	904	29,426	45,368	721	13,455	0	**105,115**
Metal manufacturing	0	414	63	16	1	1,058	20,634	0	272	0	**22,458**
Machinery & equipment (other manufacturing)	0	798	27	34	28	6,883	26,940	617	265	415	**36,006**
Retail & wholesale	275	10,676	671	397	0	35,221	136,981	1,969	688	0	**186,878**
Other services	153	16,726	1,626	310	0	39,403	93,387	886	531	3,696	**156,719**
Public sector	77	4,942	1,153	6,640	0	20,682	24,355	4,547	2,845	0	**65,240**
Total	**10,093**	**36,775**	**14,532**	**14,781**	**71,676**	**164,846**	**436,095**	**10,206**	**25,081**	**4,110**	**788,194**

Figure 30: Estimate of C&I Waste Arisings in Cheshire East and Cheshire West & Chester, by sector and waste management method (in tonnes)

3.8 Blackburn with Darwen

	Employee Sizeband						
SIC Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	92	206	6,510	0	0	0	**6,808**
Textiles/wood/paper/publishing	81	1,603	2,550	3,303	14,622	8,556	**30,717**
Power & Utilities	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	82	1,499	2,636	2,084	7,007	23,850	**37,158**
Metal manufacturing	915	409	984	4,715	5,123	0	**12,146**
Machinery & equipment (other manufacturing)	281	1,478	1,359	4,155	12,618	0	**19,891**
Retail & wholesale	4,873	7,092	7,782	5,319	4,525	8,359	**37,951**
Other services	2,733	3,754	4,089	7,123	2,757	0	**20,455**
Public sector	639	1,176	3,228	1,743	3,418	3,562	**13,766**
Total	**9,696**	**17,217**	**29,138**	**28,442**	**50,070**	**44,327**	**178,891**

Figure 31: Estimate of C&I Waste Arisings in Blackburn with Darwen, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	5,761	410	0	0	0	0	0	397	240	0	**6,808**
Textiles/wood/paper/publishing	0	805	2,056	15	5	1,719	254	9,110	16,739	14	**30,717**
Power & Utilities	0	0	0	0	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	311	15,743	774	21	4	945	5,928	6,096	7,335	0	**37,158**
Metal manufacturing	0	673	0	3	1	6,481	1,693	2,509	785	0	**12,146**
Machinery & equipment (other manufacturing)	0	232	55	128	5	11,917	36	5,127	2,205	185	**19,891**
Retail & wholesale	714	376	2	718	20	882	152	10,884	24,203	0	**37,951**
Other services	173	236	525	81	57	1,027	199	8,778	9,379	0	**20,455**
Public sector	176	3		269	2,871	28	127	7,424	2,869	0	**13,766**
Total	**7,134**	**18,479**	**3,413**	**1,235**	**2,963**	**22,999**	**8,389**	**50,324**	**63,755**	**199**	**178,891**

Figure 32: Estimate of C&I Waste Arisings in Blackburn with Darwen, by sector and waste type (in tonnes)

	Waste Management Method									
SIC Description	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Total
Food, drink and tobacco	0	209	2	0	0	188	6,408	0	0	**6,808**
Textiles/wood/paper/publishing	8	387	13	156	2,307	10,216	16,478	893	258	**30,717**
Power & Utilities	0	0	0	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	2,168	718	112	2,294	301	10,364	16,165	342	4,692	**37,158**
Metal manufacturing	0	204	32	6	1	661	11,161	0	82	**12,146**
Machinery & equipment (other manufacturing)	0	243	0	5	12	4,023	15,205	282	120	**19,891**
Retail & wholesale	61	2,050	146	81		7,218	27,839	419	137	**37,951**
Other services	23	2,365	42	38		5,439	12,276	199	74	**20,455**
Public sector	16	1,227	192	1,608		4,574	4,794	758	596	**13,766**
Total	**2,275**	**7,404**	**539**	**4,188**	**2,622**	**42,683**	**110,327**	**2,894**	**5,959**	**178,891**

Figure 33: Estimate of C&I Waste Arisings in Blackburn with Darwen, by sector and waste management method (in tonnes)

3.9 Blackpool

	Employee Sizeband						
SIC Descripotion	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	138	206	6,510	1,391	0	0	**8,245**
Textiles/wood/paper/publishing	40	321	1,275	0	0	0	**1,636**
Power & Utilities	0	0	0	0	0	0	**0**
Chemical/non-metallic minerals manufacturing	82	0	879	0	0	0	**961**
Metal manufacturing	305	136	0	4,715	0	0	**5,156**
Machinery & equipment (other manufacturing)	112	739	340	0	0	0	**1,191**
Retail & wholesale	5,427	8,017	8,490	3,989	4,525	0	**30,448**
Other services	2,849	5,706	5,976	6,232	2,068	3,779	**26,610**
Public sector	578	904	2,287	2,789	3,418	7,124	**17,100**
Total	**9,532**	**16,030**	**25,755**	**19,117**	**10,011**	**10,903**	**91,348**

Figure 34: Estimate of C&I Waste Arisings in Blackpool, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	5,923	420	115	1	0	8	0	1,007	771	0	8,245
Textiles/wood/paper/publishing	0	1	0	0	0	8	0	200	1,420	7	1,636
Power & Utilities	0	0	0	0	0	0	0	0	0	0	0
Chemical/non-metallic minerals manufacturing	0	132	0	0	0	46	26	411	346	0	961
Metal manufacturing	0	75	0	1	0	2,495	1,676	591	317	0	5,156
Machinery & equipment (other manufacturing)	0	8	5	7	1	171	7	682	218	93	1,191
Retail & wholesale	599	300	2	727	16	777	93	9,796	18,137	0	30,448
Other services	1,545	762	550	87	236	1,488	262	10,962	10,717	0	26,610
Public sector	196	4		412	3,050	47	253	9,209	3,928	0	17,100
Total	**8,262**	**1,703**	**672**	**1,236**	**3,305**	**5,040**	**2,319**	**32,858**	**35,854**	**100**	**91,348**

Figure 35: Estimate of C&I Waste Arisings in Blackpool, by sector and waste type (in tonnes)

	Waste Management Method										
SICDescription	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Waste water treatment	Total
Food, drink and tobacco	0	269	3	0	0	777	7,081	0	115		**8,245**
Textiles/wood/paper/publishing	4	32	0	31	0	203	1,366	0	1		**1,636**
Power & Utilities	0	0	0	0	0	0	0	0	0		**0**
Chemical/non-metallic minerals manufacturing	0	63	1	0	0	352	434	7	104		**961**
Metal manufacturing	0	186	32	3	1	323	4,589	0	23		**5,156**
Machinery & equipment (other manufacturing)	0	111	0	1	3	362	680	23	11	0	**1,191**
Retail & wholesale	40	2,101	63	64	0	6,151	21,558	367	105		**30,448**
Other services	26	2,837	210	53	0	6,740	16,013	178	91	462	**26,610**
Public sector	17	1,312	383	1,591	0	5,300	6,270	1,516	711		**17,100**
Total	**87**	**6,910**	**692**	**1,744**	**4**	**20,208**	**57,991**	**2,090**	**1,161**	**462**	**91,348**

Figure 36: Estimate of C&I Waste Arisings in Blackpool, by sector and waste management method (in tonnes)

3.10 Warrington

	Employee Sizeband						
SIC Description	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	46	206	0	1,391	0	0	**1,643**
Textiles/wood/paper/publishing	60	641	1,275	0	7,311	0	**9,288**
Power & Utilities	14	273	0	10,748	0	245,360	**256,395**
Chemical/non-metallic minerals manufacturing	82	750	1,757	0	7,007	0	**9,596**
Metal manufacturing	915	545	2,952	0	0	0	**4,412**
Machinery & equipment (other manufacturing)	337	1,478	1,019	2,077	6,309	0	**11,221**
Retail & wholesale	6,977	11,101	16,272	9,308	6,788	25,077	**75,523**
Other services	4,419	8,409	10,064	13,355	6,893	26,453	**69,593**
Public sector	700	769	3,632	2,789	4,272	10,687	**22,848**
Total	**13,551**	**24,172**	**36,971**	**39,669**	**38,580**	**307,576**	**460,519**

Figure 37: Estimate of C&I Waste Arisings in Warrington, by sector and employee sizeband (in tonnes)

	Waste Type (Substance Orientated Classification)										
SIC Description	Animal & vegetable wastes	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Non-wastes	Total
Food, drink and tobacco	162	11	115	1	0	8	0	685	661	0	**1,643**
Textiles/wood/paper/publishing	0	182	1,028	2	1	694	1	1,257	6,116	7	**9,288**
Power & Utilities	187	21,128	1,725	132	1	3,685	222,916	5,202	1,419	0	**256,395**
Chemical/non-metallic minerals manufacturing	6	3,124	774	3	2	259	1,437	2,227	1,764	0	**9,596**
Metal manufacturing	0	156	0	1	1	2,331	0	1,560	363	0	**4,412**
Machinery & equipment (other manufacturing)	0	125	32	71	3	6,167	25	3,291	1,321	185	**11,221**
Retail & wholesale	1,240	774	5	1,251	39	1,716	315	20,416	49,766	0	**75,523**
Other services	9,894	3,880	854	212	1,292	2,468	397	26,207	24,388	0	**69,593**
Public sector	260	7	0	454	3,865	61	380	12,586	5,235	0	**22,848**
Total	**11,750**	**29,385**	**4,533**	**2,128**	**5,205**	**17,390**	**225,472**	**73,431**	**91,033**	**192**	**460,519**

Figure 38: Estimate of C&I Waste Arisings in Warrington, by sector and waste type (in tonnes)

	Waste Management Method										
SIC Description	Composting	Don't know	Incineration with Energy Recovery	Incineration without Energy Recovery	Land recovery	Landfill	Recycling	Transfer station	Treatment plant	Waste water treatment	Total
Food, drink and tobacco	0	115	1	0	0	609	803	0	115	0	1,643
Textiles/wood/paper/publishing	6	46	7	62	1,028	1,789	5,855	415	80	0	9,288
Power & Utilities	3,072	10	10,562	6	1,610	12,445	225,433	102	3,155	0	256,395
Chemical/non-metallic minerals manufacturing	0	320	88	20	5	4,071	4,350	162	579	0	9,596
Metal manufacturing	0	34	0	6	0	192	4,055	0	125	0	4,412
Machinery & equipment (other manufacturing)	0	232	0	4	9	2,420	8,320	164	72	0	11,221
Retail & wholesale	126	3,603	341	171	0	13,852	56,264	857	309	0	75,523
Other services	46	5,423	1,349	110	0	15,725	43,142	369	196	3,234	69,593
Public sector	21	1,709	572	1,980	0	7,238	8,118	2,274	936	0	22,848
Total	**3,271**	**11,492**	**12,921**	**2,357**	**2,652**	**58,341**	**356,340**	**4,344**	**5,567**	**3,234**	**460,519**

Figure 39: Estimate of C&I Waste Arisings in Warrington, by sector and waste management method (in tonnes)

4 Other survey data analysis

4.1 Nature of waste

The survey recorded the nature of each waste stream recorded (as hazardous or non-hazardous) backed up if possible with consignment notes.

Of the waste streams recorded, a grossed tonnage of 431,842 tonne of hazardous waste was recorded. Of this, 359,837 tonnes (82.8%) was evidenced by consignment notes. Why does this discrepancy exist?

	Grossed Tonnage	%
Hazardous	431,842	6.1%
Non Hazardous	6,647,961	93.9%
Total	7,079,803	

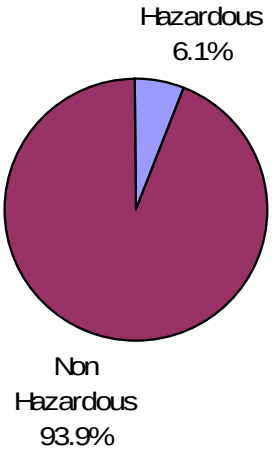

Figure 40: Nature of waste (as tonnes and %)

4.2 Source of data

For each waste stream surveyed, the source of the tonnage data entered is also recorded. The surveyors were told to ask for written evidence of tonnage where possible, for instance from waste management invoices, weighbridge receipts, transfer notes, consignment notes.

When such data was not available, a calculator built into the survey software calculated tonnages using standard container sizes (summarised in Appendix 5), conversion factors (a measure of specific gravity or density, summarised in Appendix 6) and standard items (summarised in Appendix 7).

When the calculator was used, estimates based on company information (i.e. the company provides details of number of containers and frequency of collection) were recorded as 'Company Estimate'. If the surveyor made some or all the assumptions themselves then data was recorded as 'Surveyor Estimate'.

The conversion factors used are consistent with those used in the last North West C&I Waste Arisings Survey of 2006, and in turn with those used for the last national survey in 2002-3. All of the individual waste stream data has recorded, if applicable, the conversion factors and container sizes used for the tonnage calculations, so should conversion factors be revised in the future, the resultant tonnages can be recalculated.

From this survey, the source of the data used to calculate the final grossed figures is as follows:

	Tonnage Surveyed	Grossed Tonnage
Averaged	2,239	53,742
PI Data (from PPC records)	730,034	769,036
Supermarkets (data direct from companies)	658	65,050
Survey: Company Estimate	215,359	3,820,684
Survey: Surveyor Estimate	1,430	63,901
Survey: Written records	359,549	2,307,390
Totals	1,309,269	7,079,803

Figure 41: Source of survey data (in tonnes)

Therefore, of the waste stream data recorded, 62.4% of the surveyed tonnage came from written records, 37.4% from company estimates (using tonnage calculator) and only 0.2% from surveyor estimates (also using tonnage calculator)

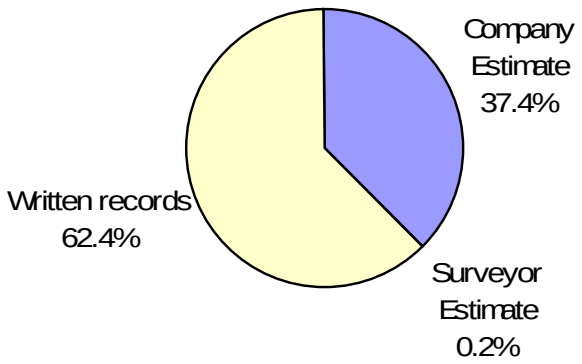

Figure 42: Source of waste stream tonnage data (as %)

For the grossed tonnages presented in this report, as reported elsewhere, tonnages came from a combination of the results from 1,000 face to face surveys, plus data from 11 large retail supermarkets (provided by the operating companies) and 19 from the

largest of the PPC reported companies. Of the total reported tonnages, the chart below shows the contribution of these data sources.

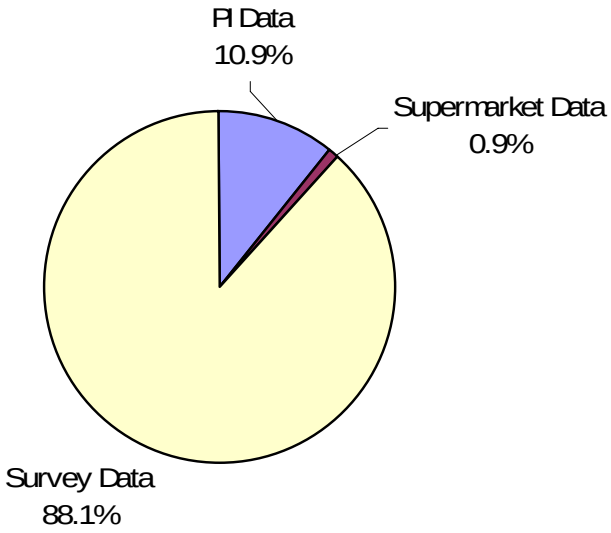

Figure 43: Source of survey data (as %)

4.3 Waste contractor

For each individual waste stream recorded in the survey, the waste contractor who either recycles, recovers or disposes of the waste stream was recorded, both in terms of public or private sector, and in terms of specific private sector contractor name (if applicable).

The list of named contractors was based upon data provided by Envirolink Northwest.

The results are shown below:

	Surveyed Tonnage	Grossed Tonnage
Local Authority	6,324	390,613
On site	3,243	15,476
Other/Don't Know	778,621	1,497,773
Private Contractor	526,997	5,175,942
Total	1,315,185	7,079,803

Figure 44: Waste contractor (in tonnes)

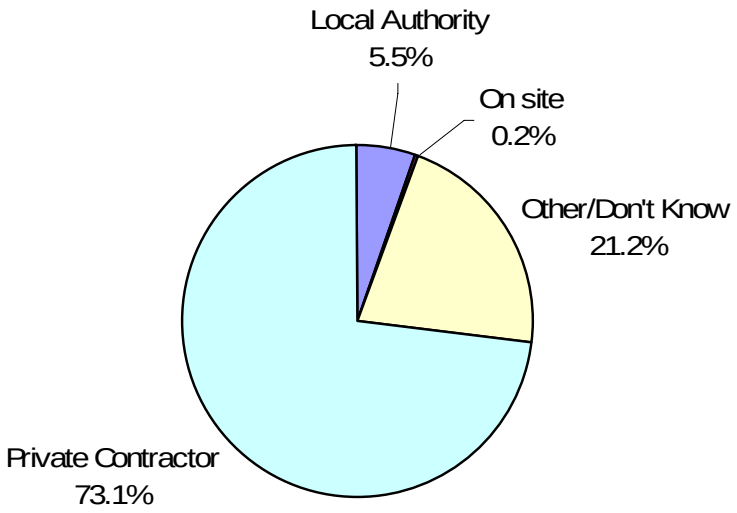

Figure 45: Waste contractor (as %)

4.4 Potential to recycle

During the survey visits, each waste stream recorded was assessed in terms of its propensity to be recycled, against a given set of criteria. These criteria are summarised in Appendix 9, and are based upon the composition of the waste stream, its state, and whether more work would be required to recycle the material or not.

The results obtained (based on grossed up data) are summarised in the following figures. By grossing up the data we have assumed that all businesses in a sector have similar waste management practices and therefore the waste has the same potential or not to be recycled.

Of the total tonnages recorded, 3.05 million tonnes was recorded as not already recycled, of which 0.33 million tonnes was recoded as "recyclable" and 1.78 million tonnes as "possibly recyclable".

	Tonnage Surveyed	Grossed Tonnage
Don't Know (PI data)	730,034	769,036
Currently Recycled	389,861	4,026,476
Not Recyclable	4,027	163,122
Possibly Recyclable	142,113	1,784,679
Recyclable	49,150	336,490
Total	1,315,185	7,079,803

Figure 46: Potential to recycle, all wastes (in tonnes)

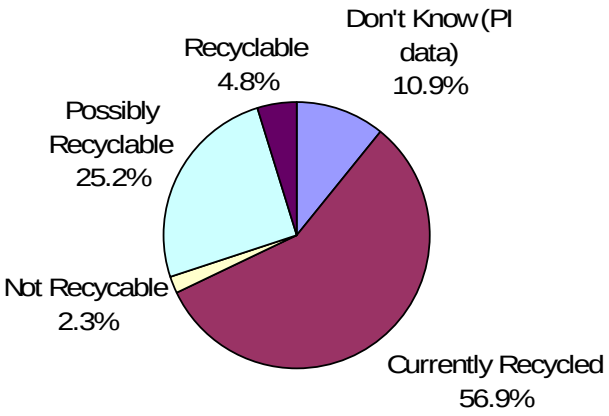

Figure 47: Potential to recycle, all wastes (as %)

However, of particular interest is the waste which is currently being landfilled, which could potentially be recycled. Filtering out these results from the full dataset showed that 0.21 million tonnes of the 1.43 million landfilled is readily recyclable, with 1.19 million tonnes requiring further work (eg. separation at a MRF) to facilitate recycling of this material. Hence the recorded data suggests that up to 97.5% of the C&I waste landfilled in the region could be recycled if the correct facilities and services were available.

	Tonnage Surveyed	Grossed Tonnage
Don't Know (PI data)	13,285	20,125
Not Recycable	1,023	14,800
Possibly Recyclable	89,231	1,187,005
Recyclable	24,319	207,470
Total	127,857	1,429,400

Figure 48: Potential to recycle, landfilled wastes (in tonnes)

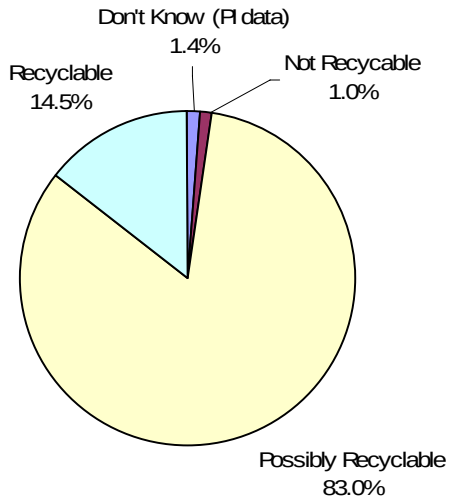

Figure 49: Potential to recycle, landfilled wastes (as %)

4.5 Potential to recover energy

Similarly, the potential to recover energy from material was also assessed, based on estimated calorific value of the materials concerned and again based on a set of pre-defined criteria. These criteria are explained in Appendix 9.

If recorded as "recoverable" the material could be incinerated to produce energy directly. If "possibly recoverable" the material would need processing before recovery eg. dried.

The grossed results tabulated below show that the majority of the waste recorded could be directly energy recovered (4.3 million tonnes) with 0.63 million tonnes possibly recoverable.

	Tonnage Surveyed	Grossed Tonnage
Don't Know (PI data)	730,034	769,036
Currently Recovered	6,396	50,401
Not Recoverable	205,452	1,301,483
Possibly Recoverable	84,710	626,270
Recoverable	288,592	4,332,613
	1,315,185	7,079,803

Figure 50: Potential to recover energy, all wastes (in tonnes)

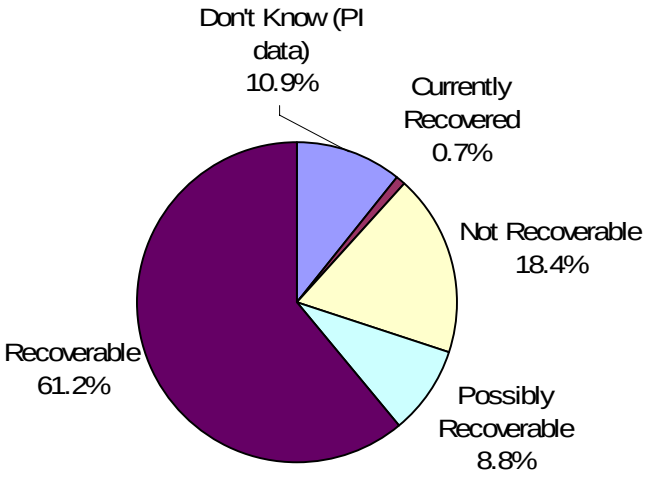

Figure 51: Potential to recover energy, all wastes (as %)

Of particular interest is the material which is currently landfilled. Filtering out these figures shows that 1.1 million tonnes (78.1%) of the 1.43 million tonnes landfilled could be energy recovered directly, with 0.12 million recovered after additional work.

Clearly there will be a considerable overlap between the material identified as recyclable, and that deemed recoverable.

	Tonnage Surveyed	Grossed Tonnage
Don't Know (PI data)	13,285	20,125
Not Recoverable	30,733	177,750
Possibly Recoverable	9,186	115,010
Recoverable	74,654	1,116,516
	127,858	1,429,401

Figure 52: Potential to recover energy, landfilled wastes (in tonnes)

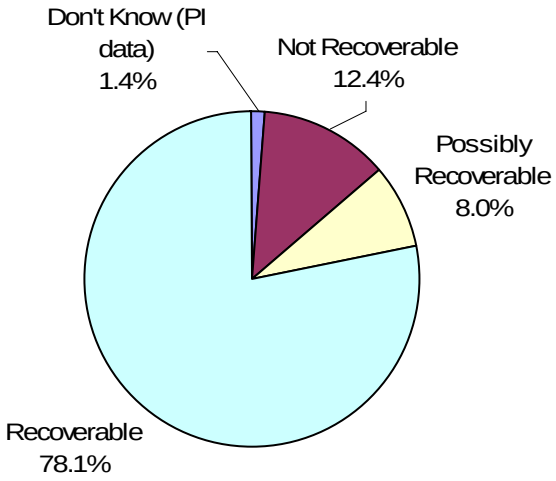

Figure 53: Potential to recover energy, landfilled wastes (as %)

4.6 Waste destination

For each waste stream recorded during survey visits, the final destination of that waste ie. where the recorded waste management process or "fate" was carried out, was recorded. Waste destination was described as either in region or outside of region. For within the North West region, the planning authority area was recorded, for outside the region, UK nation or export was recorded.

As shown in the table below over 70% of the recorded waste was disposed of within the region. Note "don't know" includes waste streams from PPC data.

	Tonnage Surveyed	Grossed Tonnage
Don't Know	765,229	1,373,936
Outside NW	88,491	748,662
Inside NW	461,465	4,957,205
Totals	1,315,185	7,079,803

Figure 54: Waste destination overview (in tonnes)

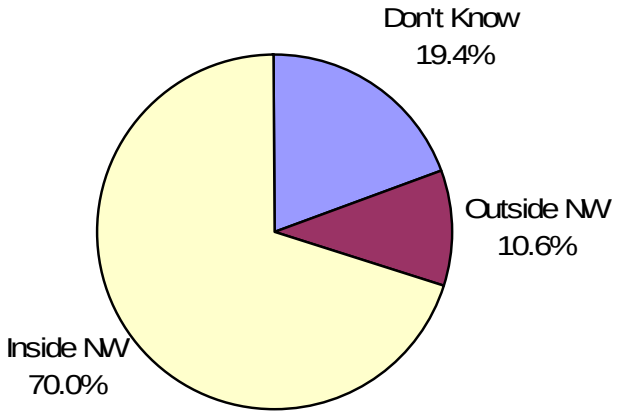

Figure 55: Waste destination overview (as %)

Of that processed outside of the region, 85% had a final destination elsewhere in England, 4% in Wales, 6% in Scotland, with 4% exported outside the UK.

	Tonnage Surveyed	Grossed Tonnage
England (excl. NW)	70,462	650,304
Outside UK	6,385	26,636
Scotland	11,119	41,920
Wales	494	28,760

Figure 56: Waste destination, outside region (in tonnes)

For material processed within the region, the most popular destinations were within the high population areas of Greater Manchester, Lancashire and Merseyside.

	Tonnage Surveyed	Grossed Tonnage
Blackburn	35,078	311,156
Blackpool	8,185	24,169
Cheshire	17,937	201,042
Cumbria	22,351	192,506
Don't Know	55,549	512,660
Greater Manchester	140,135	1,539,567
Lancashire	101,865	1,229,020
Merseyside	74,227	843,456
Warrington	6,035	103,019

Figure 57: Waste destination, inside region (in tonnes)

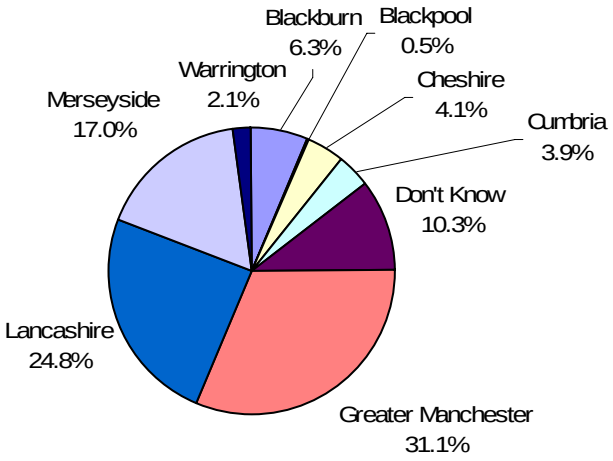

Figure 58: Waste destination inside region (as %)

4.7 Including 1-4 employee companies

It was decided at the beginning of the survey, not to directly survey micro companies ie. those who employee between 1-4 employees. The consensus was that they were less likely to want to be involved in the survey itself (as has been demonstrated with previous survey, and the waste they produce is more likely to be disposed of via the municipal waste collection route than commercial routes, either via household collections for home based businesses, or through material deposited at HWRCs.

However, there is a need to estimate the likely arisings from this group. To achieve this, we have used the same methodology as the last survey of 2006, ie. calculated by applying the average waste per employee for the 5-9 sizeband. Although averaged weights are understandably small, the number of companies in this sizeband (over 135,000) means that the totals for the region and per sector can be substantial.

Results obtained are presented below.

	0-4 Employee Sizeband	
SIC Description	**Population**	**Grossed Weight**
Food, drink and tobacco	485	1,219
Textiles/wood/paper/publishing	2,905	3,409
Power & Utilities	160	464
Chemical/non-metallic minerals manufacturing	990	4,688
Metal manufacturing	2,015	34,517
Machinery & equipment (other manufacturing)	3,095	9,969
Retail & wholesale	36,775	234,980
Other services	80,460	246,994
Public sector	8,700	15,116
Total	**135,585**	**551,356**

Figure 59: Estimated North West England C&I Waste Arisings employee Sizeband 1-4 - by sector (in tonnes)

	Employee Sizebands							
SIC Description	0-4	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	1,219	2,895	7,006	162,744	38,776	104,941	338,815	**656,395**
Textiles/wood/paper/pub	3,409	2,862	32,708	98,191	154,157	286,372	42,782	**620,481**
Power & Utilities	464	517	2,188	7,269	53,741	65,672	278,635	**408,486**
Chemical/non-metallic	4,688	5,354	43,482	54,471	80,065	196,183	214,650	**598,894**
Metal manufacturing	34,517	32,016	11,852	61,998	108,447	51,230	161,304	**461,366**
Machinery & equipment	9,969	9,109	43,226	31,595	78,943	157,725	171,345	**501,913**
Retail & wholesale	234,980	224,488	335,806	394,767	226,055	171,965	384,510	**1,972,570**
Other services	246,994	140,717	236,193	302,778	280,455	123,388	324,990	**1,655,515**
Public sector	15,116	25,140	37,534	128,718	115,382	148,672	284,978	**755,539**
Total	**551,356**	**443,098**	**749,996**	**1,242,531**	**1,136,021**	**1,306,148**	**2,202,009**	**7,631,158**

Figure 60: Estimated North West England C&I Waste Arisings including 1-4 employee sizeband - by sector (in tonnes)

The estimate is 551,356 tonnes, increasing the total for the region to 7.631,158 tonnes.

4.8 Comparison to the previous survey

The report "Study to fill Evidence Gaps for Commercial & Industrial Waste Streams in the North West Region of England" written by Urban Mines for the North West Regional Technical Advisory Board in May 2007, gives the results of that survey recording waste arisings data for the calendar year 2006.

This survey was based on data from 981 companies, 827 surveyed and the rest from PPC data. As with this survey, companies with less than 5 employees were excluded, as was agricultural, construction and demolition waste, waste from one off refurbishments, and waste which would not impact on external treatment of recycling facilities. The data structure is the same as the 2008-9 survey so that figures can be compared.

Differences

Apart from the inclusion of more PPC data to fill gaps, the main difference between the two surveys was the emphasis built into the sampling strategy and the design of the sample frame. The 2006 survey favoured industrial companies over commercial organisations, and larger organisations over smaller, to distribute samples across the sample frame in a manner which reflected the likely waste output from individual companies. The drawback of this was that the commercial sector, particularly retail and wholesale, were not surveyed to such a degree and supermarkets in particular were under represented. This was remedied in the 2008-9 survey.

Comparing the results of the two surveys at high level:

1. Total waste for this survey is 6.0% down on the last survey

2. The biggest reduction is seen in the industrial sectors where total waste is 14.25% down from 3,723,871 tonnes to 3,193,268 tonnes over the period (over the same period, the number of local units in these sectors dropped by 9.3% in the data supplied by ONS), whereas the commercial sector figure is 2.5% greater than 2006, rising from 3,808,418 tonnes to 3,886,535 tonnes with the largest

increase in retail & wholesale (local units increased also by 2.5% over this period).

	2009	2006
Food, drink and tobacco	**655,175**	**547,057**
Textiles/wood/paper/publishing	**617,072**	**1,098,709**
Power & Utilities	**408,022**	**278,775**
Chemical/non-metallic minerals manufacturing	**594,206**	**837,806**
Metal manufacturing	**426,848**	**608,007**
Machinery & equipment (other manufacturing)	**491,943**	**353,517**
Retail & wholesale	**1,737,591**	**1,353,477**
Other services	**1,408,521**	**1,848,550**
Public sector	**740,423**	**606,392**
Total	**7,079,803**	**7,532,289**

Figure 61: Waste Arisings per sector, 2009 compared to 2006.

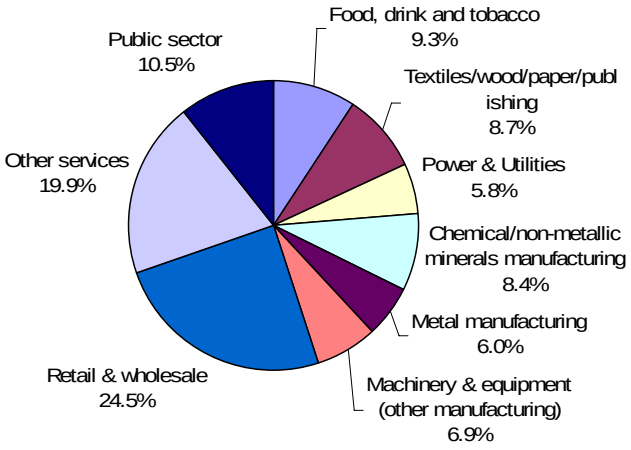

Figure 62: North West England C&I waste arisings by sector, 2008-9 survey

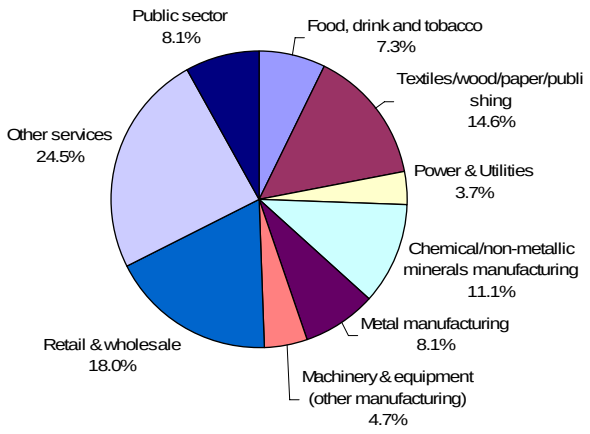

Figure 63: North West England C&I waste arisings by sector, 2006 survey

3. The landfill figure is 62% of 2006 at 1.43 million tonnes. Figures for "don't know" and "transfer station" are significantly down too. All these factors may have contributed to recycling being up to 4.2 million tonnes (+60%) mostly in the service sectors of retail & wholesale and public services.

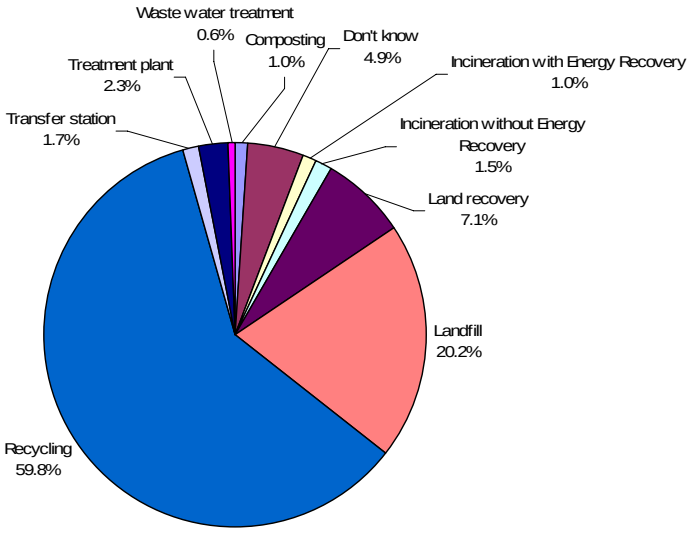

Figure 64: North West England Waste Arisings by waste management method, 2008-9 survey

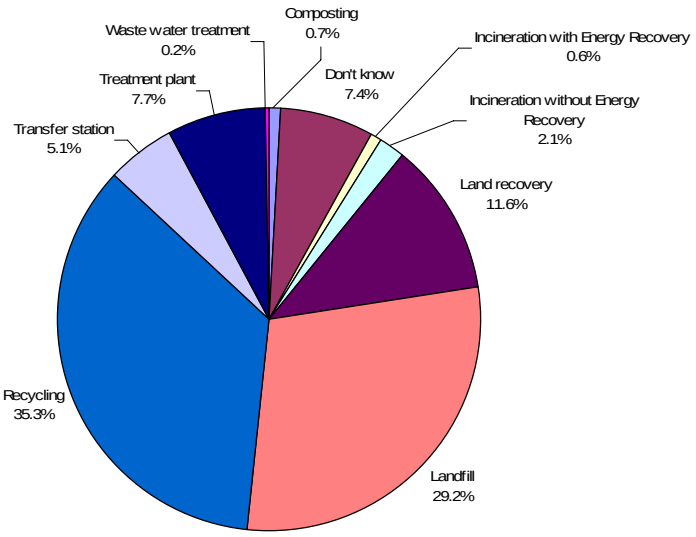

Figure 65: North West England Waste Arisings by waste management method, 2006 survey

4. In terms of waste types, animal & vegetable and non-metallic wastes are up on the previous survey (584,114t from 477,071t ie. increase of 22% and 2.36 million tonnes from 2.04 million tonnes, increase of 16% respectively) where as mixed wastes (1.96 million tonnes) is around same sort of level as 2006. Big reductions are in industrially associated wastes, chemical, sludges and metallic wastes.

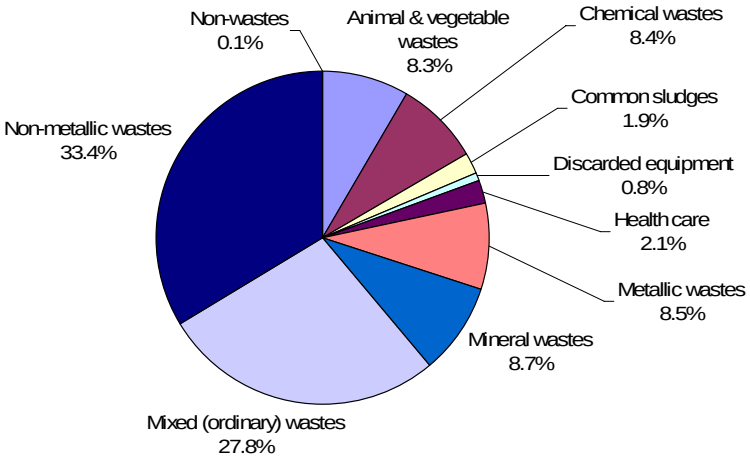

Figure 66: North West England Waste Arisings by waste type (SOC group), 2008-9 survey

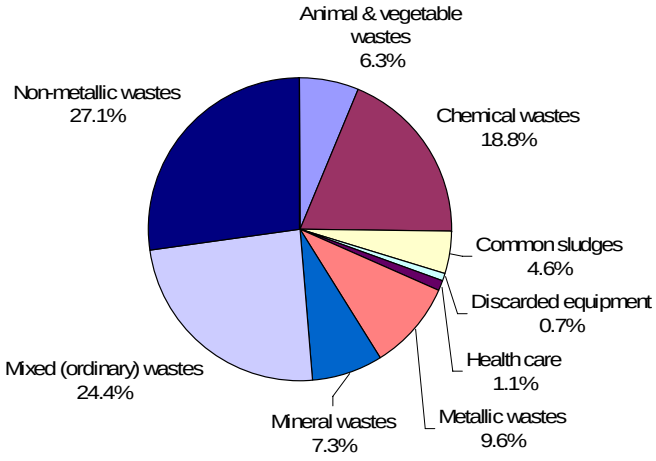

Figure 67: North West England Waste Arisings by waste type (SOC group), 2006 survey

5 Conclusions and recommendations

Survey results

The survey has shown regional waste arisings for 2008-9 to be 7.1 million tonnes (for all companies with 5 or more employees) which is 6% down on the last survey carried out in 2006. The results have shown a reduction in the waste landfilled since 2006, and a significant increase in the proportion recycled. These conclusions are based upon the grossing of data from 1,017 company locations (local units) distributed around the North West region.

This report contains some basic analysis of the results obtained, including comparison to the previous survey. The raw and grossed data is presented in separate electronic files, which can be used for further analysis or collation.

The survey delivered in 2009 recorded waste arisings data from the 2008-9 financial year, based upon a sample frame and grossing methodology which used ONS population data from March 2008. It may well be, therefore, that the survey has not recorded the full impact of the current recession.

Methodology

This survey has again demonstrated that the basic methodology for delivery of this type of survey is robust, and can be delivered effectively and efficiently. This survey was delivered to time and budget. A number of issues were identified in the delivery of the survey this time, which are reported in "Lessons Learned" in Appendix 10. This includes comments on the veracity of the data received from the Office of National Statistics, particularly sector and company size data, and increased challenge in contacting companies, possibly impacted by the recession.

Data confidence

We have taken steps to ensure that the data collected through the survey visits is robust, and that extensive data screening is carried out to ensure that errors are trapped, checked and corrected. We are therefore confident in the quality of the data collected. Data confidence levels have been calculated and are presented in this report.

However, we do need to be aware that there are a number of potential sources of error which we can only partially address in the delivery of this survey. These include, for instance, the assumptions required in use of conversion factors, the company

respondents knowledge of their actual waste production (eg. are waste bins actually 100% full when emptied?) and as reported elsewhere, the ONS data can contain significant errors.

It needs to be noted too that the emphasis of this survey has been slightly different to the 2006 survey. For instance, the sample frame for the 2006 survey emphasised larger companies and industrial sectors. It was thought that the final results therefore did not give sufficient confidence in the data for commercial companies, retail and wholesale in particular. This balance was addressed in this survey with many more commercial companies being surveyed in the region, reflecting the gradual move in the regional economy from manufacturing to service sectors, and the findings from previous surveys that the opportunities in improving sustainable waste management in the private sector lie with service sector as well as industrial companies.

Opportunities

The survey has shown significant opportunities for recycling or recovering energy from material which is currently landfilled. Although the majority of this material could be energy recovered as-is, the majority of the material available for recycling will need further work before reuse. This therefore highlights the need for increased separation and other facilities within the region.

Data

The raw data collected for this survey is available as separate file. Note that the waste stream data is presented anonymously, in that any details which enable the allocating of individual waste streams to individual companies or locations, has been removed.

The presented data includes details on how the data was sourced and method used for entering waste volumes. If calculations have been used to produce estimates, the relevant parameters are included in the data set so, for instance, quantities can be re-calculated for new conversion factors if required.

Recommendations

We propose the following recommendations:

1. The survey has shown the usefulness of repeating surveys using the same methodology, to be able to identify trends and compare arisings, down to sector, waste management type, waste type and destination levels. We therefore recommend that a further repeat survey is carried out in 2-3 years time.

2. The 2006 survey data was used to inform a number of North West region waste arisings and needs assessment models, and we propose that this work is repeated and updated to reflect the findings of this more contemporary data.

3. We have presented some high level analysis of the data from this survey, and comparison between the data from this survey and that generated in 2006. We propose that this analysis is extended, particularly focussing on the overall performance per sectors, individual key waste streams (for instance those which are biodegradable) and the impacts on relevant legislation and regional targets. This analysis should also help the establishment of new targets and focus areas for business support in waste minimisation or increasing sustainable disposal of waste.

4. The data from the original 2006 survey in the North West has also been modelled for use to quantify wastes in other regions of a variety of waste streams. Unless direct survey data becomes available for these regions, we suggest this modelling is repeated to reflect more up to date data.

1. Survey questionnaire

- Surveyor records employee numbers and sector to check ONS data

For each waste stream:

- SOC group and sub-group of waste stream
  - SOC groups and sub-groups, including “non-wastes”
  - Mixed wastes Sub-classify

- Nature of waste:
  - Hazardous
  - Non-hazardous

- Annual tonnage (written evidence or using conversion factor calculator)

- Source of data:
  - Written records
  - Company estimate
  - Surveyor estimate

- Waste Contractor (from list)

- Waste Management:
  - Landfill
  - Land Recovery
  - Incineration with Energy Recovery
  - Incineration without Energy Recovery
  - Transfer station
  - Treatment plant
  - Recycling
  - Composting
  - Waste water treatment
  - Don’t know

- Recyclable?
  - Currently recycled
  - Recyclable
  - Possibly recyclable
  - Not recyclable

- Energy Recovery?
  - Currently recovered
  - Recoverable
  - Possible recoverable
  - Not recoverable

- Where is the waste treated or re-used?
  - Within Region, by sub-region (WPA area)
  - Outside region by England, Scotland, Wales, or outside UK
  - Don’t know

2. Development of the sample matrix

2.1. Survey design

The survey was based on a two-dimensional sample matrix in which businesses were grouped into one of 9 sectors based on the 2007 UK Standard Industrial Classification (UK SIC 2007) divisions (as summarised in Figure 68 below) and one of 6 company size bands, defined by the number of employees (as shown in Figure 69). A full description of the sectors considered in the survey is given in Appendix 3.

Sector	Description	C or I*
Food drink and tobacco	Food, drink and tobacco manufacturers	I
Textiles/wood/paper/publishing	Includes manufacturers of textiles, wearing apparel, luggage, handbags and footwear; wood and wood products, pulp, paper and paper products, publishing and printing.	I
Power and utilities	Production of gas, electricity, oil and water	I
Chemical/non-metallic minerals manufacturing	Manufacture of chemicals and chemical products, cleaning products, manmade fibres, rubber and plastic products, and non-metallic mineral products	I
Metal manufacturing	Manufacture of basic metals and fabricated metal products	I
Machinery & equipment (other manufacturing)	Manufacturing of machinery and equipment, of computers, electrical and communication equipment, including medical and optical instruments. Also manufacturers of motor vehicles, and of furniture and other manufacturing.	I
Retail & wholesale	Retail and wholesale including of motor vehicles and fuel	C
Other services	Includes hotels, catering, transport, storage, communications, travel agents, finance, estate agents, IT related activities, and other business	C
Public sector	Includes public administration, social work, and education	C

*C = Commercial and I = Industrial

Figure 68: Summary of sector description

Size Band Code	Number of employees
1	5-9
2	10-19
3	20-49
4	50-99
5	100-249
6	250+

Figure 69: Business size bands

Businesses with less than 5 employees were not included in the survey. This is because such companies are difficult to survey accurately as some are based at home and as a result much of the waste they produce is likely to find its way into the municipal waste stream either via household collections or through CA sites.

2.2. Sample matrix development

In developing the sample matrix for this survey, there was the benefit of using the data collected from the previous 2006 North West survey, which means that the sample matrix was designed around the actual observed results from the 2006 North West survey.

The sampling approach was based on a stratified population of 9 sectors and 6 company size bands, which together constitute a stratum/cell/brick. A stratified random sampling approach was therefore used to determine the sample matrix for the survey. In standard stratified sampling, the sample should be proportional to the total number of companies within each stratum. However, this methodology has some weaknesses:

- It results in a sample matrix that favours the smaller, most populous companies, which conversely tend to produce smaller amounts of waste.

- It does not take into account the average waste and variability in the total waste produced by companies, which is of significant importance during the grossing up process. For instance, it is difficult to provide a reliable figure of mean waste for cells/bricks containing companies that produce both very large amounts and very small amounts of waste while an accurate measure can be provided for cells/bricks with less variability in the amounts of waste produced or where companies produce similar amounts of waste. For grossing purposes, to ensure a greater degree of accuracy of the average waste produced by companies in each cell/brick, it is important that the variability of the total waste produced by companies in each cell/brick is taken into consideration.

For these reasons the sample matrix was determined using the optimal allocation sampling approach (also known as disproportionate allocation) in which larger sample sizes are matched to larger sources of variability using the survey data from the previous North West survey carried out in 2006. This was done to ensure that the sample size for each brick is optimized to provide the best possible precision for the estimated total regional waste arisings. Given a fixed sample size of 1,000 companies at a 95% confidence level, to maximize precision the following equation was used to develop the sample matrix:

$$n_h = \frac{n\,(N_h \times \delta_h)}{\sum (N_h \times \delta_h)} \qquad (1)$$

Where:
n_h = sample size for stratum h
n = the total sample size (in this case 1,000 companies)
N_h = the population size of stratum h
δ_h = the standard deviation of stratum h

The survey data from the previous North West survey (Urban Mines, 2006) was used to determine the standard deviation for each stratum/brick. The Office for National Statistics (ONS) provided the company data, from VAT and Income Tax records. From this data, the total Local Unit count, "Universe" or population, of companies in the North West Commercial and Industrial sectors is as shown in Figure 70. ONS data dated March 2008 and SIC 2003 codes were used for this survey. It is worth noting that the ONS data supplied is rounded using the "Tau Argus" software to prevent disclosure.

	Company size bands (employees range)						
Sectors	**5 - 9**	**10 - 19**	**20 - 49**	**50-99**	**100 - 249**	**250+**	**Total**
Food Drink & Tobacco	315	170	125	75	60	55	**800**
Textiles Wood Paper & Publishing	710	510	385	155	110	25	**1,895**
Power & Utilities	50	40	55	25	15	10	**195**
Chemical & Non Metallic Minerals Manufacturing	325	290	310	165	140	45	**1,275**
Metal Manufacturing	525	435	315	115	50	10	**1,450**
Machinery & Equipment Manufacturing	810	585	465	190	125	60	**2,235**
Retail & Wholesale	10,135	5,445	2,790	850	380	230	**19,830**
Other Services	12,100	7,865	4,735	1,575	895	430	**27,600**
Public Sector	4,130	4,150	4,785	1,655	870	400	**15,990**
Total	**29,100**	**19,490**	**13,965**	**4,805**	**2,645**	**1,265**	**71,270**

Figure 70: North West England population (ONS)[2]

The data used to develop the sample matrix excludes companies with less than 5 employees, for the reasons explained earlier. This gives a total survey target of 71,270 companies.

[2] Data source March 2008 (latest available) using SIC 2003.

Based on equation (1) above, a sample matrix in which each stratum/brick is proportional to its standard deviation was developed, implying that larger samples were taken in bricks with the greatest degree of variability in order to generate the least possible sampling variance. Relatively large samples were drawn from bricks with large variation (those with large standard deviations) in the amount of waste produced by companies. On the other hand, relatively small samples were drawn from strata that are homogenous or have small standard deviations (i.e. companies produce similar amounts of waste). Sample sizes for each brick were rounded to the nearest integer. The sample matrix was adjusted as follows:

- If the calculated sample size (n_h) was greater than the population (N_h), then the sample size for that stratum was set equal to the population of the stratum hence all the companies in that stratum were surveyed (if $n_h > N_h$; $n_h = N_h$).
- If the recommended sample size was less than or equal to 3 and the population of the stratum greater or equal to 3, then the sample size was adjusted by adding 3 to the calculated sample size.

Below is the sample matrix on which the survey was based.

	Company size bands (employees range)						
Sectors	**5-9**	**10-19**	**20-49**	**50-99**	**100-249**	**250+**	**Totals**
Food, drink and tobacco	4	4	5	6	11	17	**47**
Textiles/wood/paper/publishing	6	4	5	13	17	10	**55**
Power & Utilities	3	7	3	3	3	3	**22**
Chemical/non-metallic minerals manufacturing	6	4	32	19	28	15	**104**
Metal manufacturing	3	6	8	11	50	5	**84**
Machinery & equipment (other manufacturing)	4	6	9	7	16	20	**63**
Retail & wholesale	31	17	85	53	35	25	**246**
Other services	45	29	80	102	22	45	**323**
Public sector	5	4	21	8	6	13	**56**
Total	**107**	**81**	**249**	**221**	**188**	**153**	**1,000**

Figure 71: Target sample matrix

Based on the overall sample size of 1,000 companies, the precision of the grossed up weight of waste arisings was estimated to be ±9.3% at a 95% confidence level.

Based on the above sample matrix developed and population data provided by ONS, the percentage of the population that was to be sampled was calculated for each brick (shown in Figure 72).

Sectors	Company size bands (employees range)						
	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	1.3%	2.4%	4.0%	8.0%	18.3%	30.9%	**5.9%**
Textiles/wood/paper/publishing	0.8%	0.8%	1.3%	8.4%	15.5%	40.0%	**2.9%**
Power & Utilities	6.0%	17.5%	5.5%	12.0%	20.0%	30.0%	**11.3%**
Chemical/non-metallic minerals	1.8%	1.4%	10.3%	11.5%	20.0%	33.3%	**8.2%**
Metal manufacture	0.6%	1.4%	2.5%	9.6%	100.0%	50.0%	**5.7%**
Machinery & equipment (other manufacturing)	0.5%	1.0%	1.9%	3.7%	13.6%	33.3%	**2.8%**
Retail & wholesale	0.3%	0.3%	3.0%	6.2%	9.2%	10.9%	**1.2%**
Other services	0.4%	0.4%	1.7%	6.5%	2.5%	10.5%	**1.2%**
Public sector	0.1%	0.1%	0.4%	0.5%	0.7%	3.3%	**0.4%**
	0.4%	**0.4%**	**1.8%**	**4.6%**	**7.1%**	**12.1%**	**1.4%**

Figure 72: Percentage of business sites to be surveyed in each brick

Using these percentages, another request was made to ONS for data for a total of 17,852 randomly selected local units, with 100% coverage for the power and utility sector and the majority of the large and medium businesses for the rest of the sectors. This provided the sample frame from which the units to be surveyed were drawn.

2.3. Delivered sample matrix

The survey was completed with 1,000 surveyed businesses. Every effort was made to ensure that the survey was delivered to the developed and agreed target sample matrix, however due to the variances in the ONS data and the lack of willingness of some businesses to take part in the survey there were differences in the delivered sample matrix in comparison with the developed target matrix. At the end of the survey period, the data received was further checked to ensure that the companies surveyed were placed in the right bricks/cells. There were alterations in the data as some companies were placed in the wrong bricks in the ONS data. As a result of the alterations made, some bricks were either under or over surveyed in relation to the target sample matrix. Table 6 shows the delivered survey visits for each brick as a percentage of the target sample matrix.

Sectors	Company size bands						
	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco	50%	75%	120%	117%	100%	112%	**102%**
Textiles/wood/paper/publishing	67%	150%	180%	138%	94%	40%	**104%**
Power & Utilities	67%	0%	67%	0%	100%	67%	**41%**
Chemical/non-metallic minerals manufacturing	133%	125%	94%	142%	118%	67%	**109%**
Metal manufacturing	100%	100%	75%	127%	38%	80%	**63%**
Machinery & equipment (other manufacturing)	50%	217%	144%	114%	118%	90%	**117%**
Retail & wholesale	113%	171%	100%	98%	91%	72%	**102%**
Other services	104%	121%	123%	92%	118%	76%	**103%**
Public sector	100%	100%	119%	88%	100%	115%	**109%**
Total	**101%**	**125%**	**110%**	**102%**	**88%**	**81%**	**100%**

Figure 73: Delivered sample matrix as a percentage of the target matrix

The spread of the business sites surveyed in the sub-regions of the North West region is shown in Figure 74 and Figure 75 below.

Table 7 Businesses surveyed by sub-region

Sub-region	Businesses surveyed
Blackburn with Darwen	44
Blackpool	10
Warrington	19
Cheshire	33
Cumbria	62
Greater Manchester	401
Lancashire	255
Merseyside	176
Total	**1000**

Figure 74: Businesses surveyed by sub-region

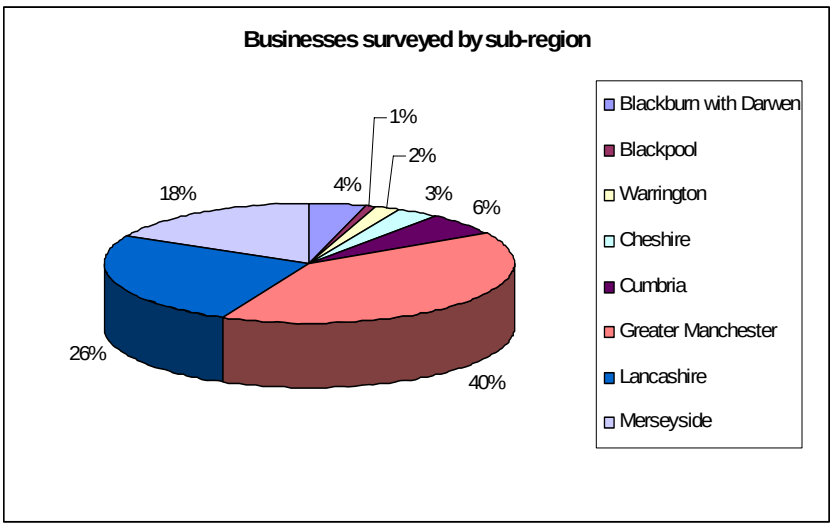

Figure 75: Businesses surveyed by sub-region (as %)

As earlier mentioned, due to variances in the ONS data and unwillingness of some businesses to take part in the survey, the final survey data did not include 10-19 and 50-99 company sizes in the power and utilities sector. These gaps were filled using PPC data where applicable and available. From the PPC data obtained from the Environment Agency, 2 companies in the 10-19 size band and 3 companies in the 250+ size band of the power and utilities sector with waste quantities that were typical of these size bands were added to the surveyed data. As the PPC data records obtained did not include data in the 50-99 size band of the power and utilities sector, average waste per company for this brick was obtained using survey data records in the neighbouring bricks, that is, 20-49 and 100-249 size bands in the power and utilities sector (2 companies in the 20-49 and 3 companies in the 100-249 size bands). The total waste between these companies was divided by 5 (total number of companies surveyed in these two size bands) to give an average weight per company for the 50-99 size band. This was used to represent a single company in this size and hence provided 1 record of data on which the grossing for this brick was based. In addition to the survey data, 5 PPC companies and 1 estimated record, 11 supermarkets were added to the retail and wholesale sector (1 company, 3 companies and 7 companies in the 50-99, 100-249 and 250+ size bands respectively). With this data added onto the survey data, there were 1,017 companies in total used for grossing up (as shown in Figure 76)

	Company size band						
Sectors	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250 +**	**Total**
Food, drink and tobacco	2	3	6	7	11	19	**48**
Textiles/wood/paper/publishing	4	6	9	18	16	4	**57**
Power & Utilities	2	2	2	1	3	5	**15**
Chemical/non-metallic minerals manufacturing	8	5	30	27	33	10	**113**
Metal manufacturing	3	6	6	14	19	4	**52**
Machinery & equipment (other manufacturing)	2	13	13	8	20	18	**74**
Retail & wholesale	35	29	85	53	35	25	**262**
Other services	47	35	98	94	26	34	**334**
Public sector	5	4	25	7	6	15	**62**
Total	**108**	**103**	**274**	**229**	**169**	**134**	**1,017**

Figure 76: Data used for grossing

3. SIC codes and industrial sectors

Sector	Type	SICRange	SectorName
1	Ind	150-160	Food drink and tobacco
2	Ind	170-193	Manufacture of textiles, wearing apparel, leather, luggage, handbags and footwear
	Ind	200-205	Wood and wood products
	Ind	210-212	Manufacture of pulp, paper and paper products
	Ind	220-223	Publishing, printing and recording
7	Ind	230-233, 400-410	Production of coke, oil, gas, electricity, water
3	Ind	240-252	Manufacture of chemicals and chemical products; cleaning products, man-made fibres etc; rubber and plastic products
	Ind	260-268	Other non-metallic mineral products
4	Ind	270-275	Manufacture of basic metals
	Ind	280-287	Manufacture of fabricated metal products
6	Ind	290-297	Manufacture of machinery and equipment
	Ind	300-335	Manufacture of office machinery, computers, electrical, radio, television and communication equipment; medical and optical instruments and clocks
	Ind	340-355	Manufacture of motor vehicles and other transport equipment
	Ind	360-366	Furniture and other manufacturing
	Ind	370-372	RECYCLING (excluded from waste production estimates to avoid double counting)
8	Comm	500-527	Retail - motor vehicles, parts and fuel; wholesale; other retail
10	Comm	550-555	Hotels, catering
	Comm	600-632, 640-642	Transport, storage, communications
	Comm	633-634, 650-726, 740-748, 910-930	Travel agents, other business, finance, real estate and computer related activities
	Comm	730-732, 850-852	Miscellaneous
9	Comm	750-753, 853	Social work and public administration
	Comm	800-804	Education

4. Waste descriptions

Below are the Substance Oriented Classification (SOC) codes used in the survey The SOC re-groups detailed EWC (6-figure) categories into a substance based classification.

SOC Group	SOC Sub-Group Name	EWC-Stat code
Chemical wastes	Spent solvents	1.1
	Acid, alkaline or saline wastes	1.2
	Used oils	1.3
	Spent chemical catalysts	1.4
	Chemical preparation wastes	2
	Chemical deposits and residues	3.1
	Industrial effluent sludges	3.2
Health care	Health care and biological wastes	5
Metallic wastes	Metallic wastes	6
Non-metallic wastes	Glass wastes	7.1
	Paper and cardboard wastes	7.2
	Rubber wastes	7.3
	Plastic wastes	7.4
	Wood wastes	7.5
	Textile wastes	7.6
	Waste containing PCB	7.7
Discarded equipment	Discarded vehicles	8.1
	Batteries and accumulators wastes	8.41
	WEEE and other discarded equipment	8.2, 8.43
Animal & vegetable wastes	Animal waste of food preparation and products	9.11
	Animal faeces, urine and manure	9.3
	Animal & vegetal wastes	9 excl. 9.11 & 9.3
Mixed (ordinary) wastes	Household and similar wastes	10.1
	Mixed and undifferentiated materials	10.2
	Sorting residues	10.3
Common sludges	Common sludges (excluding dredging spoils)	11 excl. 11.3
	Dredging spoils	11.3
Mineral wastes	Combustion wastes	12.4
	Contaminated soils and polluted dredging spoils	12.6
	Solidified, stabilised or vitrified wastes	13
	Other mineral wastes	12.5
	Construction and demolition wastes	12.1
	Asbestos wastes	12.2
	Waste of naturally occurring minerals	12.3
Non-wastes	virgin timber	
	blast furnace slag	

5. Standard container types

No	Container Group	Container Name	Container Volume
1	Front-end loader	6 yd3 front-loader	4.6
2	Front-end loader	8 yd3 front-loader	6.1
3	Front-end loader	10 yd3 front-loader	7.6
4	Rear-end loader	8 yd3 rear-loader	6.1
5	Rear-end loader	10 yd3 rear-loader	7.6
6	Rear-end loader	12 yd3 rear-loader	9.2
7	Rear-end loader	14 yd3 rear-loader	10.7
8	Rear-end loader	16 yd3 rear-loader	12.2
9	Large container - RoRo	15 yd3 RoRo	11.5
10	Large container - RoRo	18 yd3 RoRo	13.8
11	Large container - RoRo	20 yd3 RoRo	15.3
12	Large container - RoRo	25 yd3 RoRo	19.1
13	Large container - RoRo	30 yd3 RoRo	23
14	Large container - RoRo	35 yd3 RoRo	26.8
15	Large container - RoRo	40 yd3 RoRo	30.6
16	Wheeled bin	1100 litre bin	1.1
17	Wheeled bin	660 litre bin	0.66
18	Wheeled bin	240 litre bin	0.24
19	Wheeled bin	120 litre bin	0.12
20	Paladin	Paladin 850	0.85
21	Paladin	Paladin 560	0.56
22	Chamberlain	Chamberlain 940	0.94
23	Chamberlain	Chamberlain 720	0.72
24	IBC	1200 litre IBC	1.2
25	IBC	1100 litre IBC	1.1
26	Drum/barrel	200 litre drum	0.2
27	Drum/barrel	120 litre drum	0.12
28	Drum/barrel	30 litre drum	0.03
29	Refuse sack	Standard refuse sack	0.08

6. Conversion factors

SOC group	SOC sub-group	Conversion Name	Conversion Density
Chemical wastes		liquids and oils	0.9
Chemical wastes		petrol and similar fuels	0.72
Chemical wastes		spent carbon and carbon-containing wastes	0.24
Chemical wastes		powders	0.36
Chemical wastes		sludges	0.92
Health care		clinical waste incl. blood and organs	0.2
Metallic wastes		metal filings and turnings	0.3
Non-metallic wastes	glass	glass pieces (eg. waste from manufacture of glass products)	0.57
Non-metallic wastes	glass	glass powders and small particles	1.21
Non-metallic wastes	Paper & card	paper/card packaging and newspaper - whole	0.2
Non-metallic wastes	Paper & card	paper/card pulps and fibres	0.9
Non-metallic wastes	rubber	end-of-life tyres	0.47
Non-metallic wastes	plastic	plastic packing and shavings/turnings from manufacture of plastic products	0.22
Non-metallic wastes	wood	pallets and other wooden packaging	0.11
Non-metallic wastes	wood	sawdust, shavings from wood processing	0.25
Non-metallic wastes	textile	cloths, off-cuts and other textile pieces	0.2
Non-metallic wastes	textile	textile fibres	0.61
Discarded equipment	batteries	batteries	1.35
Discarded equipment	WEEE and other discarded equipmt	components, electronic equipment and similar items	0.3
Discarded equipment	WEEE and other discarded equipmt	fluorescent tubes	0.19
Animal & vegetable wastes		oils and fats	0.61
Animal & vegetable wastes		general food waste	0.28
Animal & vegetable wastes		sludges/manures	0.92
Mixed (ordinary) wastes		mixed wastes - uncompacted	0.26
Common sludges		sludges	0.92
Mineral wastes		slags (eg. furnace slags)	1.08
Mineral wastes		waste gravel, crushed rocks and other mineral wastes	1.23
Mineral wastes		flue-gas dust and similar	0.74
Mineral wastes		ash and boiler dust	0.5
		other liquid wastes	1
		other solid wastes	0
Metallic wastes		aluminium cans - whole	0.04
Metallic wastes		aluminium cans - compacted	0.2
Metallic wastes		ferrous cans - whole	0.09
Metallic wastes		ferrous cans - compacted	0.5
Non-metallic wastes	glass	glass bottles - whole	0.36
Non-metallic wastes	Paper & card	paper&card packaging and newspaper - compacted	0.51
Non-metallic wastes	plastic	plastic packing and shavings - compacted	0.32
Non-metallic wastes	plastic	plastic bottles - whole	0.02
Non-metallic wastes	plastic	plastic bottles - compacted	0.3
Non-metallic wastes	plastic	plastic film - compacted	0.5
Animal & vegetable wastes		green/garden wastes - not compacted	0.24
Animal & vegetable wastes		green/garden wastes - compacted	0.61
Mixed (ordinary) wastes		mixed waste - compacted	0.26
Mineral wastes		mixed C&D waste	0.42
Mineral wastes	asbestos wastes	waste containing asbestos	0.32
Mineral wastes		soils incl contaminated	1.3
Mineral wastes		mixed rock, stone and clays	1.1
Mineral wastes		moulding (foundry) sands	0.5
Mineral wastes		vitrified wastes	1.35

7. Standard items

Item Name	Item Weight	SOC group	SOC subgroup
Battery - commercial vehicle	25	Discarded equipment	batteries
Battery - car	18	Discarded equipment	batteries
Drums, steel, empty ca 200l	18	Metallic wastes	Metallic wastes
IBC, Empty ca 1,000l	70	Non-metallic wastes	plastic
Drums, plastic, empty ca 200l	10	Non-metallic wastes	plastic
Tyre - Commercial Vehicle	30	Non-metallic wastes	rubber
Tyre - car	10	Non-metallic wastes	rubber
Fridge	45	Discarded equipment	WEEE and other discarded equipment
Photocopier	50	Discarded equipment	WEEE and other discarded equipment
Cooker	52.5	Discarded equipment	WEEE and other discarded equipment
Computer - full	28	Discarded equipment	WEEE and other discarded equipment
Fluorescent tube	1	Discarded equipment	WEEE and other discarded equipment
Chairs - office	12	Discarded equipment	WEEE and other discarded equipment
Freezer	45	Discarded equipment	WEEE and other discarded equipment
Dishwasher	50	Discarded equipment	WEEE and other discarded equipment
Furniture - office	25	Discarded equipment	WEEE and other discarded equipment
Mattress	40	Discarded equipment	WEEE and other discarded equipment
Microwave cooker	17	Discarded equipment	WEEE and other discarded equipment
Printer - for computer	6	Discarded equipment	WEEE and other discarded equipment
Television set	20	Discarded equipment	WEEE and other discarded equipment
Video recorder	11	Discarded equipment	WEEE and other discarded equipment
Washing Machine	75	Discarded equipment	WEEE and other discarded equipment
Pallet	20	Non-metallic wastes	Wood

8. Data grossing methodology

The process of extrapolating waste arisings data from the surveyed local units to provide an estimate of the total waste arisings at a national level is known as 'grossing up'. Since the survey follows a sample matrix structured by sector (s) and size band (b), which form the cell/brick/stratum, the grossing up methodology was also executed on a brick by brick basis. The methodology assumes that company size bands are sufficiently narrow and that the sample average waste per site is representative of the population of that cell/brick.

Regional grossing up methodology

For each cell/brick (sb) the average sample weight per site ($\overline{w}_{sb}$) was calculated by dividing the total sample weight (w_{sb}) by the number of sample sites (n_{sb}) surveyed:

$$\overline{w}_{sb} = \frac{w_{sb}}{n_{sb}} \quad (1)$$

The grossed up weight for each brick (W_{sb}) was then estimated by multiplying the population (N_{sb}) by the average sample weight per site $\overline{w}_{sb}$ for each brick:

$$W_{sb} = N_{sb} \times \overline{w}_{sb} = \frac{N_{sb} \times w_{sb}}{n_{sb}} \quad (2)$$

The grossed up weights for each brick (W_{sb}) were then added together to give the regional total grossed up weight (W):

$$W = \sum_{s,b} W_{sb} \quad (3)$$

Grossing up by waste type and management option

The total grossed up waste arisings by waste type (i) was estimated using the total sample weight for each waste type (w_i) as a proportion of total sample weight within each brick (w_{sb}):

$$p_{wi} = \frac{w_i}{w_{sb}} \quad (4)$$

Where: p_{wi} is the sample weight of each waste type as a proportion of total sample weight within each brick.

Using the derived proportion in equation (4), the grossed up weight for each waste type (W_i) was then estimated by multiplying the proportion for each waste type (p_{wi}) by the grossed up weights for each brick (W_{sb}):

$$W_i = p_{wi} \times W_{sb} \quad (5)$$

The same approach was used to estimate the grossed up weight for each waste management option, however, in this case w_i, p_{wi} and W_i represent total sample weight, proportion and grossed up weight for each waste management option.

Sub-regional grossing up methodology

To estimate the total grossed up waste arisings at the sub-regional level, the total number of local units at the sub-regional level was obtained from ONS and used to determine the number of local units at the sub-regional level as a proportion of the total number of local units at the regional level for each brick.

$$p_{sbr} = \frac{N_{sbr}}{N_{sb}} \quad (6)$$

Where: p_{sbr} is the number of local units at the sub-regional level as a proportion of the total number of companies at the regional level for each brick (sb), N_{sbr} is the number of local units in each sub region for each brick, and N_{sb} is the number of local units at the regional level for each brick.

The sub-regional proportions (p_{sbr}) were then multiplied by the grossed up weights for each brick (W_{sb}) to determine the grossed up weights for each brick at the sub-regional level (W_{sbr}).

$$W_{sbr} = p_{sbr} \times W_{sb} \quad (7)$$

The grossed up weights for each brick for each sub region were then summed up to give the total grossed up weight for each sub-region (W_r).

$$W_r = \sum_{s,b} W_{sbr} \quad (8)$$

PPC added companies

Some of the companies in the 2008 PPC dataset obtained from the Environment Agency produce unusually large amounts of waste in comparison to other companies within the same brick. Simply including all the PPC data in the survey data for grossing would result in an overestimate of the total waste arisings in the region due to the inclusion of exceptionally large producers of waste. Therefore, to take such companies into consideration, they were added to the total grossed up weight for each brick

instead of including them in the grossing process. Only 14 of the PPC companies were added in this way and the cells to which they were added are shown in Figure 77.

Sector	Company size band						
	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco				2	1	2	**5**
Textiles/wood/paper/publishing				1	1		**2**
Power & Utilities	2					1	**3**
Chemical/non-metallic minerals manufacturing				2			**2**
Metal manufacturing						1	**1**
Machinery & equipment (other manufacturing)							
Retail & wholesale							
Other services			1				**1**
Public sector							
Total	**2**		**1**	**5**	**2**	**4**	**14**

Figure 77: PPC companies added to bricks

Figure 78 below shows the total waste attributed to the added PPC companies.

Sectors	Company size bands						
	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 +	Total
Food, drink and tobacco				17,905	23,175	125,515	**166,595**
Textiles/wood/paper/publishing				51,749	125,525		**177,274**
Power & Utilities	377					212,084	**212,461**
Chemical/non-metallic minerals manufacturing				11,293			**11,293**
Metal manufacturing						130,987	**130,987**
Machinery & equipment (other manufacturing)							
Retail & wholesale							
Other services			4,941				**4,941**
Public sector							
Total	**377**		**4,941**	**80,946**	**148,700**	**468,586**	**703,550**

Figure 78: Total waste of added PPC companies

Grossed data quality checks and adjustments

In addition to the data screening done for outliers, checks were carried out on the grossed data to flag up any data inconsistencies and individual waste streams which needed checking. To achieve this, a sensitivity analysis of the grossed up data was undertaken to identify the waste streams that had the greatest impact on the waste total. As a result of the accuracy of these waste stream amounts were checked through contacting a number of surveyed companies by phone to check and confirm the data with them.

8.1. Estimation of precision

The sampling error and confidence levels determine how accurate the survey results are. The margin of error gives an idea of the measure of precision of the statistical estimate while the confidence level is an indication of how confident or certain we are about the level of error in the results of the survey. The margin of error was estimated as follows:

i) Estimation of the overall sample mean using:

$$\overline{X} = \sum \left(\frac{N_{sb}}{N} \times \overline{x}_{sb} \right) \quad (9)$$

Where:
$\overline{X}$ is the overall sample mean
$\overline{x}_{sb}$ is the mean of each stratum/brick (derived from the survey data)
N_{sb} is the population size of each stratum/brick
N is the overall population from which the sample was taken

ii) Determination of the sample standard error using the survey data:

$$SE = \left(\frac{1}{N} \right) \times \sqrt{\left\{ \sum \left[N_{sb}^2 \times \left(1 - \frac{n_{sb}}{N_{sb}} \right) \times \frac{S_{sb}^2}{n_{sb}} \right] \right\}} \quad (10)$$

Where:
SE is the standard error of the of the sample (this provides the standard deviation of the sampling distribution used for the survey)
n_{sb} is the sample size of each stratum
S_{sb} is the standard deviation of each stratum (derived from the survey data)

Using equations (9) and (10) and the critical value (α)[3], also known as the z score (derived from the normal distribution tables), the sampling error of the delivered sample matrix was computed at three different confidence levels as shown in Figure 79 below:

Confidence Level (%)	Margin of error (%)
90	±9.0
95	±10.8
99	±14.2

Figure 79: Measure of precision at different confidence levels

Figure 79 shows the computed margin of error of the results of the survey at different confidence levels. The margin of error defines the range of the confidence interval and thus gives the amount by which the survey statistic deviates from the true population

[3] It is a factor used to compute the margin of error/sampling error.

parameter/value (in this case the amount waste produced), while the confidence level denotes the uncertainty.

Therefore, given the sample size of 1,017 commercial and industrial companies in the North West region and taking the 95% confidence level, we can be 95% confident that the estimated total amount of the waste produced by businesses within the North West is 7,079,803 tonnes ±10.8%.

9. Recyclable or recoverable

The waste survey included an assessment of whether an individual waste stream had the potential to be recycled or to be energy recovered, if the appropriate facilities were available. The following gives some background as to how this assessment was made:

Recyclable

Materials deemed Recyclable included:

- Paper
- Glass
- Metals
- Plastics:
  - HDPE
  - PET
  - LDPE
  - Including mixed plastics
- Timber (not including MDF)
- Some oils
- Tyres
- Batteries
- Computers
- Toner/ink cartridges
- Clothing
- Fluorescent tubes
- Drums, barrels, IBCs
- Garden and kitchen waste
- WEEE

For mixed recyclable wastes, these were recorded as "Possibly Recyclable" reflecting the fact that recyclable materials could possibly be separated or segregated at an earlier stage of processing, or post collection in the right type of facility.

Energy recoverable

Most materials have a calorific value and, if used in the right sort of facility, can be used to generate heat and/or electricity. Assessment of whether waste was considered recoverable or not was based upon the calorific value of its major component or constituents.

The calorific value of a material defines the amount of heat released during the combustion of the material. It is measured in units of energy per amount of material. The typical calorific value for coal is 28,000 kJ/kg whilst the typical value for crude oil is 45,700 kJ/kg.

The table below (as Figure 80) gives calorific values for different materials that may be found in the waste stream (and for different general waste streams).

Eminently recoverable materials of course include:

- Paper/Card
- Plastics
- Textiles
- Wood/MDF
- Tyres

For such materials, values can be as high as 32,000 KJ/Kg, compared to 28,000 for coal and 46,000 for oil.

Hence, waste streams which include a majority of these materials were classed as “Recoverable”.

Other waste materials also have a significant calorific value and again can be incinerated in the right type of facility. These include:

- Meat and bone
- Municipal waste
- Food and garden waste
- Straw
- Poultry litter

Any stream predominantly made up of such materials was classed as “Potentially Recoverable”, particularly if wet.

Waste streams classified as “Not recoverable” included:

- Metals
- Glass
- Aqueous liquids
- Construction and demolition inert waste

Material	Calorific Value kJ/kg
Paper/board	16,900
Plastic	32,650
Food/garden	9,000
Textiles	15,580
Domestic wood	10,000
Tyres	32,000
Glass	Nil
Metal	Nil
Poultry litter	8,800
Straw	15,000
Meat and bone	18,600
Dried primary sewage sludge	18,000
Municipal solid waste	9,500
Refuse derived waste	18,500
General Industrial waste	16,000
Hospital waste	14,000
Other	10,600

Figure 80: Calorific values of different materials

10. Lessons learned

ONS data inconsistencies and errors

We have reported in the past the problems with the Office of National Statistics local unit dataset, particularly related to duplicate entries, incorrect contact details, missing telephone numbers and closed companies. Data cleaning at the beginning of the project is able to take most of these errors into account.

However, it became clear during the delivery of this survey that there were serious errors and inconsistencies too in supplied company size (no of employees) and SIC code (company sector) data, which were compounded by the fact that at the start of the survey preparation in June 2009, the latest available data was from March 2008. As might be expected during a recession, in a significant number of cases, employees numbers were lower than the ONS data reported, but more seriously there were errors in the sector/SIC data too, although these were less frequent. Clearly both sets of data have a significant impact on the position of a given company in the sample frame, and therefore impacted on our ability to deliver the survey to achieve the sample frame targets.

For future surveys, these changes need to be fed back promptly and need to be updated in the sample frame targets, so that recruitment of company to the sample frame can take these changes into account. Making such changes in real time should enable a delivery profile which is much closer to the devised sample frame than we managed with this survey.

Call rates

It was noted with this survey that the rate of successful appointment booking calls had decreased significantly compared to previous surveys. There was no obvious reason for this although talking to the telephone operators and looking at the call monitoring data, it appears that getting the responsible person on the phone was much more of a challenge than before. Recruitment once that person had been reached was similar to previous surveys ie. refusal rate was no higher.

It was surmised that this may also be an impact of the recession, with reduced employee numbers at companies or the increased search for new work, increasing individual's workload and therefore reducing their accessibility.

11. Glossary and abbreviations

Statistical Terminology

Brick (cell)	A cell in the sample matrix, referring to a particular combination of size band and Standard Industrial Classification (SIC).
Confidence	Quoted in conjunction with a measure of precision, confidence is a measure of how confident one is in the reliability of an estimated quantity. For example, if total waste arisings were estimated with a precision of +/-4.7% at 90% confidence, then we can be 90% confident that the true (unknown) total waste arisings are within +/-4.7% of the estimated value.
Grossing (data)	In the context of this survey, data grossing means extrapolating the survey data to estimate the total waste produced by a national or regional population.
GUW	Grossed up weight
Mean	This is a measure of the central tendency or location of the population or sample data. It is the sum of the data values divided by the number of observations. If the data set is from a sample, then it is a sample mean and if it is from a population, it is a population mean.
Outlier	This is an observation in a set of data that is far removed in value from the others in the same data set. It is an unusually large or small value compared to others.
Population	A complete set of all units (i.e. people, places, objects or many other things) being studied and from which data is collected, described and conclusions drawn. In this report, the population is the collection of all businesses in Wales included in the scope of the survey.
Sample Matrix/Sample Frame	A table that indicates how many businesses are to be sampled from the population. The sample matrix is divided into a number of bricks.
Size Band	A classification of business size based upon the actual number of employees employed by the business on site.
Standard Deviation	Standard deviation measures the spread of the data about the mean value. It is used to summarise how much variability there is in a sample or population.

Waste Management Terminology

Anaerobic digestion	A method of composting that does not require oxygen. This composting method produces methane. Also known as anaerobic composting.
Animal By-Products Regulations (ABPR)	Legislation governing the processing of wastes derived from animal sources to prevent cross contamination.
Commercial waste	Waste arising from premises that are used wholly or mainly for trade, business, sport, recreation or entertainment, excluding household and industrial waste (as defined in Environmental Protection Act 1990, section 75).
Composting	The controlled biological decomposition and stabilisation of biodegradable materials (such as organic garden and kitchen wastes) under predominantly aerobic conditions to produce humus (organic)-rich, sanitised and stabilised product that can be beneficial to soil.
Construction and demolition waste	Arising from the construction, repair, maintenance and demolition of buildings and structures. It mostly includes brick, concrete, hardcore, subsoil and topsoil, but it can also include quantities of timber, metal and plastics.
Disposal	Any of the operations provided for in annex II A of the Waste Framework Directive.
Energy from waste (EfW)	The recovery of energy value from waste by burning the waste directly, or by burning a fuel produced from the waste.
Energy recovery	The process of extracting useful energy from waste, typically from the heat produced by incineration or via methane gas from landfills.
European Waste Catalogue (EWC)	A substance and activity-oriented classification of waste in 20 Chapters.
European Waste Catalogue for Statistics (EWC STAT)	A (mainly) substance-oriented statistical classification (SOC) of waste used for reporting waste statistics to the European Union. Do we need this?
Exempt waste	Waste handled by activities that are exempt from waste management licensing.
Gasification	Thermal treatment that involves heating waste in the presence of oxygen to recover energy in the form of gas.
Hazardous waste	Waste that is reactive, toxic, corrosive, or otherwise dangerous to living things and/or the environment.
Household waste	Waste from domestic properties including waste from caravans, residential homes and similar.

Industrial waste	Waste from a factory (within the meaning of the Factories Act 1961) or from any premises used for, or in connection with • provision of public transport • public supply of gas, water, electricity or sewerage services • provision to the public of postal or communication services
Landfilling	The final disposal of solid waste by placing it in a controlled fashion in a place intended to be permanent.
NACE	European Union classification system for economic activities.
Non-wastes	The Environment Agency and WRAP (Waste & Resources Action Programme) have reviewed and amended the legal classification of a number of materials including blast furnace slag and virgin timber, from waste to by-product, with clarification from the EU, and through consultation with industry, as part of the "Waste Protocols Project". A quality protocol gives guidance on how to recover waste, remove it from the regulatory regime and unnecessary regulations. In the context of this report, such wastes are described as "non wastes". See http://www.environment-agency.gov.uk/business/topics/waste/32154.aspx for more details.
Pollution Prevention and Control (PPC)	A system set up in the UK to implement the Integrated Pollution Prevention and Control Directive (96/61/EC) to prevent and control pollution from certain types of business. The PPC regime replaced the Integrated Pollution Control regime. Permitted sites are now under Environmental Permitting Regulations from 6th April 2008.
Pyrolysis	Chemical decomposition of a substance by heat in the absence of oxygen, resulting in various hydrocarbon gases and carbon-like residue.
Recovery	Generating value from wastes from a wide variety of activities such as recycling, composting and energy recovery.
Recyclables	Materials that are capable of being recycled.
Recycling	Recycling involves processing waste materials to produce new materials. Recycling materials like cans, glass, paper and textiles recovers the valuable resources in waste to make new products. The recycled materials can be made into the same product (closed-loop recycling) or a different product (open loop recycling).
Reuse	The use of a product more than once in its original form, for the same or a new purpose.
Thermal treatment	A broad generic term covering processes that involve the use of heat to treat waste. Incineration is the most common thermal treatment process. Pyrolysis and gasification are other high temperature processes but there are also low temperature processes used, for example, in technologies producing refuse-derived fuel.
Transfer station	A site to which waste is delivered for sorting and compacting prior to transfer to another place for recycling, treatment, or disposal.
Wastes	In the context of this report, wastes which are controlled under the EU Waste Framework Directive ie. not including "non wastes"

UK Standard Industrial Classification (SIC) codes	UK classification system for economic activities.
Waste	Any substance or object in the categories set out in Annex 1 of the Waste Framework Directive (91/156/EEC), which the holder discards or intends or is required to discard.
Waste arisings	The amount of waste generated in a given locality over a given period of time.
Waste minimisation	The reduction of waste at source, by understanding and changing processes to reduce and prevent waste. Waste minimisation can also include the substitution of less environmentally harmful materials in the production process. Also called process or resource efficiency.
Waste Statistics Regulations	European Union regulations that require Member States to report data on waste generation and treatment to the European Commission every two years.
WEEE	Waste Electrical and Electronic Equipment