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The City of San Francisco
STREETS LITTER RE-AUDIT
2009

PREPARED FOR

The City of San Francisco
San Francisco Environment Department

PREPARED BY

HDR | Brown, Vence & Associates, Inc.

&

MGM Management
A DIVISION OF 6528058 CANADA INC.

September 2009

Executive Summary

The City of San Francisco conducted its third litter audit in April 2009, following up on similar studies conducted in the city in 2008 and 2007. The audit was conducted by HDR / BVA Engineering, a local San Francisco engineering and environmental consulting firm. HDR contracted MGM Management, a Canadian environmental consulting firm that has expertise in the area of litter audits to design the audit to conform to previous litter audits conducted for the city. MGM Management has conducted sixteen previous litter audits for major North American municipalities and provincial clients since 2002, accumulating a data base of over 67,000 litter observations. James Madden, Sustainability Practice Project Manager, SAIC Engineering and Chris Hammer of Sustainable Design Resources, supervised the field audit teams and field data collection activities.

Litter is classified as "large litter" for those items over 4 square inches in size or as "small" litter for items less than 4 sq. in. Eighty-four sub-categories of large and sixteen sub-categories of small litter were examined.

A total of 4,488 large litter items were observed by auditors, on San Francisco streets during the April 2009 litter audit.

One hundred and thirty eight sites were chosen (increased from 132 potential sites in 2008) of which 132 were audited between April 20 – May 5, 2009. Of the 138 potential sites, there were six sites not audited. They were rejected in the field for safety or logistical reasons by audit teams. This audit was conducted at the same time of the year as the 2007 - 2008 audits (mid-April – early May).

The table below illustrates the results of the 2009 large litter audit results compared to 2007 (baseline year) and 2008.

Table ES - 1: Comparison of Results 2009, 2008, 2007

2009	2008	2007
Sites	**Sites**	**Sites**
132	130	105
Items/ Site	**Items/ Site**	**Items/ Site**
34.0	30.6	36.3
11%	-16%	Baseline

-6.4% 2009 lower than 2007 baseline year

The 2009 audit results show an 11% increased in large litter items / site compared to 2008, however the 2009 results for large litter were 6.4% lower than the baseline year of 2007.

The largest category of large litter observed was Miscellaneous Paper at 552 litter pieces. This is a higher result for this sub-category as compared to the 2008 (319 items) but similar to the result for this sub-category in the 2007 audit (570 items). Non-branded paper napkins were the next most significant sub-category noted in the 2009 audit (438 items). This is a lower result for this sub-category as compared to the 2008 (664 items) but similar to the result for this category in the 2007 audit (494 items).

Printed paper materials were the third most significant litter sub-category in the 2009 audit, at 373 items, which is similar to the result noted in 2008 (380 items) and higher than noted in 2007 (287 items)

In 2009 fiber materials contributed 46 % of the total large litter observed. In 2008 fiber contributed 51% of the total large litter observed, as compared to 54% in the 2007 audit. Fiber based litter included paper, paperboard, cardboard, towels, napkins, newspapers, books, flyers, printed materials, and business forms, stationary , paper packaging, and paper bags. The data suggests that fiber based litter continues to be a major contributor to litter on San Francisco streets.

Table ES - 2: All Paper & Fiber Litter – 2009 Audit

All Fiber Observed	Items Observed	% of Total Large Litter
Printed materials	557.5	12.4%
Misc. Paper	552.5	12.3%
Napkins (all types)	479	10.7%
Fiber Packaging (incl bags/wraps)	432.5	9.6%
Misc. Cardboard	34.5	0.8%
Misc. Paperboard	6	0.1%
	2,062	45.9%

Note: Whole numbers may not appear due to averaging.

The second most significant material type observed were plastic materials. These included miscellaneous plastic, plastic packaging, wrap, plastic bags-retail and non-retail, hot and cold plastic drink cups, plastic jars, bottles, composites, utensils, zip bags, beverage containers, trays, polystyrene cups, confectionary, sweet and snack food packaging, pouches, plates, retail bags, and carrying rings. The most significant single category of plastic litter was unidentified miscellaneous plastic litter; which is litter that is broken up or weathered such that auditors cannot identify it with certainty but can identify the litter as plastic. Miscellaneous plastic litter accounted for 219 littered items or 4.9 % (compared to 4.7% in 2008) of total litter. All large plastic litter in aggregate accounted for 887 items observed (compared to 953 in 2008 and 746 in 2007). Plastic litter accounted for 20% of total large litter observed in 2009 (compared to 24 % in 2008 and 20% in 2007). Details of the plastic litter observed appear below in Table ES 3 – All Plastic Litter 2009 Audit.

Table ES – 3: All Plastic Litter – 2009 Audit

All Plastics Observed	Items Observed	% of Total Large Litter
Misc. Plastic	219	4.9%
Cup Lids, Pieces lids	160.5	3.6%
Plastic packaging other	111.5	2.5%
Plastic retail bags	68	1.5%
Plastic drink cups	51	1.1%
Plastic Jars / Bottles/ Lids	32.5	0.7%
Utensils	29.5	0.7%
Polystyrene cups (foam)	27.5	0.6%
Plastic wrap	25	0.6%
Plastic bags - not retail	23.5	0.5%
Candy pouches	17.5	0.4%
Sweet packaging	17	0.4%
Water bottles (plastic)	15.5	0.3%
Zipper bags/ sandwich	15.5	0.3%
Plastic / composite other	13	0.3%
Other confectionery pckg	12.5	0.3%
Sport Drink (plastic)	11	0.2%
Other Plastic Shells/Boxes	10	0.2%
Polystyrene clamshells	7	0.2%
Polystyrene Trays	7	0.2%
Poly Fast Food Plates	5.5	0.1%
Other Plastic FF Plates	5	0.1%
Six pack plastic rings	2.5	0.1%
	887	19.8%

Note: Whole numbers may not appear due to averaging.

In Figure ES – 1 below, we compare litter occurrence in San Francisco versus previous audits completed using this methodology. This allows a comparison to other jurisdictions where litter audits have been done using this methodology.

The average of items of large per site observed in San Francisco in 2009, 2008 and 2007 can be compared to other jurisdictions that have conducted litter audits using this methodology.

Figure ES – 1: Comparison San Francisco vs. Other Jurisdictions

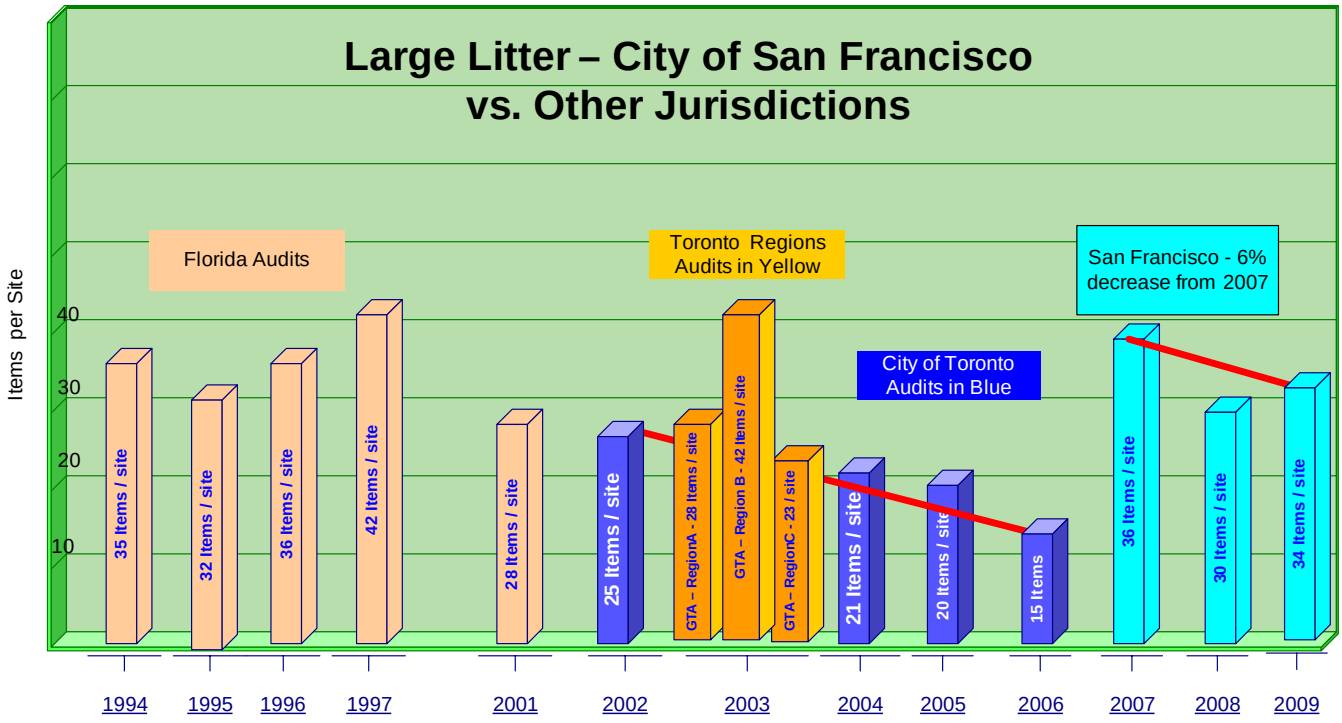


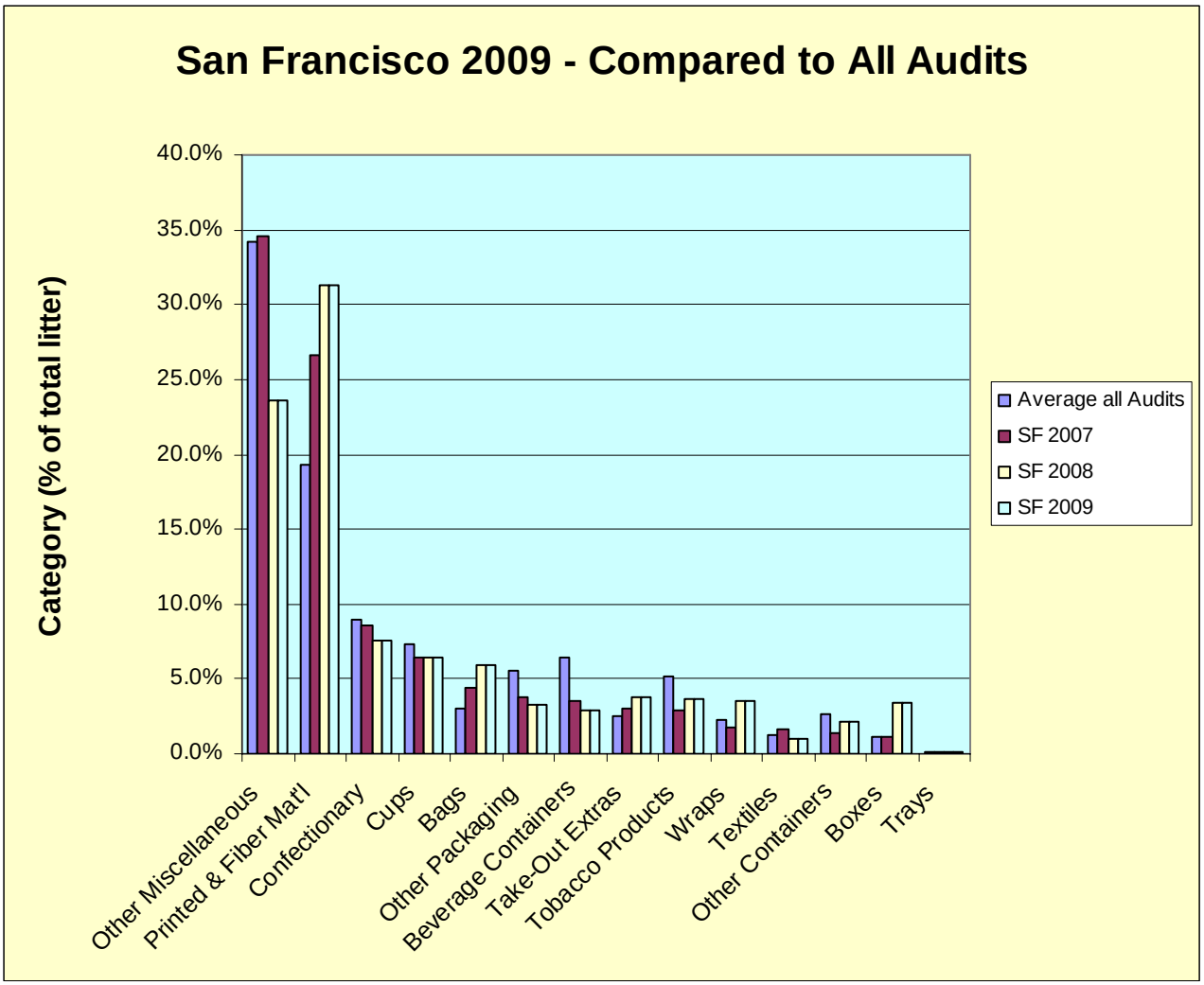
Table ES – 4: Comparison to Multiple Litter Audits

San Francisco 2009 vs. Other Jurisdictions (2002 - 2008) [1.]

	Observations - 2002 to 2008 (other jurisdictions)	Percentage 2002 to 2008 (other jurisdictions)	San Francisco April 2007	San Francisco April 2008	San Francisco April 2009
		% of total large litter	% of total large litter	% of total large litter	% of total large litter
Other Miscellaneous	21,270	34.2%	34.5%	23.6%	23.6%
Printed & Fiber Mat'l	11,985	19.3%	26.7%	31.3%	31.3%
Confectionary	5,568	8.9%	8.6%	7.6%	7.6%
Cups	4,580	7.4%	6.4%	6.4%	6.4%
Bags	1,865	3.0%	4.4%	5.9%	5.9%
Other Packaging	3,475	5.6%	3.8%	3.3%	3.3%
Beverage Containers	4,012	6.4%	3.5%	3.0%	3.0%
Take-Out Extras	1,553	2.5%	3.0%	3.8%	3.8%
Tobacco Products	3,217	5.2%	2.9%	3.7%	3.7%
Wraps	1,409	2.3%	1.8%	3.6%	3.6%
Textiles	811	1.3%	1.6%	1.0%	1.0%
Other Containers	1,678	2.7%	1.4%	2.2%	2.2%
Boxes	714	1.1%	1.2%	3.4%	3.4%
Trays	108	0.2%	0.2%	0.1%	0.1%
	62,245	100.0%	100%	100%	100%

1. Aggregated litter data, Litter audits by MGM Management including:
City of Toronto, Canada (2002, 2003, 2004 (2 audits), 2005, 2006
Regional Municipality of Peel, Canada (2003)
Regional Municipality of York, Canada (2003)
Regional Municipality of Durham, Canada (2003)
City of Edmonton, Canada (2007)
City of San Jose, CA (2008), City of San Francisco 2007 & 2008

Figure ES 2: Comparison to Multiple Litter Audits



Note: Chart compares San Francisco – Large litter results to all litter observations conducted by consultant , 2002 - 2009

Regulated Materials

At the time of the 2009 litter audit two types of potentially littered items were regulated under municipal ordinances: retail plastic bags and polystyrene packaging materials. The tables below compare large litter results for these items for the 2007, 2008 and 2009 litter audits. Further detail is presented in Appendix 5.

Table ES – 5 - Regulated Materials

Summary - Retail Plastic Bags Litter

	% of Total Large Litter				
2007	2.49%				
2008	4.08%	-64%	Decrease from 2007		
2009	2.05%	50%	Decrease from 2008		
		18%	Decrease from 2009 vs 2007		

Summary - Polystyrene Litter

	% of Total Large Litter				
2007	1.81%				
2008	1.16%	36%	Decrease from 2007		
2009	1.07%	8%	Decrease from 2008		
		41%	Decrease from 2009 vs 2007		

Small Litter in San Francisco

Observations of the small litter classification during the San Francisco audit resulted in a higher occurrence of small litter on city streets, as compared to 2008 and 2007 audits. During the 2009 audit 3,370 small litter items were observed at audited sites (25 items per site) , compared to 2,335 small litter items in the 2008 audit (18 items per site) and 2,393 in 2007 (23 items per site). Averages twice as high as these small litter rates observe in San Francisco in 2007 have been recorded by the consultant in other litter audits.

In 2009, the City of San Francisco litter audit examined small litter using the same methods used in 2008 and 2007. However, in 2009 another approach to observing small litter was added to the study. This expanded methodology examined all the small litter on a given site which were named “Super Sites”.

As identified in both of the 2007 and 2008 litter audits, gum deposits on San Francisco streets continue to be a significant issue. Gum deposits on sidewalks and roadways cause an annoying problem for pedestrians. Gum deposits accounted for 32% of all the small litter observed during the 2009 audit. In the 2008 litter audit gum deposits were even higher at 41% of all the small litter observations. Glass and paper small litter were also significant contributors to this class of litter, at 23% of total small litter for glass and 8% for paper.

Cigarette butts observed accounted for 8% of all the small litter observed on the regular litter audit site samples. It must be noted however, that the proportion of the site examined for small litter is quite small; hence it is not unexpected to see results that are skewed to the low side. To improve the data in examining small litter the consultant used a comprehensive site methodology called “Super Site” examination. More detailed discussion about the Super Site audit methodology where small litter was examined in much greater detail in presented in Section 5.0, of this report.

The small litter results, for the 2009 San Francisco audit sites, done using the routine methodology are illustrated below.

Due to the nature of randomly selecting sites and the methodology used for litter auditing of those locations, the consultant is of the opinion that this litter audit is representative of the overall small litter occurrence in the City of San Francisco streets, as of April 2009.

Figure ES - 3: 2009 San Francisco - Small Litter – by Category

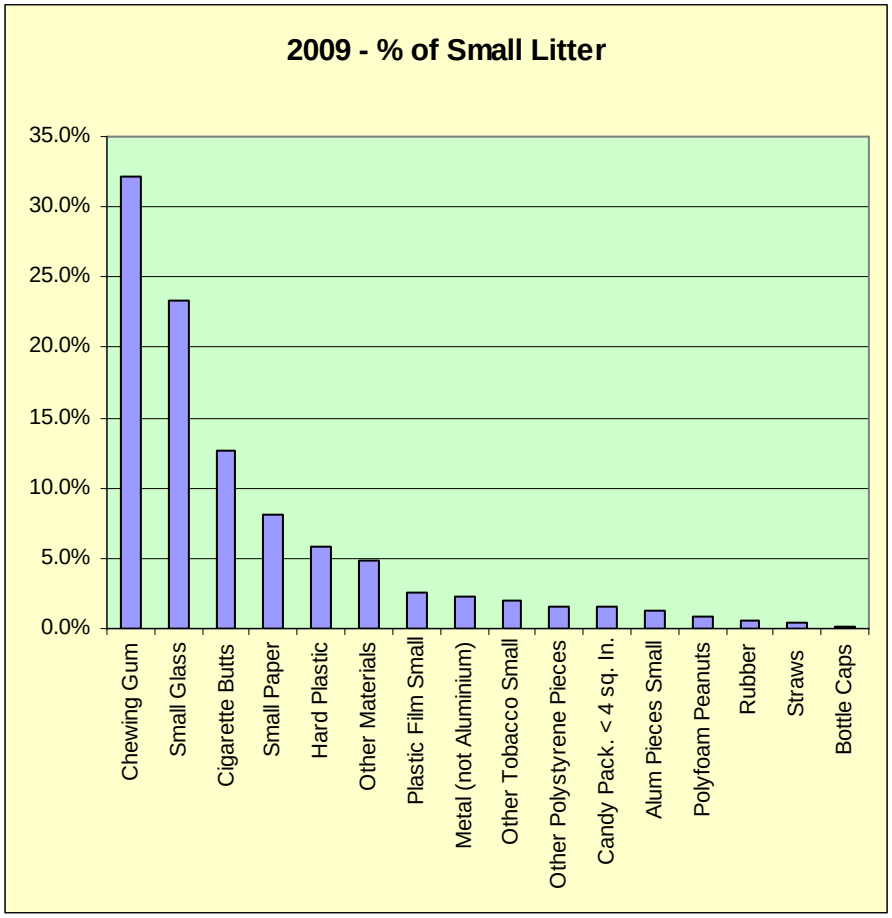


Table ES – 6: Small Litter Summary Table

Small Litter Summary - SF 2009

	Category Description	SF 2009 Total Small Litter Items Observed	SF 2009 % of Total Small Litter	SF 2008 Total Small Litter Items Observed	SF 2008 % of Total Small Litter	SF 2007 Total Small Litter Items Observed	SF 2007 % of Total Small Litter
16	Chewing Gum	1082	32.1%	960	41.1%	946	39.5%
8	Small Glass	787	23.4%	535	22.9%	710	29.7%
9	Small Paper	271	8.0%	153	6.6%	187	7.8%
1	Cigarette Butts	425	12.6%	234	10.0%	135	5.6%
15	Other Materials	162	4.8%	73	3.1%	97	4.1%
11	Hard Plastic	197	5.8%	85	3.6%	92	3.8%
10	Plastic Film Small	84	2.5%	33	1.4%	56	2.3%
2	Other Tobacco Small	67	2.0%	9	0.4%	51	2.1%
14	Metal (not Aluminium)	77	2.3%	52	2.2%	41	1.7%
13	Rubber	18	0.5%	10	0.4%	26	1.1%
12	Alum Pieces Small	44	1.3%	135	5.8%	19	0.8%
5	Candy Pack. < 4 sq. In.	52	1.5%	36	1.5%	16	0.7%
6	Polyfoam Peanuts	31	0.9%	2	0.1%	8	0.3%
7	Other Polystyrene Pieces	54	1.6%	6	0.3%	5	0.2%
3	Bottle Caps	6	0.2%	8	0.3%	4	0.2%
4	Straws	13	0.4%	4	0.2%	0	0.0%
		3370	100.0%	2,335	100%	2,393	100%
	Number of Sites Audited	132		130		105	
	Aver Small Litter per site	25.5		18.0		22.8	

Super Site - Small Litter

An additional data collection methodology was added as an addendum piece of research to the annual field work activities during the San Francisco litter audit conducted in 2009.

The San Francisco Department of Environment requested that we examine a sample of audit sites in detail for small litter. Thirty-two sites were examined, where all the small litter on the site was documented. This approach compares to auditing a smaller slice of a site as in the normal small litter methodology. This new labor intensive approach was added to San Francisco's annual litter audit in an effort to expand the City's knowledge of small litter on streets.

Table ES-6 summarizes the results of those observations. We have excluded chewing gum deposits from the data, as they are the result of historic accumulations on side walks and street curb side's, and skew the small litter portion of the results for the Super Site observations. In Figure ES – 6 below are the results of the Super Site audits:

Table ES – 7: Super Site Summary

Super Sites - San Francisco - Excluding Gum Deposits

Glass	4,100	37.5%	
Cigarette Butts & Tobacco Other	2,683	24.6%	Top 3 Items
Paper	1,819	16.6%	78.7%
Hard Plastics	720	6.6%	
Candy wrappers	390	3.6%	
Plastic film	328	3.0%	
Metal (not Alum)	263	2.4%	
Aluminum	197	1.8%	
Other Materials	127	1.2%	
Polyfoam pieces	107	1.0%	
Bottle caps	65	0.6%	
Rubber	57	0.5%	
Straws	55	0.5%	
Polyfoam peanuts	16	0.1%	
	10,927	100%	

Cigarette butts and other small tobacco litter (matches, filters, etc) accounted for 2,683 observations or 24.6% of all litter observed at the 32 Super Sites, and were the second most predominant sub-category recorded. Paper pieces were third, at 17% of all litter observed on the Super Sites. These three sub-categories of litter accounted to 78.7% of items observed at the Super Sites.

Further details related to the Super Site audit portion of this audit appear in Section 5.0.

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Acknowledgements

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- Chris Hammer, Sustainable Design Resources; Team Leader , San Francisco Litter Audit 2007, 2008 and 2009
- Mark McKenney, Partner, MGM Management
- Patricia McKenney, Partner, MGM Management
- Auditors:
  - Melissa Barrow
  - Salem Kimble
  - Douglas Anthony
  - Thorne Bertram
  - Anthony Broese
  - Dan Krantz .

1.0 Introduction

1.1 Overview

Litter is a problem virtually everywhere where disposable / recyclable packaging is used. People have personal opinions about what litter is – the reality is much different. Whereas there is a general perception that select groups of products make up the majority of litter, field research shows that litter is made up of a broad range of products and materials.

The purpose of this report is to outline the methodology and results of the third litter audit conducted on behalf of the City of San Francisco during April 2009, and to compare these results with the litter audit conducted in San Francisco in April 2007 and April 2008.

This work was conducted by HDR / BVA Engineering Inc.; a San Francisco based full service engineering and environmental management firm. SAIC Engineering of Oakland, CA, assisted in the project management of the work, Chris Hammer of Sustainable Design Resources was the field supervisor for a portion of the audit work. MGM Management, a Division of 6528058 Canada Inc. was sub-retained by HDR / BVA Engineering Inc. to assist them in the design, site selection, data management and data analysis for this litter audit.

MGM Management has conducted a number of litter audits including this audit:

- Ontario – conducted under supervision of Dan Syrek, 1990
- Ontario – Toronto area 1994, done by McKenney with Syrek assistance
- City of Toronto, Streets Litter Audit 2002
- Regional Municipality of Peel, Streets Litter Audit 2003
- Regional Municipality of York, Streets Litter Audit 2003
- Regional Municipality of Durham, Streets Litter Audit 2003
- City of Toronto – Streets Litter Audit 2004
- City of Toronto – Parks Litter Audit 2004
- City of Toronto - Streets Litter Audit 2005
- City of Toronto - Streets Litter Audit 2006
- City of San Francisco (USA) - Streets Litter Audit 2007 (April 2007)
- City of Edmonton - Streets Litter Audit 2007 (May –June 2007)
- City of San Francisco (USA) - Streets Litter Audit 2008 (April 2008)
- City of San Jose (USA) - Streets Litter Audit 2008 (August 2008)
- City of San Francisco (USA) - Streets Litter Audit 2008 (April 2009)
- City of Edmonton (Canada) - Streets Litter Audit 2008 (June 2009)
- Alberta Transportation – Evaluation of the Effectiveness of Litter Clean-up Programs on Alberta Highways (July 2009)

In the USA – over 30 litter count surveys have been done by Syrek, (and reviewed by MGM Management). More recently five excellent surveys have been completed across all of the 29 counties of Florida by the University of Florida. Criticism developed that the Syrek methodology was too complicated and difficult to replicate the results, thus a simpler method was sought. In 1993 the Florida Legislature directed the Florida Center for Solid and Hazardous Waste Management to conduct a state-wide litter count. The Center developed a method for surveying litter that was understandable, simple and statistically valid. MGM Management has been trained in the methods of both the Syrek and by staff of the University of Florida to extract the best of both methodologies and adapt them to our methods.

In the past some local environmental groups have done litter audits of their own design. These methodologies may not be scientific in their development and they often tended to not be reproducible. Measurement techniques need to be unbiased, scientifically rigorous, and reproducible to be defensible. Comparison to other jurisdictions has not usually been possible with local litter audit methods. The methodology used and the data developed from this audit can be reproduced should the City of San Francisco wish to do so, and the results can be compared to other jurisdictions that have used the same approach.

This audit uses a proven and recognized method of identifying litter survey sites and for counting litter.

2.0 City of San Francisco Litter Audit - Methodology

The City of San Francisco litter audit counted “accumulated litter”. This is as compared to “fresh litter” counts, where a site is cleaned, then researchers return after a set time to count the number of pieces of litter that have been deposited. Accumulated litter allows for an examination of the occurrence of litter as it is has developed over time. Fresh litter count surveys are much more labour intensive, and costly to conduct, than accumulated litter counts.

2.1 Site Selection Process

2.1.1 Random Site Selection

In selecting where to conduct a site audit it is important to have an unbiased method of selection. The current methodology does not allow discretion in the field in selecting sites to be audited. Sites are pre-selected using computer techniques. In this way, neither the “dirtiest” nor the “cleanest” locations are picked. The survey teams count litter at sites that are selected in advance of field crews traveling to the location.

To select sites for the City of San Francisco Litter Audit, a geographical information system (GIS) database for the City of San Francisco was acquired (software used was ArcGIS 9.2 by Environmental Systems Research Institute Inc.). Working with San Francisco Environment, GIS data files were provided. Using ArcGIS 9.2, the consultant had access to 16,256 center-line coordinates for all potential public street locations within the service area of the City of San Francisco. With these data coordinates, the consultant used a computer sample generation program to randomly select potential litter audit sites. These data were then plotted on computer generated maps using ArcGIS 9.2, and detailed locations identified.

The consultant was requested to weight the site selection program to provide 75% of the locations within the internal boundary service areas of the City, while the remaining 25% of sites represented the rest of the City’s geographical area.

The final outcome was 175 randomly selected potential sites. Some of these sites were rejected because they were within ¼ mile of each other, or because they occurred on freeways, railway lines, or ponds. In 2007 a total of 105 randomly selected sites were audited by field surveyors, from the period April 9, 2007 to April 20, 2007.

These same 105 sites were re-audited in 2008, plus an additional 25 randomly selected sites were added to the list of sites, to increase the sample size to 130 sites that were audited. The 2008 field audit work was completed from April 7 – April 18, 2008.

All of the 2007 and 2008 sites were again audited in 2009. Two additional sites were added in 2009 to the list of sites, which increased the sample size to 132 sites. The 2009 field audit work was completed from April 20 – May 5, 2009.

Figure 1 - 132 Random Sites Were Audited in 2009

Sites were chosen by computer using ArcGIS 9.2 software.

The potential sample sites were then plotted for the entire City of San Francisco on a GIS generated map. Detailed street maps are then used to more accurately locate the sites, using two local map sources, San Francisco; ISBN 1-55368-168-1,MapArt www.mapart.com and also San Francisco & San Mateo Counties; Street Guide, The Thomas Guide, ISBN 01-528-85961-7.

Sites were rejected if they were located:

- on major highways / freeways
- location was on a bridge
- location clearly within a construction area
- on railway / subway rights-of-way
- on hydroelectric power line rights-of-way
- on / within water (ponds, rivers, streams/ lakes)
- access was difficult or impossible
- if located on industrial or private lands

Detailed directions were written by the consultant to direct audit teams to each of the selected sites. Directions were written in a manner that would allow any field team to find each site easily. Field teams were asked to travel to the sites using these directions so that no bias towards whether the site was dirty or clean would be introduced.

For each site further details of the audit site were added to the archival file by the audit team while at location, to allow future audit teams to find the same sites should the City wish to re-audit them in the future.

2.2 Detailed Site Files

The consultant created an individual hard copy site file for each location. These files contain the following:

- discrete site location ID number
- travel directions sheet
- photographic label card (for taking photos on-site)
- Large Litter Site Surveyor Form - (for recording large litter observed)
- Small Litter Item Count form (for recording small litter)

2.3 Conducting a Site Audit

Teams were paired in groups of two. Site auditors were hired by HDR / BVA Engineering Inc. Each team worked independently, reporting their activities to the SAIC Engineering, Project Manager and to the Sustainable Design Resources, field work supervisor. The City was divided into two work sectors, with teams assigned site files accordingly.

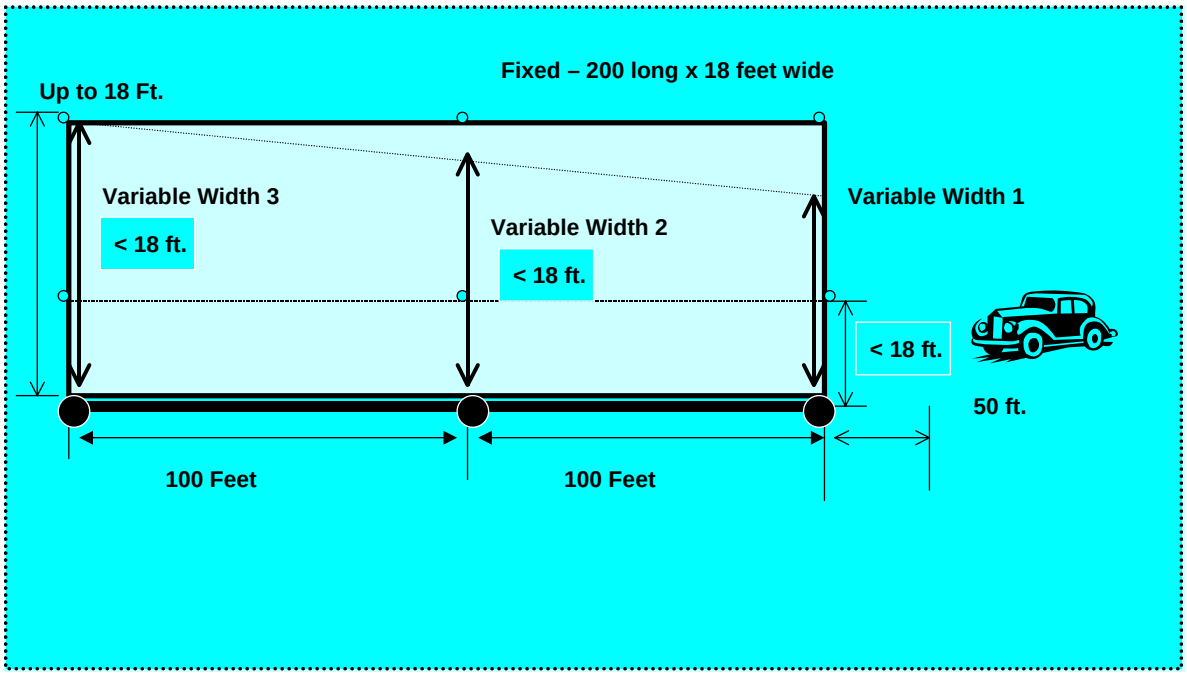
Upon being assigned site files each audit team traveled to their sites. It is of note that the team that audited the downtown areas volunteered to use bicycles as their transportation method. This proved to be a very effective means of doing sites in a congested metropolitan area. By using bicycles, time was saved, and parking costs avoided.

Teams approached their assigned sites from the directions requested and located the site. Upon arriving at a site, the teams safely parked their vehicles. Traffic cones were place on the roadway for traffic control, and team members dressed in fluorescent orange/ yellow traffic vests to increase their visibility. The teams reported their activities throughout the sampling day to the Project Manager by cellular telephone.

Beginning at the front of the parked car (or the start of the site), the team used a measuring device to measure 50 feet ahead of the start of the site. Using street marking paint, a mark was drawn on the pavement ahead to denote the staring point of the audit site. From this point the team measured an additional 100 feet, marking the roadway with another identifier to show the mid-point of the site. A final measurement of an additional 100 feet denoted the end of the audit site. Each site was 200 feet in length.

The width of the site was measured from 1.5 feet inside the curb (from the center of the roadway) towards the outer edge of the site, up to a maximum width of 18 feet. The rule was set to include 1.5 feet into the street since the curb is a normal catchments structure, for which the municipality is responsible for litter clean up. Sites with a width of 18 feet and 200 feet long were designated as a "fixed" site. In many instances a site was less than 18 feet wide. This occurred in commercial areas where storefronts provide less than 18 feet from the roadways (plus 1.5 feet into the road). Sites less than 18 feet in width are designated as "variable" sites.

Figure 2 - Schematic of Litter Audit Site



2.4 Classification of Large Litter

For purposes of classifying litter, and in accordance with the methods used in previous litter surveys conducted by us, large litter was defined to be that which is greater than 4 square inches in size.

2.5 Classification of Small Litter

Small litter were those pieces of debris that were less than 4 square inches in size, within a defined area within an audit site. The small litter audit methodology examines three transacts, or slices, of the site. A frame made of 1/2 inch P.V.C. plastic tubing was constructed to act as a frame. This frame was 1 foot wide and 6 feet long. A surveyor would look for and count small litter in three samples, one at the start of the site, one at the mid-point and one at the end of the site. At each transact section; three flips of the frame are done, thus surveying 18 square feet of the site – repeated three times.

Figure 3 – Small Litter Templates

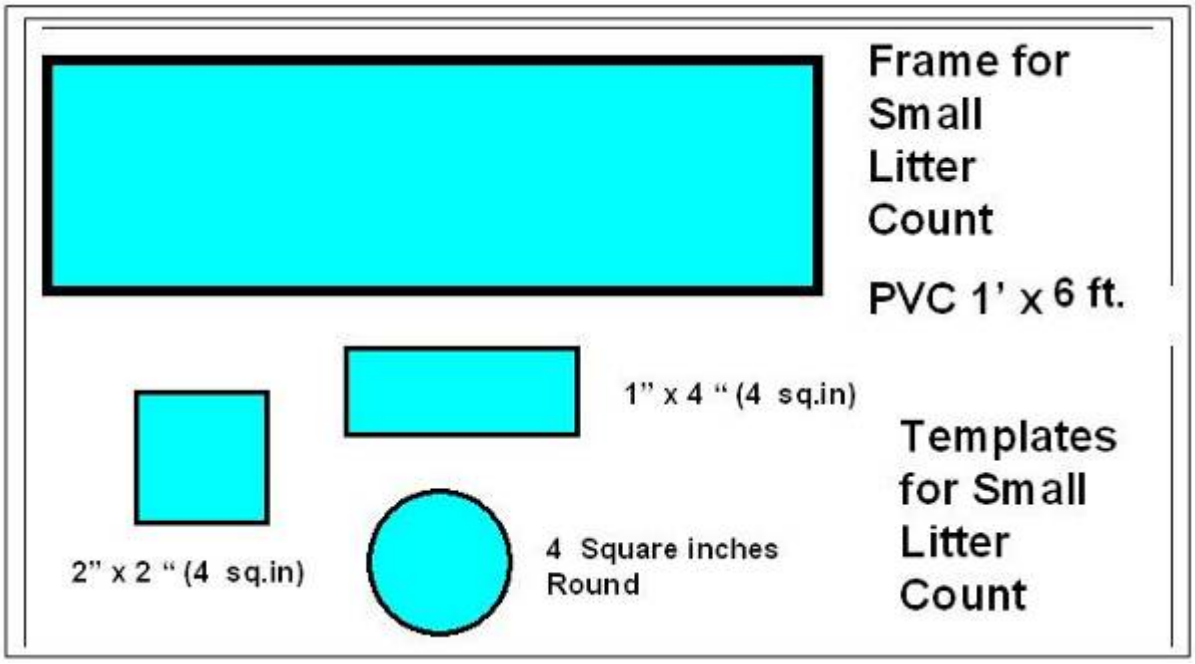


Figure 4 – Site Set-up – Small Litter

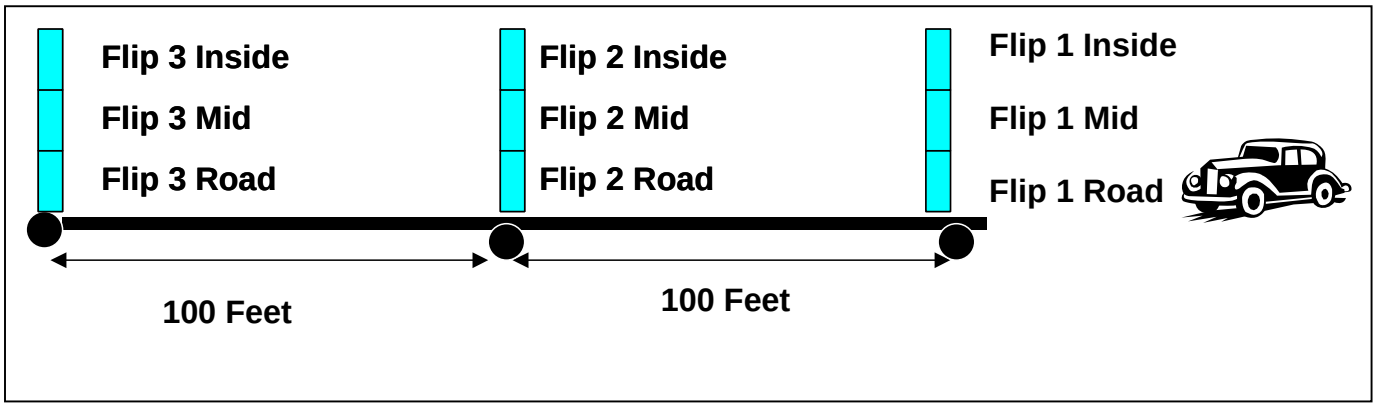


Table 1 - Categories of Small Litter

The categories in the litter counts less than 4 square inches that were examined are:

- cigarette butts/ debris
- other tobacco
- bottle caps
- straws
- candy packaging & wrappers
- polyfoam packing materials
- other polystyrene debris
- glass
- paper
- plastic film
- hard plastic
- aluminum / foil debris
- rubber
- metal (not aluminum)
- other materials
- gum deposits on roadways & sidewalks

Table 2 - Categories of Large Litter

Eighty-four sub-categories of large litter were counted, including:

Major Category	Sub-Category Number	Large Litter	Sub-Category Name	Material
1	1	Beer Cans	Beverage	metal
	2	Beer Bottles (glass)	Beverage	glass
	3	Soft Drink (glass)	Beverage	glass
	4	Soft Drink (cans)	Beverage	metal
	5	Soft Drink (plastic)	Beverage	plastic
	6	Sport Drink (glass)	Beverage	glass
	7	Sport Drink (plastic)	Beverage	plastic
	8	Water (glass)	Beverage	glass
	9	Water (plastic)	Beverage	plastic
	10	Wine/ Liquor (glass)	Beverage	glass
	11	Wine/ Liquor (plastic/other)	Beverage	plastic
	12	Milk/Juice (Plastic)	Beverage	plastic
	13	Milk/Juice (glass)	Beverage	glass
	14	Milk/Juice (Gable Top)	Beverage	paper
2	15	Foil Pouches	Other Packaging	composite
	16	Aseptic (Box)	Other Packaging	composite
	17	Broken Glass Container	Other Packaging	glass
	18	Six pack plastic rings	Other Packaging	plastic
	75	Foil containers	Other Packaging	metal
3	19	Plastic drink cups	Cups	plastic
	20	Paper Cups (cold)	Cups	paper
	21	Paper Cups (Hot)	Cups	paper
	22	Polystyrene cups (foam)	Cups	plastic
	23	Other paper cups	Cups	paper
	24	Cup Lids, Pieces lids	Cups	plastic
4	25	Plastic retail bags	Bags	plastic
	26	Paper retail bags	Bags	paper
	27	Paper bags - fast food	Bags	paper
	28	Plastic bags - not retail	Bags	plastic
	29	Paper bags - not retail	Bags	paper
	30	Zipper bags/ sandwich	Bags	plastic
5	31	Cardboard boxes/ box mat'l	Other Packaging	paper
	32	Paperboard (cereal type)	Other Packaging	paper
	33	Paper Beverage Cases	Other Packaging	paper
	34	Polystyrene clamshells	Other Packaging	plastic
	35	Paper clamshells	Other Packaging	paper
	36	Other Plastic Shells/Boxes	Other Packaging	plastic
6	37	Plastic Jars / Bottles/ Lids	OTHER CNTRS.	plastic
	38	Glass jars/ bottles misc.	OTHER CNTRS.	glass
	39	Cans - steel	OTHER CNTRS.	metal
	40	Cans - aluminum	OTHER CNTRS.	metal
	41	Container lids	OTHER CNTRS.	
	42	Aerosol cans (paint, oils, etc.)	OTHER CNTRS.	metal
7	43	Paper Food Wrap	Food Wraps/ Cntrs	paper
	44	Paper / foil composite wrap	Food Wraps/ Cntrs	composite
	45	Plastic wrap	Food Wraps/ Cntrs	plastic
	54	Condiment package (salt, ketchup, vinegar etc.)	Take-Out Extras	
	55	Utensils	Take-Out Extras	plastic

	56	Name Brand (Fast Food etc.) Towels / Napkins / Serviettes	Take-Out Extras	paper
	57	Paper Fast Food Plates	Take-Out Extras	paper
	58	Poly Fast Food Plates	Take-Out Extras	plastic
	59	Other Plastic FF Plates	Take-Out Extras	plastic
	60	Plates - Other Mat's	Take-Out Extras	
8	46	Polystyrene Trays	Trays	plastic
	47	Paper Trays	Trays	paper
	48	Other Mat'l Trays (what?)	Trays	
9	49	Gum wrappers	Confectionary/Snack	
	50	Candy bar wraps	Confectionary/Snack	
	51	Candy pouches	Confectionary/Snack	
	52	Sweet packaging (describe)	Confectionary/Snack	
	53	Other confectionery (describe)	Confectionary/Snack	
	63	Snack food packaging	Confectionary/Snack	
10	61	Clothing or clothing pieces	Cloth	
	62	Other cloth	Cloth	
11	64	Plastic packaging other	Other Miscellaneous	plastic
	65	Paper packaging other	Paper/ Fibre Mat'l	paper
	66	Plastic / composite other	Other Miscellaneous	
	67	Foil materials / foil pieces	Other Miscellaneous	metal
12	68	No Brand Name Towels / Napkins / Serviettes	Paper/ Fibre Mat'l	paper
	69	Lottery ticket debris	Paper/ Fibre Mat'l	paper
	70	Printed material (newspapers, flyers, books etc.)	Paper/ Fibre Mat'l	paper
	71	Stationary (school, business etc.)	Paper/ Fibre Mat'l	paper
	72	Receipts (business forms, bus transfers, etc.)	Paper/ Fibre Mat'l	paper
13	73	Cigarette / cigar debris (>4")	Tobacco	
	74	Tobacco other (packs, matches, cellophane)	Tobacco	
14	76	Misc. Paper	Other Miscellaneous	paper
	77	Misc. Plastic	Other Miscellaneous	plastic
	78	Misc. Paperboard	Other Miscellaneous	paper
	79	Misc. Cardboard	Other Miscellaneous	paper
	80	Misc. Glass	Other Miscellaneous	glass
	81	Vehicle & Metal Road Debris	Other Miscellaneous	
	82	Construction debris	Other Miscellaneous	
	83	Tire & Rubber debris	Other Miscellaneous	rubber
	84	Home Articles	Other Miscellaneous	

Table 3 - Detailed Descriptions of Large Item Categories

1	Beer Cans		All brands of consumer beer can containers
2	Beer Bottles (glass)		Refillable and non-refillable beer bottles, all sizes
3	Soft Drink (glass)		Soft drinks, carbonated, non-carbonated, flavoured drinks in glass containers
4	Soft Drink (cans)		Soft drinks, carbonated, non-carbonated, flavoured drinks in metal can containers
5	Soft Drink (plastic)		Soft drinks, carbonated, non-carbonated, flavoured drinks in plastic containers, all sizes
6	Sport Drink (glass)		Sport drinks, carbonated or non-carbonated, flavoured drinks in glass containers, all sizes
7	Sport Drink (plastic)		Sport drinks, carbonated or non-carbonated, flavoured drinks in plastic containers, all sizes
8	Water (glass)		Packaged water, carbonated or non-carbonated, flavoured drinks in glass containers, all sizes
9	Water (plastic)		Packaged water, carbonated or non-carbonated, flavoured drinks in plastic containers, all sizes
10	Wine/ Liquor (glass)		Wine & liquor in glass, all sizes
11	Wine/ Liquor (plastic/other)		Wine & liquor in plastic or any other formats, all sizes
12	Milk/Juice (Plastic)		Milk or juice containers, packages in plastic
13	Milk/Juice (glass)		Milk or juice containers, packages in glass
14	Milk/Juice (Gable Top)		Milk or juice containers, packages in gable top paper cartons, all sizes
15	Foil Pouches		All packaged goods in foil packaging, pieces of foil materials
16	Aseptic (Box)		Drink-in-box, juice, fluids, other
17	Broken Glass Container		Glass fragments
18	Six pack plastic rings		Retainer plastic for carrying cans
19	Plastic drink cups		Cups, all sizes, all resin types
20	Paper Cups (cold)		Cups, all sizes, all paper types - cold drinks
21	Paper Cups (Hot)		Cups, all sizes, all paper types - hot drinks
22	Polystyrene cups (foam)		Cups, all sizes, all polystyrene types - hot drinks
23	Other paper cups		Cups, other materials
24	Cup Lids, Pieces lids		Fragments and pieces of cups
25	Plastic retail bags		Whole and pieces of retail plastic bags
26	Paper retail bags		Whole and pieces of retail paper bags

27	Paper bags – fast food		Whole and pieces of fast food outlet paper bags
28	Plastic bags – not retail		Whole and pieces of plastic bags, not retail i.e. dry cleaning
29	Paper bags - not retail		Paper bags & sacs, example leaf bag debris
30	Zipper bags/ sandwich		plastic lunch bags and sacs
31	Cardboard boxes/ box mat'l		All cardboard and box materials
32	Paperboard (cereal type)		Cereal, shoe boxes and pieces etc.
33	Paper Beverage Cases		Paper material outer packaging for beverage products
34	Polystyrene clamshells		Whole and pieces of take-away or other Styrofoam containers
35	Paper clamshells		Whole and pieces of take-away or other paper containers
36	Other Plastic Shells/Boxes		PET, PVC, HDPE , other material shells
37	Plastic Jars / Bottles/ Lids		All jars, bottles etc, plastic, non beverage, example dish detergent bottle
38	Glass jars/ bottles misc.		All jars, bottles not described above, in glass
39	Cans – steel		Food, non-food and other product steel can containers
40	Cans - aluminum		Food, non-food and other product aluminum can containers
41	Container lids		All lids, closures, and pieces > 4 sq. in.
42	Aerosol cans (paint, oils, etc.)		Aerosol cans, tops, lids - all products
43	Paper Food Wrap		Wrap for food, commercial & non-commercial; example meat wrap,
44	Paper / foil composite wrap		Wrap for food or non-food items, commercial & non-commercial; example hamburger paper/ foil composite wrap,
45	Plastic wrap		All plastic wrap types, food, non-food
46	Polystyrene Trays		Trays for take-out, non-take out, microwavable, display etc
47	Paper Trays		Trays for take-out, non-take out, microwavable, display etc
48	Other Mat'l Trays (what?)		Trays for take-out, non-take out, microwavable, display etc
49	Gum wrappers		Packaging used to seal, sell gum products
50	Candy bar wraps		Packaging used to seal, sell candy products
51	Candy pouches		Packaging used to seal, sell candy products - pouch format
52	Sweet packaging (describe)		Packaging used to seal, sell confections (cakes, pies, sweet snack products

53	Other confectionery (describe)		All other packaging for confectionaries
54	Condiment package (salt, ketchup, vinegar etc.)		Pouches, containers, creamers etc
55	Utensils		Forks, knives, chop sticks etc
56	Name Brand (Fast Food etc.) Towels / Napkins / Serviettes		Towels & napkins etc with brand identification identifiable
57	Paper Fast Food Plates		Paper Plates, used to serve fast food
58	Poly Fast Food Plates		Polystyrene Plates, used to serve fast food
59	Other Plastic FF Plates		Other Material Plates, used to serve fast food
60	Plates - Other Materials		Plates for other than fast food applications, i.e. picnic plates used by families
61	Clothing or clothing pieces		All cloth, clothing pieces, and clothing discarded on the site
62	Other cloth		Tarps, industrial fabrics etc
63	Snack food packaging		All snack food (i.e.. Salty snacks, chips)
64	Plastic packaging other		Plastic packaging otherwise not described
65	Paper packaging other		Paper packaging otherwise not described
66	Plastic / composite other		All paper and composite debris not previously described
67	Foil materials / foil pieces		Foils and pieces, aluminum food foils, industrial foils
68	No Brand Name Towels / Napkins / Serviettes		Napkins and towels - no brand identification
69	Lottery ticket debris		Tickets, and gaming items
70	Printed material (newspapers, flyers, books etc.)		All printed material, commercially printed
71	Stationary (school, bus. etc.)		Includes school papers, written items, other printed materials such as business forms
72	Receipts (business forms, bus transfers etc.)		Receipts, business items, invoices, packing slips, bus transfers, commercial tickets (concerts, cinema)

73	Cigarette / cigar debris (>4")		Tobacco items
74	Tobacco other (packs, matches, cellophane)		Packages, wrappers, tobacco foil products, lighters, matchboxes
75	Foil containers		Foil containers (ice cream wraps)
76	Misc. Paper		All other non-described paper material, whole or shredded, unidentifiable as another category
77	Misc. Plastic		All other non-described plastic material, whole or shredded, unidentifiable as another category
78	Misc. Paperboard		All other non-described paperboard material, whole or shredded, unidentifiable as another category
79	Misc. Cardboard		All other non-described cardboard material, whole or shredded, unidentifiable as another category
80	Misc. Glass		All other non-described glass material, whole or broken, unidentifiable as another category
81	Vehicle & Metal Road Debris		Debris associated with transportation, private or commercial
82	Construction debris		Debris associated with construction, private or commercial
83	Tire & Rubber debris		Rubber materials, tire pieces, shock absorbers, sheet rubber or pieces
84	Home Articles		All non-described household items, (i.e.. Lamps, electrical, lawn chairs, etc)

2.6 Survey Counts

After setting up each site, one auditor commenced the large litter survey count, and recorded brands of items observed at the site. The other auditor commenced the small litter survey, using the methodology described above.

Before starting the large litter survey, the field technician first checked his/her tape recorder to ensure it was working properly.

The auditor then dictated the description sections of the Surveyor Site Form (Appendix 1) into the recorder. This information describes the site number, date, digital photos taken, camera used, start time, type of site (residential, industrial, commercial, downtown core), type of roadway, whether road is divided, grass height, evidence of a clean-up, stop sign/ traffic light visible, fast food near-by, convenience store nearby, described the litter catch points (grass mow line, hedge, fence, other), and provided a visual litter rating on a subjective basis. All photographs are part of the archival record for this survey – and are part of the electronic database supplied to the City

The visual litter rating is an "opinion" expressed by the surveyor as to whether the site is dirty (highest rating = 4) or clean (lowest rating = 1).

Once this information is recorded the auditor proceeds to walk the first pass through the site slowly, taping his/ her observations into the tape-recorder as they observe the site. Proceeding back and forth across the site until the surveyor has walked the site up to the mid-point. The surveyor noted that they had reached the mid-point, then continuing on observing litter up to the end of the site boundary, making verbal notations of the litter observed and describing them into the 84 sub-categories of litter. This completed "Pass One". The surveyor then repeated the observations (Pass Two) over the site, using the same procedure, but in the opposite direction. Results of the two passes are used in data analysis.

2.7 Documentation & File Management

At each site the teams were required to make a tape-recorded record of their observations of large litter. At the end of doing the verbal entries into the recorder, a team member then transcribed the verbal observations onto a Large Litter Site Form (Appendix 1). In this way the verbal record was transferred to a written record for the site.

These forms were later entered into MGM Management's database for analysis. Each site's observation forms were transcribed at the site before leaving the location. If a recording problem occurred, the site was redone.

Each form was returned in its file folder to the Project Manager for archival purposes. All data forms were scanned to preserve them for archival purposes.

2.8 Photographic Record of the Site

At each site location, the litter audit team took digital photographs. One shot was taken at the start of the site, looking towards the end of the site – away from the vehicle. The second shot was taken in the mid-point of the site – looking across the width of the site toward the boundary. And the final photograph was taken at the end of the site – looking back towards the start of the site (towards the vehicle). The purpose of the photographs is to set the scene

of what an individual site looked like at the time of its audit – not to show details of the litter on the ground.

In each case the number of photographs at each site was recorded on the Surveyor Site Form. The site-specific digital photographs were downloaded to the database of the survey, as an archival record of the site during the audit period.

Figure 5 - Site Photographs (example photographs)

2.9 Branded Litter Observations

Using the Large Litter Site Form (with 84 sub-categories of large litter) as a guide, data was also gathered for observing Branded Litter. Branded litter is large litter (i.e. over 4 square inches) that has a recognizable brand name affixed. Team auditors verbally identified litter by brand name, which was later transcribed onto the Large Litter Site Form, for data entry and analysis. Where any doubt occurred in the identification of a brand of litter, no entry was made.

2.10 Survey Schedule and Progress

The field audit teams were assembled for training on April 20, 2009. Following an orientation and safety training session field observations began immediately. Fieldwork was conducted between April 20 – May 5, 2009.

Each two-person audit team were able to complete between 7 – 10 sites per day allowing for breaks, lunch and travel time.

3.0 Large Litter Survey Results

Field observations were dictated into tape recorders, and then later transcribed onto Large Litter Site Form (Appendix 1).

Forms were then inputted into a Microsoft Access database for analysis.

3.1 Discussion of Large Litter Results

Litter counted for the City of San Francisco Litter audit, were grouped into 14 broad categories.

- Other (incl. misc. paper)
- Other Packaging (salty snacks etc)
- Cups (hot, cold drinks)
- Tobacco products
- Bags (paper, plastic)
- Food wraps
- Plates

Paper (printed mat's, news)
Confectionary (candy)
Beverage containers
Other Containers (not beverage)
Take out extras (condiments etc)
Cloth / Clothing
Trays

In total, 4,488 pieces of large litter were counted. This is an average of 34 items per site based upon the 132 sites audited. This compares to 3,978 large litter items averaging 31 items of large litter per site in the 2008 audit and 3,812 large litter items, averaging 36 items of large litter per site in the 2007 audit.

The table below illustrates the results of the 2009 large litter audit results compared to 2007 (baseline year) and 2008.

Table 4 – Summary of Results 2009, 2008, 2007

2009	2008	2007
Sites	**Sites**	**Sites**
132	130	105
Items/ Site	**Items/ Site**	**Items/ Site**
34.0	30.6	36.3
11%	-16%	Baseline

-6.4% 2009 lower than 2007 baseline year

The 2009 audit results show an 11% increased in large litter items / site compared to 2008, however the 2009 results for large litter were 6.4% lower than the baseline year of 2007.

The largest category of large litter observed was Miscellaneous Paper at 552 litter pieces. This is a higher result for this sub-category as compared to the 2008 (319 items) but similar to the result for this sub-category in the 2007 audit (570 items). Non-branded paper napkins were the next most significant sub-category noted in the 2009 audit (438 items). This is a lower result for this sub-category as compared to the 2008 (664 items) but similar to the result for this category in the 2007 audit (494 items).

Printed paper materials were the third most significant litter sub-category in the 2009 audit, at 373 items, which is similar to the result noted in 2008 (380 items) and higher than noted in 2007 (287 items)

In 2009 fiber materials contributed 46% of the total large litter observed. In 2008 fiber contributed 51% of the total large litter observed, as compared to 54% in the 2007 audit. Fiber based litter included paper, paperboard, cardboard, towels, napkins, newspapers, books, flyers, printed materials, and business forms, stationary , paper packaging, and paper bags. The data suggests that fiber based litter continues to be a major contributor to litter on San Francisco streets

Table 5 - All Paper & Fiber Litter – 2009 Audit

All Fiber Observed	**Items Observed**	**% of Total Large Litter**
Printed materials	557.5	12.4%
Misc. Paper	552.5	12.3%
Napkins (all types)	479	10.7%
Fiber Packaging (incl bags/wraps)	432.5	9.6%
Misc. Cardboard	34.5	0.8%
Misc. Paperboard	6	0.1%
	2,062	45.9%

Note: Whole numbers may not appear due to averaging.

The second most significant material type observed were plastic materials. These included miscellaneous plastic, plastic packaging, wrap, plastic bags-retail and non-retail, hot and cold plastic drink cups, plastic jars, bottles, composites, utensils, zip bags, beverage containers, trays, polystyrene cups, confectionary, sweet and snack food packaging, pouches, plates, retail bags, and carrying rings. The most significant single category of plastic litter was unidentified miscellaneous plastic litter; which is litter that is broken up or weathered such that auditors cannot identify it with certainty but can identify the litter as plastic. Miscellaneous plastic litter accounted for 219 littered items or 4.9 % (compared to 4.7% in 2008) of total litter. All large plastic litter in aggregate accounted for 887 items observed (compared to 953 in 2008 and 746 in 2007). Plastic litter accounted for 20% of total large litter observed in 2009 (compared to 24 % in 2008 and 20% in 2007). Details of the plastic litter observed appear below in Table 6 – All Plastic Litter 2009 Audit.

Table 6 - All Plastic Litter – 2009 Audit

All Plastics Observed	Items Observed	% of Total Large Litter
Misc. Plastic	219	4.9%
Cup Lids, Pieces lids	160.5	3.6%
Plastic packaging other	111.5	2.5%
Plastic retail bags	68	1.5%
Plastic drink cups	51	1.1%
Plastic Jars / Bottles/ Lids	32.5	0.7%
Utensils	29.5	0.7%
Polystyrene cups (foam)	27.5	0.6%
Plastic wrap	25	0.6%
Plastic bags - not retail	23.5	0.5%
Candy pouches	17.5	0.4%
Sweet packaging	17	0.4%
Water bottles (plastic)	15.5	0.3%
Zipper bags/ sandwich	15.5	0.3%
Plastic / composite other	13	0.3%
Other confectionery pckg	12.5	0.3%
Sport Drink (plastic)	11	0.2%
Other Plastic Shells/Boxes	10	0.2%
Polystyrene clamshells	7	0.2%
Polystyrene Trays	7	0.2%
Poly Fast Food Plates	5.5	0.1%
Other Plastic FF Plates	5	0.1%
Six pack plastic rings	2.5	0.1%
	887	19.8%

Note: Whole numbers may not appear due to averaging.

In Figure 6, below we compare litter occurrence in San Francisco versus all previous audits completed by the consultant. This allows a comparison to other jurisdictions where litter audits have been done using the same methodology.

The average of items of large per site observed in San Francisco in 2009, 2008 and 2007 can be compared and contrasted versus other jurisdictions that have conducted litter audits using this methodology.

Figure 6 – Large Litter – San Francisco vs. Other Jurisdictions

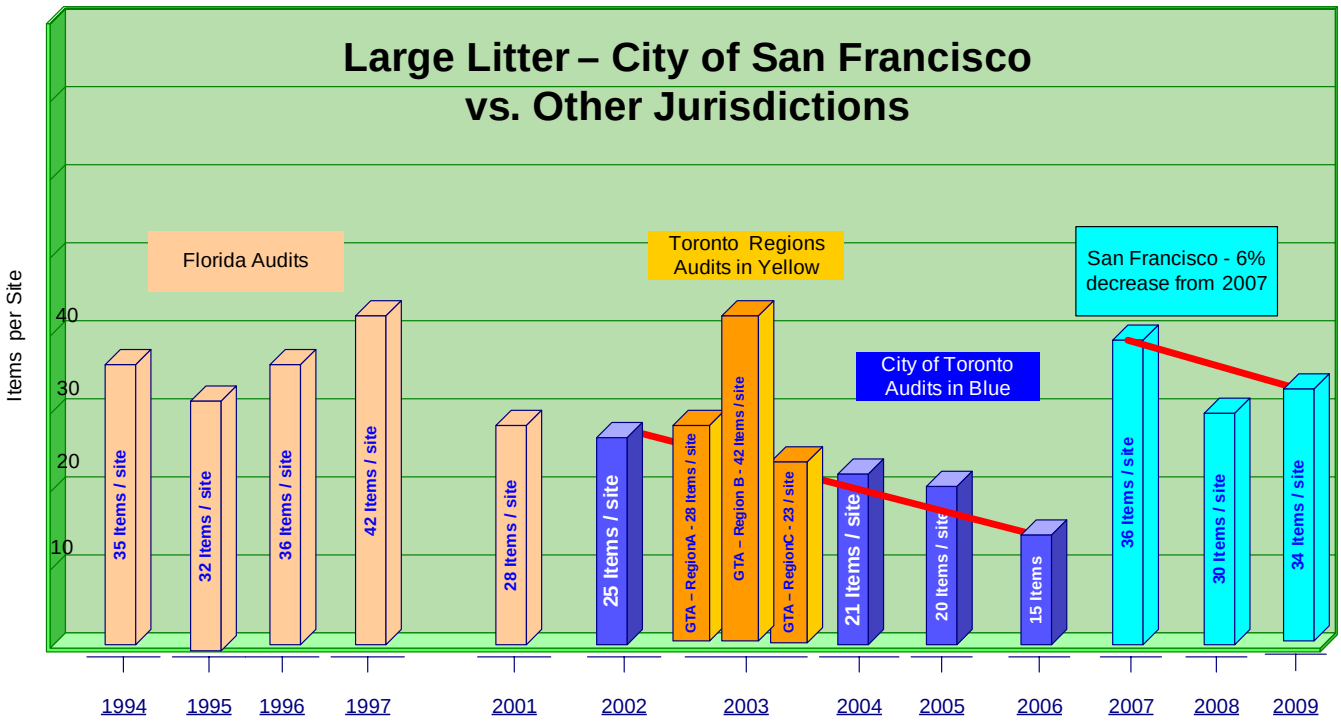


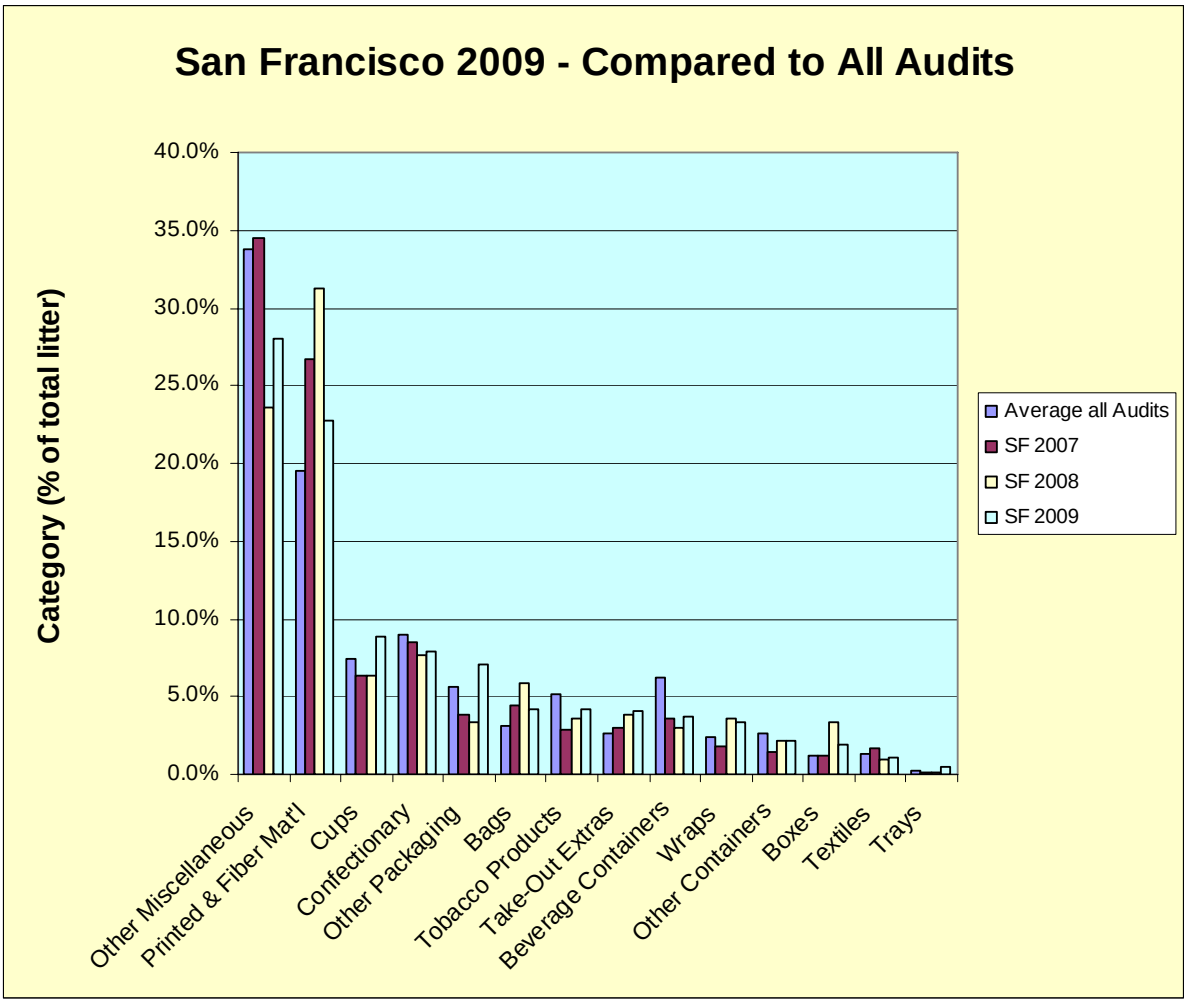
Table 7 – Comparison of San Francisco Litter Audits

San Francisco 2009 vs. Other Jurisdictions (2002 - 2008) [1.]

	Observations - 2002 to 2008 (other jurisdictions)	Percentage 2002 to 2008 (other jurisdictions)	San Francisco April 2007	San Francisco April 2008	San Francisco April 2009
		% of total large litter	% of total large litter	% of total large litter	% of total large litter
		Average all Audits	SF 2007	SF 2008	SF 2009
Other Miscellaneous	22,538	33.8%	34.5%	23.6%	28.0%
Printed & Fiber Mat'l	13,009	19.5%	26.7%	31.3%	22.8%
Cups	4,980	7.5%	6.4%	6.4%	8.9%
Confectionary	5,991	9.0%	8.6%	7.6%	7.9%
Other Packaging	3,727	5.6%	3.8%	3.3%	7.1%
Bags	2,057	3.1%	4.4%	5.9%	4.2%
Tobacco Products	3,406	5.1%	2.9%	3.7%	4.2%
Take-Out Extras	1,730	2.6%	3.0%	3.8%	4.1%
Beverage Containers	4,180	6.3%	3.5%	3.0%	3.7%
Wraps	1,563	2.3%	1.8%	3.6%	3.4%
Other Containers	1,763	2.6%	1.4%	2.2%	2.1%
Boxes	793	1.2%	1.2%	3.4%	1.9%
Textiles	863	1.3%	1.6%	1.0%	1.1%
Trays	133	0.2%	0.2%	0.1%	0.5%
	66,733	100.0%	100%	100%	100%

1. Aggregated litter data, Litter audits by MGM Management including:
City of Toronto, Canada (2002, 2003, 2004 (2 audits), 2005, 2006
Regional Municipality of Peel, Canada (2003)
Regional Municipality of York, Canada (2003)
Regional Municipality of Durham, Canada (2003)
City of Edmonton, Canada (2007)
City of San Jose, CA (2008), City of San Francisco 2007 & 2008

Figure 7 - Comparison San Francisco to All Litter Audits



Note: Chart compares San Francisco – Large litter results to all litter observations conducted by consultant , 2002 - 2009

Miscellaneous paper, non-branded napkins, printed materials, candy bar wrappers, miscellaneous plastics and tobacco products led the list of items found on 2009 audit sites.

The top 25 sub-categories, accounted to 81% of the total large litter observed in the 2009 audit.

Figure 8 and Table 8 below illustrate these findings.

Figure 8 – Top 25 Subcategories Significant

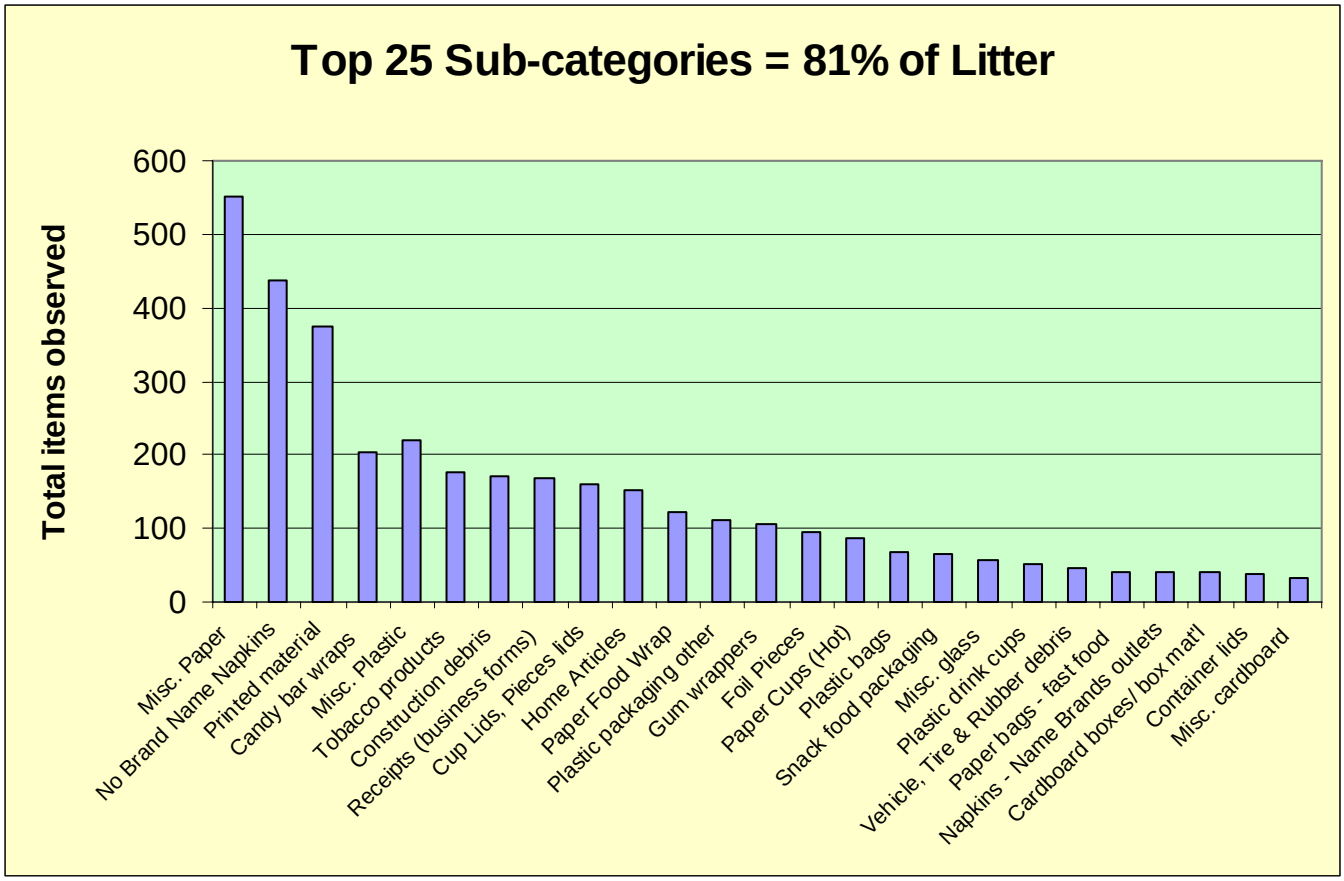


Table 8 - Details of the Top 25 Sub-categories

Top 25 Sub-categories 2009

		2009	2008	2007
1	Misc. Paper	552	317	570
2	No Brand Name Napkins	438	664	495
3	Printed material	374	380	287
4	Candy bar wraps	203	100	152
5	Misc. Plastic	219	186	342
6	Tobacco products	177	144	109
7	Construction debris	170	103	Not in Top 25
8	Receipts (business forms)	167	167	203
9	Cup Lids, Pieces lids	161	96	101
10	Home Articles	151	128	145
11	Paper Food Wrap	122	51	Not in Top 25
12	Plastic packaging other	112	56	Not in Top 26
13	Gum wrappers	106	131	32
14	Foil Pieces	96	Not in Top 25	Not in Top 25

		2009	2008	2007
15	Paper Cups (Hot)	87	57	36
16	Plastic bags	68	136	72
17	Snack food packaging	66	Not in Top 25	Not in Top 25
18	Misc. glass	57	Not in Top 25	Not in Top 25
19	Plastic drink cups	51	Not in Top 25	Not in Top 25
20	Vehicle, Tire & Rubber debris	47	62	43
21	Paper bags - fast food	41	Not in Top 25	Not in Top 25
22	Napkins - Name Brands outlets	40	Not in Top 25	Not in Top 25
23	Cardboard boxes/ box mat'l	40	49	51
24	Container lids	38	Not in Top 25	Not in Top 25
25	Misc. cardboard	32	Not in Top 25	Not in Top 25
	Sum - Top 25 Sub-categories	3,615		
	% of Total Large Litter	81%		

Table 9 - Summary of All Large Litter Observed (2009 – 2008 - 2007)

San Francisco - All Large Litter Data

Large Litter	**2009 Results**	2008 Results	2007 Baseline
Misc. Paper	552.5	317	570
No Brand Name Towels / Napkins / Serviettes	438.5	664	494.5
Printed material (newspapers, flyers, books etc.)	373.5	380	287
Misc. Plastic	219	185.5	342
Candy bar wraps	203	100	152
Tobacco other (packs, matches, cellophane)	177	144	109
Construction debris	169.5	102.5	31.5
Receipts (business forms, bus transfers, etc.)	167	166.5	203
Cup Lids, Pieces lids	160.5	96	100.5
Home Articles	151	127.5	145
Paper Food Wrap	122	51	32.5
Plastic packaging other	111.5	55.5	27.5
Gum wrappers	105.5	131	32
Foil materials / foil pieces	95.5	55.5	104.5
Paper Cups (Hot)	87	56.5	36
Condiment package (salt, ketchup, vinegar etc.)	77	87	46
Paper Cups (cold)	72	37	32
Plastic retail bags	68	25.5	23
Snack food packaging	66	30	90.5
Misc. Glass	57	18.5	65
Plastic drink cups	51	31	29.5
Vehicle & Metal Road Debris	46.5	33	43
Paper bags - fast food	41	6	7
Name Brand (Fast Food etc.) Towels / Napkins / Se	40.5	14.5	14.5
Cardboard boxes/ box mat'l	39.5	49	7
Container lids	39	6.5	3
Misc. Cardboard	34.5	35	50.5
Clothing or clothing pieces	33.5	26.5	28
Plastic Jars / Bottles/ Lids	32.5	74	33
Paper packaging other	31	10	2.5
Utensils	29.5	37	49
Foil Pouches	28	8.5	7
Polystyrene cups (foam)	27.5	31	43
Lottery ticket debris	26.5	6	31
Plastic wrap	25	85.5	25.5
Plastic bags - not retail	23.5	136	71.5
Paper retail bags	21	14	14
Paper bags - not retail	20.5	43	42.5
Other cloth	18	9	34
Paper Fast Food Plates	18	4	3
Candy pouches	17.5	71.5	18.5
Milk/Juice (Plastic)	17	5.5	7
Stationary (school, business etc.)	17	25.5	1
Sweet packaging	17	16	30.5
Paperboard (cereal type)	16	39.5	10
Water bottles (plastic)	15.5	11	9

Large Litter

	2009 Results	2008 Results	2007 Baseline
Zipper bags/ sandwich	15.5	10.5	11.5
Beer Bottles (glass)	14.5	2.5	29.5
Plastic / composite other	13	9	10.5
Tire & Rubber debris	13	62	9.5
Other confectionery pckg	12.5	7	3
Wine/ Liquor (glass)	12.5	7	3.5
Cigarette / cigar debris (>4")	11.5	1	1
Other Mat'l Trays (what?)	11.5	0	0
Soft Drink (plastic)	11	6	4
Aseptic (Box)	10.5	1	5.5
Other Plastic Shells/Boxes	10	16	7.5
Glass jars/ bottles misc.	9.5	3.5	2
Wine/ Liquor (plastic/other)	9.5	12	13
Soft Drink (cans)	9	17	12
Milk/Juice (Gable Top)	8.5	13.5	4
Paper Beverage Cases	8.5	8.5	0
Cans - steel	7	2	5
Foil containers	7	17	10
Polystyrene clamshells	7	7.5	20
Polystyrene Trays	7	2.5	1
Soft Drink (glass)	7	1	6
Sport Drink (plastic)	7	4.5	3
Paper / foil composite wrap	6.5	4.5	10
Beer Cans	6	4	6
Misc. Paperboard	6	55.5	59
Paper clamshells	6	12	1
Paper Trays	6	0	4
Sport Drink (glass)	6	0	10
Aerosol cans (paint, oils, etc.)	5.5	0	5
Plates - Other Mat's	5.5	0	0
Poly Fast Food Plates	5.5	4	3
Other Plastic FF Plates	5	4	0
Milk/Juice (glass)	2.5	3	1
Other paper cups	2.5	3	1
Six pack plastic rings	2.5	2.5	0
Broken Glass Container	1	10	2
Cans - steel	0	0	5
Cans - aluminium	0	0	6
	4488.5	3972.5	3812.5

2009	2008	2007
Sites	**Sites**	**Sites**
132	130	105
Items/ Site	**Items/ Site**	**Items/ Site**
34.0	30.6	36.3

Change from previous year audit	11%	-16%	Baseline
	-6.4%	2009 lower than 2007 baseline year	

3.2 Detailed Analysis by Major Category

3.2.1 Beverage Containers

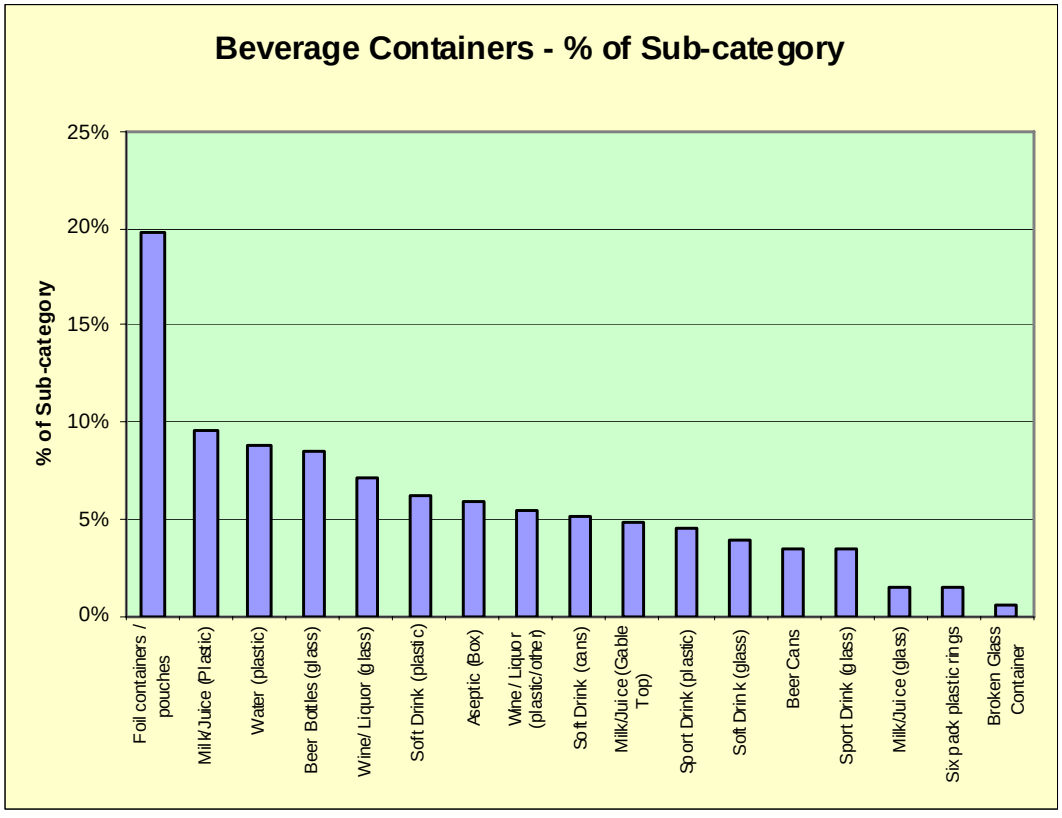
(Soft drink, beer, wine/liquor, milk & juice, sports drinks, water)

Beverage Containers

	2009	2009	2009	2008	2007
Soft drinks, bottled water, juices, milk, liquor, wine , beer , sport dinks , other	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Foil containers / pouches	35	20%	0.780%	0.642%	0.460%
Milk/Juice (Plastic)	17	10%	0.379%	0.151%	0.180%
Water (plastic)	15.5	9%	0.345%	0.277%	0.250%
Beer Bottles (glass)	15	8%	0.334%	0.063%	0.770%
Wine/ Liquor (glass)	12.5	7%	0.279%	0.176%	0.090%
Soft Drink (plastic)	11	6%	0.245%	0.151%	0.100%
Aseptic (Box)	10.5	6%	0.234%	0.025%	0.140%
Wine/ Liquor (plastic/other)	9.5	5%	0.212%	0.302%	0.340%
Soft Drink (cans)	9	5%	0.201%	0.428%	0.330%
Milk/Juice (Gable Top)	8.5	5%	0.189%	0.113%	0.100%
Sport Drink (plastic)	8	5%	0.178%	0.126%	0.080%
Soft Drink (glass)	7	4%	0.156%	0.025%	0.170%
Beer Cans	6	3%	0.134%	0.101%	0.160%
Sport Drink (glass)	6	3%	0.134%	0.000%	0.280%
Milk/Juice (glass)	2.5	1%	0.056%	0.076%	0.040%
Six pack plastic rings	2.5	1%	0.056%	0.050%	0.000%
Broken Glass Container	1	1%	0.022%	0.252%	0.050%
	176.5	100%	3.93%	2.96%	3.54%

Note: Whole numbers may not appear due to averaging.

Average 2002 - 2009, all audits 67,000 observations = 6.3%



Discussion:

More beverage container litter was observed in 2009, than in 2008 or in 2007. In 2009 the audit documented 176 beverage containers (3.9% of total large litter) compared to a count of 118, or 3.0 % in 2008, and 3.5% in 2007.

These levels of beverage container litter are lower that than the 6.3 % of total litter for beverage containers observed in audits conducted by the consultant in all jurisdictions from 2002-2009 by this consultant. This may be partially explained by the California Redemption Value, placed upon containers in California which provides an incentive for many of these containers to be salvaged for refunds. It is interesting to note that in San Francisco, non-California Redemption Value containers were the products observed most often, such as milk, juice and drink pouch containers

As in 2008, foil pouches and foil beverage containers were the largest subcategory observed as beverage container litter. These pouches continue to be extremely popular at and are used by brands such as Capri Sun and Minute Maid.

Soft drink containers in aggregate accounted for less than 1 % of total litter (0.91% for all types of soft drink and sport drink containers – compared to 0.73% in 2008). Beer containers accounted for more litter than in 2008, 0.47% of total litter compared to 0.16% in 2008, and 0.92% of total litter in 2007.

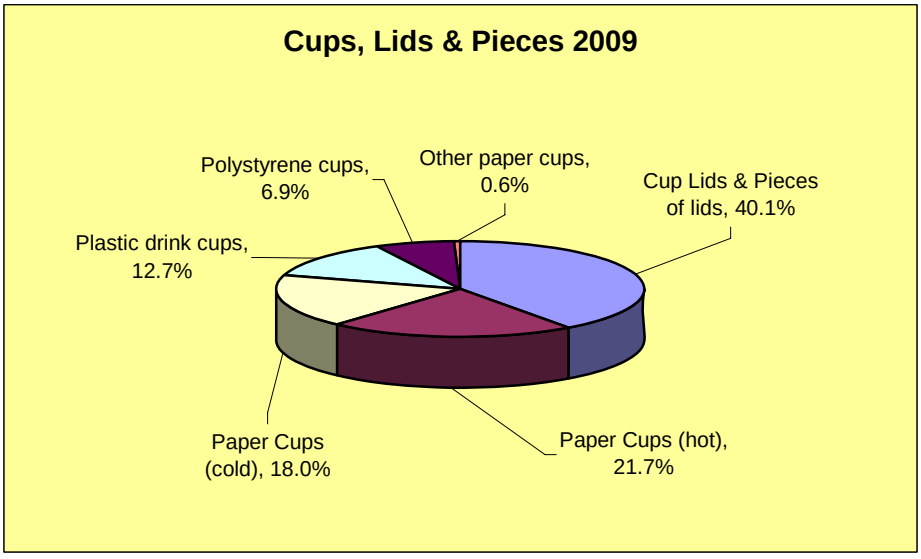
Water bottles continue to be a significant portion of beverage container litter being the third largest type of containers observed during the audit (9% of subcategory and 0.345 % of total litter.

3.2.2 Cups

Cups, lids, pieces of cup debris[1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Cup Lids & Pieces of lids	160.5	40.1%	3.6%	2.42%	2.64%
Paper Cups (hot)	87	21.7%	1.9%	1.42%	0.94%
Paper Cups (cold)	72	18.0%	1.6%	0.93%	0.84%
Plastic drink cups	51	12.7%	1.1%	0.78%	0.77%
Polystyrene cups	27.5	6.9%	0.6%	0.78%	1.13%
Other paper cups	3	0.6%	0.1%	0.06%	0.04%
	400.5	100.0%	8.9%	6.39%	6.36%

1. Note: Whole numbers may not appear due to averaging.
Average 2002 - 2009, all audits 67,000 observations = 7.5%



Discussion:

Cup litter includes hot and cold drink cups and pieces of lids from cups. This is indicative of wastes from a variety of over-the-counter food providers, whereby litter is then deposited on streets and sidewalks. This sub-category includes paper and plastic cups as well as lids and pieces of lids from hot and cold cups.

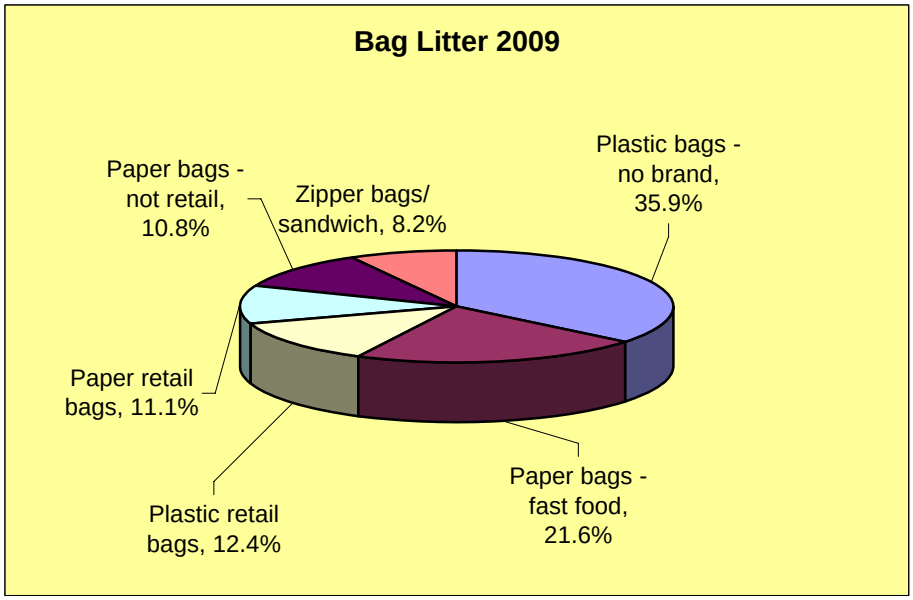
The sub-category contributed less litter in 2009, 8.9% compared to 2008 at 10.1%, but more than the 2007 baseline audit (6.4 % of the total litter). When compared to all litter audits between 2002 – 2009 audits from other jurisdictions which averaged 7.5% of total litter San Francisco appears to have an average or slightly above average amount of cup litter. Cup lids and pieces and paper cups make up the majority of the litter in this category, reflecting those food retailers that sell their products in cups.

3.2.3 Bags

Bags [1.]

	2009 Items	2009 % of Sub-category	2009 % of Total Large Litter	2008 % of Total Large Litter	2007 % of Total Large Litter
Plastic bags - no brand	68	35.9%	1.52%	3.42%	1.11%
Paper bags - fast food	41	21.6%	0.91%	1.08%	1.88%
Plastic retail bags	23.5	12.4%	0.52%	0.64%	0.60%
Paper retail bags	21	11.1%	0.47%	0.35%	0.37%
Paper bags - not retail	20.5	10.8%	0.46%	0.26%	0.31%
Zipper bags/ sandwich	15.5	8.2%	0.35%	0.15%	0.18%
	189.5	100.0%	4.22%	5.91%	4.45%

1. Note: Whole numbers may not appear due to averaging.
Average 2002 - 2009, all audits 67,000 observations = 3.1%



Discussion:

Plastic bags including retail sacks and zipper bags represented 2.4% of total large litter (108 items out of 4,488). Plastic bags accounted for 57% of bag litter, compared to 73% of bag litter observed in the 2008 litter audit. Paper fast food bags accounted for 22 % of this sub-category, with non-fast food and non-retail paper bags (like lunch bags) also representing 22% of the sub-category.

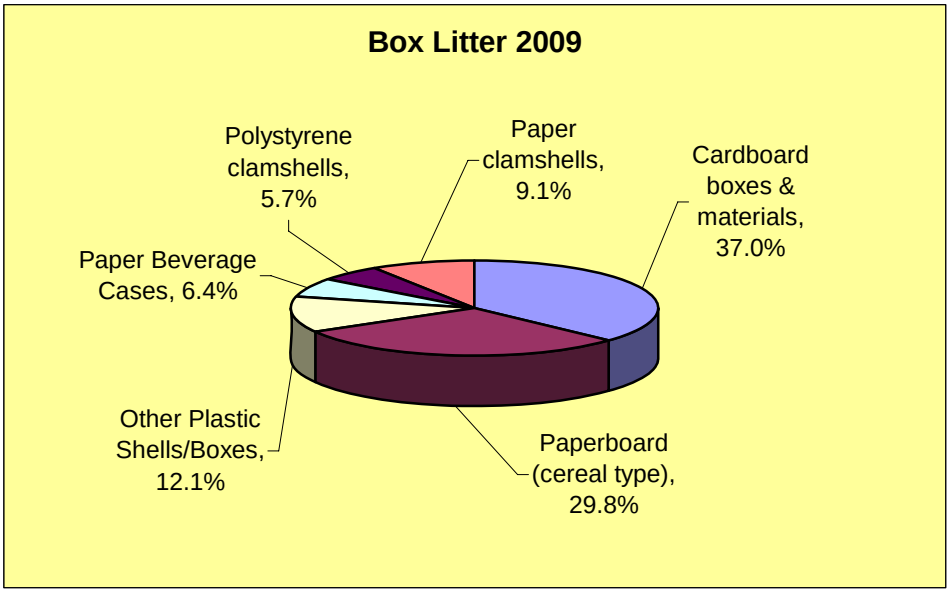
In each of the three litter audits (2007 – 2008 – 2009) bag litter in San Francisco has been observed as being higher (4.5% in San Francisco) than the sub-category average for bags in all audits conducted between 2002 – 2009 (3.1%) in all jurisdictions.

3.2.4 Boxes

Boxes [1.]

	2009 Items	2009 % of Sub-category	2009 % of Total Large Litter	2008 % of Total Large Litter	2007 % of Total Large Litter
Cardboard boxes & materials	39.5	37.0%	0.88%	1.23%	0.20%
Paperboard (cereal type)	16	29.8%	0.36%	0.99%	0.30%
Other Plastic Shells/Boxes	10	12.1%	0.22%	0.40%	0.20%
Paper Beverage Cases	8.5	6.4%	0.19%	0.30%	0.00%
Polystyrene clamshells	7	5.7%	0.16%	0.21%	0.00%
Paper clamshells	6	9.1%	0.13%	0.19%	0.50%
	87	100.0%	1.80%	3.34%	1.20%

1. Note: Whole numbers may not appear due to averaging.
Average 2002 - 2009, all audits 67,000 observations = 1.2%



Discussion:

The amount of large litter in the boxes sub-category which was observed in 2009 was similar to that documented in 2007 (1.8% in 2009, 1.2% in 2007). There was more box litter observed in 2008 than observed in the 2007 audit.

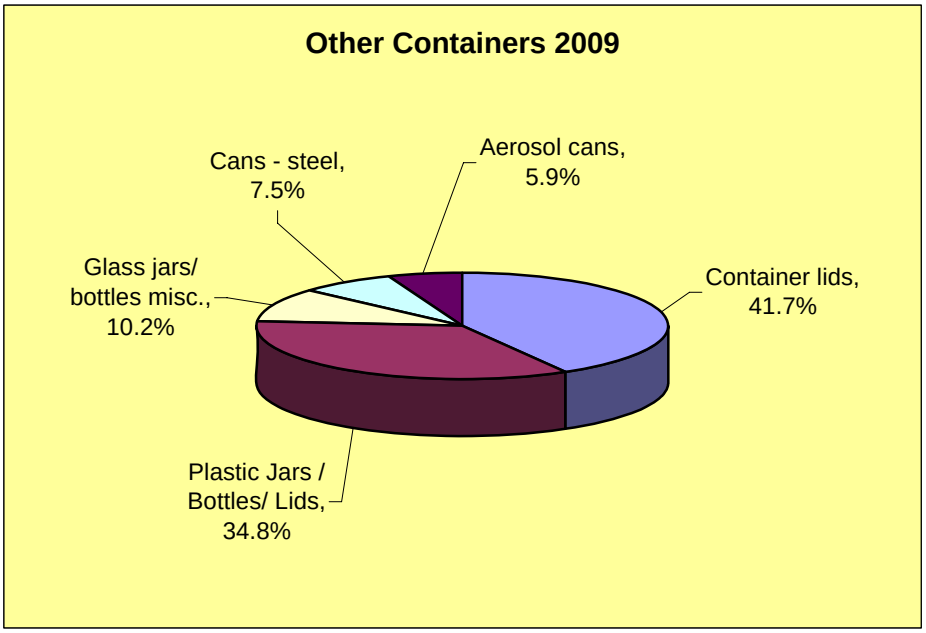
The amount of cardboard box litter was in San Francisco was similar to the average for this sub-category as observed in all jurisdictions audited by the consultant between 2002 – 2009 1.8% vs. 1.2% of all large litter documented in all previous audits).

3.2.5 Other Containers (non-beverage)

Other Containers [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Container lids	39	41.7%	0.87%	1.86%	0.87%
Plastic Jars / Bottles/ Lids	32.5	34.8%	0.72%	0.16%	0.08%
Glass jars/ bottles misc.	9.5	10.2%	0.21%	0.09%	0.05%
Cans - steel	7	7.5%	0.16%	0.05%	0.13%
Aerosol cans	5.5	5.9%	0.12%	0.00%	0.14%
Cans - Aluminum	0	0.0%	0.00%	0.00%	0.16%
	93.5	100.0%	2.08%	2.16%	1.43%

1. Note: Whole numbers may not appear due to averaging.
Average 2002 - 2009, all audits 67,000 observations = 2.6%



Discussion:

Containers other than beverage containers accounted for a relatively small proportion of total litter in the 2009 San Francisco litter audit. The amount of Other Containers has held fairly consistent in all three litter audits conducted since 2007, at or around 2% of total large litter.

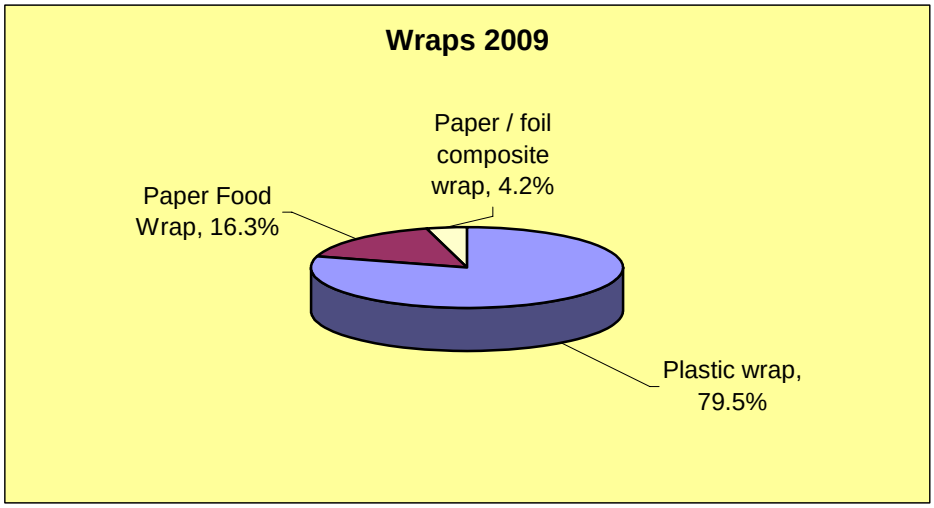
Container lids and plastic jars, bottles and lids which did not fit another specific sub-category were 77% of the litter in this sub-category, which is similar to the results of the 2008 audit for this sub-category. The proportion of Other Container litter observed during the 2009 San Francisco litter audit (2.1% of total large litter) was slightly lower than the consultant's observations of this sub-category (2.6% of total litter), in all previous audits performed between 2002 – 2009 in other jurisdictions (67,000 observations).

3.2.6 Wraps

Wraps [1.]

	2009 Items	2009 % of Sub-category	2009 % of Total Large Litter	2008 % of Total Large Litter	2007 % of Total Large Litter
Plastic wrap	122	79.5%	2.72%	2.15%	0.67%
Paper Food Wrap	25	16.3%	0.56%	1.28%	0.85%
Paper / foil composite wrap	6.5	4.2%	0.14%	0.11%	0.26%
	153.5	100%	3.42%	3.55%	1.78%

1. Note: Whole numbers may not appear due to averaging.
Average 2002 - 2009, all audits 67,000 observations = 2.6%



Discussion:

Within this sub-category are items which are used to wrap food for consumption off premises, mainly from fast food outlets. About 40% more food wrap materials were observed in the 2009 and 2008 litter audits as compared to the base year of 2007. This may be a sampling anomaly since the observed wrap litter in 2008 and 2009 are similar. The majority of food wrap materials in 2009 were plastic food wrap litter, accounting for 80% of this subcategory in 2009 of the food wrap materials (plastic food wrap represented 85% of this sub-category in 2008).

The proportion of wrap litter observed during the 2009 San Francisco litter audit was higher than the average found in aggregated litter observations in audits performed between 2002 – 2009 in audits in all other jurisdictions (3.4% wraps in San Francisco vs. 2.6% wraps in 67,000 observations).

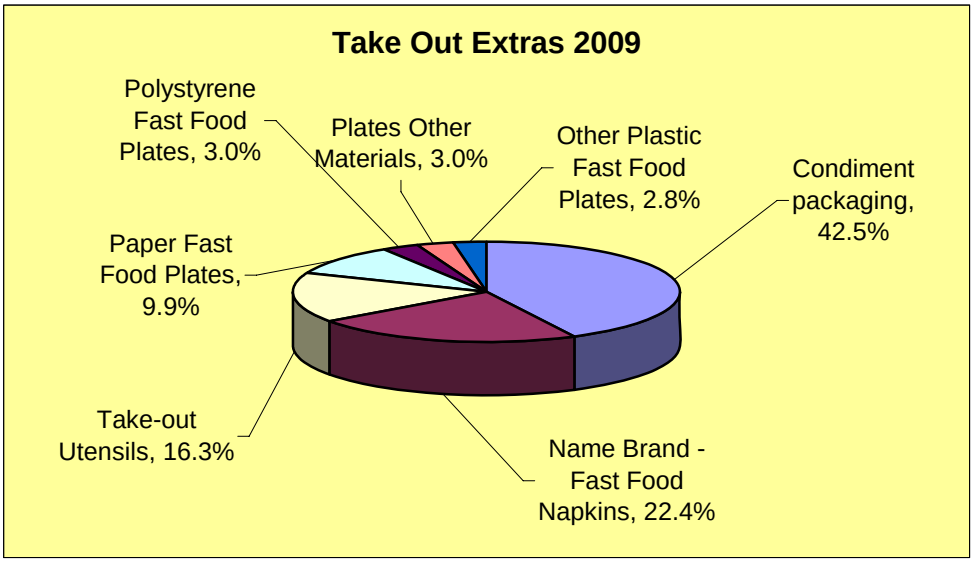
3.2.7 Take Out Extras

Take-Out Extras [1. & 2.]

	2009 Items	2009 % of Sub-category	2009 % of Total Large Litter	2008 % of Total Large Litter	2007 % of Total Large Litter
Condiment packaging	77	42.5%	1.72%	2.19%	1.21%
Name Brand - Fast Food Napkins	40.5	22.4%	0.90%	0.36%	0.38%
Take-out Utensils	30	16.3%	0.66%	0.93%	1.29%
Paper Fast Food Plates	18	9.9%	0.40%	0.10%	0.09%
Polystyrene Fast Food Plates	5.5	3.0%	0.12%	0.10%	0.08%
Plates Other Materials	5.5	3.0%	0.12%	0.10%	0.08%
Other Plastic Fast Food Plates	5	2.8%	0.11%	0.10%	0.08%
	181	100.0%	4.03%	3.79%	3.04%

Sub-category average (2002 - 2009 - 67,000 observations) = 2.6%

1. Item counts may not equal whole numbers due to averaging.
2. Take-out extras include: condiment packaging (eg. Salt, pepper, sugar, soya,mustard, relish, mayo, spoons, forks, plates, other fast food items



Discussion:

The sub-category of Take-out Food Extras includes condiment packages (ketchup, vinegar, salt, pepper, etc.) and utensils used by patrons of fast food establishments, as well as name brand napkins and fast food plates. Non-branded napkins are not included in this sub-category, since they may or may not be attributable to fast food outlet customers, and are therefore included with fiber based litter.

In the 2009 litter audit condiment packaging, napkins and utensils continued to be the main large litter components in this sub-category, together accounting for 81% of Take-out Extra litter (same result as in 2008). In all three litter audits since 2007, the proportion of take-out extras litter observed during the San Francisco litter audit has been greater than the average found in aggregated litter observations between 2002 – 2009 in all jurisdictions (4.03% in 2009, 3.79% in 2008, 3.04% 2007; vs. 2.6% in 67,000 observations). Take-out extras litter as a proportion of total large litter has remained at a fairly constant level since 2007.

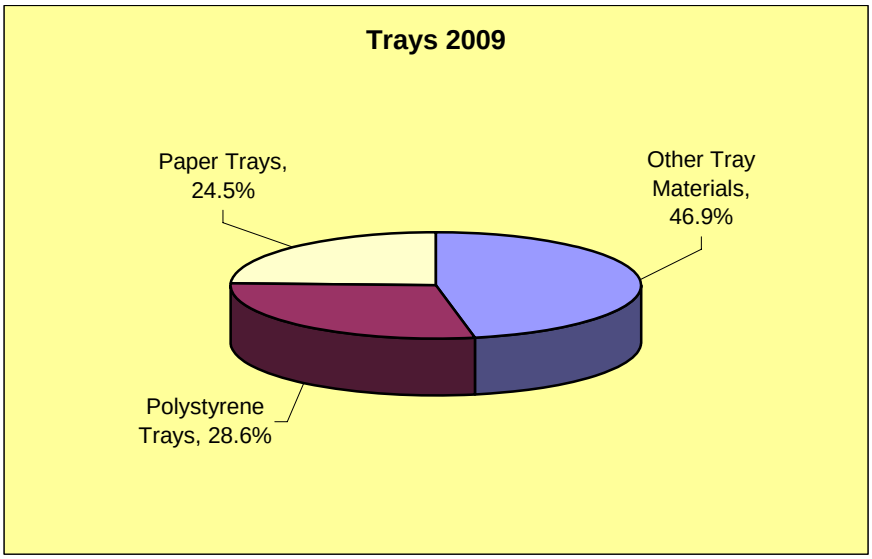
3.2.8 Trays

Trays [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Other Tray Materials	11.5	46.9%	0.26%	0.00%	0.00%
Polystyrene Trays	7	28.6%	0.16%	0.08%	0.03%
Paper Trays	6	24.5%	0.13%	0.03%	0.12%
	24.5	100.0%	0.55%	0.10%	0.15%

Sub-category average (2002 - 2009 - 67,000 observations) = 0.2%

1. Item counts may not equal whole numbers due to averaging.



Discussion:

Trays continue to represent a very small sub-category of large litter which is less than 1% of total litter (0.55% in 2009; 0.10% in 2008 and 0.15% of total litter in 2007). Tray litter observed during the San Francisco litter audit was higher than the average found in aggregated litter observations in audits performed from 2002 – 2009 in aggregated data for all jurisdictions. (0.55% wraps in San Francisco vs. 0.20 % take-out extra litter found in 67,000 observations).

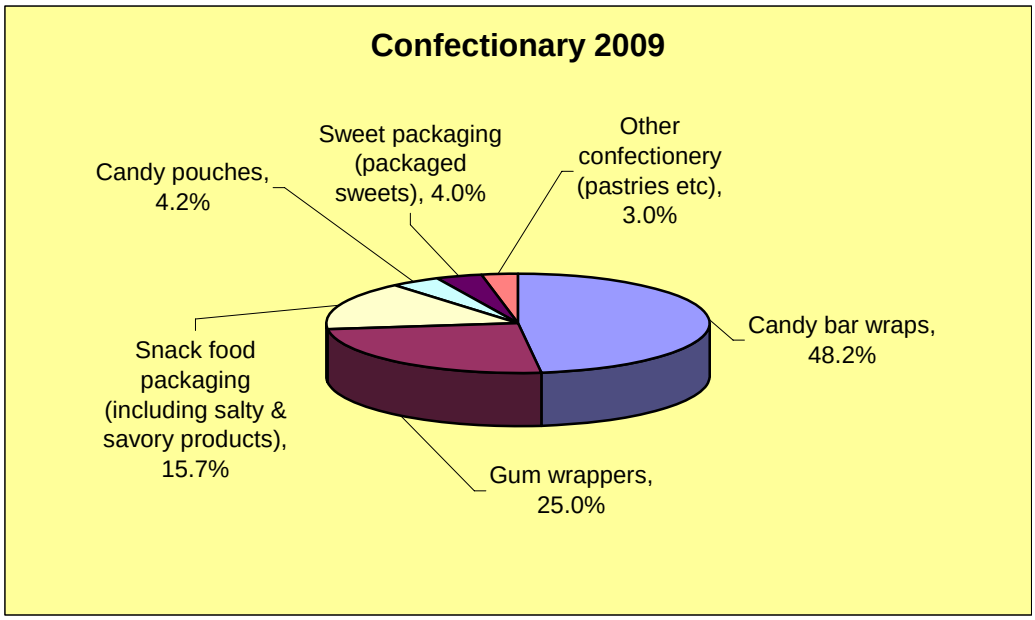
3.2.9 Confectionary

Confectionary [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Candy bar wraps	203	48.2%	4.52%	2.52%	3.99%
Gum wrappers	105.5	25.0%	2.35%	3.30%	0.84%
Snack food packaging (including salty & savory products)	66	15.7%	1.47%	0.76%	2.37%
Candy pouches	17.5	4.2%	0.39%	1.80%	0.49%
Sweet packaging (packaged sweets)	17	4.0%	0.38%	0.40%	0.81%
Other confectionery (pastries etc)	12.5	3.0%	0.28%	0.18%	0.07%
	421.5	100.0%	9.39%	7.61%	8.57%

Sub-category average (2002 - 2009 - 67,000 observations) 9.00%

1. Item counts may not equal whole numbers due to averaging.



Discussion:

Confectionary products include candy bar wraps, candy pouches, including other sweet and snack food packaging. Confectionary packaging litter continued to be a significant component of the litter observed in this audit, at 9.4% of total large litter compared to 7.6% observed in 2008 and 8.6% in 2007. The contribution of this sub-category of litter is at the average observed in all audits conducted by the consultant since 2002.

The most significant contributors were candy bar wrappers and gum wrappers which collectively accounted for 73% of the confectionary litter observed in 2009. Confectionary litter observed during the 2009 San Francisco litter audit was slightly higher than the average found in aggregated litter observations in audits performed between 2002 – 2000 in all jurisdictions (9.4 % of total litter in San Francisco vs. 9.0% observed in 67,000 observations).

3.2.10 Textiles

Textiles [1.]

	2009 Items	2009 % of Sub-category	2009 % of Total Large Litter	2008 % of Total Large Litter	2007 % of Total Large Litter
Clothing or clothing pieces	33.5	65.0%	0.75%	0.68%	0.74%
Other cloth	18	35.0%	0.40%	0.23%	0.89%
	51.5	100.0%	1.15%	0.91%	1.63%

Sub-category average (2002 - 2009 - 67,000 observations) =1.3%

1. Item counts may not equal whole numbers due to averaging.

Discussion

In the 2009 litter audit 52 textile items were observed, compared to a 35 items in 2008 and 62 textile items in 2007. The 2009 audit yielded a similar result for textile materials as in 2008 and 2007, confirming that this sub-category is a relatively small contributor to total large litter in the City. The textile litter observed during the 2009 San Francisco litter audit was near the average found in aggregated litter observations in audits performed from 2002 – 2009 in other jurisdictions (1.2% of total litter in San Francisco vs. 1.3% observed in 67,000 combined litter observations).

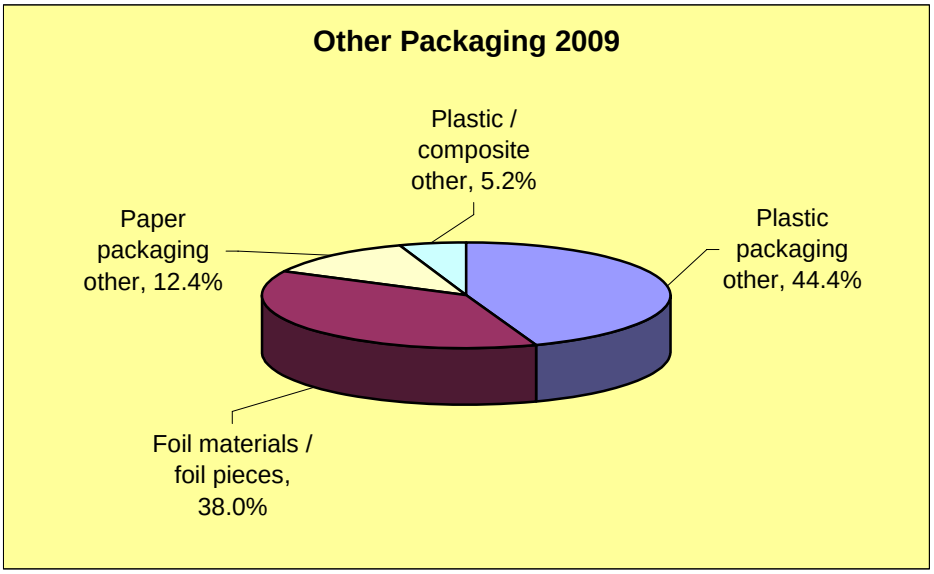
3.2.11 Other Packaging

Other Packaging [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Plastic packaging other	111.5	44.4%	2.48%	1.40%	0.72%
Foil materials / foil pieces	95.5	38.0%	2.13%	1.41%	2.74%
Paper packaging other	31	12.4%	0.69%	0.26%	0.27%
Plastic / composite other	13	5.2%	0.29%	0.23%	0.07%
	251	100%	5.59%	3.30%	3.80%

Sub-category average (2002 - 2009 - 67,000 observations) = 5.6%

1. Item counts may not equal whole numbers due to averaging.



Discussion

This sub-category includes packaging that did not fit into other packaging sub-categories, but were identifiable as packaging litter. This sub-category is a significant contributor of large litter in the City.

The data shows a higher contribution of Other Packaging litter in 2009 as compared to the 2008 and 2007 litter audits. In the 2008 litter audit and the 2007 study, “other packaging” large litter was less than the average found in aggregated litter observations in audits performed between 2002 – 2009 in other jurisdictions (2008 – 3.3% and 2007 - 3.8 % of total litter). In 2009, this sub-category increased to 5.6% of total large litter, equalling the average of observed in 67,000 observations, from all jurisdictions between 2002 and 2009.

A similar result was observed in 2009 compared to 2008, whereby other plastic packaging and foil packaging materials and pieces represent 82% of this sub-category (85% in 2008).

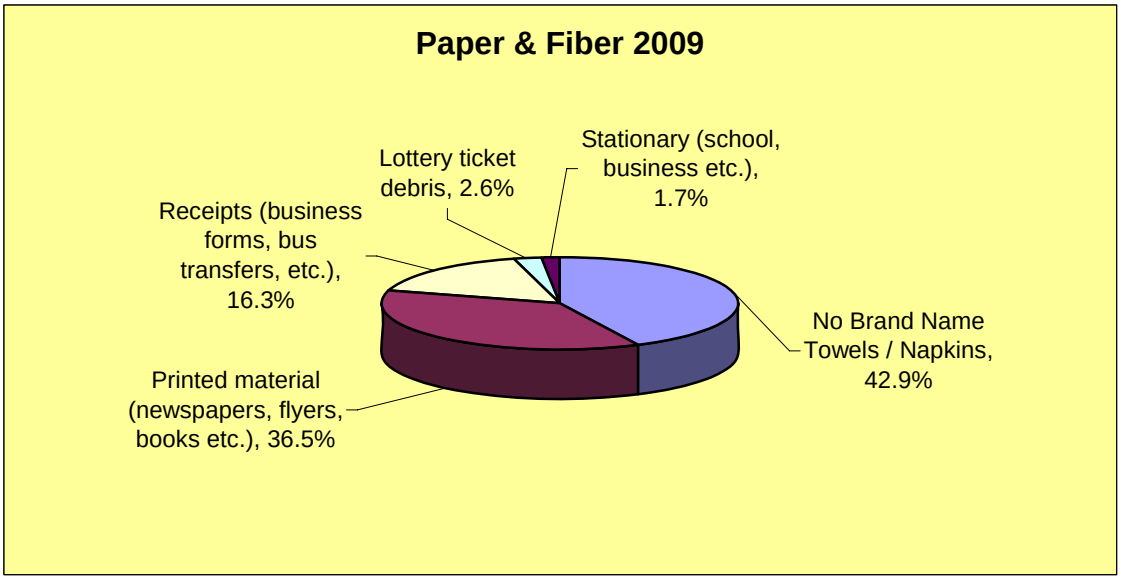
3.2.12 Printed & Fibre Materials

Printed and Fiber Materials [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
No Brand Name Towels / Napkins	438.5	42.9%	9.77%	16.71%	13.00%
Printed material (newspapers, flyers, books etc.)	373.5	36.5%	8.32%	9.56%	7.50%
Receipts (business forms, bus transfers, etc.)	167	16.3%	3.72%	4.19%	5.30%
Lottery ticket debris	26.5	2.6%	0.59%	0.15%	0.80%
Stationary (school, business etc.)	17	1.7%	0.38%	0.64%	0.10%
	1022.5	100.0%	22.78%	31.26%	26.70%

Sub-category average (2002 - 2009 - 67,000 observations) = 19.5%

1. Item counts may not equal whole numbers due to averaging.



Discussion

This sub-category continues to be a significant contributor to large litter in San Francisco. The 2009 audit shows similar results for this sub-category as observed in the 2008, and in 2007. The largest contributor to fiber litter in 2009 continues to be paper napkins or pieces of napkins which could not be directly attributed to the fast food sub-category, because no brand markings were visible. It is likely that a significant proportion of this napkin litter originates from fast food service outlets.

Printed materials including newspaper and flyer litter, printed MUNI tickets and other business receipts are significant contributors to large litter observed in the City. This sub-category exhibits a higher proportion of litter, compared to the average found in aggregated litter observations in audits performed from 2002 – 2009 in other (23 % in San Francisco vs. 19.5% from 67,000 previous observations).

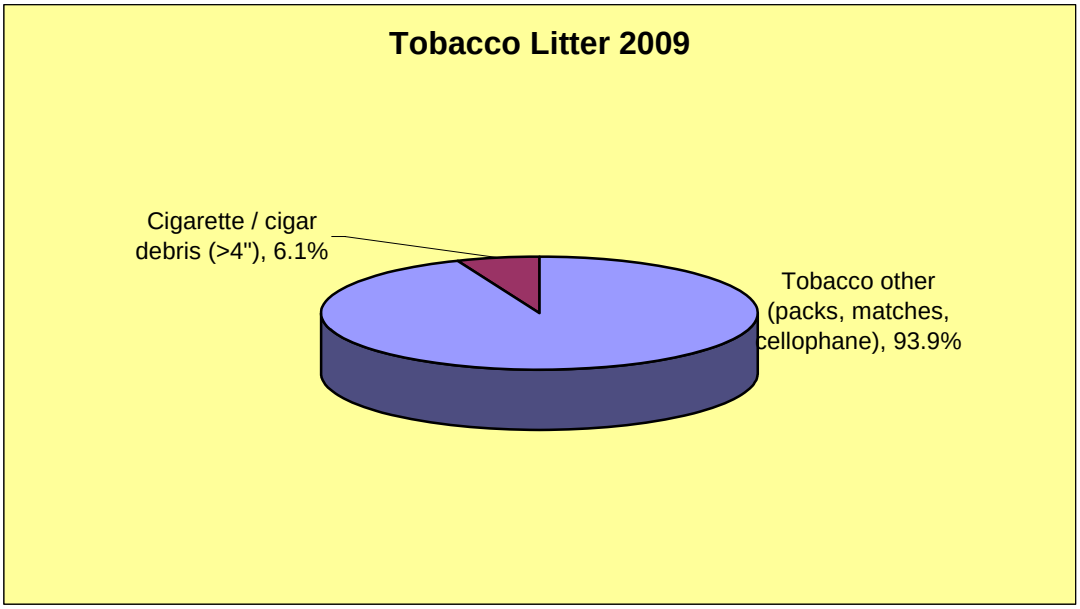
3.2.13 Tobacco

Tobacco Packaging & Materials [1. & 2.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Tobacco other (packs, matches, cellophane)	177	93.9%	3.94%	3.65%	2.89%
Cigarette / cigar debris (>4")	11.5	6.1%	0.26%	0.00%	0.00%
	188.5	100.0%	4.20%	3.65%	2.89%

Sub-category average (2002 - 2009 - 67,000 observations) = 5.1%

1. Item counts may not equal whole numbers due to averaging.
2. Large litter in the tobacco sub-category does not include cigarette butts - which are < 4 sq.in and are included in the analysis of small litter, and Super Site litter that follows in this report



Discussion

The amount of large tobacco litter observed on San Francisco streets was 4.2% of total litter in the 2009 audit, compared to 3.65% of total large litter in 2008. Tobacco packaging and product litter in San Francisco, was observed to be below the average amount of this sub-category found in aggregated litter observations in audits performed from 2002 – 2009 in all jurisdictions (4.2 % of total litter in San Francisco vs. 5.1% observed in 67,000 observations). The reader is directed to the Super Site observations in this report as they appear in Section 5, which comment upon the occurrence of all small litter including tobacco (cigarette butts etc) in an expanded audit procedure. Tobacco products and cigarette butts are a significant contributor to litter on City streets, as they proven to be in most other cities that have conducted litter audits.

3.2.14 Other Miscellaneous

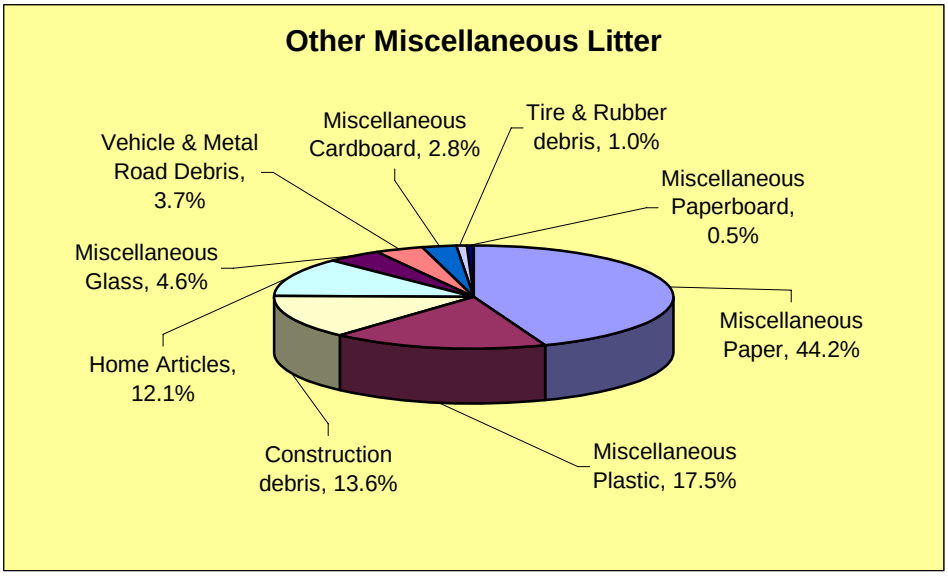
This sub-category is normally the largest sub-category grouping because it includes various miscellaneous material types which cannot be grouped in other categories. The sub-category includes miscellaneous paper, miscellaneous plastic, miscellaneous cardboard, miscellaneous paperboard, miscellaneous glass, vehicle & road debris, tire and rubber debris, construction debris, and home articles.

Other Miscellaneous Materials [1.]

	2009	2009	2009	2008	2007
	Items	% of Sub-category	% of Total Large Litter	% of Total Large Litter	% of Total Large Litter
Miscellaneous Paper	552.5	44.2%	12.31%	7.98%	15.00%
Miscellaneous Plastic	219	17.5%	4.88%	4.67%	9.00%
Construction debris	169.5	13.6%	3.78%	2.58%	0.80%
Home Articles	151	12.1%	3.36%	3.21%	3.80%
Miscellaneous Glass	57	4.6%	1.27%	0.47%	1.70%
Vehicle & Metal Road Debris	46.5	3.7%	1.04%	0.83%	1.10%
Miscellaneous Cardboard	34.5	2.8%	0.77%	0.88%	1.30%
Tire & Rubber debris	13	1.0%	0.29%	1.56%	0.20%
Miscellaneous Paperboard	6	0.5%	0.13%	1.40%	1.60%
	1249	100.0%	27.83%	23.57%	34.50%

Sub-category average (2002 - 2009 - 67,000 observations) = 33.8%

1. Item counts may not equal whole numbers due to averaging.



Discussion:

This sub-category yields the largest segment of large litter observed in the City of San Francisco Litter Audit since it is a sub-category that encompasses much of the unspecific litter observed. In total 1,249 items in this category were observed (28% of all large litter), compared to 937 items in 2008. These results compare to 1,316 Other Miscellaneous litter items which were observed on fewer sites (105) in 2007.

Other Miscellaneous Materials are those that cannot be identified other than by the material type or likely origin of the litter (i.e. home articles, vehicle debris). In the 2009 audit, miscellaneous paper materials accounted for the largest proportion of this sub-category, at 552 large litter items in this sub-category (42% of the sub-category) equalling a significant 12% of the total large litter counted. Miscellaneous plastic material was the next most significant material accounting for 219 items of the sub-category or 4.9% of all the large litter observed.

Miscellaneous paper consists of items of stationary, newspapers, flyers, and often included shredded paper from lawn mowing. This material derives from a plethora of sources, that once weathered or when grass is mowed can be shredded into indistinguishable large litter pieces.

Similar to the 2009 observations, in the 2007 and 2008 audits, miscellaneous paper and miscellaneous plastic represent the two most significant material categories of litter. Because of the nature degradation of paper or plastic litter, it is often not possible for litter auditors to determine what the paper or plastic litter was as an original product or packaging component. Weathering causes the loss of distinguishing features that would allow more positive identification to include the litter in another sub-category. If litter auditors could not positively categorize a piece of paper or plastics litter as belonging to a specific sub-category (i.e. confectionary), then that item was classified that as miscellaneous paper or plastic. These two sub-categories are significant for planners of litter abatement programs, since in aggregate they represent 17% of all large litter in 2009, 13% in 2008, and 24% of all large litter in the 2007 audit. Effective efforts to reduce paper litter and plastic litter would be effective in reducing total litter on City streets. The Other Miscellaneous Material large litter sub-category remains the most significant grouping of litter in 2009, as it was in 2007 and in 2008.

The Other Miscellaneous Materials litter observed in the 2009 litter audit was lower than aggregated litter observations from all audits performed from 2002 – 2009 (28 % of total litter in San Francisco 2009 vs. 34% from 67,000 observations).

4.0 Small Litter Survey Results

4.1 Discussion of Small Litter Results

The categories examined in the litter counts of items less than 4 square inches in size are:

- cigarette butts/ debris
- other tobacco
- bottle caps
- straws
- candy packaging
- polyfoam packing materials
- other polystyrene debris
- glass
- paper
- plastic film
- hard plastic
- aluminum / foil debris
- rubber
- metal (not aluminum)
- other materials
- chewing gum

The small litter methodology requires researchers to count small litter that appears within three slices at a site (transacts). These transacts are three 6 square foot segments of each site (3 x 1 foot by 6 feet). Accordingly, the small litter counts does not record all of the small litter existing on a site, but only a sample of the small litter present. However, the benefit of this method is its rigor. Every site was sampled in the same way. Thus, observations are fair and objective and give a snap shot of small litter at all sites during the litter audit.

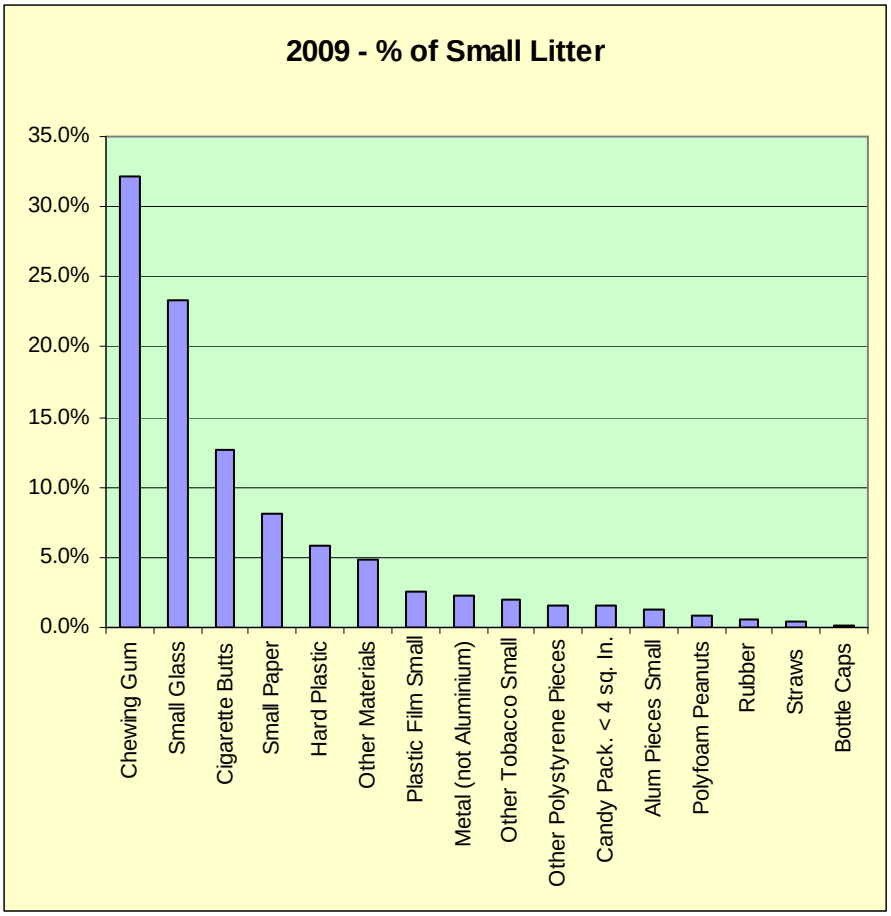
Observations of small litter during the San Francisco litter audit showed a relatively low occurrence of small litter on City streets, as compared other to audits performed by the consultant in other jurisdictions. The 2009 litter audit found more small litter on sites than in was observed in 2008 or 2007. In the 2009 audit the average number of small litter items per site was 26 items accounting for 3,370 items on the 130 sites examined. This compares with results from the 2008 audit in San Francisco where 2,335 items of small litter (18 items per site over 130 sites) and to 2,393 in 2007 (23 items / site observed in 2007 over 105 sites).

In 2009, as observed in 2007 and in 2008, gum deposits on San Francisco streets continue to be the most significant small litter item recorded. This is consistent with other audits performed by the consultant where gum deposits are usually the largest proportion of small litter observed. The other top small litter proportions (i.e. paper, glass, cigarette butts) observed in the San Francisco audit are also consistent with previous audit observations from other jurisdictions.

For a closer examination of small litter observed using an expanded methodology in 2009, see Section 5.0; Super Sites.

Small Litter Summary - SF 2009

Description	2009 Total Small Litter Items Observed	SF 2009 % of Total Small Litter	SF 2008 Total Small Litter Items Observed	SF 2008 % of Total Small Litter	SF 2007 Total Small Litter Items Observed	SF 2007 % of Total Small Litter
Chewing Gum	1082	32.1%	960	41.1%	946	39.5%
Small Glass	787	23.4%	535	22.9%	710	29.7%
Small Paper	271	8.0%	153	6.6%	187	7.8%
Cigarette Butts	425	12.6%	234	10.0%	135	5.6%
Other Materials	162	4.8%	73	3.1%	97	4.1%
Hard Plastic	197	5.8%	85	3.6%	92	3.8%
Plastic Film Small	84	2.5%	33	1.4%	56	2.3%
Other Tobacco Small	67	2.0%	9	0.4%	51	2.1%
Metal (not Aluminium)	77	2.3%	52	2.2%	41	1.7%
Rubber	18	0.5%	10	0.4%	26	1.1%
Alum Pieces Small	44	1.3%	135	5.8%	19	0.8%
Candy Pack. < 4 sq. In.	52	1.5%	36	1.5%	16	0.7%
Polyfoam Peanuts	31	0.9%	2	0.1%	8	0.3%
Other Polystyrene Pieces	54	1.6%	6	0.3%	5	0.2%
Bottle Caps	6	0.2%	8	0.3%	4	0.2%
Straws	13	0.4%	4	0.2%	0	0.0%
	3370	100.0%	2,335	100%	2,393	100%
Number of Sites Audited	132		130		105	
Aver Small Litter per site	26		18		23	



5.0 Super Site – Small Litter Results

5.1 Methodology for Super Site Audits

A new approach to examining small litter was added as an addendum piece of research to the field work activities during the San Francisco litter audit in 2009.

San Francisco Environment requested that the consultant examine 30 sites (32 sites were actually done) to observe ALL small litter and large litter of those sites. This labor intensive approach was added to San Francisco's annual litter audit in an effort to expand the City's knowledge of small litter occurrence on City streets.

The table following summarizes the results of those observations. The client asked that we comment upon the occurrence of small litter with the exclusion of chewing gum deposits from the data, as gum deposits are the result of historic accumulations on side walks and street curb side's, and skew the small litter portion of the results for the Super Site observations.

5.2 Results of Super Site Audits

When we look at the Super Site data with gum excluded we see:

Super Sites - San Francisco - Excluding Gum Deposits

Glass	4,100	37.5%	
Cigarette Butts & Tobacco Other	2,683	24.6%	Top 3 Items
Paper	1,819	16.6%	78.7%
Hard Plastics	720	6.6%	
Candy wrappers	390	3.6%	
Plastic film	328	3.0%	
Metal (not Alum)	263	2.4%	
Aluminum	197	1.8%	
Other Materials	127	1.2%	
Polyfoam pieces	107	1.0%	
Bottle caps	65	0.6%	
Rubber	57	0.5%	
Straws	55	0.5%	
Polyfoam peanuts	16	0.1%	
	10,927	100%	

Cigarette butts and other small tobacco litter (matches, filters, etc) accounted for 2,683 observations or 24.6% of all litter observed at the 32 Super Sites, and were the second most predominant sub-category recorded. Paper pieces were third, at 17% of all litter observed on the Super Sites. These three sub-categories of litter accounted to 78.7% of items observed at the Super Sites.

Along with 10,927 pieces of small litter on the 32 Super Sites, our audit teams recorded 43 large litter tobacco product items (tobacco packaging, wraps, cellophane etc).

This data is supported by observations made by the City of Toronto, in Super Site audits they conducted during three audits 2004 – 2006. Toronto observed 98,819 pieces of small litter on 68 sites. In their data Cigarette Butts & Tobacco, paper and glass represented 73% of small litter on the audit sites examined. This is a reasonable correlation to the San Francisco observations reported here.

SUPER SITE - San Francisco - Small Litter Data 2009 (excluding Gum Deposits)

	Site ID Number	Site Name	Map Coord.	Large Tobacco Packaging Litter Also Observed	1 Cigarette Butts	2 Other Tobacco Small	3 Bottle caps	4 Straws	5 Candy Wrappers	6 Polyfoam Peanuts	7 Polyfoam Pieces	8 Glass	9 Paper	10 Plastic Film	11 Hard Plastic	12 Aluminum	13 Rubber	14 Metal (not Alum.)	15 Other Material	Site Total
	001	Francisco Street	H-82 / A-10	5	328	3	1	4	11	0	0	87	97	12	26	11	2	4	2	588
	005	Jasper Place	D-83 / B-11	5	54	5	1	0	15	0	2	223	90	17	17	15	5	14	0	458
	008	Powell Street	D-83 / B-11		96	20	0	0	8	0	0	39	54	12	10	6	2	1	3	251
	010	The Embarcadero	C-85 / B-12		41	2	0	0	7	3	2	128	65	13	13	4	1	4	1	284
	011	Drum Street	D-85 / B-12	1	24	1	1	0	6	1	2	71	47	6	8	3	2	6	1	179
	013	Fremont Street	F-86 / C-12		126	5	3	4	1	0	0	142	43	4	27	0	2	34	5	396
	015	Montgomery St	E-84 / C-11		55	14	0	0	3	0	0	326	7	15	7	0	2	5	0	434
	017	Taylor Street	E-82 / C-10		187	11	0	0	19	0	23	51	28	9	14	8	2	6	1	359
	022	King Street	H-86 / D-12		59	18	0	0	4	0	5	94	75	11	10	8	2	1	0	287
	024	Russ Street	H-83 / D-11	6	183	13	15	1	15	0	0	204	89	16	55	8	1	5	60	665
	028	McAllister Street	G-82 / D-10		58	12	1	1	7	1	1	131	56	17	4	8	0	3	0	300
	030	Golden Gate Ave.	G-81 / D-10	1	131	2	3	2	6	0	2	54	42	11	7	5	1	5	0	271
	035	Fell Street	H-81/ D-10	1	34	0	2	0	17	0	3	423	40	10	31	5	1	18	2	586
	052	3rd St - S of Cargo Way	H-13		21	2	0	0	9	7	5	68	68	6	9	4	1	4	2	206
	054	Phelps Street	H-12		26	1	2	5	23	0	20	276	49	19	66	9	1	10	1	508
	062	Folsom Street	F-10	3	32	2	2	2	27	0	0	42	86	6	16	8	3	8	2	236
	063	Treat Street	F-10	6	29	4	6	1	20	2	12	98	79	6	18	10	2	17	3	307
	070	Mission Street at Bosworth	J-9		68	4	1	0	19	0	0	27	59	9	37	9	2	5	4	244
	073	Cayuga Avenue	K-8	2	54	1	3	3	36	0	19	413	49	15	43	12	3	4	2	657
	085	Broad Street	L-6	1	85	2	2	6	31	0	2	23	171	21	31	8	4	2	4	392
	087	Vincente Street	H-3		68	3	1	1	8	0	0	43	24	8	8	4	0	0	1	169
	091	Lawton Street	F-3	4	29	4	0	0	7	0	2	35	18	5	15	4	2	5	5	131
	093	Stanyan - N Waller	E-7		211	14	4	5	17	1	0	329	80	8	13	9	2	6	3	702
	095	Ellis Street	D-8	2	84	4	2	7	29	0	4	59	135	31	18	3	2	55	6	439
	104	12th Avenue	D-5		33	4	1	0	11	0	2	49	33	5	13	4	5	2	3	165
	112	3rd St - S of Galvez	H-12	1	87	12	1	4	7	0	0	223	67	4	91	7	0	11	1	515
	113	3rd St - N of Underwood	J-12	4	33	9	3	4	5	0	1	107	26	3	43	5	1	9	0	249
	200	9th Street	H-82 / D-10		112	33	1	0	4	1	0	163	55	12	14	8	1	13	9	426
	205	Hampshire Street	F-11		19	4	3	2	12	0	0	83	18	5	7	5	2	3	1	164
	007	Washington Street	D-81 / B-10	1	31	2	0	0	4	0	0	49	38	9	15	5	2	1	2	158
	Supp 1	Judah / Great Highway			45	3	6	3	2	0	0	37	26	1	28	1	1	2	3	158
	Supp 3	Sloat Rd / Crestlake Drive			25	1	0	0	0	0	0	3	5	2	6	1	0	0	0	43
																				0
																				0
		All Large + Small Tobacco Litter	2,511	43	2,468	215	65	55	390	16	107	4,100	1,819	328	720	197	57	263	127	10,927
					2683															10,927
	32	Total Super Sites			25%		0.6%	0.5%	3.6%	0.1%	1.0%	37.5%	16.6%	3.0%	6.6%	1.8%	0.5%	2.4%	1.2%	100.0%
			Items / site		77	7	2	2	12	1	3	128	57	10	23	6	2	8	4	341

Notes: