Agenda Item #:________________________________

Staff Report
City of Manhattan Beach

TO: Honorable Mayor Montgomery and Members of the City Council

THROUGH: Geoff Dolan, City Manager

FROM: Lindy Coe-Juell, Assistant to the City Manager

DATE: July 1, 2008

SUBJECT: Consideration of an Ordinance to Prohibit the Use of Plastic Carry-Out Bags in Manhattan Beach

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RECOMMENDATION:
Staff recommends that the City Council: 1) review the Initial Study, 2) conduct the public hearing, 3) waive further reading, and 4) introduce Ordinance No. 2115. This ordinance would ban all point-of-sale plastic carry-out bags within the City of Manhattan Beach. This ban would take effect for grocery stores, food vendors, restaurants, pharmacies and City facilities six months after the ordinance is adopted and one year after adoption for all other retail establishments and vendors.

FISCAL IMPLICATION:
There are no direct budget implications related to the Staff recommendation. There will, however, be Staff time involved with outreach and education. Also, though we expect a high rate of compliance, there may be Staff time involved with enforcement issues.

BACKGROUND:
The City Council, as a part of its 2008-2009 Work Plan, asked Staff to investigate and provide information on strategies to ban plastic bag use, including what other cities have done. This report provides information for a discussion of banning plastic carry-out bags used at the point-of-sale.

DISCUSSION:

The Initial Study
In accordance with the California Environmental Quality Act (CEQA) of 1970, after conducting an Initial Study, Staff found that the proposed ordinance would not have a significant effect on the environment and a Negative Declaration has been prepared. The Initial Study is attached to this report for review. Further discussion of environmental impacts related to carry-out bags is provided below.

The Problem
Plastic carry-out bags (or plastic bags) contribute to litter and to have many negative impacts on the environment. Plastic bags were first introduced by retail stores in the United States in 1975 and began to be distributed to customers at the point-of-sale in grocery stores in 1977. Plastic Bags are made

from plastic resin, which is created by taking chemical chains called polymers commonly found in petroleum and natural gas processing, and connecting them together using heat and pressure.[1] Today these bags are ubiquitous in the marketplace because they are light-weight, strong and inexpensive.

According to the California Integrated Waste Management Board (CIWMB), approximately 6 billion plastic bags are consumed in Los Angeles County each year. This number is equivalent to 600 bags per person per year. Plastic bags are recyclable, however less than 5 percent are actually recycled. Research conducted by the County of Los Angeles found that this is largely due to the logistics of sorting, high contamination rates, the tendency of the bags to jam the screens used to separate materials at the recycling facilities, the low quality of plastic used in the bags and the lack of suitable markets for the recycled plastic resin.

Plastic bags have a propensity to become litter and to adversely effect the marine environment. This impact is of particular concern for many people who live in, work in, and visit Manhattan Beach. As a coastal city, we have a strong interest in protecting the marine environment as an element which contributes to the unique quality of life in Manhattan Beach. Due to the expansive and lightweight characteristics of plastic bags, they are easily windblown and end up littering landscaping, streets, streams, storm drain systems and, ultimately, the ocean.

Plastic bags make up a significant portion of the litter found in storm drains and contribute to the vast amount of plastic debris found in the marine environment. A study conducted by the City of Los Angeles in 2004 found that plastic bags made up 25 percent of the litter cleaned from 30 storm drain catch basins by weight and 19 percent by volume. A primary problem with plastic is that it does not biodegrade. Plastic goes through a process called photodegredation, where sunlight breaks the material down into smaller and smaller pieces that remain in the marine environment for many years. A study cited by the California Coastal Commission found an average of 334,271 pieces of plastic per square mile in the North Pacific Central Gyre, which serves as a natural eddy system where debris accumulates.[2] Other research has found that broken, degraded plastic pieces outweigh surface zooplankton in the North Pacific Central Gyre by a factor of 6 to 1.[3]

Although the impacts of plastic bags on the ecosystem are not precisely quantified, reports[4] have documented the numerous health impacts on wildlife attributed to plastic carry-out bag litter. Plastic bags pose a particular problem for wildlife that mistake the bags for food, and as a result, ingest the bags thereby choking, starving or suffocating. Whales and birds often swallow plastic bags

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[1]LA County Staff Report, "An Overview of Carryout Bags in Los Angeles County", August 2007.

[2]Moore, C.J., S. L. Moore, M.K. Leecaster, and S.B. Weisberg, 2001. A comparison of plastic and plankton in the North Pacific Central Gyre. In: "The Problem with Marine Debris, California Coastal Commission Public Education Program, www.coastal.ca.gov/publiced/marinedebris.html June 16, 2008).

[3]"Pelagic Plastic", The Agalita Marine Research Foundation, www.algalita.org/pelagic_plastic.html.

[4]"Marine Debris Facts", National Oceanic and Atmospheric Administration, www.marinedebris.noaa.gov (June 16, 2008).
"Pelagic Plastic", citation above.
"The Problem with Marine Debris", citation above.
"Plastics in Our Oceans", Woods Hole Oceanographic Institution, www.whoi.edu/science/B/people/kamaral/plasticsarticle.html, (June 16, 2008).
"Marine Debris", Ocean Conservancy, www.oceanconservancy.org/site/PageServer?pagename=issues_debris (June 24, 2008).

inadvertently during feeding. Turtles swallow the bags since they resemble their main food source, jellyfish. Plastic pieces have also been shown to contain additives such as PCBs, DDT and nonylphenols and in turn can seep into marine animals that inadvertently ingest them, which endangers their health and potentially impacts the larger food chain.[5]

Bag Alternatives

The primary alternatives to plastic bags are reusable bags (made from cloth or other durable materials) and paper bags. Reusable and paper bags are widely available in the marketplace and are currently being used at grocery stores, restaurants and other retail stores. Biodegradable plastic bags are not a viable option for Southern California even though they have been considered as an alternative to plastic bags in cities such as San Francisco and Oakland. Northern California has the commercial composting facilities needed to process biodegradable bags; however, these types of facilities are not available in our area.[6] Additionally, the biodegradable bags have the same lightweight and inflatable qualities as regular plastic bags that allow them to become windblown and litter the environment.

Reusable bags are the best alternative for several reasons. Accelerating the widespread use of reusable bags would conserve energy and natural resources, reduce the total volume of waste disposed in landfills, diminish plastic bag litter and help to promote a clean and sustainable environment. Many people have already begun to carry and use reusable bags. Most grocery stores and large retails stores have reusable bags available for purchase and some offer incentives for customers that bring their own reusable bags. For example, Ralphs grocery stores offers a $0.05 refund per reusable bag.

We expect that an ever greater number of people will begin turning to the option of reusable bags given the growing awareness of environmental issues and the demand for change. However, it is a fair assumption that more paper bags will be used if plastic bags are banned, especially soon after the ban is passed and before people have had time to adjust. The primary concern of many people in our community regarding plastic bags is the impact they have on the marine environment. Unlike plastic bags, paper bags do biodegrade in the water. They are heavier and so are not easily blown by the wind. They are made from renewable resources (especially if recycled paper content is used) and have a higher recycling rate, estimated at 21 percent by the US EPA.

Life Cycle Assessment Information

Much attention has been directed toward studies that have reported Life Cycle Assessments[7] for plastic versus paper bags. LCAs can be a useful tool for evaluating a range of energy and materials

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[5] A Brief Analysis of Organic Pollutants Absorbed to Pre and Post Production Plastic Particles from the Los Angeles and San Gabrial River Watersheds, C.J. Moore, G.L. Lattin, A.F. Zellers, Algalita Marine Research, Long Beach, CA.

[6] Biodegradable bags will break down under properly maintained composting conditions, they will not break down quickly enough in the marine environment to avoid impacts to wildlife. They also have the potential to contaminate plastic recycling programs and will cause the same problems, with clogging recycling screens, at sorting facilities as do the regular plastic bags.

[7] As defined by the US EPA, a Life Cycle Assessment (LCA) is a technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by: compiling an inventory of relevant energy and material inputs and environmental releases; evaluating the potential environmental impacts associated with identified inputs and releases; and interpreting the results to help you make a more informed decision.

used and wastes released from a product lifecycle, but they are limited in terms of assumptions made by the researchers and the quality of data used as input. Also, the LCAs that compare paper and plastic bags do not address the direct impact these bags have on the marine environment. In our community, the impact to the marine environment is the primary concern that motivated the consideration of a policy to ban plastic bags. Further, the paper versus plastic environmental impact debate becomes less and less meaningful if one believes that our environmentally conscience community will begin to take reusable bags for their shopping rather than rely on paper or plastic bags provided at the store.

Staff reviewed several paper versus plastic LCA studies,[8] and have included all of the studies we reviewed as attachments to this report for independent review. We have summarized the findings of a comparative report prepared by the Department of Trade and Industry in the Republic of South Africa. The authors of this report examined two studies with similar goals—to compare the LCA of paper and plastic—but differing results. In our overall review of the LCA studies, we found that assumptions, such as the number of plastic bags compared to paper bags that are used to hold an equivalent amount of goods, varied from study to study. Other factors such as the amount of post-consumer recycled content included in the bags that were studied also varied, or were not explicitly described. We observed that differing results from the reports could be selectively used to lend support to proponents of either plastic or paper bags.

The first LCA study reviewed in the South African report was prepared by the consulting firm Franklin Associates and was commissioned by the Council for Solid Waste Solutions in 1990.[9] Although this report is 18 years old, it is often cited in articles related to the paper versus plastic debate. The second LCA study was prepared by an Independent Swedish Environmental Consulting Group and was published in the year 2000.

It is interesting to note that some of the findings from the two reports (energy used, air emissions and water emissions) were directly contradictory. The Franklin Associates study showed that plastic had

[8] "Paper or Plastic", Washington Post.com, http://www.washingtonpost.com/wp-dyn/content/graphic/2007/10/03/GR2007100301385.html?referrer=emaillink (June 25, 2008).

The ULS Report, "Review of Life Cycle Data Relating to Disposable, Compostable, Biodegradable, and Reusable Grocery Bags", March 2008.

Franklin Associates, LTD., "Resource and Environmental Profile Analysis of Polyethylene and Unbleached Paper Grocery Sacks", June 1990.

Fund for Research into Industrial Development, Growth and Equity (FRIDGE), "Socio-Economic Impact of the Proposed Plastic Bag Regulations", chapter 3 lifecycle analysis accessed from the City of San Francisco website at http://www.sfenvironment.org/downloads/library/asticlifecycleanalysis.pdf.pdf

Boustead Consulting & Associates, "Life Cycle Assessment for Three Types of Grocery Bags - Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper, June 2007.

AEA Technology Environment, Scottish Executive Report, "Proposed Plastic Bag Levy - Extended Impact Assessment Final Report, June 2005.

[9] According to www.sourcewatch.org The Council for Solid Waste Solutions was a Washington D.C. based organization that later evolved into the American Plastics Council and then merged with the American Chemistry Council.

the least environmental impact in these categories and the Environmental consulting firm study found that paper had the least environmental impact in the same categories. Other categories of impact were not considered by one report or the other.

The overall conclusion of the South African report was that LCA results are sensitive to and limited by factors such as scope, objectivity, geography, climate, and energy sources. They also concluded that any LCA can be constructed to carry a specific message by carefully selecting the impacts to examine.

Table 1: LCA Findings from the South African Report

Impact Category	Study 1: Franklin Associates	Study 2: Swedish Environmental Consulting Group
Primary Energy	Plastic uses 23.08% less	Paper uses 80% less
Solid Waste	Plastic uses 75.68% less	Category not considered
Abiotic Resource Depletion	Category not considered	Paper depletes 85% less
Global Warming	Category not considered	Paper contributes 95.69% less
Acidification	Category not considered	Paper contributes 53.79% less
Nutrient Enrichment	Category not considered	Plastic contributes 55.36% less
Ozone Formation	Category not considered	Paper contributes 64.04% less
Aquatic Ecotoxicity	Category not considered	Paper contributes 37.04% less
Air Emissions	Plastic contributes 57.45% less	Paper contributes 52.23% less
Water Emissions	Plastic contributes 96.58% less	Paper contributes 28.79% less

Economic Analysis

There are a wide range of factors including size, composition (for example, the percentage of recycled content), quantity ordered and style that impact the cost to a retailer for purchasing different kinds of bags. In general, plastic bags are less expensive than paper bags. However, the cost impact to store owners for a change from plastic to paper bags will depend largely on the quantity of bags used and the style of paper bag selected. The cost to a grocery store or a large retailer for a standard size paper bag will be different than the cost to a boutique store owner that chooses to use a stylized, and perhaps logo-branded, bag. Although there is not one standard finding that we can present, we have attempted to provide information and several examples by which to gage cost impacts to local businesses.

<u>Bag Costs</u>

- In the report titled "An Overview of Carryout Bags in Los Angeles County", the County of Los Angeles found the plastic bags range 2 to 5¢ per bag; and paper bags range 5 to 23¢ per bag.
- A local retail store owner reported that the plastic bags ordered for the store range 13 to 18¢ per bag and that the paper bags ordered range 42¢ to $1.13 per bag.

<u>Bags Used</u>

- A local restaurant owner reported that the restaurant provides approximately 1,000 plastic carry-out bags per year to customers.
- Based on information from a local retail store owner, a retail store provides approximately 12,000 carry-out bags per year to customers.
- A local grocery store manager reported that historically the store provided approximately 3,000,000 plastic bags to customers per year. This manager also reported that many more customers than in the past are brining their own bags (approximately 1/3 of customers currently bring their own bag).

Cost Differences

- Based on the bag costs reported by the County and a local retail store owner, plastic bags range from 2 to 18¢ per bag; and paper bags range from 5¢ to $1.13 per bag.
- The low point price difference between a plastic and paper bag is 3¢. The high point price difference between a plastic and paper bag is 95¢.
- For a local restaurant owner that uses approximately 1,000 plastic carry-out bags per year, the approximate cost difference to switch from plastic to paper would range from $30 to $950. If one assumes that most restaurants would not use a stylized, high-end paper bag, the price difference would probably be at the lower end of the scale.
- For a local retail owner that uses approximately 12,000 plastic carry-out bags per year (assuming that they currently use plastic bags exclusively and no paper bags), the approximate cost difference to switch from plastic to paper would range from $360 to $11,400.
- For a grocery store that uses approximately 3,000,000 plastic carry-out bags per year (assuming that this amount will not decrease with more people brining their own reusable bags and using the price difference of 3¢ for a basic lower end plastic bag to a basic lower end paper bag), the approximate cost difference to switch from plastic to paper bags would be $90,000 per year.

Policy Alternatives

Several U.S. Cities and many Countries have adopted various policy strategies from fees to voluntary programs to reduce the consumption of plastic bags. Of these strategies, per bag fees have been shown to be particularly effective.

The Ireland PlasTax Case Study

In March 2002, Ireland became the first Country to introduce a plastic tax, or "PlasTax" at the rate of 20 (U.S.) cents. Ireland's tax resulted in a 90 percent reduction in the consumption of plastic bags. The monies received from the tax are earmarked for a green fund established to benefit the environment. Although the per bag fees have been shown to be effective in reducing plastic bag consumption, that option is not available in California due to current state law.

State Law Concerning Bag Fees

The California State Legislature enacted Assembly Bill 2449, which took effect on July 1, 2007. This law requires retail stores that have over 10,000 square feet and a licensed pharmacy or supermarkets with gross annual sales of $2 million or more to provide customers the option to return clean plastic carry-out bags for recycling. It also requires these stores to make reusable bags available to customers for purchase. Additionally, and of importance to local governments, AB 2449 prohibits a city, county or other public agency from imposing a per bag fee on plastic bags.

The Legislature is considering a new measure, AB 2058 (Levine), that would establish a diversion/recycling benchmark[10] and require the defined stores (same definition as AB 2449) to

[10] AB 2058 states that stores must demonstrate to the California Integrated Waste Management Board that, in comparison to the number of plastic carryout bags provided by the store to customers and subjected to diversion in the 2007 calendar year, at least 70 percent more plastic carryout bags provided by the store to customers during the 12-month period ending on December 31, 2010, and annually thereafter, have been subjected to diversion. Diversion, for the purposes of AB 2449, is defined as a reduction in the volume of plastic carry out bags provided to customers and an increase in the volume of plastic carryout

charge a fee of at least 25 cents per plastic bag if the diversion rate is not met by July 2011. The bill would also require the defined stores to charge 25 cents per paper bag distributed after July 2011.

Due to the fact that AB 2058 limits the affected stores to those that meet the definition of a retail store that has over 10,000 square feet and a licensed pharmacy and a supermarket that has gross annual sales of $2million or more, it would not apply to most stores in Manhattan Beach that distribute plastic and/or paper carry-out bags to customers at the point of sale.

Voluntary Reduction Programs

On January 22, 2008, the Los Angeles Board of Supervisors voted to reduce plastic bag use by enacting voluntary reductions of 30 percent and 65 percent by 2010 and 2013 respectively. If these targets are not met by the deadlines, a mandatory ban may be implemented. Although this is a step in the right direction for improving recycling rates, international experience shows that voluntary programs may not be effective in reducing plastic bag litter. In 2002, the Australian federal government began a voluntary initiative to reduce plastic bag consumption by 50 percent and plastic bag litter by 75 percent by 2005. After retailers had spent $50 million on education efforts, recycling rates did increase but there was no change in the amount of plastic bag litter. In January 2008, the Australian federal government announced plans to eliminate the use of plastic carry-out bags by the end of 2008, in part because the voluntary program did not achieve the desired results.

Examples of Plastic Bag Ban Policies

Other Countries that have banned plastic bags include Taiwan, Kenya, Rwanda, Bangladesh, Germany, Sweden and China. Within California, the Cities of San Francisco and Oakland have passed ordinances to ban the distribution of non-biodegradable plastic bags.[11] The San Francisco ordinance applies only supermarkets with gross annual sales of two million dollars or more or retail pharmacies with at least five locations in the City under the same ownership. The Oakland ordinance applies to retail establishments, excluding restaurants, with gross annual sales of one million dollars or more. On May 12, 2008, Malibu became the first City in California to ban point-of-sale plastic bags (both compostable and non-compostable) at all retail establishments.[12] The City of Santa Monica is considering a comprehensive plastic bag ban similar to the Malibu ban.

The San Francisco bag ban took effect for large supermarkets in November 2007 and for pharmacies in May 2008. According to a representative with the Environmental Division in the City of San Francisco, they have experienced a very high rate of compliance. In addition to banning non-compostable plastic bags their ordinance requires that paper bags must have 40% recycled content. All but one grocery store was in compliance before the effective date of the ban in terms of eliminating non-compostable plastic bags and in providing the 40% post-consumer recycled paper bags. Staff worked with the one remaining store, which met compliance shortly after the ban took effect. They are experiencing similar cooperation with the pharmacies.

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bags recycled. The diversion rate considered to comply with AB 2449 will include any combination of an individual store, a chain of stores under common ownership, diversion within a city, county or region, within the entire state.

[11]As mentioned in the Discussion section of this report, appropriate commercial composting facilities are available in Northern California making the use of biodegradable bags a viable alternative.

[12]Malibu’s ban will take effect for grocery stores, food vendors restaurants, pharmacies and city facilities in December 2008; and will take effect for all remaining retail establishments, vendors and non-profit vendors in June of 2009.

After passing their ordinance, the City of Oakland was sued by the "Coalition to Support Plastic Bag Recycling" on CEQA grounds. The Superior Court for the County of Alameda has issued a tentative decision granting petition for a writ of mandate. Oakland has suspended their ban and is in the process of developing a response. See Attachment H for the full Superior Court tentative decision.

Conclusion

Staff recommends that the City Council adopt Ordinance No. 2115, which would ban all point-of-sale plastic carry-out bags within the City of Manhattan Beach. This ban would take effect for grocery stores, food vendors, restaurants, pharmacies and City facilities six months after the ordinance is adopted and one year after adoption for all other retail establishments and vendors. Staff believes that this ban is the best policy alternative to address the concern regarding plastic bag litter and its impact on the marine environment.

As discussed above, reusable bags are the best alternative for conserving energy and natural resources, for reducing the total volume of waste disposed in landfills, and to help promote a clean and sustainable environment. The City Council could consider a plastic bag ban as the first step toward encouraging the use of reusable bags. If the City Council decides to adopt Ordinance No. 2115, Staff will begin an aggressive education and outreach campaign to inform our residential and business community of the ban and to promote the use of reusable bags. Among the outreach activities, we will advertise in local papers, post information on our website, distribute information at upcoming public events and include the information in our City-wide newsletter.

As an additional step, the City Council could consider a fee or tax to be required for paper bags. The State law that prohibits government agencies from implementing a fee for plastic bags does not extend to paper bags. The City of Santa Monica is currently studying this issue and developing options for implementation. If the City Council is interested in investigating a paper bag fee or tax, Staff would return at a later date with more information.

Through our education and outreach campaign, we would work with business groups like the Chamber of Commerce, the Downtown Business and Professional Association and the Village Mall. The Executive Directors of the Chamber and the Downtown Business and Professional Association have expressed support for the ordinance. As an initial outreach step, the President of the Chamber of Commerce sent an email to the Chamber's membership asking if they would support a ban on plastic bags in Manhattan Beach. As of Friday afternoon, 86 businesses had responded; 70 are in favor of the ban, 10 are opposed to the ban and 6 were uncertain.

Based on the support expressed by members of our community we expect to have a high rate of compliance with this point-of-sale plastic bag ban. However, we will plan to provide warnings and work with businesses to promote awareness of the ban before moving to enforcement through citations. We have also included an exemption clause in the ordinance whereby businesses that show the ban would cause undue hardship may be granted a one-year extension to comply by the City Manager.

Part of the evolving, and improving, awareness of environmental stewardship includes the idea of the "four R's": reduce, reuse, recycle and *rethink*. The ultimate goal of our outreach campaign will be to reach people on the importance of changing behavior by switching to reusable bags for carrying goods in order to make a positive and sustainable collective impact on the environment.

ALTERNATIVES:

1. Adopt Ordinance No. 2115 to prohibit the use of plastic carry-out bags in Manhattan Beach.
2. Provide other direction.

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ATTACHMENTS:

A. Initial Study, in accordance with CEQA, for Ordinance No. 2115
B. Public Notice in the June 12, 2008 Beach Report of the Hearing to Consider Ordinance No. 2115
C. Ordinance No. 2115
D. Emails in Support of Ordinance No. 2115
E. Emails in Opposition of Ordinance No. 2115
F. Letters in Support of Ordinance No. 2115
G. Letters in Opposition of Ordinance No. 2115
H. Superior Court Tentative Decision in the Oakland Case
I. City of Malibu Staff Report Dated May 12, 2008
J. Materials Regarding the Use and Impact of Plastic Carry-Out Bags
K. Formal Objections by the Save the Plastic Bag Coalition
L. Life Cycle Assessment Reports

Attachment A:

Initial Study for the Manhattan Beach Municipal Code Amendment to Prohibit Single-Use Plastic Carry-Out Bags at Commercial Establishments

CITY OF MANHATTAN BEACH
PROPOSED NEGATIVE DECLARATION

In accordance with the California Environmental Quality Act of 1970, as amended, and the City of Manhattan Beach CEQA Guidelines, the Community Development Department after conducting an Initial Study found that the following project would not have a significant effect on the environment and has instructed that this Negative Declaration be prepared.

1. **Project Title**: Municipal Code Amendment to Prohibit Single-Use Plastic Carry-Out Bags at Commercial Establishments

2. **Project Location**: Citywide

3. **Project Description**: Prohibit Issuance of Plastic Bags with Purchased Merchandise at all Manhattan Beach Commercial Establshments.

4. **Support Findings**: Based upon the Initial Study, which is attached hereto and made a part hereof, it is the finding of the Community Development Department that the above mentioned project is not an action involving any significant environmental effects.

Prepared by the Community Development Department on June 11, 2008

Richard Thompson, Director of Community Development

INITIAL STUDY/ENVIRONMENTAL CHECKLIST

FOR THE

MANHATTAN BEACH MUNICIPAL CODE AMENDMENT TO PROHIBIT SINGLE-USE PLASTIC CARRY-OUT BAGS AT COMMERCIAL ESTABLISHMENTS

Prepared by:

City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, California 90266

June 2008

INITIAL STUDY, ENVIRONMENTAL CHECKLIST

1.	**Project Title:**	Municipal Code Amendment to Prohibit Single-Use Plastic Carry-Out Bags at Commercial Establishments	
2.	**Lead Agency Name and Address:**	City of Manhattan Beach 1400 Highland Ave. Manhattan Beach, California 90266	
3.	**Contact Person and Phone Number:**	Mr. Eric Haaland Community Dev. Dept (310) 802-5511	Lindy Coe-Juell Assistant to the City Manager (310) 802-5054
4.	**Project Location:**	Citywide	
5.	**Project Sponsor's Name and Address:**	Same as Lead Agency	
6.	**General Plan Designations:**	Various	
7.	**Zoning:**	Various	
8.	**Project Description**	Prohibit Issuance of Plastic Bags with Purchased Merchandise at all Manhattan Beach Commercial Establishments	
9.	**Surrounding Land Uses And Setting**	Neighboring South Bay Cities composed of residential, commercial, public/semi-public, and industrial uses.	
10.	**Approvals Required**	Ordinance Approval: City of Manhattan Beach City Council	
11.	**Other Public Agencies Whose Approval Is Required**	None	

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages:

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation / Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

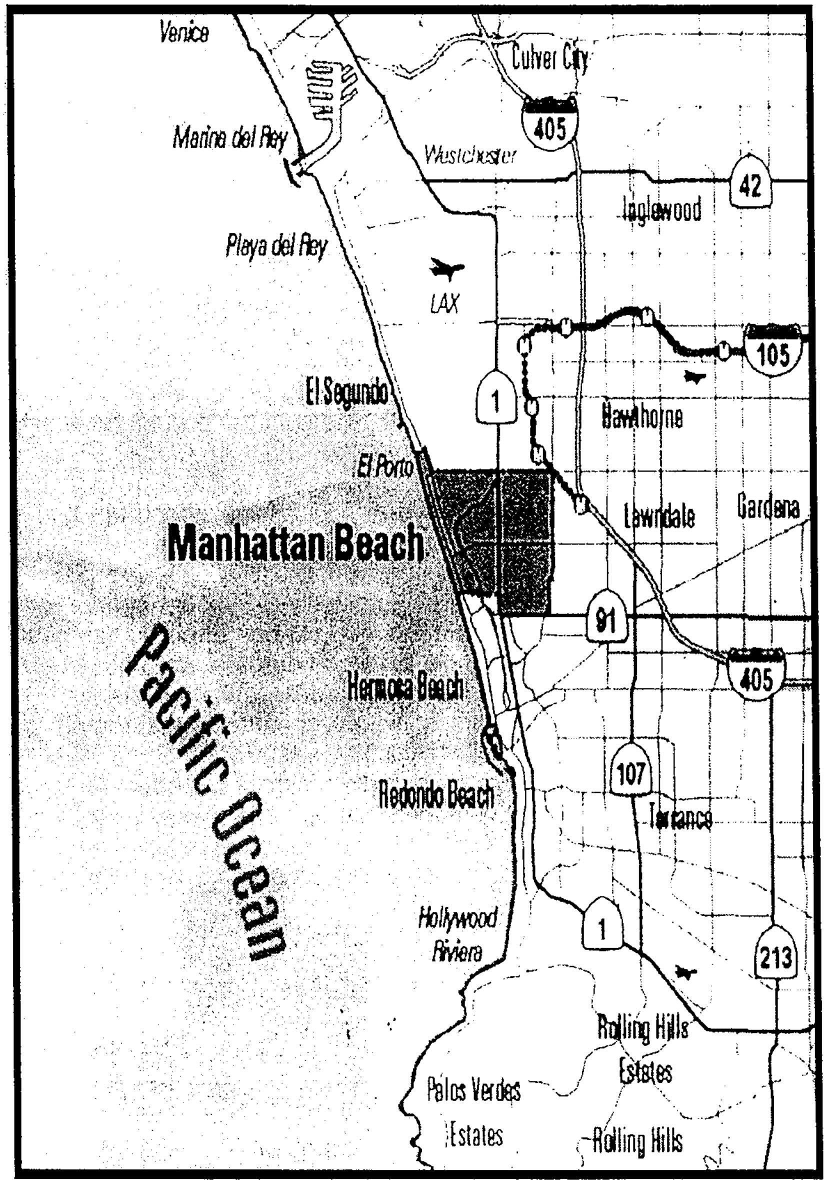
☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been address by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Eric Haaland (signature)	6/11/08
Signature	Date
Eric Haaland	Associate Planner
Printed Name	

For: Richard Thompson
Community Development Director,
City of Manhattan Beach
1400 Highland Avenue.
Manhattan Beach, California 90266
(310) 802-5000

FIGURE 1 – REGIONAL LOCATION MAP



Detailed Project Description

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF MANHATTAN BEACH, CALIFORNIA, ADDING A NEW SECTION 5.88.010 TO A NEW "ENVIRONMENTAL REGULATIONS" CHAPTER 5.88 TO TITLE 5 OF THE MANHATTAN BEACH MUNICIPAL CODE PROHIBITING THE USE OF PLASTIC CARRY-OUT BAGS

Earlier Analysis

The California Environmental Quality Act (CEQA) (Guidelines Section 15063(c)(3)(D)) permits earlier analysis to be used where a CEQA document has adequately analyzed an effect. No earlier analysis had adequately analyzed the project's potential effects and as such, no earlier analysis was utilized.

References

California Air Resources Board, *The 2001 California Almanac of Emissions & Air Quality* (2001).

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California Department of Water Resources, *California's Groundwater*, Bulletin 118 (October 2003).

California Code of Regulations, Title 14 Chapter 3, *Guidelines for California Environmental Quality Act* (2004). (Short Title: State CEQA Guidelines [14 CCR 3, Section 15001])

California Government Code, Section 65962.5.

California Public Health and Safety Code, Section 5097.98

California Public Resources Code Division 13, *Environmental Quality*, Sections 21000-21178, 2004.

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South Coast Air Quality Management District, *CEQA Handbook*, 1993.

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City of Manhattan Beach, *Local Coastal Program Land Use Plan Amendment*, Adopted January 1994.

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California Environmental Quality Act, CEQA Guidelines, 2004

An Overview of Carryout Bags in Los Angeles County, A staff report to the Los Angeles County Board of Supervisors, August 2007.

National Oceanic and Atmospheric Administration, Marine Debris Program, http://marinedebris.noaa.gov/

California Integrated Waste Management Board, http://www.ciwmb.ca.gov/Plastic/

Agalita Marine Research Foundation, http://www.algalita.org/research.html

"Pelagic Plastics", www.algalita.org/pelagic_plastic.html

Moore, C.J., Lattin, G.L., Zellers, A.F.,.Working Our Way Upstream: A Snapshot of Land-based Contributions of Plastic and other Trash to Coastal Waters and Beaches of Southern California., 2005

Moore, C.J., Lattin, G.L., Zellers, A.F., *A Brief Analysis of Organic Pollutants Sorbed to Pre and Post-Consumer Plastic Particles from the Los Angeles and San Gabriel River Watersheds*, 2005

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Ordinance No. 2115, An Ordinance of the City of Manhattan Beach, California, establishing a ban on plastic carry-out shopping bags Citywide.

REPORT PREPARERS

Lead Agency: City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, CA 90266

INITIAL STUDY CHECKLIST

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers, except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factor as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis.)

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiring, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) *Earlier Analysis Used.* Identify and state where they are available for review.

   b) *Impacts Adequately Addressed.* Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures, which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and

   b) the mitigation measure identified, if any, to reduce the impact to less than significance.

ENVIRONMENTAL CHECKLIST

I AESTHETICS	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway corridor?	☐	☐	☐	X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	X
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☐	☐	☐	X

Explanation of Checklist Judgments:

I(a-d). **No Impact:** Plastic bags are a significant component of litter in the environment due to their durability and light weight. The City of Los Angeles conducted a waste characterization study in June 2004 and found that plastic bags made up 25 percent by weight, and 19 percent by volume, of litter found in 30 storm drain catch basins. Often, plastic shopping bags are white or brightly colored, creating a significant eyesore throughout the community, which is currently aesthetically detrimental. Adoption of a prohibition of single-use plastic carry-out bags would prohibit plastic shopping bags Citywide, thereby decreasing the amount of plastic bags that become litter and improving visual aesthetics. The project would not adversely affect any scenic vistas, damage scenic resources, degrade existing visual character, and will not create a source of substantial light or glare. Therefore, no impact is anticipated and no further investigation is required.

II AGRICULTURE RESOURCES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	X
c). Involve other changes in the existing environment that due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	X

Explanation of Checklist Judgments:

II(a-c). **No Impact:** The proposed project involves the adoption of an ordinance which would ban plastic shopping bags Citywide, and will have no impact on land designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, or land within a Williamson Act contract. Therefore, no impact is anticipated and no further investigation is required.

III **AIR QUALITY**	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?		☐	☐	X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?		☐	☐	X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?		☐	X	☐
d) Expose sensitive receptors to substantial pollutant concentrations?		☐	☐	X
e) Create objectionable odors affecting a substantial number of people?		☐	☐	X

Explanation of Checklist Judgments:

III(a,b). **No Impact:** The proposed project involves the adoption of an ordinance which would ban plastic shopping bags Citywide. The project would not conflict or obstruct the implementation of the applicable air quality plan nor violate any air quality standards in the City.

III(c). **Less Than Significant Impact:** There is a potential that the banning of plastic bags in the City of Manhattan Beach may result in an increase in paper bag usage. The proposed ordinance does require that all paper bags used in the City at point of sale be at least composed of 40% recyclable material. However, it is well documented that the manufacture and distribution of paper bags can consume more energy than plastic bags. This increased use of energy could have an impact on the environment by increasing emissions from power plants and possibly from trucks carrying the heavier, bulkier paper bags.

However, the banning of plastic bags by political subdivisions is not widespread. In California only San Francisco, Oakland and Malibu have enacted such bans and Oakland's was invalidated by a court. San Francisco's ban does not include biodegradable plastic bags and so will not displace all plastic bag usage.

The population of Manhattan Beach is only 33,852 according to the 2000 census. However, per capita bag usage would provide an inflated measurement of any net increase in paper bag use since the proposed ordinance does not ban the use of plastic bags by residents but their distribution at point of sale. Only 11.2% of the City is zoned commercial and there are only 217 licensed retail establishments within the City which might use plastic bags. There are only two supermarkets, three (and two future) drug stores, and one Target store known to be high volume users of plastic shopping bags in the City which would be affected by the ban. The remaining businesses tend to be smaller and lower volume and many restaurants and most fast food outlets already use paper bags for take out orders.

Plastic bags would not be replaced by paper bags on a one to one ratio since paper bags have a higher capacity. One study (commissioned by the plastic bag industry) estimates that for every 1500 plastic bags it would take 1000 paper bags to replace them. Other studies find that paper bags may hold up to four times the volume of plastic bags. In light of anticipated education efforts, increased publicity (partially resulting from the subject ordinance), and the public's increased concern for pollution and water quality, at least some percentage of plastic bags are expected to be replaced by reusable bags rather than paper bags.

Based on the foregoing it appears that any increase in the total use of paper bags resulting from the proposed ban on plastic bags in Manhattan Beach (and even considering it as a cumulative increase from the bans in Malibu and San Francisco) would be relatively small with a minimal or nonexistent increase in energy consumption. Therefore, the project should not conflict with nor obstruct AQMP implementation, and no further investigation is required.

III(d,e). **No Impact:** The project would not expose sensitive receptors to substantial pollutant concentrations or create objectionable odors.

IV **BIOLOGICAL RESOURCES**	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.	☐	☐	☐	X
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.	☐	☐	☐	X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	☐	☐	☐	X

e)	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	X
f)	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	X

Explanation of Checklist Judgments:

IV(a-e). **No Impact:** The project consists of the adoption of an ordinance which would ban plastic shopping bags, thereby decreasing the prevalence of plastic bag litter in the marine environment in and near the City. The proposed project is not expected to result in any impacts to federally protected wetlands. It is not expected to substantially interfere with the movement of any native resident or migratory fish or wildlife species or impact any native wildlife nursery sites. The proposed project does not conflict with any local policies protecting biological resources, or conflict with any adopted Habitat Conservation Plan, Natural Community Conservation Plan or other local or regional conservation plans.

Plastic debris is a major pollutant of coastal waters. In the Pacific Ocean there exists a huge accumulation of debris know as the "Great Pacific Garbage Patch" or "Plastic Soup." This is an accumulation of mostly plastic debris drawn by currents to accumulate in the area of the northern Pacific Ocean known as the "North Pacific Gyre". Some scientists estimate the density of plastic in this region at one million pieces of plastic per square mile. Plastic does not biodegrade so over the past two decades this mass has been growing. Some studies show that plastic photo-degrades breaking into smaller pieces and making its way into the food chain via animals such as jellyfish.

While it may be difficult to ascertain the exact numbers of marine life which perish every year due to ingestion of or choking on plastic debris there are numerous anecdotal accounts of marine life being discovered with plastic debris in their stomachs or clogging their breathing apparatus.

Reducing the use of plastic bags in Manhattan Beach will have only a modest positive impact on the migration of plastic refuse into the ocean. However, as a coastal City the imposition of the ban is likely to have some modest impact on improving water quality and removing a potential biohazard from the marine environment. The proposed project would not result in substantial adverse effect, directly or through habitat modification on any species identified as a candidate, sensitive or special species. The adoption of the ordinance would not adversely affect riparian habitats or other sensitive natural communities identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service. A prohibition of single-use plastic carry-out bags is anticipated to result in a positive effect on species and habitats. No impacts to listed species or habitat plans are anticipated, and no further investigation is required.

Consequently, no impacts to biological resources are anticipated. No further investigation is required.

V CULTURAL RESOURCES		Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project.					
k)	Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines §15064.5?	☐	☐	☐	X
l)	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☐	X
m)	Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☐	☐	X
n)	Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	X

Explanation of Checklist Judgments:

V(a-d). **No Impact:** The proposed project involves the adoption of an ordinance to ban plastic shopping bags Citywide and does not include any development or alterations of physical sites or structures. The project would not result in substantial adverse change to a historical resource or archaeological resource. The project would not directly or indirectly destroy a unique paleontological resource or site, nor disturb any human remains, including those interred outside of formal cemeteries. Consequently, there is no impact and no further research is necessary.

VI GEOLOGY AND SOILS		Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:					
a)	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	X
	ii) Strong seismic ground shaking?	☐	☐	☐	X
	iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	X
	iv) Landslides?	☐	☐	☐	X
b)	Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	X
c)	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	X
d)	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risk to life or property?	☐	☐	☐	X

e)	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

Explanation of Checklist Judgments:

VI(a-e) **No Impact:** The project does not include any development; therefore, the project would not expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, liquefaction, landslides, or substantial soil erosion or loss of top soil. A prohibition of single-use plastic carry-out bags would not result in future development that would be located on a geologic unit or soil that is unstable, or that would become unstable, or result in offsite landslide, lateral spreading, subsidence, liquefaction or collapse as a result of the project. No further investigation is required.

VII	**HAZARDS AND HAZARDOUS MATERIALS**	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:					
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

Explanation of Checklist Judgments:

VII(a-h). **No Impact:** The project involves the adoption of an ordinance to ban plastic shopping bags in the City of Manhattan Beach and does not cause increased use, disposal or disruption of hazardous materials or create a public or safety hazard or affect existing emergency response plans or routes. The City is not within an airport land use plan or within two miles of a public airport and the project would not create or result in a safety hazard for people residing or working in the project area. The proposed ordinance would not affect emergency procedures or result in exposure of people or structures to a significant risk of loss, injury or death involving wildland fires. No associated impacts are anticipated, and no further investigation is required.

	VIII HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
	Would the project:				
a)	Violate any water quality standards or waste discharge requirements?	☐	☐	☐	X
b)	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	X
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site?	☐	☐	☐	X
d)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site?	☐	☐	☐	X
e)	Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.	☐	☐	☐	X
f)	Otherwise substantially degrade water quality?	☐	☐	☐	X
g)	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	X
h)	Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	X
i)	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	X
j)	Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	X

Explanation of Checklist Judgments:

VIII(a-j). **No Impact:** The proposed project does not involve any development; therefore, would not violate water quality standards or water discharge requirements. Furthermore, the proposed reduction of plastic bag usage would not generate increased use of groundwater, alter existing drainage patterns, increase surface water runoff, or degrade water quality. The project does not involve placing structures within a 100-year flood hazard area or impede and redirect flood flow. The project would not expose people or structures to a significant risk of loss, injury or death involving flooding, or inundation by seiche, tsunami or mudflow. The proposed project is anticipated to have a positive impact on water quality by reducing the potential for plastic bags entering storms drains and the ocean from the Manhattan Beach area.

There is a potential that the banning of plastic bags in the City of Manhattan Beach may result in an increase in paper bag usage. The proposed ordinance does require that all paper bags used in the City at point of sale be at least composed of 40% recyclable material. However, it is well documented that the manufacture and recycling of paper generates more wastewater than plastic bags. This increased use of energy could have an impact on the environment by increasing emissions from paper mills and recycling plants.

However, the banning of plastic bags by political subdivisions is not widespread. In California only San Francisco, Oakland and Malibu have enacted such bans and Oakland's was invalidated by a court. San Francisco's ban does not include biodegradable plastic bags and so will not displace all plastic bag usage. Malibu is a City of only 12,575 with an extremely small retail component within its boundaries.

The population of Manhattan Beach is only 33,852 according to the 2000 census. However, per capita bag usage would provide an inflated measurement of any net increase in paper bag use since the proposed ordinance does not ban the use of plastic bags by residents but their distribution at point of sale. Only 11.2% of the City is zoned commercial and there are only 217 licensed retail establishments within the City which might use plastic bags. There are only two supermarkets, three (and two future) drug stores, and one Target store known to be high volume users of plastic shopping bags in the City which would be affected by the ban. The remaining businesses tend to be smaller and lower volume and many restaurants and most fast food outlets already use paper bags for take out orders.

Plastic bags would not be replaced by paper bags on a one to one ratio since paper bags have a higher capacity. One study (commissioned by the plastic bag industry) estimates that for every 1500 plastic bags it would take 1000 paper bags to replace them. Other studies find that paper bags may hold up to four times the volume of plastic bags. In light of anticipated education efforts, increased publicity (partially resulting from the subject ordinance), and the public's increased concern for pollution and water quality, at least some percentage of plastic bags are expected to be replaced by reusable bags rather than paper bags.

Plastic debris is a major pollutant of coastal waters. In the Pacific Ocean there exists a huge accumulation of debris know as the "Great Pacific Garbage Patch" or "Plastic Soup." This is an accumulation of mostly plastic debris drawn by currents to accumulate in the area of the northern Pacific Ocean known as the "North Pacific Gyre." Some scientists estimate the density of plastic in this region at one million pieces of plastic per square mile. Plastic does not biodegrade so over the past two decades this mass has been growing. Some studies show that plastic photo-degrades breaking into smaller pieces and making its way into the food chain via animals such as jellyfish. Reducing the use of plastic bags in Manhattan Beach will have only a modest positive impact on the migration of plastic refuse into the ocean. However, as a coastal City the imposition of the ban is likely to have some modest impact on improving water quality or at least preventing it from degenerating as quickly.

Based on the foregoing it appears that any increase in the total use of paper bags resulting from the proposed ban on plastic bags in Manhattan Beach (and even considering it as a cumulative increase from the bans in Malibu and San Francisco) would be relatively small with a minimal or nonexistent increase in pollutants generated from production and recycling. This is counterbalanced by a modest reduction in plastic refuse being generated in a coastal region.
No further investigation is required.

Consequently, no impacts to hydrology and water quality are anticipated. No further investigation is required.

	IX LAND USE AND PLANNING	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
	Would the project:				
a)	Physically divide an established community?	☐	☐	☐	X
b)	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	X
c)	Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	X

Explanation of Checklist Judgments:

IX(a). **No Impact:** The proposed project involves the adoption an ordinance which would ban plastic shopping bags Citywide. The project does not physically divide an established community. No further investigation is required.

IX(b-c). **No Impact:** The proposed ordinance would not conflict with any applicable land use plan and policy or conflict with any habitat or natural community conservation plans. Furthermore, it would complement the water pollution policies of the City of Manhattan Beach Local Coastal Program to protect marine resources by decreasing the prevalence of plastic shopping bag litter. The project would result in beneficial impacts to litter prevention efforts Citywide. No further investigation is required.

X MINERAL RESOURCES	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact

Would the project:					
a)	Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?				X
b)	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

Explanation of Checklist Judgments:

X(a,b). **No Impact:** The proposed project is the adoption of an ordinance and does not affect known state, regional, or local mineral resources. No impacts to mineral resources are anticipated. Consequently, no impact or interference with mineral recovery will result, and no further investigation is required.

XI	<u>NOISE</u>	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project result in:					
a)	Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b)	Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?				X
c)	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f)	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

Explanation of Checklist Judgments:

XI(a-d). **No Impact:** The project would not expose people to, or generate, noise levels in excess of standards established in the General Plan Noise Element or the Manhattan Beach Noise Ordinance. The proposed ordinance would not expose people to excessive ground vibration or result in a substantial permanent or a temporary increase of ambient noise. No further investigation is required

XI(e,f). **No Impact:** The proposed ordinance is effective Citywide, but will not cause any additional exposure to airport noise. The Manhattan Beach City limits are not located within two miles of an airport or near an airstrip; therefore, no impacts are anticipated. Consequently, no airport-related noise impacts are anticipated, and no further investigation is required.

XII **POPULATION AND HOUSING**	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

Explanation of Checklist Judgments:

XII(a-c). **No Impact:** The proposed project includes the adoption of an ordinance and would not increase, decrease, or otherwise affect population or local population growth rates. Therefore, no impacts to population or housing would occur as a result of the proposed project. No further investigation is required.

XIII **PUBLIC SERVICES**	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project: result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services?				
a) Fire protection?				X
b) Police protection?				X
c) Schools?				X
d) Parks?				X
e) Other public facilities?			X	

Explanation of Checklist Judgments:

XIII(a-d). **No Impact:** The proposed project is the adoption of an ordinance to ban plastic shopping bags Citywide and does not involve Public Safety, School, or Recreation services. No further investigation is required.

XIII(e). **Less than Significant Impact:** The implementation of the ordinance will involve enforcement and education outreach to residents and business owners by administrative City staff. The implementation of the ordinance is anticipated to involve comparable staff resources to similar ordinances previously adopted by the City of Manhattan Beach. Any impacts to government services and facilities are anticipated to be less than significant, and no further investigation is required.

XIV	RECREATION	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a)	Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b)	Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

Explanation of Checklist Judgments:

XIV(a,b). **No Impact:** The proposed project is the adoption of an ordinance and would not increase the use of recreational facilities. The project does not require the construction or expansion of recreational facilities or otherwise affect existing recreational facilities. No further investigation is required.

XV	TRANSPORTATION/TRAFFIC	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:					
a)	Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system. (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			X	☐
b)	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?			X	☐
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?			X	☐
d)	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e)	Result in inadequate emergency access?				X
f)	Result in inadequate parking capacity?				X
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X

Explanation of Checklist Judgments:

XV(a-c). **Less than Significant Impact:** The proposed project involves the adoption of an ordinance to ban plastic shopping bags Citywide and would not directly affect current traffic loads, the street system capacity, existing levels of service, or air traffic patterns. There is a potential that the banning of plastic bags in the City of Manhattan Beach may result in an increase in paper bag usage which have more mass per square foot compared to plastic and may increase traffic involved in shipping paper bags to retail establishments. The ordinance will require those paper bags to have 40% recycled content encouraging reduced use with increased costs for single-use bags, and education programs will be launched to encourage patrons to choose and use reusable bags, and thereby reduce total use of single-use bags.

While some shipping traffic increases may result, the banning of plastic bags by political subdivisions is not widespread. In California only San Francisco, Oakland and Malibu have enacted such bans and Oakland's was invalidated by a court. San Francisco's ban does not include biodegradable plastic bags and so will not displace all plastic bag usage. Malibu is a City of only 12,575 with an extremely small retail component within its boundaries.

The population of Manhattan Beach is only 33,852 according to the 2000 census. However, per capita bag usage would provide an inflated measurement of any net increase in paper bag use since the proposed ordinance does not ban the use of plastic bags by residents but their distribution at point of sale. Only 11.2% of the City is zoned commercial and there are only 217 licensed retail establishments within the City which might use plastic bags. There are only two supermarkets, three (and two future) drug stores, and one Target store known to be high volume users of plastic shopping bags in the City which would be affected by the ban. The remaining businesses tend to be smaller and lower volume and many restaurants and most fast food outlets already use paper bags for take out orders.

Based on the foregoing it appears that any increase in the total use of paper bags resulting from the proposed ban on plastic bags in Manhattan Beach (and even considering it as a cumulative increase from the bans in Malibu and San Francisco) would be relatively small with a minimal or nonexistent increase in truck traffic.

XV(d-f). **No Impact:** The project is the adoption of an ordinance, and does not include any development; therefore, no increase in traffic hazards, impacts to emergency access or parking capacity are anticipated.

XV(g). **No Impact:** The project would not conflict with adopted policies, plans, or programs supporting alternative transportation. No further investigation is required.

XVI UTILITIES AND SERVICE SYSTEMS	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?		☐	☐	X

XVI UTILITIES AND SERVICE SYSTEMS		Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e)	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			X	
g)	Comply with federal, state, and local statutes and regulations related to solid waste?				X

Explanation of Checklist Judgments:

XVI(a-e). **No Impact:** The proposed project involves the adoption an ordinance to ban plastic shopping bags Citywide. The adoption of the proposed ordinance would not affect wastewater treatment requirements of the Regional Water Quality Control Board or result in construction of a new water or wastewater treatment facility or expansion of existing facilities. The project does not require any additional water supply or wastewater capacity. No further investigation is required.

XVI(f). **Less Than Significant Impact:** While the ordinance would ban plastic shopping bags, it would allow paper bags to be used Citywide. The ordinance will require those paper bags to have 40% recycled content reducing landfill demand and encouraging reduced use with increased costs for paper bags. Since the substituted paper bags can also become litter, education programs will be launched to encourage patrons to choose and use reusable bags, and thereby reduce total use of single-use bags. The substitution of paper bags for plastic that does occur, although larger in mass per square foot compared to plastic, would not significantly impact landfill capacity since a larger portion of paper bags is recycled than plastic, substituted paper bags will be at least 40% paper diverted from landfills, and the City of Manhattan Beach represents a small proportion of regional landfill users. No further investigation is required.

XVI(g). **No Impact:** The proposed ordinance complies with federal, state, and local statues and regulations related to solid waste. No further investigation is required.

XVII MANDATORY FINDINGS OF SIGNIFICANCE		Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
Does the project:					
a)	Does the project have the potential to degrade the quality of the environment. substantially reduce the habitat of a fish or wildlife species. cause a fish or wildlife population to drop below self-sustaining levels. threaten to eliminate a plant or animal community. reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☐	X
c)	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	X

Explanation of Checklist Judgments:

XVII(a-c). **No Impact:** The proposed project involves the adoption of an ordinance to ban plastic shopping bags and does not include any development. The proposed ordinance does not have the potential to degrade the quality of the environment or substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop, or threaten to eliminate a plant or animal community. The project would not eliminate important examples of the major periods of California history or prehistory. The project would not have environmental effects or substantial adverse effects on human beings, either directly or indirectly. Furthermore, the proposed ordinance would decrease the prevalence of plastic bag litter in the marine environment, which adversely impact marine wildlife. The proposed ordinance would decrease the prevalence of plastic bag litter in the City.

Attachment B:

Public Notice of the Hearing to Consider ORDINANCE NO. 2115

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PUBLIC NOTICE | PUBLIC NOTICE | PUBLIC NOTICE | PUBLIC NOTICE | PUBLIC NOTICE | PUBLIC NOTICE

June 12, 2008

NOTICE TO CONTRACTORS INVITING BIDS

CITY OF REDONDO BEACH

NOTICE IS HEREBY GIVEN that sealed proposals for performing the following described work will be received at the office of the City Clerk of the City of Redondo Beach, 415 Diamond Street, Door C, Redondo Beach, California, until **10:00 a.m. on July 2, 2008.** Thereafter said bids will be publicly opened and read in the City Clerk's office of said City.

PACIFIC COAST HIGHWAY AT SAPPHIRE STREET-S. FRANCISCA AVENUE TRAFFIC CALMING PROJECT JOB NO. 40570

The work includes excavation, curb and gutter, sidewalk, ADA curb ramps, detector loops, pedestrian push button, traffic signal standard removal and installation, and other items on the plans and specifications.

The estimated cost of this work is $ 120,000.

Bidders shall have an active **Class A** license from the Contractor's State License Board at the time of submitting bid.

Bidders and subcontractors must pay the general prevailing rates of per diem wages in the Redondo Beach area for each craft, classification or type of workman needed to execute the contract. Copies of the wage rates, as established by Resolution of the City Council, are on file in the Engineering Services Division of City Hall and available for inspection by any interested person.

Ten percent of the payments due to the successful Contractor shall be withheld by City as retention for performance security, but the Contractor may substitute securities for said retention pursuant to Section 7.04 of the General Conditions.

If the Project includes the construction of a pipeline, sewer, sewage disposal system, boring and jacking pits, or similar trenches or open excavations, which are five feet or deeper, the bid shall contain, as part of the lump sum bid package, adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life or limb, which shall conform to all applicable safety laws, rules, regulations and orders.

If the Bidder is awarded the contract, the contract shall be terminated and the bid bond forfeited if the Bidder fails to provide the applicable insurance certificates and bonds within the time set forth in Section 21 of the Instructions to Bidders.

Published as The Beach Reporter No. 6248,
June 12, 2008

CITY OF MANHATTAN BEACH
NOTICE OF A PUBLIC HEARING BEFORE THE CITY COUNCIL TO CONSIDER A MUNICIPAL CODE AMENDMENT REGARDING THE PROHIBITION OF SINGLE-USE PLASTIC CARRY-OUT BAGS IN ALL COMMERCIAL ESTABLISHMENTS AND NOTICE OF INTENT TO ADOPT NEGATIVE DECLARATION

A public hearing will be held before the City Council of the City of Manhattan Beach for the project described below.

Applicant: City of Manhattan Beach
Project Location: Citywide

Project Description: The proposed Amendment would revise the Manhattan Beach Municipal Code to prohibit retail commercial establishments from providing plastic bags to customers with purchased merchandise.

Environmental Determination: In accordance with the provisions of the California Environmental Quality Act (CEQA) as amended by the City of Manhattan Beach CEQA Guidelines, an Initial Environmental Study (IES) has been prepared. Based upon the analysis provided in the IES, the Community Development Department has determined that the project is not an action involving any significant environmental impact and therefore a Negative Declaration is proposed.

Project Contact: Lindy Coe-Juell, Assistant City Manager, lcoe-juell@citymb.info or 310-802-5054

Public Hearing Date: Tuesday, July 1, 2008
Time: 6:30 p.m.
Location: Council Chambers, City Hall, 1400 Highland Avenue, Manhattan Beach

Further Information: Proponents and opponents may be heard at that time. Further information may be obtained from the Project Contact. The proposed Negative Declaration is available for review at the Community Development Dept. in City Hall. A Staff Report will be available for review on the City website at http://www/citymb.info at 5:00pm on Friday, June 27, 2008 and at City Hall on Monday, June 30, 2008.

Public Comments: Oral and written testimony will be received during the public hearing. Anyone wishing to provide written comments for inclusion in the Staff Report must do so by June 23, 2008. Comments received after this date will be forwarded to the City Council at or prior to the meeting

If you challenge the proposed actions in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this Notice, or in correspondence delivered to the City Council at, or prior to, the public hearing.

LIZA TAMURA
City Clerk

Publish: June 12, 2008 – Beach Reporter

Published as The Beach Reporter No. 6252,
June 12, 2008

RESOLUTION NO. 6141

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MANHATTAN BEACH, CALIFORNIA, DECLARING ITS INTENTION TO PROVIDE FOR ANNUAL LEVY AND COLLECTION OF ASSESSMENTS FOR CERTAIN STREET LIGHTING MAINTENANCE IN AN EXISTING MAINTENANCE DISTRICT, PURSUANT TO THE PROVISIONS OF DIVISION 15, PART 2, OF THE STREETS AND HIGHWAYS CODE OF THE STATE OF CALIFORNIA, AND SETTING A TIME AND PLACE FOR PUBLIC HEARING THEREON

WHEREAS, this City Council has previously formed a Lighting District pursuant to the provisions of Division 15, Part 2, of the Streets and Highways Code of the State of California, being the "Landscaping and Lighting Act of 1972," for a maintenance district to be known and designated as LANDSCAPING AND STREET LIGHTING MAINTENANCE DISTRICT NO. 99 (hereinafter referred to as the "District"); and

WHEREAS, there has been presented and preliminarily approved by the City Council, the Engineer's Report as required by law, and at this time, this City Council finally approves the Report; and

WHEREAS, at this time, this City Council is desirous of continuing with proceedings for the annual levy of assessments for the next ensuing fiscal year, to provide for the costs and expenses necessary for continued maintenance of improvements within said District.

NOW, THEREFORE, IT IS HEREBY RESOLVED BY THE CITY COUNCIL OF THE CITY OF MANHATTAN BEACH, CALIFORNIA, AS FOLLOWS:

SECTION 1. That the above recitals are all true and correct.

SECTION 2. Public Interest

A. That the public interest and convenience requires, and it is the intention of this Council to undertake proceedings for the annual levy and collection of special assessments for the continual maintenance of certain lighting, all to serve and benefit said District as said area is shown and delineated on a map as previously approved by this City Council and on file in the office of the City Clerk, open to public inspection, and herein so referenced and made a part hereof.

B. That the improvements to be maintained are substantially the same as for the previous fiscal year and reference is hereby made to said proceedings, and there are not substantial changes proposed to be made in any existing improvements or maintenance thereof.

C. That in all zones within the District, except Zone 10, the costs of street lighting for the 2008-2009 year shall be allocated to property owners within the District based upon an Equivalent Dwelling Unit parcel method more completely described in the Report. In Zone 10, the cost will continue to be allocated using the adjusted front footage method.

SECTION 3. Report. That the Report of the Engineer regarding the annual levy for said District, which Report is for the maintenance for the fiscal year 2008-2009 is hereby approved and is directed to be filed in the office of the City Clerk.

SECTION 4. Assessment. That the public interest and convenience requires, and it is the intention of this City Council to order the annual assessment levy for the District as set forth and described in said Engineer's Report, and further it is determined to be within the best public interest and convenience to levy and collect annual assessments to pay the costs and expenses of said maintenance and improvements as estimated in said Report.

SECTION 5. Description of Maintenance. The assessments which are to be levied and collected shall be for the maintenance of certain lighting as set forth in the Engineer's Report referenced and incorporated herein.

SECTION 6. County Auditor. The County Auditor shall enter on the County Assessment Roll the amount of the assessments and shall collect said assessments at the time and in the same manner as county taxes are collected. After collection by the County, the net amount of the assessment, after the deduction of any compensation due to the County for collection, shall be paid to

SECTION 7. Special Funds. That all monies collected shall be deposited in the previously established fund known as STREET LIGHTING FUND. Payment shall be made out of said fund only for the purpose provided for in this Resolution, and in order to expedite the making of this maintenance and improvement, the City Council may transfer into said special fund, money from any available source, such funds as it may deem necessary to expedite the proceedings. Any funds shall be repaid out of the proceeds of the assessments provided for in this Resolution.

SECTION 8. Boundaries of District. Said contemplated maintenance work is, in the opinion of this City Council, of direct benefit to the properties within the boundaries of the District, and this City Council makes the costs and expenses of said maintenance chargeable upon the District, which District said City Council hereby declares to be the District benefited by said improvements and maintenance, and to be further assessed to pay the costs and expenses thereof. Said District shall include each parcel of land within the boundaries of said District as said District is shown in a map as approved by this City Council and on file in the Office of the City Clerk and so designated by the name of the District.

SECTION 9. Public Property. Any lot or parcels of land known as public property, as the same are defined in Section 22663 of Division 15, Part 2, of the Streets and Highways Code of the State of California, which are included within the boundaries of the Maintenance District, shall be omitted and exempt from any assessment to be made under these proceedings to cover any of the costs and expenses of said maintenance work.

FICTITIOUS BUSINESS NAME STATEMENT

File No. 20080957287. The following person is doing business as RAVEN NALIKA ROSE / SACRED PLAY, 1718 Esplanade, Redondo Beach, CA., 90277, Neeta Dave', 1718 Esplanade, Redondo Beach, CA., 90277. This business is conducted by an individual. Registrant has not yet

FICTITIOUS BUSINESS NAME STATEMENT

File No. 20080957523. The following person is doing business as AESLEHC MORTGAGE, 15705 Hawthorne Blvd. Suite H, Lawndale, CA., 90260, Los Angeles, Aeslehc Inc., 7319 Hazeltine Ave., #7, Van Nuys, CA., 91405, California. This business is conducted by a corporation. Registrant has not yet

FICTITIOUS BUSINESS NAME STATEMENT

File No. 20080957522. The following person is doing business as TRI WES MORTGAGE LENDING, 15705 Hawthorne Blvd. Suite H, Lawndale, CA., 90260, Los Angeles, Aeslehc Inc., 7319 Hazeltine Ave. #7, Van Nuys, CA., 91405, California. This business is conducted by a corpo-

STATEMENT OF ABANDONMENT OF USE OF FICTITIOUS BUSINESS NAME

The following person has abandoned the use of the fictitious business name: CREPES SANS, FRONTIERES, 4412 Ventura Cayon Ave, Sherman Oaks,

Attachment C:

ORDINANCE NO. 2115

ORDINANCE NO. 2115

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF MANHATTAN BEACH, CALIFORNIA, ADDING A NEW SECTION 5.88.010 TO A NEW "ENVIRONMENTAL REGULATIONS" CHAPTER 5.88 TO TITLE 5 OF THE MANHATTAN BEACH MUNICIPAL CODE PROHIBITING THE USE OF PLASTIC CARRY-OUT BAGS

THE CITY COUNCIL OF THE CITY OF MANHATTAN BEACH, CALIFORNIA, DOES ORDAIN AS FOLLOWS:

SECTION 1. The City Council of the City of Manhattan Beach hereby finds as follows:

A. As a coastal city Manhattan Beach has a strong interest in protecting the marine environment an element which contributes to the unique quality of life in the City;
B. Plastic and paper bags each have negative impacts on the environment. It is well known that paper bags require more energy to manufacture and recycle and generate effluent during these processes. It is also known that paper bags are bulkier and heavier than plastic bags.
C. However a primary and significant problem with plastic bags is that they do not biodegrade and are extremely light and easily caught in the wind. In a coastal city like Manhattan Beach even plastic bags which are properly discarded can find their way into the marine environment where they do not break down and essentially remain indefinitely.
D. The Pacific Ocean contains a huge accumulation of debris known as the "Great Pacific Garbage Patch" which consists mostly of plastic debris. Some scientists estimate the density of plastic in this garbage patch as one million pieces of plastic per square mile. While plastic does not bio-degrade it does "photo-degrade" breaking down into smaller pieces which can make their way into the food chain vis such animals as jellyfish.
E. While the exact numbers are unknown there are many reported instances of marine animals being injured or dying from ingesting or choking on plastic debris in the ocean. It is reasonable to conclude from such information that the presence of plastic debris in the ocean provides a hazard for marine life.
F. Because there is a strong possibility that plastic bags discarded in Manhattan Beach can end up in the ocean where they will last indefinitely and create an aesthetic blight and potential hazard to marine life (and paper bags will not do so because they biodegrade and are less likely to be blown out to sea) it is in the best interests of the public health, safety and welfare to adopt the proposed ban on distribution of plastic bags at point of sale within the boundaries of the City of Manhattan Beach.
G. The City Council of the City of Manhattan Beach conducted a noticed public hearing regarding the project at their regular scheduled meeting of July 1, 2008. The public hearing was advertised pursuant to applicable law and testimony was invited and received.
H. An Initial Environmental Study was prepared in compliance with the provisions of the California Environmental Quality Act. Based upon this study it was determined that the project is not an action involving any significant impacts upon the environment, and a Negative Declaration was prepared and is hereby adopted.
I. The proposed amendments will have no negative impact on Fish and Game resources pursuant to Section 21089(b) of the Public Resources Code.

SECTION 2. A new Section 5.88.010 is hereby added to a new Chapter 5.88 "Environmental Regulations" in Title 5 of the Manhattan Beach Municipal Code to read as follows:

"CHAPTER 5.88 ENVIRONMENTAL REGULATIONS"

Section 5.88.010 Prohibition Of Plastic Carry-Out Bags

(a). Definitions:

For purposes of this chapter, the following terms shall have the following meanings:

"Affected Retail Establishment" means any retail establishment located within or doing business within the geographical limits of the City of Manhattan Beach.

"City Sponsored Event" means any event organized or sponsored by the City of Manhattan Beach or any Department of the City of Manhattan Beach.

"Customer" means any person obtaining goods from an Affected Retail Establishment, Vendor or Non-Profit Vendor.

"Grocery Store" means any dealer in staple foodstuffs, meats, produce and dairy products and usual household supplies.

"Non-Profit Vendor" means a recognized tax exempt organization which provides goods as a part of its services.

"Person" means any natural person, firm, corporation, partnership or other organization or group however organized.

"Pharmacy" means a retail use where the profession of pharmacy by a pharmacist licensed by the State of California in accordance with the Business and Professions Code is practiced and where prescription medications are offered for sale.

"Plastic Carry-Out Bag" or "Plastic Bag" means any bag made from plastic (including compostable and biodegradeable plastic), excluding reusable bags, provided by an Affected Retail Establishment, Vendor or Non-Profit Vendor to a customer at the point of sale for the purpose of carrying away goods.

"Recyclable" means material that can be sorted, cleansed, and reconstituted using Manhattan Beach's available recycling collection programs for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, converting, or otherwise thermally destroying solid waste.

"Recyclable Paper Bag" means a paper bag that meets all of the following requirements: (1) contains no old growth fiber; (2) is 100% recyclable overall and contains a minimum of 40% post-consumer recycled content; and (3) displays the words "Reusable" and "Recyclable" in a highly visible manner on the outside of the bag.

"Retail Establishment" means any commercial business facility that sells goods directly to the ultimate consumer including but not limited to grocery stores, pharmacies, liquor stores, "mini-marts," and retail stores and vendors selling clothing, food and personal items.

"Reusable Bag" means a bag with handles that is specifically designed and manufactured for multiple reuse and is either: (1) made of cloth or other machine washable fabric; or (2) made of other durable material suitable for reuse.

"Vendor" means any store, shop, restaurant, sales outlet or other commercial establishment located within or doing business within the City of Manhattan Beach, which provides perishable or non-perishable goods.

(b). Plastic Carry-Out Bags Prohibited

A. No Affected Retail Establishment, Restaurant, Vendor or Non-Profit Vendor shall provide Plastic Carry-Out Bags to customers at the point of sale. Reusable Bags and Recyclable Paper Bags are allowed alternatives.

B. Nothing in this section shall be read to preclude Affected Retail Establishments, Restaurants, Vendors and Non-Profit Vendors from making Recyclable Paper Bags available to customers.

C. Affected Retail Establishments are strongly encouraged to provide incentives for the use of Reusable Bags through education and through credits or rebates for customers that use Reusable Bags at the point of sale for the purpose of carrying away goods.

D. No person shall distribute Plastic Carry-Out Bags at any City facility or any event held on City property.

E. This Chapter shall apply only to Plastic Carry-Out Bags provided at the point of sale for the purpose of carrying away goods. This Chapter shall not apply to single-use plastic produce bags distributed in a grocery store exclusively for the purpose of transporting produce to the point of sale.

(c). Exemption.

The City Manager, or his or her designee, may exempt an Affected Retail Establishment, Vendor or Non-Profit Vendor from the requirements of this Chapter for a period of up to one additional year after the operative date of this Ordinance, upon sufficient showing by the applicant that the provisions of this Chapter would cause undue hardship. The phrase undue hardship includes:

A. Situations where there are no acceptable alternatives to Plastic Carry-Out Bags for reasons which are unique to the Retail Establishment, Vendor or Non-Profit Vendor;

B. Situations where compliance with the requirements of this Code would deprive a person of a legally protected right."

SECTION 3. All other provisions of Manhattan Beach Municipal Code shall remain unchanged and continue in full force and effect.

SECTION 4. Any provisions of the Manhattan Beach Municipal Code, or appendices thereto, or any other ordinances of the City, to the extent that they are inconsistent with this ordinance, and no further, are hereby repealed.

SECTION 5. If any section, subsection, sentence, clause, or phrase of this ordinance is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of the ordinance. The City Council hereby declares that it would have passed this ordinance and each section, subsection, sentence, clause, and phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases be declared invalid or unconstitutional.

SECTION 6. This Ordinance shall become operative as to: 1) Grocery Stores, Food Vendors, Restaurants, Pharmacies and City facilities six (6) months after its effective date; and 2) all remaining Affected Retail Establishments, Vendors and Non-Profit Vendors one (1) year after its effective date.

SECTION 7. The City Clerk shall cause this Ordinance or a summary thereof to be published and, if appropriate posted, as provided by law. Any summary shall be published and a certified copy of the full text of this Ordinance posted in the Office of the City Clerk at least five (5) days prior to the City Council meeting at which this Ordinance is to be adopted. Within fifteen (15) days after the adoption of this Ordinance, the City Clerk shall cause a summary to be published with the names of those City Council members voting for and against this Ordinance and shall post in the Office of the

City Clerk a certified copy of the full text of this Ordinance along with the names of those City Council members voting for and against the Ordinance.

PASSED, APPROVED and ADOPTED this 15th day of July, 2008.

Ayes:
Noes:
Absent:
Abstain:

Mayor, City of Manhattan Beach, California

ATTEST:

City Clerk

APPROVED AS TO FORM:

By

City Attorney

Attachment D:

Emails in support of ORDINANCE NO. 2115

From: Nicole Sevier
Sent: Sunday, June 15, 2008 3:37 PM
To: Richard Montgomery
Cc: Lindy Coe-Juell

Hello Richard,

I am writing to you as a supportive resident and Chair of the Planet Pal Program at Pacific.

Thank you and the Council for your support and consideration of banning plastic bags in our city. It is CRUCIAL to make this move and lead the way for other communities to do the same. There are many other options in which to "carry" items. Plastic bags cause too much harm to too many. Convenience holds no wait. We need to make inconvenient choices and create inconvenient habits to preserve the future. Banning Styrofoam and plastic bags is a start.

My family and I will attend the City Council Meeting on July 1st to offer our support to make MB plastic bags free.

I will get the word out at our school this last week and contact friends and acquaintances throughout the city.

Once again, thank you for working to better and sustain our city.

Cheers,
Nicole Sevier

From: Geri Shapiro
Sent: Monday, June 16, 2008 4:17 PM
To: Richard Montgomery
Cc: Lindy Coe-Juell
Subject: plastic bag ban

Please support the plastic bag ban in Manhattan Beach. This is a good step forward for our environment.

Geri Shapiro

From: Tanya Sanchez
Sent: Monday, June 16, 2008 9:20 PM
To: Richard Montgomery
Cc: Lindy Coe-Juell
Subject: mbeach plastic bag ban!

Dear Mayor Montgomery,

As a science teacher at Grand View Elementary School it gives me great happiness to see the City make such tremendous steps in helping the environment. Our school is dedicating itself to becoming greener each year and our students are really passionate about plastic bag pollution. Not only can we make a difference as a leader in stepping forward and becoming a role model for other cities, we must protect our beautiful beaches from becoming polluted with plastics that harm our wildlife. The images of sea turtles, whales, fish, and other sea mammals that ingest and die from blocked digestive systems caused by plastic bags and degraded plastic particles is devastating. Please consider this ban on plastic bags, it will help tremendously! As for what grocers and businesses can do, there are many new eco-friendly products such as corn starch bags, paper bags, and the selling of canvas bags that are reusable.

Our students have discussed a canvas bag education and promotion for next year as our new fifth graders carry on the Earth Club messages of promoting the three R's. Thank you for your time, I just wanted you to know how a majority of us feel about banning plastic bags and how supportive we are of the City's proposed efforts!

Best Regards,

Tanya Sanchez
Grand View Science Teacher
Earth Club Advisor

From: Matthew Grimes
Sent: Wednesday, June 18, 2008 4:43 AM
To: Richard Montgomery
Cc: Lindy Coe-Juell
Subject: (no subject)

I just heard that the Council is considering banning plastic bags. Great idea. Reusable bags are not that inconvenient. I am writing to show my support and trust me, I never get involved in politics and am a Republican. I hope you all pass the ban and it spreads to the other cities.

Matthew R. Grimes

From: Wandel, Denise
Sent: Wednesday, June 18, 2008 5:28 PM
To: Richard Montgomery; Lindy Coe-Juell
Subject: FW: good bye plastic bags

I support a ban of plastic bags for the following reasons:

Every year 500 billion plastic bags are used worldwide...1,000,000 are used EVERY MINUTE.
Plastic bags are costly and difficult to recycle.
They take 300 years to photo degrade.
As they degrade, toxic particles contaminate the soil and waterways.
There are 5 times more plastic particles in our ocean than plankton.
Plastic bags are ingested and KILL animals.
We want to make a difference for our children's future.

Yes, plastic bags are convenient. Yes, paper bags aren't much better than plastic...they are even more costly to produce. The answer...REUSABLE BAGS. Keep several in your car. Go bag less if you have a couple of items.

No, this is will not solve poverty and hunger today, BUT...This little step will eventually make a BIG difference in our ocean and soil which will allow healthier sea life and crops which will strengthen our food chain, and provide healthier food for more people.

From: Tracey Childs
Sent: Thursday, June 19, 2008 10:49 AM
To: Richard Montgomery; Lindy Coe-Juell
Subject: please vote to eliminate plastic bags

richard,

Every year 500 billion plastic bags are used worldwide...1,000,000 are used EVERY MINUTE.
Plastic bags are costly and difficult to recycle.
They take 300 years to photo degrade.
As they degrade, toxic particles contaminate the soil and waterways.
There are 5 times more plastic particles in our ocean than plankton.
Plastic bags are ingested and KILL animals.
We want to make a difference for our children's future.

we hope you vote to eliminate plastic bags in mb

tracey childs
craig breitman
abby breitman

From: Lora Dapoz
Sent: Tuesday, June 24, 2008 11:00 AM
To: Richard Montgomery
Cc: Lindy Coe-Juell
Subject: Plastic Bag Ban

Hi Richard,

I hope you are enjoying the summer. Thank you again for coming to American Martyrs to present the Enviro-medals, the students were excited and we heard nice comments about how great it was to meet the mayor up until the last day of school!

Today, I am writing to support the ban on plastic bags. We will be on vacation July 1 and unable to attend the meeting. My 8-year old daughter is bummed because she was one of the presenters at the American Martyrs Earth Day Assembly that focused on eliminating the use of plastic bags. Approximately 30 parents attended that morning assembly and commented that they learned so much from the presentation they would stop using plastic bags!! Additionally, we collected enough plastic bags (Wed-Fri following Earth Day) to fill six 50- gallon trash bags stuffed with compacted plastic bags. Students brought newspaper bags, dry cleaning bags and plastic shopping bags.

The parents were so supportive they asked that we continue the collection on a regular basis. Instead, we prefer to discontinue the use of plastic bags by bringing our own!

In our household, we have challenged ourselves to go the entire year without getting a plastic or single-use bag from any store. It took a little time to get in the habit of ALWAYS bringing our own bags, but so far we have been able to do it. My daughter and I help bag our purchases (cashiers don't always like customers bringing their own bags because it can slow things down) and cheerfully tell the clerk that we are trying to use our own bags for a year so it becomes a natural habit!

We love living in Manhattan Beach and are thrilled to be part of a community that is dedicated to protecting our environment.

All the best,

Lora

Lora Dapoz

From: Kaye Sherbak
Sent: Wednesday, June 25, 2008 7:16 AM
To: Lindy Coe-Juell
Subject: plastic bags

Hello,

I would like to voice my support of the Manhattan Beach City's council's efforts to ban plastic bags. While I think it's good to eliminate plastic bags I prefer incentives to businesses and consumers for reduction practices. Plastic bags have some trades that compare with paper, although the non-renewable source of most plastic bags is an overwhelming negative in my mind. Perhaps requiring recycled plastic content and renewable alternatives to plastics are a compromise if the plastic industry's legal lobby becomes to strong for our small city. I would strive for re-usable programs which are financially incentives by vendors and consumers.

Thanks for your efforts to green our city,

Kaye Sherbak

Attachment E:

Emails in opposition of ORDINANCE NO. 2115

From: Kyle Lan Franco
Sent: Monday, June 02, 2008 3:56 PM
To: Geoff Dolan
Subject: Why are you proposing a ban on plastic bags?

Attachments: Harvard_Crimson.pdf; NY TIMES_Plastic.pdf; Paper Or Plastic.pdf; Oil Barrel.pdf; San Francisco Study.pdf

Mr. Dolan,

I know it is a priority for the city of Manhattan Beach to become "green" however the recent attempt to green wash citizens about plastic bags is just too much to comprehend. "The Problem" that was proposed in your recent June 3rd meeting has been proven time and again to be full of ill informed information. The scientific and factual proof is that plastic bags are the best source of disposables when compared to the alternative, paper bags.

Plastic bags don't kill 1 million seabirds and they defnitely do not kill 100,000 marine animals annually. This was proven in an article just recently by the EPA, www.EPA.gov.

Before making these allegations and misinform the public, I highly recommend you have your environmental team truly look into plastic bags. They might conclude that plastic bags use less energy then the alternative, produce no water pollutants and create minimal air pollution. In fact, paper bags on the other hand emit 70 percent more air pollution and 100 times more water pollutants. Plastic bags do NOT take up space in the landfills, plastic bags takes up less than 2% when compared to paper which tops out around 30%.

When you compare the usage between plastic and paper it's apples to oranges. Plastic bags are used more than paper, therefore the percent of recycling should be smaller, however when you see the lbs per recycling, plastic is leaps and bounds ahead of paper. It's a two way street for the recycling argument.

Furthermore, the argument about oil is old and garners no truth. If you were to take 1 barrel and break it down you will conclude that all plastic (not just bags) used only 1.5% and bags takes up .5% of that entire barrel. In addition, most domestic manufacturers use natural gas, so in essence rather then burning that left over crude oil, it is being used for the production of plastic bags.

I know this issue better than most average Joe's and I truly hope you will think about the true environmental implications this could have in the long run. By banning plastic bags you are making a move that will worsen the environment. It sounds like your issue is litter, and will a little education and city wide program you can move forward in minimizing that problem.

San Francisco banned plastic bags for large retailers and the use of paper bags sky rocketed, that will not help our environment become "greater and greener".

Please see my attachments, they will definitely be good reads and go into further detail about the plastic myths.

Just wanted to add my two cents.

Best,

--

Kyle Lanfranco

Opinion
The University Daily Since 1873
Updated: 1

Unsustainable Environmentalism

Bans on the plastic bag are a classic case of style over substance

Published On Wednesday, April 16, 2008 12:52 AM
By JULIET S. SAMUEL

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Last month, San Francisco's ban on the polyethylene plastic bag—cheap, convenient, and 100 percent recyclable—celebrated its first anniversary (although it has only been in effect since September). The ban banished the bags from 50 of San Francisco's largest supermarkets and has reportedly reduced usage by five million bags so far. In its place: Government-mandated paper bags, compostable plastic, and reusable canvas sacks.

The ban on plastic bags was passed in March 2007 in order to stop consumers from making the wrong choice for the environment. But those responsible for the ban didn't seem to quite understand what that meant: "We're not taking away any choices," said Mark Westlund of the San Francisco Environmental Department. Pressed, he switched from denial to paternalism: "We've taken away a choice that is a detrimental choice."

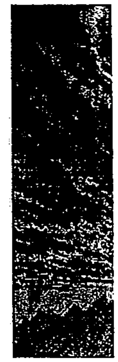
And the trend has spread: At least 10 U.S. cities have considered or passed some form of ban on the innocent polyethylene bag, from Oakland to Boston, Annapolis to Portland. And, in an effort to seem green, government ministers from England to Australia have promised to wage war on plastic. Reportedly, plastic bags clog up landfills and kill fish; they guzzle oil and energy; they decay far slower than other waste and are difficult to recycle. In fact, the bans are a case of style over substance: Plastic bags are relatively harmless in environmental terms, and where they are a problem, the ultimate issue is littering, not bag use.

One problem is that those backing the bans seem to be confused as to the true impact of these flimsy sacks. Alderman Sam Shropshire, sponsor of a bill to ban them in Annapolis, Md., last year (the ban was rejected in Novermber) compares plastic bag use to DDT: "It's wrong, it's immoral," he says, "They're inundating our environment."

Supposedly, littered bags wreak havoc on environmentally sensitive areas where they get caught in rivers and entangle birds and fish. But if the ban had gone through, the cure might have been worse than the disease: According to the EPA, paper bags discharge significantly more water and air pollutants than plastic.

Of course, plastic is derived from a non-renewable resource—oil. But it's misleading to claim that their use constitutes a crisis. All of America's annual 100 billion plastic bags are made from 12 million barrels of oil—0.15 percent of the U.S.'s total yearly oil consumption. And a Waste Characterization Study for California in 2004 concluded that the bags account for just 0.4 percent of the total content of landfills.

Yet some proponents of anti-plastic measures seem misinformed. "Any environmentalist would argue when push comes to shove, paper is better for the environment than plastic," says Maria Blanchard, Press Secretary to Massachusetts State Senator Brian Joyce, who wants to introduce a statewide tax on plastic bags in his home state. The senator's office needs to check its facts: According to ReusableBags.com, an organization founded to promote the use of canvas sacks, plastic bags take four times less energy to produce and 91 percent less energy to recycle than paper, and Professor Bill Rathje, director of The Garbage Project, says they are at least three times less voluminous, requiring fewer gas-guzzling trucks to move them around and taking up less space in landfills.



Of course, the idea is to encourage consumers to bring reusable canvas totes to the store instead of using paper—in Shropshire's case by mailing 15,000 of them to his constituents. But it's not the hemp bags' lack of availability that makes them unpopular—IKEA sells them for 59 cents. Consumers just aren't convinced that the personal and environmental benefits of using them are worth the inconvenience of carrying ten canvas sacks for the week's groceries. If they were, a ban wouldn't be necessary.

So the likely upshot of banning plastic is an increase in the use of paper bags, which cost more energy to produce and take up more space than plastic. Supposedly, paper is better anyway, because it has a higher recycling rate than plastic—around 20 percent versus a rather dismal one percent. But the comparison is not entirely apt: The country currently uses only 7 billion paper sacks per year, compared to 100 billion plastic bags. And paper has an organic, green image, making its users more likely to be the recycling type. When the average consumer, no more or less informed than she was yesterday, find her most convenient shopping option banned she's unlikely to start recycling soggy paper sacks.

And most importantly, a ban is the one sure way to stop progress in its tracks. Modern plastic bags are the most environmentally friendly yet: They thinned down a third between 1977 and 1990, and have even started to appear in biodegradable form (at least these compostable bags are exempt from the San Francisco ban). Banning the product removes the incentive to improve it, just as it discourages individuals from educating themselves about their choices. Environmentalists need to reflect upon these long-term consequences before they charge in with sledgehammers to kill flies. Their current mentality—"for your own good"—simply isn't sustainable.

Juliet S. Samuel '09, a former Crimson associate editorial chair, is a social studies concentrator affiliated with Eliot House.

From The Times

March 8, 2008

Series of blunders turned the plastic bag into global villain

Alexi Mostrous

Green Central: click here to read Times Online's environment blog

Scientists and environmentalists have attacked a global campaign to ban plastic bags which they say is based on flawed science and exaggerated claims.

The widely stated accusation that the bags kill 100,000 animals and a million seabirds every year are false, experts have told The Times. They pose only a minimal threat to most marine species, including seals, whales, dolphins and seabirds.

Gordon Brown announced last month that he would force supermarkets to charge for the bags, saying that they were "one of the most visible symbols of environmental waste". Retailers and some pressure groups, including the Campaign to Protect Rural England, threw their support behind him.

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But scientists, politicians and marine experts attacked the Government for joining a "bandwagon" based on poor science.

Lord Taverne, the chairman of Sense about Science, said: "The Government is irresponsible to jump on a bandwagon that has no base in scientific evidence. This is one of many examples where you get bad science leading to bad decisions which are counter-productive. Attacking plastic bags makes people feel good but it doesn't achieve anything."

Campaigners say that plastic bags pollute coastlines and waterways, killing or injuring birds and livestock on land and, in the oceans, destroying vast numbers of seabirds, seals, turtles and whales. However, The Times has established that there is no scientific evidence to show that the bags pose any direct threat to marine mammals.

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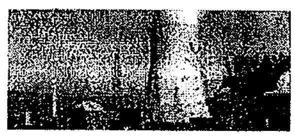

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fishing gear, ropes, lines and strapping bands. Most mammals are too big to get caught up in a plastic bag."

He added: "The impact of bags on whales, dolphins, porpoises and seals ranges from nil for most species to very minor for perhaps a few species.For birds, plastic bags are not a problem either."

The central claim of campaigners is that the bags kill more than 100,000 marine mammals and one million seabirds every year. However, this figure is based on a misinterpretation of a 1987 Canadian study in Newfoundland, which found that, between 1981 and 1984, more than 100,000 marine mammals, including birds, were killed by discarded nets. The Canadian study did not mention plastic bags.

Fifteen years later in 2002, when the Australian Government commissioned a report into the effects of plastic bags, its authors misquoted the Newfoundland study, mistakenly attributing the deaths to "plastic bags".

The figure was latched on to by conservationists as proof that the bags were killers. For four years the "typo" remained uncorrected. It was only in 2006 that the authors altered the report, replacing "plastic bags" with "plastic debris". But they admitted: "The actual numbers of animals killed annually by plastic bag litter is nearly impossible to determine."

In a postscript to the correction they admitted that the original Canadian study had referred to fishing tackle, not plastic debris, as the threat to the marine environment.

Regardless, the erroneous claim has become the keystone of a widening campaign to demonise plastic bags.

David Santillo, a marine biologist at Greenpeace, told The Times that bad science was undermining the Government's case for banning the bags. "It's very unlikely that many animals are killed by plastic bags," he said. "The evidence shows just the opposite. We are not going to solve the problem of waste by focusing on plastic bags.

"It doesn't do the Government's case any favours if you've got statements being made that aren't supported by the scientific literature that's out there. With larger mammals it's fishing gear that's the big problem. On a global basis plastic bags aren't an issue. It would be great if statements like these weren't made."

Geoffrey Cox, a Tory member of the Commons Environment Select Committee, said: "I don't like plastic bags and I certainly support restricting their use, but plainly it's extremely important that before we take any steps we should rely on accurate information. It is bizarre that any campaign should be endorsed on the basis of a mistranslation. Gordon Brown should get his facts right."

A 1968 study of albatross carcasses found that 90 per cent contained some form of plastic but only two birds had ingested part of a plastic bag.

Professor Geoff Boxshall, a marine biologist at the Natural History Museum, said: "I've never seen a bird killed by a plastic bag. Other forms of plastic in the ocean are much more damaging. Only a very small proportion is caused by bags."

Plastic particles known as nurdles, dumped in the sea by industrial companies, form a much greater threat as they can be easily consumed by birds and animals. Many British groups are now questioning whether a ban on bags would cost consumers more than the environmental benefits.

Charlie Mayfield, chairman of retailer John Lewis, said that tackling packaging waste and reducing carbon emissions were far more important goals. "We don't see reducing the use of plastic bags as our biggest priority," he said. "Of all the waste that goes to landfill, 20 per cent is household waste and 0.3 per cent is plastic bags." John Lewis added that a scheme in Ireland had reduced plastic bag usage, but sales of bin liners had increased 400 per cent.

HAVE YOUR SAY

I made grocery bags out of my old t-shirts. The risk of them ripping is slim to nil' and i'm not utilizing a product that is dependent on petroleum for its production. No matter the claims, little harm can come from using LESS plastic bags.

Christine, Chicago,

Plastic bags, as the article states, are not the source of environmental imbalance.
Paper bags are a worse option by far; they are dyed in chemicals to get that brownish color; they have glue at the bottom which attracts cocroaches, an they are bulkier than plastics. Unlike plastics they can not be downgauged (made thinner in thickness) since they would not hold the weight.
It is time we clarify this fallacy about plastic bags and really concentrate on what does the most damage to our environment: us, human beings acting irresponsibly with the resources we obtain.

Rafael Alvarado, Houston, Texas, USA

Many people actually re-use the plastic bags tp throw trash. If Government banned all types of plastic bags, then we will have to buy trash liners which are made from plastics too. Trash liners are thicker and consume more plastics.

Just an additional information, the new plastic resin technology is now using the ethane gas. Previously the ethane gas was just released to the air as a by-product of oil drilling. Actually the using of ethane gas to make plastic resins helps to reduce air pollution.

My point is: we have to reduce energy consumption. Use more public transports. Reduce the numbers of private cars. Have only 1 TV at home, 1 radio, 1 computer. Learn to share.

If we consume less oil, we will have less petrochemicals. If we don't make the petrochemicals into products, we might pollute the world with them, as they are the byproducts of the major production, i.e. fuel production.

Layminto Jubilee, Singapore, Singapore

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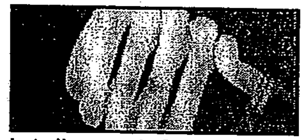

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Paper or Plastic?

Get the facts before you decide.

According to the U.S. Environmental Protection Agency*

- Paper Manufacturing facilitate: smoke stacks, logging trucks, clear cut forests
- It takes 13 to 17 trees to make one ton of paper bags. In 1997, 955,000 tons of paper bags were used in the U (that's about 13 to 17 million trees).
- It takes more than four times as much energy to manufacture a paper bag as it does to manufacture a plastic
- It takes 91 percent less energy to recycle a pound of plastic than it takes to recycle a pound of paper.
- Paper sacks generate 70 percent more air and 50 times more water pollutants than plastic bags.
- Plastic grocery bags generate 80% less solid waste than paper bags.
- 2,000 plastic bags weigh 30 pounds, 2000 paper bags weigh 280 pounds. Paper bags require significant more landf
- Current research demonstrates that paper in today's landfills does not degrade or break down at a substantially fa

USA TODAY reported**

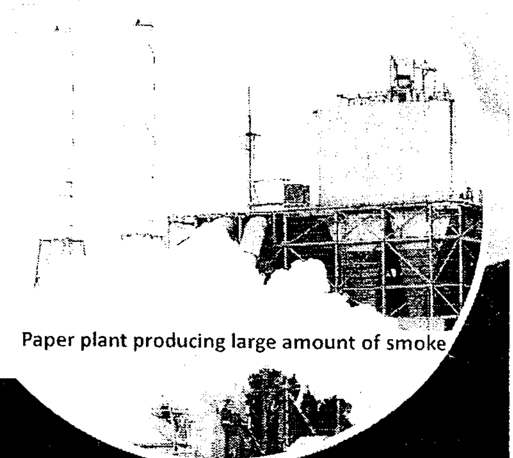
- Four times as much energy is required to produce paper bags and 85 times as much energy is neede
- Paper takes up nine times as much space in landfills.
- Compostable bags must be segregated from regular plastic
  recycling efforts mo

The New Yo

The paper indus
chemical, petroleum

Banning plastic bags means more paper bags which means more pollution, more energy consumption and more landfill usage.

Protect the environment by doing the RIGHT thing.
Choose plastic bags - AND RECYCLE



Paper plant producing large amount of smoke

For more information, contact www.commandpackaging.com/environment

* www.epa.gov/region1/communities/shopbags.html
** USA Today, Editorial, April 2, 2007
***The New York Times, Editorial, October 5, 2006

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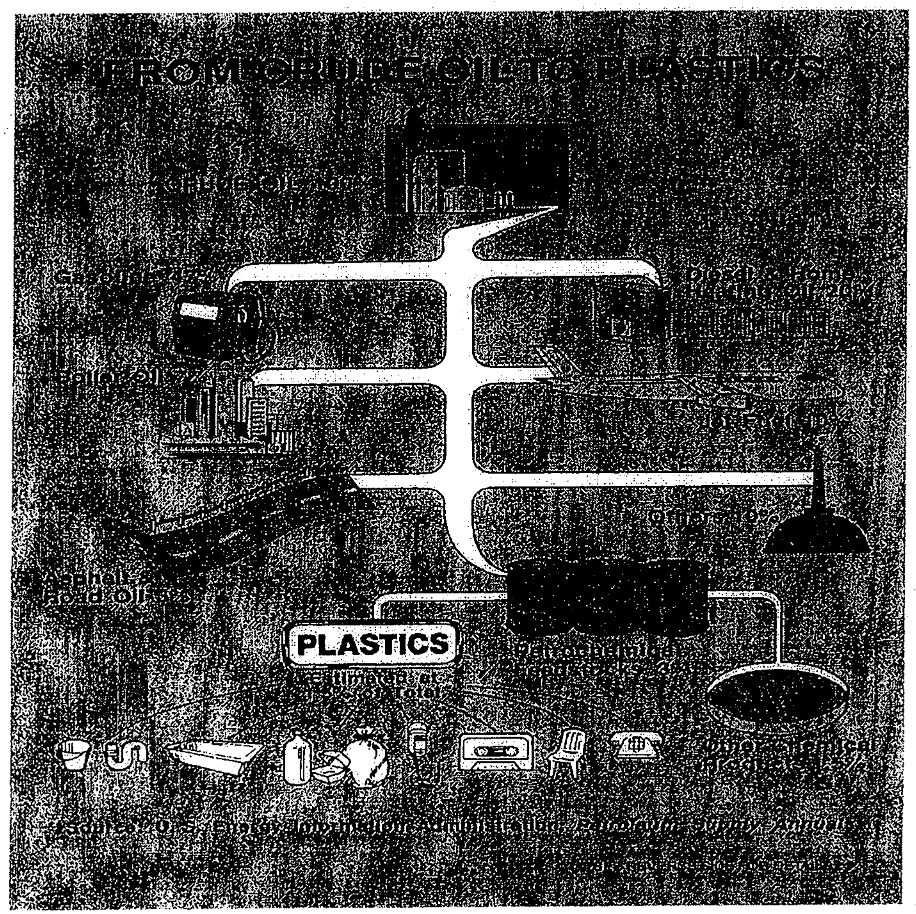


REVIEW OF LIFE CYCLE DATA RELATING TO DISPOSABLE, COMPOSTABLE, BIODEGRADABLE, AND REUSABLE GROCERY BAGS

I. BACKGROUND

In March 2007, the Board of Supervisors of the City of San Francisco passed an ordinance effectively banning the use of plastic grocery bags at supermarkets and large pharmacies. The Board's objective was to stop environmental degradation and reduce litter, and its solution was to legislate the replacement of traditional plastic bags with reusable bags or bags made from paper or compostable plastic.

In an effort to gauge the impact of the Board's decision, both in terms of environmental impact and litter reduction, the Editors of *The ULS Report* have examined a number of credible third-party research reports, and used the findings to develop their own conclusions and recommendations.

II. METHODOLOGY

An examination was made of three studies that compared the environmental impacts of various grocery bags, or provided data widely used to do so:

1. Carrefour Group, an international retail chain that was founded in France and is second only to Wal-Mart in terms of global retail revenues, commissioned a Life Cycle Assessment (LCA) Study by Price-Waterhouse-Coopers/EcoBalance *(Évaluation des impacts environnementaux des sacs de caisse, February 2004, #300940BE8)* that compared the environmental impact of four types of bags: plastic made from high density polyethylene (HDPE), paper, biodegradable plastic (50% corn starch and 50% polycaprolactone compostable plastic), and reusable plastic (flexible PE). The study evaluated environmental impacts from material production, through bag manufacturing and transport, to end of life management.

   The study was completed according to ISO standards 14040-14043, and peer reviewed by the French environmental institute, ADEME, the Agency for Environment and Energy Management. The first review was by Henri Lecouls, an independent lifecycle analysis expert assisted by Laura Degallaix, representative of the Federal Consumers' Union, Que Choisir, and Dominique Royet, World Wildlife Federation (WWF) representative. A second review was made by related parties: APME (European Plastics Manufacturers Association; CEPI (Confederation of European Paper Industries); and Novamont, manufacturer of the biodegradable plastic assessed in the study.

2. *Life Cycle Inventories for Packagings*, Environmental Series No. 250/1, Swiss Agency for the Environment, Forests and Landscape (SAEFL), 1998. The study was critically reviewed by corporate and association members representing the paper, plastics, glass, aluminum and steel packaging industries.

4853 Goodison Place Drive • Rochester • MI • 48306
248-726-9729 • www.use-less-stuff.com

3. *Eco-Profiles of the European Plastics Industry*, performed by I. Boustead for PlasticsEurope, 2005. This series was developed by LCA pioneer Boustead Consulting and conforms wherever possible to ISO standards 14040-14043. The data on polyethylene film are also referenced in the SAEFL study listed above.

Relevant data published by the U.S. Environmental Protection Agency (EPA) were also reviewed. This information was found on the EPA's website (www.epa.gov), and includes data from its well-known *Municipal Solid Waste in the United States* series.

III. STUDY LIMITATIONS

1. Findings, conclusions, and recommendations are based on data that have been obtained through publicly available channels or through the broad group of contacts that *The ULS Report* has developed. There may be other data available that refute, confirm, or extend the findings herein developed.

2. Results are based upon an analysis of quantitative data, especially in relation to materials consumption, energy and water usage, pollution, and greenhouse gas (GHG) production. Because of their qualitative and personal nature, issues that transcend a scientific approach, such as the social value of renewable vs. non-renewable resources and composting vs. landfilling, are best considered independently by the reader.

3. Other than U.S. EPA data, the other studies originated in Europe and are based upon European manufacturing processes. Because production processes are relatively similar globally, the data provide accurate assessments between materials that can be used to draw valid conclusions in the United States.

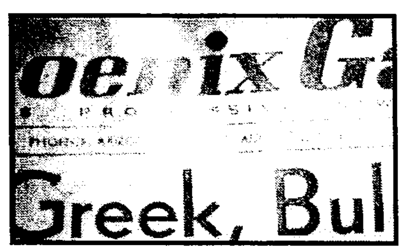
IV. FINDINGS

A. Biodgredation/Compostability

While paper and certain plastics may be biodegradable or compostable in specially designed industrial facilities, evidence indicates that this feature may be of little value in the effort to reduce waste:

1. According to the EPA, "Current research demonstrates that paper in today's landfills does not degrade or break down at a substantially faster rate than plastic does. In fact, nothing completely degrades in modern landfills due to the lack of water, light, oxygen, and other important elements that are necessary for the degradation process to be completed."[1]

   As evidence of this, here is a photo of a newspaper buried in an Arizona landfill and dug up after more than three decades. As can be clearly seen, paper does not degrade rapidly in landfills. *(Photo credit: Dr. William Rathje, Founder of The Garbage Project at The University of Arizona, and ULS Report Contributing Editor.)*



Compostable plastics, which are produced from plant-based feedstocks, do not degrade in landfills, either. According to Natureworks®, a producer of a corn-based plastic known as PLA, containers made from its material will last as long in landfills as containers made from traditional plastics.[2]

2. In order to breakdown as intended, compostable plastics must be sent to an industrial or food composting facility, rather than to backyard piles or municipal composting centers. Since there are apparently fewer than 100 of these facilities functioning in the entire United States, the economic and environmental costs of wide-scale plastics composting are prohibitive, significantly reducing the value of such an alternative.[3]

3. By definition, composting and biodgradation release carbon dioxide (CO_2), a greenhouse gas, into the atmosphere, increasing the potential for climate change. For example, composted paper produces approximately twice the CO_2 emissions produced by non-composted paper. (See Paragraph B.2. just below for specific details.)

B. Waste, Energy Consumption, Greenhouse Gas Emissions

The evidence does not support conventional wisdom that paper bags are a more environmentally sustainable alternative than plastic bags. While this is certainly counterintuitive for many people, relevant facts include the following:

1. Plastic bags generate 60% less greenhouse gas emissions than uncomposted paper bags, and 79% less greenhouse gas emissions than composted paper bags. The plastic bags generate 3,097 tons of CO_2 equivalents per 100 million bags; while uncomposted paper bags generate 7,621 tons, and composted paper bags generate 14,558 tons, per 100 million bags produced.[4]

2. Plastic bags consume less than 4% of the water needed to make paper bags. It takes 5,527 cubic meters of water to produce 100 million plastic bags, versus 145,729 cubic meters of water to produce 100 million paper bags.[5]

3. Plastic grocery bags consume 40% less energy during production and generate 80% less solid waste than paper bags.[6] Significantly, even though traditional disposable plastic bags are produced from fossil fuels, the total non-renewable energy consumed during their lifecycle is no greater than the non-renewable energy consumed during the lifecycle of paper and biodegradable plastic bags.[7]

4. Paper sacks generate 70 percent more air, and 50 times more water pollutants, than plastic bags.[8]

5. It takes 91 percent less energy to recycle a pound of plastic than it takes to recycle a pound of paper.[9]

6. After three uses, reusable plastic bags are superior to all types of disposable bags --paper, polyethylene and compostable plastic -- across all significant environmental indicators.[10]

C. Litter

While the data appear to indicate that paper and compostable plastic bags may account for less litter, data also indicates that this finding is offset by the increased environmental impacts these bags produce versus traditional plastic bags:

1. The manufacture of paper bags consumes three times more water and emits about 80% more greenhouse gases than the production of plastic bags.[11]

2. Compared to disposable plastic bags, biodegradable plastic bags generate higher levels of greenhouse gas emissions, atmospheric acidification and eutrophification (a process whereby bodies of water receive excess nutrients that stimulate excessive plant growth, such as algae blooms).[12]

V. CONCLUSIONS/INDICATED ACTIONS

The conclusion to be drawn about how to reduce the environmental impacts and litter associated with grocery bags is very much in line with both longstanding EPA guidelines and the *ULS Report* philosophy: the issue is not paper or plastic, but rather finding ways to reduce, reuse, and recycle both of them - *in that order*. By putting more items in fewer bags, avoiding double bagging, switching to durable tote bags, and reusing and recycling disposable bags, significant reductions in material and non-renewable energy consumption, pollution, solid waste, greenhouse gas emissions, and litter, will occur.

And, while recycling can help save resources, its real value lies in the reduction of greenhouse gas emissions, and the minimization of waste going to landfills. Also, recycling helps reduce litter, as bags are contained and stored. Containment reduces the potential for them to be left in open spaces, where they become eyesores.

VI. SUMMARY

Legislation designed to reduce environmental impacts and litter by outlawing grocery bags based on the material from which they are produced will not deliver the intended results. While some litter reduction might take place, it would be outweighed by the disadvantages that would subsequently occur (increased solid waste and greenhouse gas emissions). Ironically, reducing the use of traditional plastic bags would not even reduce the reliance on fossil fuels, as paper and biodegradable plastic bags consume just as much non-renewable energy during their full lifecycle.

Further, an Internet scan of available government and non-profit information for the United States, United Kingdom, Canada and Australia indicates that chewing gum and cigarette butts account for up to 95% of the litter generated in the English-speaking world.[13] Thus, there would appear to be far better and potentially more effective legislative opportunities available if the objective is to significantly reduce litter.

Again, when it comes to reducing the environmental and litter impacts of grocery and merchandise bags, the solution lies in a.) minimizing the materials used to produce all types of bags, regardless of their composition, and b.) building public awareness and motivation to reduce, reuse and recycle these bags - in that order.

Robert Lilienfeld

Robert Lilienfeld, Editor

Footnotes

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[1] U.S. Environmental Protection Agency (EPA) website, *Questions About Your Community: Shopping Bags: Paper or Plastic or… ?* (www.epa.gov/region1/communities/shopbags.html).

[2] *Corn Plastic to the Rescue*, by Elizabeth Royte, *Smithsonian*, August, 2006 (www.smithsonianmag.com/issues/2006/august/pla.php?page=1).

[3] These figures were provided by a number of experts, but due to the fluctuating dynamics of the composting industry, no firm citation can be given. One article that mentioned the relative unavailability of industrial and food composting was *Composting that Plastic* by Eliza Barclay, *Metropolis Magazine*, March 1, 2004 (www. metropolismag.com/cda/story.php?artid=153). See also the *BioCycle* site www.findacomposter.com.

[4] *Life Cycle Inventories for Packagings*, Volume 1, SAEFL, 1998, Environmental Series 250/I and *Eco-Profiles of the European Plastics Industry*, developed by I. Boustead for PlasticsEurope, March, 2005 (www.plasticseurope.org/content/Default.asp?PageID=404&IsNewWindow=True).

[5] Ibid.

[6] U.S. EPA website, (www.epa.gov/region1/communities/shopbags.html).

[7] Évaluation des impacts environnementaux des sacs de caisse Carrefour (Evaluation of the Environmental Impact of Carrefour Merchandise Bags), prepared by Price- Waterhouse-Coopers/Ecobilan (EcoBalance), February 2004, #300940BE8.
(www.ademe.fr/htdocs/actualite/rapport_carrefour_post_revue_critique_v4.pdf).

[8] U.S. EPA website, (www.epa.gov/region1/communities/shopbags.html).

[9] U.S. EPA website, (www.epa.gov/region1/communities/shopbags.html).

[10] Évaluation des impacts environnementaux des sacs de caisse Carrefour. *Op cit.*

[11] Ibid.

[12] Ibid.

[13] See *Litter Composition Survey of England*, October 2004, produced by ENCAMS for INCPEN (www.incpen.org/pages/userdata/incp/LitterCompSurvey24Jan2005.pdf). Also see *Facts About Litter* from an Australian governmental site (www.environment.nsw.gov.au/litter/factsaboutlitter.htm), and equivalent government and non-profit sites in Canada and the United States, such as Keep America Beautiful.

----- Original Message -----
From: "Andrew Casana"
To: Jim Aldinger; Portia Cohen; Richard Montgomery; Nick Tell; Mitch Ward
Sent: Monday, June 02, 2008 4:27 PM
Subject: Re:

> 6/3/2008
>
> Mayor Richard Montgomery
>
> Manhattan Beach City Council
>
> Dear Mayor and City Council,
>
> I am writing you on behalf of the members of the California Restaurant
> Association doing business in the City of Manhattan Beach. We are
> concerned about the plastic bag ban being proposed by the City of
> Manhattan Beach and the unintended consequences that could follow.
>
> Plastic bags are used a mobile trash bag that is intended to hold the
> food wrappers, straws, utensils, cups, etc and then placed into a
> trash can when finished. We do have many members that use paper bags,
> but others like Panda Express and Subway have unique food packaging
> designs so they use plastic bags because they are the best option.
>
> There are other concerns about the alternative bags that need to be
> addressed. First of all the CRA has been informed by the Los Angeles
> County Environmental Health Department that restaurants, fast-food
> establishment?s and other food service establishments will not be
> allowed to use reusable bags due to the possibility of cross
> contamination or infecting the food in the kitchen with unknown
> diseases. The Health Department made it clear that they do not want
> any bags, plates or utensils being brought into any food service
> establishment from the outside.
>
> We are also concerned with the discussion about applying a fee to
> single use bags. We have already talked to Santa Monica and Malibu and
> both removed the foodservice industry from the fee discussion. The
> main concern is charging tourists a fee to eat in your city. That
> could be bad for tourism.
>
> We respectfully ask for the Manhattan Beach City Council to remove the
> food service industry from the proposed plastic bag ban until city
> staff can meet with the food service industry to discuss the impacts
> of such a ban.
>
> Thank you for your time.
>
> Sincerely,
>
> Andrew Casana
>
> Englander and Associates

From: Dana McFarland
Sent: Monday, June 09, 2008 1:54 PM
To: Nick Tell; Richard Montgomery; Portia Cohen; Jim Aldinger; Mitch Ward; Mary Ann Varni
Subject: Plastic Bags

Dear City Council,

I have a few stores in town and am concerned about the considered ban on plastic bags. Our stores stopped the exclusive use of paper bags for these reasons:

1) It takes a box that is approximately 4' by 2.5' by 2.5' to hold 250 paper bags, while it takes a box that is approximately 2' by 2' by 6"
to hold 1000 plastic bags. It takes 8 trucks to ship the same amount of paper bags as it takes one truck to ship the same amount of plastic bags. While you might eliminate one type of pollution, you would be adding another. You would also be adding more truck traffic to the downtown.

2) The plastic bags are cheaper than paper.

3) We also provide nice reusable paper bags. While saving money with plastic bags, we are able to spend more on nice quality reusable bags.

Putting a ban on plastic bags would be bad for businesses, and bad for
the environment.

Thank you,

Dana McFarland
47 year Manhattan Beach resident and home owner
Owner of: Wright's, Lulu's, and The Beehive in Manhattan Beach

From: Webserver@govpartner.com [mailto:Webserver@govpartner.com]
Sent: Monday, June 09, 2008 2:40 PM
To: I.S. Helpdesk
Subject: Request Form Response

You have received a new request.

The details of the request are presented below.

What is your comment and/or suggestion regarding the City's website?

The Beach Reporter said that the city wants to end the use of plastic bags by the supermarkets.
I believe that is a mistake which will cost the city a lot of money. I walk my dog twice a day along Veterans Parkway. I use the supermarket bags to pick up after him. If I, and other dog owners, can`t get bags from the supermarket, we will forced to use the bags the city provides at various locations along the green belt. The city buys those bags, at a higher price than supermarkets pay,. In an average week, I ``recycle`` 10 to 15 plastic bags each week. I have had dogs for 21 years. I estimate that I have used 10,000 bags during that time. There are hundreds of other citizens doing the same thing. Without the supermarket bags, the city will be paying for the bags.

From: "Jackie MCGOUGH"

Date: Fri, 13 Jun 2008 16:34:50
To: Richard Montgomery
Subject: Proposed Plastic Bag Ban

Dear Mayor Montgomery,

I was recently asked to support the proposed ban on plastic bags in the City of Manhattan Beach. I'm an avid supporter of the environment. On its face, saving our beaches and waterways from plastic bags is a very nice idea. However, has anyone considered, let alone studied, the environmental impacts such a ban would create? Most grocery stores already offer paper bags as an alternative to plastic. But, what would the impact be on our already depleted forests if stores were only allowed to use paper bags. Even if recycled paper bags are utilized, what are the environmental impacts from the recycling process itself? The recycling process itself can actually harm the environment. Recycling consumes a significant amount of fossil because with all of the nasty side effects, including CO2 emissions that everyone is so convinced has led to an increase in global warming. I can not support an outright ban on the use of plastic bags until the net environmental impacts of such a ban is studied and considered.

Jackie McGough

From: John Post
Sent: Friday, June 27, 2008 11:37 AM
To: MBDBPA
Subject: Re: Input on plastic bag ban

Dear Mary Anne,
Did I miss something? Is Manhattan Beach really drowning in a sea of plastic bags littering the city (*like the 100 or so trash cans on the beach from 1st street to the Pier*) or does the city just want to create another costly inconvenience for retail businesses operating in the city?

As much as I am concerned with environmental issues as anyone else, I have to say that I think this ban is little more than a '***feel good***,' or '***we are so much better than you other cities***', law.

Plastic bags are not so much the issue, what is the issue is what people do with them after use. Recycling is a better alternative than making the use of plastic bags a criminal offense. Maybe the city should criminalize the wrongful disposal of plastic bags instead! But then that would inconvenience non business owners.

It is my understanding, from scientific studies, that it costs more in energy, uses more natural resources and creates more pollution to produce a paper bag than a plastic bag.

If natural resource conservation is the issue, plastic beats paper. If litter pollution of the environment is the issue then consumers are at fault.

A bit of consumer education on proper use and disposal would be a less hostile and less costly business approach to the issue. The consumer must at some point bare some responsibility regards this issue.
Most supermarkets now have recycling programs for plastic bags that seem to be working fine.

It is easy and convenient for non-retail businesses and 'City' folk (Bureaucrats) to take the perceived 'high road' on issues such as this as long as they don't personally have to contribute to the additional costs that retailers have to deal with from their decisions.

Q. How is the city going to help businesses offset the higher costs incurred to substitute other more costly customer courtesy carry bags?

Maybe the City could give out free to all the retailers in the city, ***proper*** "City of Manhattan Beach Retail Bags" of paper or some other **'City Authorized Material'** and of the appropriate sizes that the stores need for their customers.

Are we going to have to tell our customers to bring their own bags because the City Bureaucrats outlawed plastic bags or do we give them unwieldy paper bags unsuited for carrying our particular product and which cost us the forests and the earths other natural resources more?

Maybe the bureaucrats could better use their time and the cities money policing the unsightly mess from dogs profusely urinating and defecating all over the sidewalks and Strand.
By the way, how will people be able to clean up their dogs feces with all plastic bags banned in the city of MB? (let's not have any loopholes, fair is fair, its all or nothing!)

Thanks for listening,
John Post

Attachment F:

Letters in support of ORDINANCE NO. 2115

Heal the Bay

1444 9th Street
Santa Monica CA 90401

ph 310 451 1550
fax 310 496 1902

info@healthebay.org
www.healthebay.org

June 2, 2008

Lindy Coe-Juell
Assistant to the City Manager
City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, CA 90266

RE: Consideration of an Ordinance to Prohibit the Use of Plastic Carry-Out Bags in Manhattan Beach

Dear Ms. Coe-Juell:

On behalf of Heal the Bay and our over 12,000 members, we support your proposal to ban the free distribution of single use plastic (including biodegradable plastic) carryout bags at all stores within Manhattan Beach. Heal the Bay applauds the City of Manhattan Beach for taking leadership to curb the proliferation of single use plastic bags in your community. We further encourage you to include a provision in your proposal that would require retailers to charge a fee on single use paper bags and include penalties for noncompliance with the proposed ordinance.

Plastic carryout bags are wreaking havoc in our inland and beach communities. An estimated 6 billion plastic bags are used each year in Los Angeles County. Because these bags are only designed for single-use and have a very low recycling rate (1-5%)[1] the majority of these bags are either landfilled or end up as litter in our watersheds and beaches. During the 2006 California Coastal Cleanup Day volunteers collected over 120,000 plastic bags.[2] Plastic bags have become so ubiquitous that public agencies in Los Angeles County collectively spend $18 million annually to clean up plastic bag litter.[3]

Furthermore, plastic bags severely threaten wildlife and degrade the environment. For months after a storm, streamside vegetation, in-stream habitats and creek bottoms are littered with seemingly endless piles of plastic shopping bags. Streams and storm drains carry plastic bags to the ocean where they are frequently mistaken as food and ingested by marine life. Over 267 species worldwide have been impacted by plastic litter such as plastic bags.[4] The world's largest ocean garbage dump in the North Pacific is currently estimated to be over twice the size of Texas, where densities of bits of plastic trash have tripled during the last decade. It is estimated

[1] US EPA 2005 Characterization of Municipal Solid Waste, Table 4.
[2] Ocean Conservancy, 2006 International Coastal Cleanup Day Report.
[3] County of Los Angeles (August 2007). "An Overview of Plastic Carryout Bags in Los Angeles County: A Staff Report to the Los Angeles County Board of Supervisors."
[4] N. Wallace. "Debris entanglement in the marine environment: A review" (985) pp. 259-277 in: R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, U.S. Department of Commerce, NOAA Technical Memorandum. NMFS, NOAA-TM-NMFS-SWFC-5.

Heal the Bay

1444 9th Street
Santa Monica CA 90401

ph 310 451 1550
fax 310 496 1902

info@healthebay.org
www.healthebay.org

that 80% of marine debris comes from land-based sources, the majority of which is comprised of plastic materials.[5]

Heal the Bay supports the inclusion of biodegradable plastic bags in the City's proposed ordinance. Plastics claiming to be "biodegradable" or "compostable" have not proven to degrade in the marine environment and may pose serious threats to marine life.[6] Instead, they require high heat and bacteria, such as those present in industrial composting facilities, to break down into constituents that assimilate back into the environment.

We also recommend that the City include a fee on paper carryout bags in its ordinance, consistent with the City of Santa Monica staff recommendation for action on single-use carryout bags. State law does not currently preclude cities from imposing fees on paper bags, only plastic bags. As the most ubiquitous alternative to plastic, paper bags are themselves fraught with environmental impacts. The production of paper bags contributes to natural resource depletion, greenhouse gas emissions and additional waterborne wastes from the pulping and paper making process.[7] A paper bag fee is critical in driving the use of the most sustainable option, reusable bags, rather than shifting consumer use from plastic to paper carryout bags.

Finally, Heal the Bay recommends that the City include penalties for noncompliance with this ordinance consistent with the penalties adopted by the cities of Malibu and San Francisco. It is critical that the proposed ordinance include enforceable penalties to truly influence retailer and consumer behavior.

The urgency for local government to take action has never been greater. The legacy of our growing addiction to single-use plastic packaging will be felt in the environment for centuries to come. Banning plastic bags in the City of Manhattan Beach will help enhance the City's recreational and tourism economy, improve the quality of life for residents, free valuable landfill space and restore our environment to a cleaner and healthier state. We urge you make the City of Manhattan Beach an international leader on this issue and adopt a ban on single-use plastic and biodegradable plastic bags.

Sincerely,

Sarah Abramson
Coastal Resources Director
Heal the Bay

Sonia Diaz
Legislative Associate
Heal the Bay

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[5] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Public and Constituent Affairs. (1999) "Turning to the Sea: America's Ocean Future;" United Nations Environment Programme (1995) "Global Programme of Action for the Protection of the Marine Environment from Land-based Activities." Note by the secretariat. UNEP (OCA) /LBA/IG.

[6] California Integrated Waste Management Board. (June 2007) "Performance Evaluation of Environmentally Degradable Plastic Packaging and Disposable Food Service Ware: Final Report." pp. 38-39.

[7] Australian Department of the Environment and Heritage Plastic Shopping Bags – Anaylsis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002, Page 33.

June 18, 2008

Richard Montgomery, Mayor
City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, CA 90266
VIA FAX: (310) 802-5051

Re: Staff Recommendations Regarding a Ban on Plastic Bags – Support

Dear Mayor Montgomery:

Californians Against Waste (CAW) strongly supports Manhattan Beach's proposed ordinance to ban plastic bags. CAW believes that the unrestrained distribution of single-use bags damages California's coastal ecosystem and burdens the economies of local governments through rapidly increasing litter clean-up costs and lost tourist revenue.

Californians consume around 20 billion bags per year, very few of which are currently recycled. Plastic bags and foamed polystyrene comprise a disproportionately high percentage of litter because, even when properly disposed, they are easily transported by wind and rain into watersheds. Once in the environment, plastic film is deadly to wildlife and can wreak havoc on public storm drain infrastructure.

CAW was the sponsor of AB 2449 (Levine), which provides in-store recycling for plastic bags. In addition, CAW is sponsoring AB 2058 (Levine) this year which will potentially incorporate a state fee on plastic bags if required bag reduction and recycling benchmarks are not met. However, AB 2058 is not intended to supplant tougher local action beyond specified restrictions. CAW has continued to advocate for the toughest possible measures at the local level and has been supportive of plastic bag bans in San Francisco, Oakland and Fairfax and the plastic bag reduction and recycling benchmark program enacted in unincorporated Los Angeles County.

Plastic marine pollution is a global problem with local solutions. California has one of the most robust consumer economies in the Pacific Rim and disproportionately contributes to the Pacific Ocean's alarmingly high levels of plastic pollution contamination. According to research carried out by the Algalita Research Foundation, in some of the most affected areas of the Pacific there is over 46 times more plastic than plankton by weight. For all intents and purposes, plastic never biodegrades; instead it slowly photo degrades. As it photo degrades plastic film breaks into smaller and smaller pieces, which form a progressively greater risk of food chain contamination as it attracts surrounding toxins.

Sincerely,

Bryan Early
Plastic Waste Reduction Campaign Coordinator

Cc: Mayor Pro Tem, Portia Cohen; Councilmember, Mitch Ward; Councilmember, Nick Tell; Councilmember, Jim Aldinger; City Manager, Geoff Dolan; Assistant to the City Manager, Lindy Coe-Juell; City Attorney, Robert Wadden

Attachment G:

Letters in opposition of ORDINANCE NO. 2115

American Chemistry Council

June 2, 2008

The Honorable Richard Montgomery
Mayor, City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, CA 90266

Re: Agenda Item: 06/03/08-18: Consideration of an Ordinance to Prohibit the Use of Plastic Carry-Out Bags in Manhattan Beach

Dear Mayor Montgomery:

On behalf of the Progressive Bag Affiliates of the American Chemistry Council (ACC), I am writing to comment on a proposed non-compostable plastic shopping bag ban ordinance. Though we support the intent of this idea, we believe that the most environmentally responsible solution to addressing plastic bag litter and disposal is a comprehensive program aimed at recycling these bags so that they may be used as feedstock in the production of other products, such as new bags, pallets, containers, crates, and pipe. In many cases, DEMAND for this material EXCEEDS the available supply. Such a policy has been recently adopted by the State of California and New York City.

Successful recycling programs undertaken by large retailers around the nation illustrate a willingness on the part of consumers to participate in at-store recycling programs for plastic bags. These programs also exploit an active and growing market for recycled plastic that did not exist 15 years ago. Since it is more cost-effective to use recycled product than new raw material, bag manufacturers and private recyclers are seeking recycled plastic in greater numbers. This creates opportunity for retailers who can sell recycled plastic and create a second revenue stream that will defray their bag expense.

ACC would welcome the opportunity to partner with the City of Manhattan Beach, the grocery and retail industry, recyclers, and other interested stakeholders to develop a system that effectively and efficiently helps to recycle these products.

ACC has been instrumental in developing public education materials to help consumers identify convenient plastic bag and film recycling opportunities. For example, ACC has developed the most comprehensive on-line database of local plastic bag recycling opportunities that is available free of charge to the general public. This information can be accessed at www.PlasticBagRecycling.org.

In our view, policies that promote recycling make the most sense from both an environmental and economic standpoint. *Prohibiting the use of one material or package type does not take into account the full "life cycle" analysis necessary for adequately assessing the environmental impact of any package or material*.

As the attached fact sheet describes, the manufacture and use of paper bags generates 70% more air emissions than plastic; plastic bags generate only 40% of the greenhouse gas (GHG) emissions of non-composted paper bags and only 21% of the GHG emission of composted paper bags; and it take 91% less energy to recycle a pound of plastic than it takes to recycle a pound of paper.

Reducing litter, increasing recycling, and improving the overall environmental landscape is a complex undertaking that requires the active participation of industry, government, non-profit groups, and consumers. To that end, identifying one particular "silver bullet" to reducing the environmental impacts of carry-out bags is not possible. All carry-out bags (plastic, paper, reusable) have some form of environmental impact and that no product or material is manufactured or used "in a vacuum." Each material type has its own unique environmental footprint. Therefore, we do not support banning or restricting the use of a particular carry-out bag, especially recyclable plastic bags.

Thank you in advance for the opportunity to provide these comments. We would be pleased to schedule a meeting with you to discuss the science and the data with respect to the environmental impacts of recyclable plastic bags. Should you have any questions or comments, please contact me at 916-448-2581 or via email at tim_shestek@americanchemistry.com.

Sincerely,

Tim Shestek
Director, Western Region
American Chemistry Council

cc: Members of the City Council
City Manager

Info Sheet

Contact: Keith Christman (703) 741-5602
Email: keith_christman@americanchemistry.com

RECYCLABLE PLASTIC BAGS

Plastic grocery bags are an extremely resource-efficient disposable bag choice.

- Plastic grocery bags require 40 percent less energy to manufacture than paper bags.[1]
- For every seven trucks needed to deliver paper bags, only one truck is needed for the same number of plastic bags, helping to save energy and reduce emissions.
- It takes 91% less energy to recycle a pound of plastic than it takes to recycle a pound of paper.[1]

Less material means less waste and fewer emissions.

- 2,000 plastic bags weigh 30 lbs; 2,000 paper bags weigh 280 lbs. Plastic bags take up a lot less space in a landfill.[1]
- Plastic bags generate 80 percent less waste than paper bags.[1]
- Plastic grocery bags make up a tiny fraction (less than 0.5 percent) of the U.S. municipal solid waste stream.[2]
- The manufacture and use of paper bags generates 70% more air emissions than plastic.[1]
- Plastic bags generate only 40% of the greenhouse gas (GHG) emissions of non-composted paper bags and only 21% of the GHG emissions of composted paper bags.[3]
- The production of plastic bags consumes less than 4 percent of the water needed to make paper bags.[3]

Plastic grocery bags are fully recyclable[4] and the number of recycling programs is increasing daily.

- Plastic bags can be made into dozens of useful new products, such as building and construction products, low-maintenance fencing and decking, and of course, new bags.
- There is high demand for this material, and in most areas, demand exceeds the available supply because many consumers are not aware that collection programs are available at local stores.
- In recent years, many grocers and retailers have introduced plastic bag collection programs. Consumers should look for a collection bin, usually located at the front of the store. The number of municipal drop-off centers and curbside programs to recycle plastic bags is increasing also. Consumers can locate plastic bag recycling programs in their communities by visiting www.PlasticBagRecycling.org.
- In addition to grocery bags, other plastic retail bags, dry cleaning bags and newspaper bags can be included wherever plastic bags are collected for recycling.

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[1] GUA - Gesellschaft für umfassende Analysen, The Contribution of Plastic Products to Resource Efficiency, Vienna, 2005, http://www.plasticseurope.org/Content/Default.asp?PageID=517#
Boustead Consulting , "Life Cycle Assessment for Three Types of Grocery Bags - Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper," 2007,

U.S. Environmental Protection Agency. *Questions about Your Community Shopping Bags: Paper or Plastic*. See: www.epa.gov/region1/communities/shopbags.html. Downloaded from the Internet May 2007.

[2] U.S. Environmental Protection Agency. *Municipal Waste in the United States: 2005 Facts and Figures*. See: http://www.epa.gov/garbage/pubs/mswchar05.pdf.

[3] Swiss Agency for Environment, Forests & Landscape (SAEFL). *Life Cycle Inventories for Packagings*. Environmental Series 250/1. 1998. Based on data from *Eco-Profiles of the European Plastics Industry, LDPE Film Extrusion: A Report by I. Boustead for PlasticsEurope*. March 2005. See http://lca.plasticseurope.org/index.htm.

[4] Recycling may not be available in all areas. Check to see if recycling exists in your community. See: http://www.plasticbagrecycling.org/01.0/.

In addition to recycling, a recent national survey shows that over 90% of Americans reuse their plastic bags.

- About 65% of Americans reuse their bags for trash disposal. Other common uses include lunch bags and pet pick-up.
- In this regard, the reuse of a plastic shopping bag prevents a second bag from being purchased to fulfill these necessary functions.

WHAT TO KNOW ABOUT BAG BANS

Banning recyclable plastic bags will not reduce society's dependence on oil.

- In the United States, nearly 80% of polyethylene, the type of plastic used to make plastic bags, is produced from natural gas. This includes feedstock, process and transportation energy.
- Much of the energy used to make plastic bags is embodied in the bag itself, and since plastic bags are fully recyclable, that energy is available for new products.

Mandating that recyclable plastic bags be replaced with biodegradable or compostable bags will not reduce litter or the amount of waste in our landfills.

- The biodegradable and compostable bags currently on the market will only degrade in a professionally-managed, large-scale composting facility. They will not breakdown in the natural environment, in a home composting device or in a landfill.
- It is currently estimated that there are fewer than 100 suitable composting facilities in the United States. Where composting facilities are not available, "compostable" bags will be sent to a landfill.

Banning recyclable plastic bags or mandating their replacement with compostable bags will diminish efforts to recycle these products.

- Mandating that grocers and retailers replace plastic bags with compostable or paper bags will eliminate many in-store collection programs, which are currently the largest mechanism for recovering post-consumer bags for recycling.
- In addition, the mandated use of compostable bags will cause the accidental commingling of biodegradable and recyclable bags, which will contaminate the recovered material, rendering it unusable by manufacturers.

# # #

*The **American Chemistry Council (ACC)** represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $635 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.*

http://www.americanchemistry.com

CGA
CALIFORNIA GROCERS ASSOCIATION

CALIFORNIA
GROCERS
ASSOCIATION

www.cagrocers.com

TO: Members, City of Manhattan Beach City Council

FR: Kristin Power, Vice President, Government Relations
California Grocers Association

K Power

DT: June 2, 2008

RE: Ordinance 2115 – Carryout Bags

On behalf of the California Grocers Association, I write to inform you of our concerns regarding a prohibition on recyclable plastic carryout bags. Our experience with carryout bags has shown a ban will lead to negative effects and unintended consequences counter to the City's expressed environmental goals.

The California Grocers Association is a non-profit, statewide trade association representing the food industry since 1898. CGA represents approximately 500 retail members operating over 6,000 stores in California and Nevada, and approximately 300 grocery supplier companies, many of whom operate in your City.

A ban on the use of recyclable plastic carryout bags would force grocery stores to use paper or compostable carryout bags, which provides no environmental benefit. Eliminating one bag type does not encourage consumers to reduce carryout bag usage or use reusable bags. It is reasonable to assume a phase-out on plastic carryout bags will cause consumers will switch to paper carryout bags which have their own environmental impacts. In order to reduce carryout bag usage grocery stores discourage double bagging, retrain baggers to pack bags efficiently, sell reusable bags, and provide public education to Reduce-Reuse-Recycle.

On July 1, 2007, the grocery industry implemented Assembly Bill 2449 (Levine, Statutes of 2006), which requires certain grocery and other retailers providing plastic carryout bags to implement at-store recycling programs. Additionally, stores must provide reusable bags for sale to customers. This program provides Manhattan Beach residents opportunities to properly dispose of plastic carryout bags through recycling. Prohibiting plastic carryout bags would virtually eliminate the existing at-store recycling program.

CGA is an active participant the County of Los Angeles plastic carryout bag task force. We believe there are significant benefits to partnering with the County of Los Angeles to increase consumer awareness of recycling opportunities, litter reduction and bag reduction strategies and to promote use of reusable bags. CGA voluntarily committed to several activities in partnership with other interested stakeholders.

CGA believes encouraging consumers to use fewer carryout bags, reuse carryout bags and use reusable grocery bags consistently, regardless of bag type, is the only way to change consumer behavior, essential to real environmental gain. Any piecemeal approach to controlling carryout bag usage and encouraging reusable bag use will result in little environmental gain as related to waste and litter control and will only shift negative effects. Only a comprehensive approach to carryout bag usage involving ALL bag types and ALL retail uses would limit negative effects and unintended consequences on waste reduction, litter control and store operations.

1415 L Street, Suite 450 Sacramento, CA 95814 Tel: 916/448.3545 Fax: 916/448.2793
1020 North Lake Street, Burbank, CA 91502

Assembly Bill 2058 (Levine), which includes both reduction benchmarks and fees on bags, recently passed the Assembly and now moves to the Senate for consideration. CGA is working with the author, sponsor and other stakeholders to develop a comprehensive approach to the issue of carryout bags. We believe this issue is of statewide concern and should be addressed in a collaborative manner which addresses the concerns of local governments and the retailers which serve their communities.

CGA looks forward to discussions with the City of Manhattan Beach regarding opportunities to reduce carryout bag use through encouragement and disincentives, with the goal of moving consumers to use reusable bags consistently. CGA is generally opposed to fees on carryout bags, but is willing to explore the option as one of several methods. Any effort to create disincentives on carryout bag use must include application to ALL retail uses on ALL carryout bag types; clear communication of the disincentive to consumers; and that any financial resources gained are shared between the city and retailers for litter reduction efforts. Additionally, any program must include a sunset date to allow for a re-evaluation of program effectiveness.

In order to properly develop and evaluate options to reduce carryout bag usage through encouragement or disincentives, CGA recommends the City Council direct staff to work with the grocery and retail community through a 120-day Carryout Bag Task Force process, with the intent of bringing a proposal back to City Council for review. CGA appreciates your consideration and looks forward to further discussion on this matter.

CGA looks forward to working with you on this issue and developing comprehensive and collaborative approaches.

Attachment H:

Superior Court of the State of California In and For the County of Alameda Tentative Decision Regarding the Coalition to Support Plastic Bag Recycling vs. the City of Oakland

SUPERIOR COURT OF THE STATE OF CALIFORNIA
IN AND FOR THE COUNTY OF ALAMEDA

COALITION TO SUPPORT PLASTIC BAG RECYCLING, an unincorporated association, Petitioner, vs. CITY OF OAKLAND, et al. Respondents.	No. RG07-339097 TENTATIVE DECISION GRANTING PETITION FOR WRIT OF MANDATE

The Petition of Coalition to Support Plastic Bag Recycling for Writ of Mandate came on regularly for hearing on January 29, 2008, in Department 31 of this Court, Judge Frank Roesch presiding. Petitioner appeared by Michael N. Mills, Esq. of Downey Brand LLP. Respondents City of Oakland and Oakland City Council appeared by Kevin D. Siegel, Esq., Deputy City Attorney of the City of Oakland.

The court has considered all the papers filed on behalf of the parties and the arguments presented at the hearing and hereby issues this TENTATIVE DECISION granting the Petition for Writ of Mandate. This Tentative Decision shall become the Statement of Decision unless, within ten days, a party specifies controverted issues or makes proposals not covered in this Tentative Decision. The Petition for Writ of Mandate is hereby GRANTED. The Court's findings and reasoning follow.

Factual Summary

This action challenges the legality of Oakland Ordinance No. 12818 ("the Ordinance"), adopted by Respondent City Council on behalf of Respondent City of Oakland (collectively, "City") on July 17, 2007. (1 AR 4-9.) The Ordinance bans the distribution of plastic carry out bags by an affected class of retailers in Oakland whose annual sales meet or exceed $1,000,000. (Ordinance, Section 3.A. found at 1 AR 6) The Ordinance defines "plastic carry out bag" as a non-compostable plastic bag provided by a store to a customer at the point of sale. (1 AR 6.) Although the Ordinance would ban those 100% petroleum based plastic carry out bags,[1] the Ordinance allows, but does not require, the affected retailers to provide "[r]eusable bags, recyclable paper bags and compostable plastic bags" as alternatives to the 100% petroleum plastic bags. (1 AR 7, Ordinance section 3B.)

"Compostable plastic bag" means "a carry out bag that is certified and labeled as meeting the current ASTM-Standard Specifications for compostability ...." (1 AR 6.) Compostable plastic bags are not visually distinguishable from the 100% petroleum plastic bags and the Ordinance requires they be color-coded to allow them to be sorted out from the 100% petroleum bags. (1 AR 6.)

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[1] The court uses the following naming conventions: "100% petroleum plastic bags" are the bags presently provided by most grocery retailers which are banned by the Ordinance. "Compostable plastic bags" are the plastic bags permitted by the Ordinance as one of the alternative carry out bags.

Compostable bags are manufactured with less than 100% petroleum (many with 70-80% petroleum content [see e-mail of Brenda Platt to Misseldine then to Arrona then to Councilmember Nadel dated May 16, 2007]), and decompose in a commercial composting facility (but not in a backyard compost pile).) "Reusable Bag" means a bag that is specifically designed and manufactured for multiple re-use. (1 AR 6.) "Recyclable Paper Bag" is the familiar paper carry out bag provided by retailers to a customer at the point of sale for purposes of transporting groceries or other goods and which, here, meets all of the following requirements: (1) contains no old growth fiber; (2) is 100% recyclable; and (3) contains a minimum of 40% post-consumer recycled content. (1 AR 6.)

The stated purpose of the Ordinance is to prevent litter in, and toxic contamination of, the marine environment; to reduce the consumption of oil; and to discourage use of non-biodegradable plastic bags in favor of reusable bags as governments in other countries have done. (1 AR 4-5, recitals.) A staff report prepared in advance of the July 3, 2007 City Council meeting explains that a further purpose of the Ordinance is to "ban the use of single-use, non-biodegradable plastic bags and to foster a behavioral shift on the part of shoppers away from the use of any type of single-use bag and toward the use of their own re-usable bags." (1 AR 114.)

The City promulgated a Notice of Exemption (from CEQA review) for the Ordinance on July 19, 2007, citing each of the exemptions found in CEQA Guidelines[2] sections 15307 and 15308 on the basis that the Ordinance will "maintain, restore, or enhance" natural resources or the environment and further citing CEQA Guidelines section 15061, subdivision (b)(3) ("the common sense

[2] "CEQA Guidelines" refers to title 14 of the California Code of Regulations Sections 15000 et seq.

exemption"), asserting the Ordinance will have "positive environmental effects and no possibility of significant adverse effects."[3] (1 AR 1-3.)

On August 3, 2007, Petitioner filed its action to invalidate the Ordinance asserting non-compliance with the California Environmental Quality Act (Public Resources Code Sections 21000 et seq.) Petitioner[4] contends that City ignored substantial evidence in the record supporting the proposition that the Ordinance will have unintended adverse environmental consequences, making City's reliance on categorical and other exemptions for the project inappropriate and requiring further CEQA review. More specifically, Petitioner contends that if 100% petroleum plastic bags are banned, the ban will cause a significant increase in the use of paper bags and that such an increase of paper bag use will have a significant effect on the environment. Petitioner also contends that if compostable plastic bags are available, their use will trigger the significant environmental effect of causing contamination of the 100% petroleum plastic bag recycling stream mandated by AB 2449.[5] Petitioner asks the court to invalidate the Ordinance and the City's finding that the Ordinance is exempt from further environmental review under CEQA.

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[3] City's Notice also states that City relied on the exemption found in Guidelines section 15183 for projects that are consistent with a community plan, general plan or zoning. (CEQA Guidelines, § 15183) Petitioner contends that this exemption does not apply to the Ordinance and City does not refute this contention in its brief. For that reason, any argument that might have been raised here regarding the applicability of CEQA Guidelines section 15183 is deemed waived.

[4] Petitioner Coalition to Support Plastic Bag Recycling is comprised of the following: Fresh Pak Corporation, Advanced Polybag, Inc., Crown Poly, Inc. Elkay Plastics Co., Inc. Grand Packaging, Inc. Heritage Plastics, Inc. Hilex Poly Company LLC, Superbag Operating, Ltd. and Kevin Kelly. Mr. Kelly lives in Oakland and is the Chief Executive Officer of Emerald Packaging, a plastic packaging manufacturer. Petition ¶ 7; 2 AR 463.

[5] AB 2449 is a state law enacted in 2006 requiring large retailers to install in-store plastic bag recycling stations that consumers can use to recycle petroleum-based plastic bags. (Pub. Resources Code, §§ 42250-42257.)

Standard of Review

The standard of review in an action alleging a violation of CEQA is whether there has been a prejudicial abuse of discretion. (*See* § 21168.5; *Laurel Heights Improvement Assn. v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376, 392.) "Abuse of discretion is established if the agency has not proceeded in a manner required by law or if the determination or decision is not supported by substantial evidence." (§ 21168.5; *Laurel Heights*, *supra*, 47 Cal.3d at 409.) Substantial evidence is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (CEQA Guidelines § 15384(a); *Laurel Heights*, *supra*, 47 Cal.3d at 393.) It includes facts, reasonable assumptions predicated on facts, and expert opinion supported by facts; however, it does not include argument, speculation, or unsubstantiated opinion or narrative. (CEQA Guidelines §§ 21080(e), 21082.2(c).)

This case involves an analysis of the applicability of "the common sense exemption" and the applicability of two categorical exemptions. Further, if either or both of the categorical exemptions apply, the issue arises of the applicability of exceptions to the categorical exemptions.

An activity is exempt from the requirements of CEQA if it is activity that has no potential for causing a significant effect on the environment. "Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." (CEQA Guidelines, section 15061 (b)(3).) The applicability of this "common sense exemption" is determined by an analysis of the Administrative Record. If there is substantial evidence in the record demonstrating no possibility of environmental effect, the exemption applies. The burden is on the City to produce the evidence to support its determination that the common sense exemption applies, including evidence that entirely negates any substantial evidence in the record of an environmental effect.

> "The showing required of a party challenging an exemption under Guidelines section 15061, subdivision (b)(3) is slight, since that exemption requires the agency to be certain that there is no possibility the project may cause significant environmental impacts. If legitimate questions can be raised about whether the project might have a significant impact and there is any dispute about the possibility of such an impact, the agency cannot find with certainty that a project is exempt."

Davidon Homes v. City of San Jose, (1997) 54 Cal.App.4th 106, 117.

An activity is also exempt from CEQA if it falls into any one of the categorical exemptions. (see CEQA Guidelines Sections 15300-15332.) If there is substantial evidence in the record demonstrating that the activity qualifies for any asserted exemption, the exemption applies. The burden is on the City to produce the evidence to support its determination of applicability. "On review, an agency's categorical exemption determination will be affirmed if supported by substantial evidence that the project fell within the exempt category of projects." (*Magan v County of Kings* (2002) 105 Cal.App.4th 468, 474 quoting from *Davidon Homes*, supra.)

If the agency establishes that the activity or project falls within a categorical exemption, the burden shifts to the party challenging the exemption who must show, by substantial evidence in the Administrative Record, that an exception to the exemption applies. (see, e.g., *Davidon Homes*, supra, and *Magan*, supra; see also *Apartment Assn of Greater Los Angeles v. City of Los Angeles* (2001) 90 Cal.App.4th 1162, 1172-1175.)

<u>City's Reliance on the Common Sense Exemption</u>

City relied on the "common sense" exemption from CEQA review for the Ordinance. (1 AR 1, Notice of Exemption.) CEQA Guidelines section

15061(b)(3) states: "The activity is covered by the general rule that CEQA applies only to projects which have the potential for causing significant effect on the environment. Where it can be seen with certainty that there is *no possibility* that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." (14 CCR § 15061, subd. (b)(3) [emphasis added].)

It appears from a review of the Ordinance that its sole operative portion merely substitutes one type of plastic single use carry out bag (the compostable plastic bag) in place of another (the 100% petroleum plastic bag). Common sense would suggest that such a one-for-one substitution would engender no environmental effect and that the "common sense exemption" of CEQA Guidelines section 15061(b)(3) would apply (assuming there was no evidence whatever that the compostable plastic bag may, of itself, have environmental consequences separate or worse than the 100% petroleum plastic bag). (See, *e.g.*, *Muzzy Ranch Co. v. Solano County Airport Land Use Commission* (2007) 41 Cal. 4^{th} 372).

However, this seductively simple, straightforward (and elegant) argument is completely undercut by the credible (and uncontroverted) evidence presented by Kevin Kelly, a manufacturer of both 100% petroleum plastic bags and compostable plastic bags who described himself as "one of the larger providers of biodegradable and compostable produce packaging in the State of California."

Kevin Kelly is the Chief Executive Officer of a Union City plastic packaging manufacturer and a member of Petitioner Coalition. In a comment letter to City in advance of its June 26, 2007 Public Works Committee meeting , Mr. Kelly gave his opinion that compostable plastic bags were unlikely to be available in quantities sufficient to meet the demand created by the (proposed) Ordinance. (2 AR 463-464.) In subsequent testimony to the City Council at its July 3, 2007 meeting, Mr. Kelly gave the basis for his unavailability prediction:

"There is not enough biodegradable resin in the United States...to support the demand that would be generated [by the Ordinance]." (1 AR 180-181.)

As the Chief Executive Officer of one of the "larger" manufacturers of one kind of compostable plastic bag, Mr. Kelly is competent to express an opinion regarding the availability or unavailability of the material needed to produce the substitute compostable bags permitted by the Ordinance.[6] (See *Architectural Heritage Ass'n v. County of Monterey* (2004) 122 Cal.App.4th 1095, 1117 [fact based observations by persons qualified to speak to a question qualify as substantial evidence].)

The fact of credible evidence in the record supporting a fair argument in that the substitute compostable plastic bags may not be available after the 100% petroleum plastic bags are banned needs be evaluated together with the Scottish Executive Environment Group Research Report 2005/6 (1 AR 333-446) ("Scottish Report") which provides evidence that the reduced availability of plastic bags (because of a surcharge in the Scottish situation) resulted in an increase in the use of paper bags.

The Scottish Report is the result of a study to evaluate the environmental impacts of a proposed levy in Scotland on petroleum-based plastic bags, called "lightweight plastic carrier bags" in the Scottish Report. (2 AR 337.) Under a heading entitled "Consumer Behavior," the report's findings included:

> [i]f a levy is introduced and does not include paper bags, it is anticipated that there will be an increased use of paper bags...Under scenarios 1A and 1B (in which paper bags are not subject to the levy), it is assumed that of consumers not purchasing a lightweight plastic carrier bag...*25% will switch to paper carrier bags.*

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[6] The fact that Mr. Kelly is a member of Petitioner's coalition does not alter the validity of his opinion as an "expert opinion supported by facts," or at a minimum, a lay opinion predicated on his personal observations in the packaging trade. (Pub. Resources Code, §21082.2(c); and see Bowman v. City of Berkeley (2004) 122 Cal.App.4th 572, 583 [lay witnesses testimony may qualify as substantial evidence if based on relevant personal observations or involve non-technical issues].)

(2 AR 363 (emphasis added)).

The Scottish Report further concluded:

> In scenarios where paper bags are excluded, the environmental benefits of reduced plastic bag usage are negated for some indicators by the impacts of *increased paper bag usage*. This is because a paper bag has a more adverse impact than a plastic bag for most of the environmental issues considered..."

(2 AR 375 (emphasis added)).

The City attempts to distinguish the Scottish Report on the ground that the report did not consider the availability of compostable plastic bags in its analysis. (2 AR 366 ["we have not considered compostable...bags in the analysis…because they are not thought to be used in any great numbers."]). In other words, because the Scottish Report did not analyze how a *plastic* plastic-bag alternative might affect consumer choice, the City argues that its conclusions are not evidence of any adverse environmental effect here.

Were it not for Mr. Kelly's comments regarding a shortage in the material needed to manufacture compostable bags, the court might agree with the City regarding the relevance of the Scottish Report's conclusions. However, considered together, the Kelly comments and the Scottish Report amount to "enough relevant information and reasonable inferences from this information that a fair argument can be made that a project may have a significant environmental effect." (CEQA Guidelines § 15384(a); *Laurel Heights*, *supra*, 47 Cal.3d at 393.) Moreover, the Scottish Report's conclusion of a 25 percent increase in the use of paper bags appears conservative as applied here. Under the scenarios analyzed in the Scottish Report, consumers had the option to purchase single-use plastic bags, whereas consumers lack this option under the Ordinance. The findings of the Scottish report raise a reasonable inference that an outright ban on single-use 100% petroleum plastic bags may result in increased use of paper bags.

This evidence is sufficient to defeat the assertion of the "common sense exemption" because, with such evidence as part of the record, the City cannot meet the standard that there is no possibility that the Ordinance will cause a significant environmental effect.

Stated in a different way: the City is not able to assert the common sense exemption because the record contains evidence which raises a fair argument that there will be a shortage of substitute compostable plastic bags and that such shortage will cause an increase in the use of paper take out bags. It is because of that evidence in the record and unanimity (1 AR 114) of the uncertainty whether paper bags are less (or more) environmentally friendly than plastic bags that the City cannot assert that there is "no possibility" of any significant environmental effect caused by the ban of the 100% petroleum plastic bags.

Having found evidence to support a fair argument regarding the significant adverse effects of the Ordinance claimed by Petitioner, and no evidence that would permit the City to conclude to a certainty that Petitioner's concerns are unfounded, City's reliance on the common sense exemption was an abuse of discretion. (*Davidon Homes v. City of San Jose*, *supra*, 54 Cal.App.4th 106,118 [if a reasonable argument is made to suggest a possibility that a project will cause a significant environmental impact, the agency must refute that claim to a certainty before finding that the exemption applies].)

City's Reliance on Categorical Exemptions for the Ordinance.

The City also relied on the two CEQA categorical exemptions found in Guideline sections 15307 and 15308, which provide an exemption for projects undertaken to assure the "maintenance, restoration, or enhancement" of a natural resource or the environment. (CEQA Guidelines, §§15307, 15308.) The City's determination that the Ordinance falls within those categorical exemptions will be upheld if there is substantial evidence in the record that the Ordinance meets the definition of a categorically exempt project. (*Davidon Homes v. City of San Jose, supra,* 54 Cal.App.4th 106, 114-115.)

The court finds that the City met its burden to demonstrate substantial evidence in the record to support the City's reliance on the foregoing categorical exemptions for the Ordinance. The Ordinance is intended to maintain, restore and enhance natural resources and the environment based on evidence that it will reduce the City's contribution of oil-based plastic waste to the landfills; reduce oil consumption in general; reduce the amount of toxic plastic litter in the environment; and reduce degradation of the marine environment and harm to marine wildlife. (See, *e.g.*, 1 AR 2:4-5; 1 AR 206; 1 AR 209; 1 AR 211 and 1 AR 217.)

However, there are exceptions to the categorical exemptions. The City cannot rely on a categorical exemption for a project where there is a "reasonable possibility" that the activity will have a significant effect on the environment due to "unusual circumstances." (CEQA Guidelines § 15300.2(c).) The City's determination whether the Ordinance will have a significant effect on the environment is reviewed under the fair argument standard. (*Banker's Hill, Hillcrest, Park West Community Preservation Group v. City of San Diego* (2006) 139 Cal.App.4th 249, 264, 265.) The question is whether "on the basis of the whole record, there was *no* substantial evidence that there would be a significant [environmental] effect." (*Asuza Land Reclamation Company v. Main San Gabriel Basin Watermaster* (1997) 42 Cal.App.4th 1165, 1202 [emphasis in the original].)

A shift in consumer use from one environmentally damaging product to another constitutes an "unusual circumstance" of an activity that would otherwise be exempt from review under CEQA as activity undertaken to protect the environment. (See, e.g., *Magan v. County of Kings, supra,* 105 Cal.App.4th 468, 474.) The court also finds that substantial evidence in the record supports at least a fair argument that single-use paper bags are more environmentally damaging than single-use plastic bags. (2 AR 368 (Scottish Report); 3 AR 742 (EPA Report), 3 AR 739 (ULS Report); see also 1 AR 114 [City's acknowledgement of an "ongoing debate" regarding whether single use paper or single use plastic bags have the greatest environmental impact].)

The Ordinance allows the use of compostable plastic bags as an alternative to 100% petroleum plastic bags, but it does not require retailers to provide them. (1 AR 6, Ordinance, Section 3.C.) It is self evident that a consumer desiring a plastic single use carry out bag would accept a single use compostable plastic bag in place of an 100% petroleum plastic bag if it were offered. Thus Petitioner's claim that the Ordinance will result in a shift in consumer use to single-use paper depends on the existence of evidence that compostable plastic bags will not be available. For the reasons discussed above relative to the common sense exemption, the court concludes that the evidence cited by Petitioner, consisting of comments by plastic packaging manufacturer Kevin Kelly and relevant conclusions contained in the Scottish Report (1 AR 333-446), amounts to substantial evidence that would support a fair argument of an adverse environmental effect excepting the Ordinance from both categorical exemptions and warranting further environmental review.

Although City points to evidence in the record that contradicts evidence cited by Petitioner, the court does not address it except to note that none of this evidence negates the evidence cited by Petitioner. "If such evidence [supporting a fair argument of significant environmental impact] is found, it cannot be overcome by substantial evidence to the contrary." (Leonoff v. Monterey County Board of Supervisors (1990) 222 Cal.App.3d 1337, 1348.) Having concluded that the record contains sufficient evidence of a fair argument that the Ordinance may have a significant environmental effect, City must conduct further environmental review, even if other conclusions might also be reached. (*Friends of "B" Street v. City of Hayward* (1980) 106 Cal.App.3d 988, 1000-1003.)

The court need not address Petitioner's alternate claim concerning the potential for contamination of the plastics recycling stream in the event that more compostable bags are used.

Conclusion

For the reasons set forth above, the Petition is GRANTED. Petitioner is asked to prepare form of judgment for the Court and to submit it to Respondent for approval as to form before submitting it to the Court.

Evidentiary Rulings

1. City's unopposed Requests for Judicial Notice are GRANTED.
2. The court GRANTS Petitioner's request to augment the administrative record to include the May 16, 2007 email messages addressing the merits of banning compostable bags as part of the Ordinance.

Date: April 17, 2008

FRANK ROESCH
Judge of the Superior Court

CLERK'S DECLARATION OF MAILING

I certify that I am not a party to this cause and that on the date stated below I caused a true copy of the foregoing TENTATIVE DECISION GRANTING PETITION FOR WRIT OF MANDATE to be mailed first class, postage pre paid, in a sealed envelope to the persons hereto, addressed as follows:

Michael N. Mills, Esq.
DOWNEY BRAND LLP
555 Capitol Mall, 10^{th} Floor
Sacramento, CA 95814

Kevin D. Siegel, Deputy City Attorney
One Frank Ogawa Plaza, 6^{th} Floor
Oakland, CA 94612

I declare under penalty of perjury that the same is true and correct.
Executed on April 17, 2008.

By: Vicki Daybell
Vicki Daybell, Deputy Clerk
Department 31

Attachment I:

City of Malibu Staff Report May 12, 2008 – Includes:

- City of Malibu Ordinance No. 323 to Ban Plastic Non-Compostable Shopping Bags (note: the Malibu City Council expanded the ordinance to include a ban of compostable, as well as non-compostable bags, the evening of the ordinance review).
- City of Malibu Initial Study and Negative Declaration
- Letters received from the public in response to the City of Malibu's Initial Study and Negative Declaration
- City of San Francisco code section related to their Plastic Bag Ban
- City of Santa Monica City Council Report February 26, 2008 Recommendations Regarding a Ban on Plastic Bags for Commercial Establishments in Santa Monica

City Council Meeting
05-12-08
Item
4.C

Council Agenda Report

To: Mayor Conley Ulich and the Honorable Members of the City Council

Prepared by: Jennifer Voccola, Environmental Programs Coordinator

Reviewed by: Robert L. Brager, Public Works Director

Approved by: Jim Thorsen, City Manager

Date prepared: April 25, 2008 Meeting date: May 12, 2008

Subject: Ordinance to Ban Use of Non-Compostable Plastic Shopping Bags

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RECOMMENDED ACTION: 1) After the City Attorney reads the title of the ordinance, introduce on first reading of Ordinance No. 323 Prohibiting the Use of Non-Compostable Plastic Shopping Bags (Attachment 1); and 2) direct staff to schedule second reading and adoption of Ordinance No. 323 for the May 27, 2008 City Council meeting.

FISCAL IMPACT: There are anticipated costs associated with the implementation and enforcement of this ban which will need further analysis.

DISCUSSION: At the Quarterly Meeting on October 24, 2007, City Council directed staff to research and prepare an ordinance banning the use of petroleum-based plastic and non-compostable bags in Malibu.

In the interest of providing meaningful information to the City Council and to foster the most informed decision making process practicable, the Planning Division prepared an initial study of the proposed ordinance (Attachment 2). The initial study confirmed that the action does not have the potential to result in a significant impact on the environment. Consequently, a negative declaration was prepared. The Initial Study included a copy of the draft ordinance and was available for public review for a thirty day period ending April 25, 2008. Four comment letters were received by the close of the comment period (Attachment 3).

Plastic shopping bags, also called carryout bags or take-away bags, are generally petroleum based and have been found to significantly contribute to litter and have negative impacts on the environment. Empty plastic bags, due to their lightweight and inflatable characteristics, are often windblown and pollute the local creeks, ocean, and storm drain system. They entangle in landscaping (including trees and coastal brush), litter parks and beaches, and are unsightly along roads' rights-of-way. Plastic bags pose a particular problem for wildlife, especially birds and aquatic life that mistake the bags for food, and as a result, ingest (thereby starving) or suffocate on the bag. Plastic bags are also known to smother plants, restricting growth and destroying the natural habitat.

According to the United States Environmental Protection Agency's (EPA) website, between 500 billion and 1 trillion plastic shopping bags are distributed worldwide annually. Each year, approximately 6 billion plastic carryout bags are used in Los Angeles County; this is equivalent to 600 bags per person per year. Approximately 45,000 tons of plastic shopping bags are disposed by residents countywide with less than five percent of all plastic shopping bags being recycled annually. The domestic market for plastic bags recycling is limited, requiring long distance transport of the materials. Foreign markets are also shifting to obtaining their resources locally due to transportation costs and other environmental considerations.

Compostable or biodegradable plastic shopping bags are bags that are often made from starch based material and are available in various thicknesses, although the most common is similar to the plastic bags seen in grocery stores. They will biodegrade in a commercial compost facility or in a private compost bin or pile if properly maintained under the right conditions. Unfortunately, while Northern California has the resources to handle this material, there are no local facilities that these bags can be taken to ensure they are processed properly. There are mixed opinions on the effectiveness of these bags biodegrading in the marine environment, as they need higher temperatures to properly break down. Most believe that they will not break down quickly enough in the marine environment to avoid impacts to wildlife. They also have the potential to contaminate plastic recycling programs. If compostable bags similar to typical grocery store shopping bags are used, they would have similar environmental impacts as the regular petroleum based plastic bags. Council may consider having Ordinance No. 323 revised to disallow compostable plastic shopping bags, in addition to non-compostable plastic shopping bags.

Paper shopping bags do not have the same impact on the environment as plastic shopping bags have. Because they are heavier, they are not dispersed by wind the way plastic bags are. They also are made from renewable resources, especially if recycled content is used, and have a higher recycling rate of twenty-one percent, since curbside recycling programs for paper are more universally available. Increased education and outreach can help to improve this recycling rate. Paper shopping bags are compostable, will biodegrade in the marine environment, and are not likely to be mistaken as food.

Reusable bags contribute towards environmental sustainability over plastic and paper carryout bags and are overall the best alternative. They have been found to have the least overall environmental impact. A study by the Australian Department of the Environment and Heritage in 2002 found that "the greatest environmental benefits when evaluating manufacture, transportation, use, and disposal of carryout bags are achieved when replacing single use disposable bags with reusable bags". Accelerating the widespread use of reusable bags will diminish plastic bag litter and redirect environmental preservation efforts and resources towards "greener" practices.

Several U.S. cities and many countries have adopted ordinances and policies on plastic bags (mostly at grocery stores and pharmacies), such as:

1. In 2005, San Francisco officials first proposed a 17-cent tax on distribution of plastic bags. San Francisco banned plastic bags on April 20, 2007 (Attachment 4) after declaring the tax levy program a failure. The ban took effect on November 20, 2007.

2. Internationally, plastic bags have been outlawed in South Africa, Taiwan and Bangladesh, and recently China; Ireland, France, Germany, and Japan impose a plastic bag tax which has proven to be effective.

3. On June 26, 2007, a measure to ban plastic bags from grocery stores and other large retailers in Oakland, California was unanimously passed by a key City Council committee. The ordinance (Attachment 5), adopted July 17, 2007 was later challenged on CEQA grounds, not on the merits of the ordinance.

4. In August 2007, the County of Los Angeles completed a study on plastic carryout bag in order to determine how and in what ways a plastic reduction ordinance would affect the region and found that biodegradable bags are not a practical solution to this issue in Los Angeles County because there are no local commercial composting facilities able to process the biodegradable bags at this time. On January 22, 2008, the Los Angeles County Board of Supervisors voted to reduce plastic bag use by enacting voluntary reductions of 30 percent and 65 percent by 2010 and 2013 respectively. If these targets are not met by the deadlines, a mandatory ban may be implemented.

5. On February 26, 2008, the City of Santa Monica approved the staff recommendation to direct the City Attorney to prepare an ordinance banning the free distribution of single-use plastic carryout bags to customers at stores within the City and to research options to charge a fee on single use paper bags (Attachment 6). Although the use of paper bags has less of an impact on the environment, the City of Santa Monica is considering imposing the fee on the distribution of paper shopping bags to encourage the public to use reusable bags. The staff recommendation is to also ban compostable plastic bags.

6. The California State Legislature enacted Assembly Bill 2449 (AB 2449), which took effect July 1, 2007, requiring implementation of a statewide plastic bag recycling program. This law requires stores (those with over 10,000 square feet or gross annual sales of $2 million or more) to provide drop-off recycling services for grocery and merchandise bags. A city, county, or the state may impose civil liability for those who do not comply with AB 2449; however, a city may not impose a fee on the distribution of plastic bags. The Legislature is looking to pass a new measure that would build upon and strengthen the existing law (AB 2449) establishing recycling benchmarks and allowing stores to charge a fee of up to 15 cents per bag for one-time use plastic bags given to customers at point of sale. This money would go to cities to help with trash clean up. The bill will also prohibit stores from dispensing these bags to customers unless the stores show proof of having reduced and recycled a minimum of 35 percent of plastic bags by the end of 2010 and 70 percent by 2012.

Per bag fees or taxes have been shown to be effective in reducing the consumption of plastic bags. In March 2002, Ireland became the first Country to introduce a plastic bag tax, or "PlasTax". Intended to reduce the excessive distribution of 1.2 billion plastic bags per year, Ireland's tax resulted in a ninety percent (90%) reduction in consumption with fewer than one billion bags consumed annually. The funds received are earmarked for a green fund established to benefit the environment. The tax is intended to change consumer behavior away from rampant consumption toward habits of reducing and reusing.

Ordinance No. 323 bans the use of non-compostable plastic shopping bags for distribution at point of sale at all retail establishments and vendors located within or doing business within the geographical limits of the City. It applies to all City facilities and City sponsored events, all commercial and non-profit retailers and vendors, and any retailer or vendor selling goods at a facility owned by the City or on public property. It would not apply to single-use plastic produce bags distributed in a store exclusively for the purpose of transporting produce or other bulk items to the point-of-sale. The ordinance shall become operative for grocery stores, food vendors, restaurants, pharmacies, and City facilities six months after its effective date. This ordinance becomes operative for all other affected retail establishments, vendors, and non-profit vendors one year after its effective date.

Staff has already begun an education and outreach campaign regarding personal stewardship and responsibility in the use of reusable bags like tote bags rather than taking any bag at point of sale. On December 10, 2007, the City Council joined a coalition of 22 cities in Los Angeles County and several environmental organizations in proclaiming December 20th to be "A Day without a Bag" discouraging the use of all disposable bags in favor of reusable tote type bags for shopping on that day and throughout the year. Staff has also placed articles in the City's Quarterly environmental newsletter *Malibu Life*, and in the City's Parks and Recreation Quarterly newsletter. In April 2008, staff designed and purchased two thousand reusable tote bags made from recycled and recyclable materials bearing the logo "Think Legacy" to distribute to the community and visitors as a reminder to think about the legacy they will leave behind on the planet and make responsible choices to protect the environment for future generations. One easy way to protect the environment is to reduce harmful waste by carrying and using durable bags intended for multiple uses whenever shopping, and not just for groceries.

ALTERNATIVES:
1. Direct staff to revise the ordinance
2. Take no action

ATTACHMENTS:
1. City of Malibu Ordinance No. 323 Banning Disposable Non-Compostable Plastic Shopping Bags
2. City of Malibu Initial Study and Negative Declaration
3. Letters received from the public in response to City's Initial Study and Negative Declaration
4. City of San Francisco Municipal Code Chapter 17 related to their Plastic Bag Reduction Ordinance
5. City of Oakland Municipal Code Chapter 8.11 Related to the Ban of Non-Compostable Plastic Carryout Bags
6. City of Santa Monica City Council Report February 26, 2008 Recommendations Regarding a Ban on Plastic Bags for Commercial Establishments in Santa Monica

ORDINANCE NO. 323

AN ORDINANCE OF THE CITY OF MALIBU PROHIBITING THE USE OF NON-COMPOSTABLE PLASTIC SHOPPING BAGS

The City Council of the City of Malibu does ordain as follows:

Section 1. Chapter 9.28 of the Malibu Municipal Code is hereby added to the Malibu Municipal Code to read as follows:

"Chapter 9.28 Ban on Non-Compostable Plastic Shopping Bags"

Section 9.28.010 Definitions

For purposes of this chapter, the following terms shall have the following meanings:

"Affected Retail Establishment" means any retail establishment located within or doing business within the geographical limits of the City of Malibu.

"ASTM Standard" means the American Society for Testing and Materials (ASTM)'s International standard D6400 for compostable plastic, as that standard may be amended from time to time.

"City Sponsored Event" means any event organized or sponsored by the City of Malibu or any Department of the City of Malibu.

"Compostable Plastic Bag" means a plastic bag that: (1) conforms to California labeling law (Public Resources Code Section 42355 et seq.), which requires meeting the current ASTM-Standard Specifications for compostability; (2) is certified and labeled as meeting the ASTM-Standard by a recognized verification entity such as the Biodegradable Product Institute; (3) contains no petroleum derived content; and (4) displays the word "Compostable" in a highly visible manner on the outside of the bag.

"Customer" means any person obtaining goods from an Affected Retail Establishment, Vendor or Non-Profit Vendor.

"Grocery Store" means a dealer in staple foodstuffs, meats, produce, and dairy products and usually household supplies.

"Non-Profit Vendor" means a recognized tax exempt organization which provides goods as a part of its services.

"Person" means any natural person, firm, corporation, partnership, or other organization or group however organized.

"Pharmacy" means a retail use where the profession of pharmacy by a pharmacist licensed by the State of California in accordance with the Business and Professions Code is practiced and where prescription medications are offered for sale.

"Plastic Bag" means any bag made from non-compostable plastic, excluding reusable bags, provided by an Affected Retail Establishment, Vendor or Non-Profit Vendor to a customer at the point of sale for the purpose of carrying away goods.

"Produce Bag" means any plastic bag, excluding reusable bags, exclusively used to transport produce to the point-of-sale.

"Recyclable" means material that can be sorted, cleansed, and reconstituted using Malibu's available recycling collection programs for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, converting, or otherwise thermally destroying solid waste.

"Recyclable Paper Bag" means a paper bag that meets all of the following requirements: (1) contains no old growth fiber; (2) is 100% recyclable overall and contains a minimum of 40% post-consumer recycled content; and (3) displays the words "Reusable" and "Recyclable" in a highly visible manner on the outside of the bag.

"Retail Establishment" means any commercial business facility that sells goods directly to the ultimate consumer including but not limited to grocery stores, pharmacies, liquor stores, "mini-marts," and retail stores and vendors selling clothing, food and personal items.

"Reusable Bag" means a bag with handles that is specifically designed and manufactured for multiple reuse and is either: (1) made of cloth or other machine washable fabric; or (2) made of durable plastic that is at least 2.25 millimeters thick.

"Vendor" means any store, shop, restaurant, sales outlet or other commercial establishment located within or doing business within the City of Malibu, which provides perishable or non-perishable goods.

9.28.020 Non-Compostable Plastic Shopping Bags Prohibited.

A. No Affected Retail Establishment, Restaurant, Vendor or Non-Profit Vendor shall provide Plastic Bags to customers.

B. Nothing in this section shall be read to preclude Affected Retail Establishments, Vendors and Non-Profit Vendors from making Recyclable Paper Bags available to customers.

C. No person shall distribute Plastic Bags at any City facility or any event held on City property.

D. This Chapter shall apply only to Plastic Bags provided at the point of sale for the purpose of carrying away goods. This Chapter shall not apply to single-use plastic produce bags distributed in a grocery store exclusively for the purpose of transporting produce to the point of sale.

Section 2. The City Manager, or his or her designee, may exempt an Affected Retail Establishment, Vendor or Non-Profit Vendor from the requirements of this Chapter for a period of up to one additional year after the operative date of this Ordinance, upon sufficient showing by the applicant that the provisions of this Chapter would cause undue hardship. This request must be submitted in writing to the City within 60 days of the effective date of this Chapter. The phrase undue hardship includes without limitation:

1. Situations where there are no acceptable alternatives to Plastic Bags for reasons which are unique to the Retail Establishment, Vendor, or Non-Profit Provider;

2. Situations where compliance with the requirements of this Code would deprive a person of a legally protected right.

Section 3. Affected Retail Establishments, Vendors and Non-Profit Vendors that have entered into agreements for the purchase of Plastic Bags within the year prior to the effective date of this Ordinance are exempt from the provisions of this Chapter for one additional year following its operative date.

Section 4. Operative Date.

This Ordinance shall become operative as to: 1) Grocery Stores, Food Vendors, Restaurants, Pharmacies and City facilities six (6) months after its effective date; and 2) all remaining Affected Retail Establishments, Vendors and Non-Profit Vendors one (1) year after its effective date.

Section 5. California Environmental Quality Act (CEQA) Findings

Pursuant to the authority and criteria contained in CEQA, the City Council has analyzed the proposal as of projects that have been determined not to have a significant adverse effect on the environment and therefore, the proposed ordinance is exempt from the provisions of CEQA. Specifically, the City Council finds that the ordinance qualifies for a Class 8 categorical exemption. Pursuant to the Class 8, exemption, the proposed ordinance is presumed not to have a significant effect on the environment. The proposed ordinance, consisting of a citywide prohibition on the use of non-compostable plastic shopping bags qualifies for this exemption pursuant to CEQA Guidelines. City Council has also considered each of the potential exceptions to categorical exemptions set forth in CEQA Guidelines section 15300.2 and determined that there is no evidence to support application of the exceptions to the Class 8 categorical exemption.

Without waiving the right to rely on any applicable categorical or statutory exemption and in the interest of providing meaningful information to the City Council and to foster the most informed decision making process practicable, the Planning Division has nevertheless conducted an initial study of the proposed ordinance. The initial study confirmed that the action does not have the potential to result in a significant impact on the environment. Consequently, a negative declaration was prepared and is hereby adopted.

Section 6. The City Clerk shall certify the adoption of this ordinance.

PASSED, APPROVED AND ADOPTED this _____ day of ______________, 2008.

PAMELA CONLEY ULICH, Mayor

ATTEST:

LISA POPE, City Clerk
(seal)

APPROVED AS TO FORM:

Lauren Feldman

CHRISTI HOGIN, City Attorney

Attachment No. 2

CITY OF MALIBU
NOTICE OF INTENT TO ADOPT
NEGATIVE DECLARATION

Name of Project: Plastic Bag Ban Ordinance

Project Description: Initial Study No. 08-002 and Negative Declaration No. 08-001

The proposed project consists of the adoption of the Plastic Bag Ban Ordinance, establishing a ban on the use of disposable, non-compostable plastic shopping bags in the City of Malibu. Plastic shopping bags are a significant component of litter in the environment due to their durability and light weight. Plastic shopping bags become litter along streets, pollute watersheds, and the marine environment. Studies have shown that plastic shopping bags have adverse effects on marine wildlife and the marine environment. Non-compostable plastic shopping bags do not biodegrade in the environment and are often mistaken for food by birds and marine animals with significant negative impacts. Not all plastic bag litter found in Malibu and its nearby marine environment originates in the City; however, the proposed project would decrease plastic debris generated in the City. While the ordinance would ban non-compostable plastic shopping bags, it would allow compostable shopping bags and paper bags made from at least 40 percent post consumer recycled materials to be used. Since these bags can also become litter, education outreach programs for residents and business owners will be launched to encourage patrons to choose and use reusable bags, and thereby offset any increased demand for and impacts from compostable plastic or paper bags.

Applicant: City of Malibu
Location: Citywide
Lead Agency: City of Malibu
Contact: Ha Ly, Assistant Planner, 310-456-2489, ext. 250, hly@ci.malibu.ca.us
Jennifer Voccola, Environmental Program Coordinator, 310-456-2489, ext. 275, jvoccola@ci.malibu.ca.us

Review Period: **Begins:** March 27, 2008 **Ends:** April 25, 2008

The Initial Study and Negative Declaration will be circulated for a 30-day review period. Written comments will be received by the City of Malibu Planning Division until 4:30 p.m. on the ending date of the public review period.

Purpose of Review: The purpose of this review is to allow public agencies and interested members of the public the opportunity to share expertise, disclose agency analysis, check for accuracy, detect omission, discover public concerns and solicit counter proposals pursuant to CEQA Section 15200 (Purposes of Review).

Where to Send Comments: Comments regarding the Initial Study and Negative Declaration should reference "Plastic Bag Ban Ordinance". Comments may be submitted as follows:

Post: City of Malibu
Planning Division
Attn: Plastic Bag Ban Ordinance
23815 Stuart Ranch Road
Malibu, CA 90265

Fax: 310-456-7650
Email: hly@ci.malibu.ca.us
jvoccola@ci.malibu.ca.us

Address Where Documents Are Available for Review:
City of Malibu City Hall
Planning Division
23815 Stuart Ranch Road
Malibu, CA 90265-4861

Public Hearings Scheduled: At this time, a hearing date before the Planning Commission has not yet been scheduled. For more information, contact the City of Malibu Planning Division at 310-456-2489, extension 250 during City Hall regular business hours or consult the City's website for further information on scheduled hearing dates.

Stacey Rice, AICP, Acting Planning Manager

Publish Date: March 27, 2008

City of Malibu
Planning Division
23815 Stuart Ranch Road
Malibu, CA 90265-4861

INITIAL STUDY / NEGATIVE DECLARATION

Ban on Non-Compostable Plastic Shopping Bags Ordinance

Initial Study No. 08-002
Negative Declaration No. 08-001

Introduction

This *Initial Study* has been prepared in accordance with relevant provisions of the *California Environmental Quality Act (CEQA) of 1970,* as amended, and the CEQA *Guidelines* as revised. *Section 15063(c)* of the CEQA *Guidelines* indicates that the purposes of an Initial Study are to:

1. Provide the Lead Agency (i.e., the City of Malibu) with information to use as the basis for deciding whether to prepare an Environmental Impact Report (EIR) or Negative Declaration;

2. Enable an applicant or Lead Agency to modify a project, mitigating adverse impacts before an EIR is prepared, thereby enabling the project to qualify for a Negative Declaration;

3. Assist the preparation of an EIR, if one is required, by:
   - Focusing the EIR on the effects determined to be significant;
   - Identifying the effects determined not to be significant;
   - Explaining the reasons why potentially significant effects would not be significant; and
   - Identifying whether a program EIR, tiering, or another appropriate process can be used for analysis of the project's environmental effects;

4. Facilitate environmental assessment early in the design of a project;

5. Provide documentation of the factual basis for the finding in a Negative Declaration that a project will not have a significant effect on the environment;

6. Eliminate unnecessary EIRs; and

7. Determine whether a previously prepared EIR could be used with the project.

CITY OF MALIBU

INITIAL STUDY ENVIRONMENTAL CHECKLIST FORM

1.	Project Title:	Ban on Non-Compostable Plastic Shopping Bags Ordinance Initial Study (IS) No. 08-002 Negative Declaration (ND) No. 08-001
2.	Lead Agency Name and Address:	City of Malibu Planning Division 23815 Stuart Ranch Road Malibu, CA 90265-4861
3.	Contact Person and Phone Number:	Ha Ly Assistant Planner (310) 456-2489, extension 250
4.	Project Location:	Citywide
5.	Project Applicant Name and Address:	City of Malibu 23815 Stuart Ranch Road Malibu, CA 90265-4861
6.	General Plan Land Use Designation:	Citywide
7.	Zoning:	Citywide

8. Description of Project:

The proposed project consists of the adoption of the Ban on Non-Compostable Plastic Shopping Bags Ordinance, establishing a ban on the use of disposable, non-compostable plastic shopping bags in the City of Malibu. Plastic shopping bags are a significant component of litter in the environment due to their durability and light weight. Plastic shopping bags become litter along streets, pollute watersheds, and the marine environment. Studies have shown that plastic shopping bags have adverse effects on marine wildlife and the marine environment. Non-compostable plastic shopping bags do not biodegrade in the environment and are often mistaken for food by birds and marine animals with significant negative impacts. Not all plastic bag litter found in Malibu and its nearby marine environment originates in the City; however, the proposed project would decrease plastic debris generated in the City. While the ordinance would ban non-compostable plastic shopping bags, it would allow compostable shopping bags and paper bags made from at least 40 percent post consumer recycled materials to be used. Since these bags can also become litter, education outreach programs for residents and business owners will be launched to encourage patrons to choose and use reusable bags, and thereby offset any increased demand for and impacts from compostable plastic or paper bags.

9. CEQA Context

The City has determined that the proposed ordinance could not have a significant adverse effect on the environment and a Negative Declaration is to be prepared for this project.

10. Project Approvals

The project requires the following City of Malibu approvals:

a. Adoption of the Negative Declaration
b. Adoption of the Ordinance

11. Other agencies whose approval is required (e.g., permits, financing approval or participating agreement):

None

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" or as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards & Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION: (To be completed by Lead Agency)

On the basis of this initial evaluation:

☒ I find the proposed project COULD NOT have a significant effect on the environment and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the project could have a significant effect on the environment there will not be a significant effect in this case because revisions in the project have been made or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Ha Ly, Assistant Planner
March 27, 2008

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including offsite as well as on-site, cumulative as well as project level, indirect as well as direct, and construction as well as operational impacts.

3. Once the lead agency has determined that a particular physical impact may occur, the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries, an EIR is required.

4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact". The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," cited in support of conclusions reached in other sections may be cross-referenced).

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a. Earlier Analysis Used: Identify and state where they are available for review.
   b. Impacts Adequately Addressed: Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

c. Mitigation Measures: For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., comprehensive plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8. The explanation of each issue should identity: a) The significance criteria or threshold, if any, used to evaluate each question; and b) The mitigation measure identified, if any, to reduce the impact to less than significant.

A. AESTHETICS

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
2. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
3. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
4. Create a source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002; An Overview of Carryout Bags in Los Angeles County, 2007.

Impact Discussion:

1 – 4 Plastic bags are a significant component of litter in the environment due to their durability and light weight. The City of Los Angeles conducted a waste characterization study in June 2004 and found that plastic bags made up of 25 percent by weight, and 19 percent by volume, of litter found in 30 storm drain catch basins. Often, plastic shopping bags

are white or brightly colored and create a significant eyesore throughout the community. Adoption of the Ban on Non-Compostable Plastic Shopping Bags Ordinance would prohibit non-compostable plastic shopping bags Citywide, thereby decreasing the amount of plastic bags that become litter. The project would not adversely affect any scenic vistas, damage scenic resources, degrade existing visual character, and will not create a source of substantial light or glare.

Recommended Mitigation Measures:
No mitigation measures are required regarding aesthetics.

Residual Impacts:
The project will not create any potentially significant impacts to aesthetic resources Citywide. As a result, no residual impacts would occur.

B. AGRICULTURAL RESOURCES

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?	☐	☐	☐	☒
2. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
3. Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to nonagricultural use?	☐	☐	☐	☒

Sources: City of Malibu General Plan; California Department of Conservation, Farmland Mapping and Monitoring Program, 2002; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-3 The proposed project involves the adoption of an ordinance which would ban non-compostable plastic shopping bags Citywide, and will have no impact on land designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, or land within a Williamson Act contract.

Recommended Mitigation Measures:
No mitigation measures are required regarding agricultural resources.

Residual Impacts:
The project will not create any potentially significant impacts to agricultural resources Citywide. As a result, no residual impacts would occur.

C. AIR QUALITY

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or sate ambient air quality standard (including releasing emissions which exceed qualitative thresholds for ozone precursors?)	☐	☐	☐	☒
4. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
5. Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-5 The proposed project involves the adoption of an ordinance which would ban non-compostable plastic shopping bags Citywide. The project would not conflict or obstruct the implementation of the applicable air quality plan nor violate any air quality standards in the City. The project would not result in a cumulatively considerable net increase of any pollutant, expose sensitive receptors to substantial pollutant concentrations or create objectionable odors.

Recommended Mitigation Measures:
No mitigation measures are required regarding air quality.

Residual Impacts:

The project will not create any potentially significant adverse impacts to air quality Citywide. As a result, no residual impacts would occur.

D. BIOLOGICAL RESOURCES

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
3. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
6. Conflict with the provisions of an adopted	☐	☐	☐	☒

Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				

Sources: City of Malibu General Plan, City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002; "The Problem with Marine Debris", California Coastal Commission Public Education Program website, City of Santa Monica, City Council Agenda Item 8C, Staff Analysis, February 19, 2008; N. Wallace, "Debris Entanglement in the Marine Environment: A Review", 1985.

Impact Discussion:

1-2 The project consists of the adoption of an ordinance which would ban non-compostable plastic shopping bags, thereby decreasing the prevalence of plastic bag litter in the marine environment in and near the City. According to a web article "The Problem with Marine Debris" on the California Coastal Commission Public Education Program's website, an estimated 60 percent to 80 percent of all marine debris, and 90 percent of all floating debris, is plastic. Non-compostable plastic shopping bags do not biodegrade in the environment and are often mistaken for food by birds and marine animals with significant negative impacts. Studies have estimated that more than 100,000 marine mammals die annually through ingestion of or entanglement in marine debris, including plastic bags. Not all plastic bag litter found in Malibu and its nearby marine environment originates in the City; however, the proposed project would decrease plastic debris generated in the City; therefore, resulting in a beneficial effect on the biological resources. The proposed project would not result in substantial adverse effect, directly or through habitat modification on any species identified as a candidate, sensitive or special species. The adoption of the ordinance would not adversely affect riparian habitats or other sensitive natural communities identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service. The Ban on Non-Compostable Plastic Shopping Bags Ordinance is anticipated to result in a positive effect on species and habitats.

3-4 The proposed project is not expected to result in any impacts to federally protected wetlands. It is not expected to substantially interfere with the movement of any native resident or migratory fish or wildlife species or impact any native wildlife nursery sites.

5-6 The proposed project does not conflict with any local policies protecting biological resources, or conflict with any adopted Habitat Conservation Plan, Natural Community Conservation Plan or other local or regional conservation plans.

Recommended Mitigation Measures:
No mitigation measures are required regarding biological resources.

Residual Impacts:
The project will not create any potentially significant adverse impacts to biological resources Citywide. As a result, no residual impacts would occur.

E. CULTURAL RESOURCES

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact

1. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
2. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
3. Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☐	☐	☒
4. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-4 The proposed project involves adoption the adoption of an ordinance to ban non-compostable plastic shopping bags Citywide and does not include any development. The project would not result in substantial adverse change in a historical resource or archaeological resource. The project would not directly or indirectly destroy a unique paleontological resource or site, nor disturb any human remains, including those interred outside of formal cemeteries.

Recommended Mitigation Measures:
No mitigation measures are required regarding cultural resources.

Residual Impacts:
The project will not create any potentially significant adverse impacts to cultural resources Citywide. As a result, no residual impacts would occur.

F. GEOLOGY AND SOILS

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
a. Rupture of a known earthquake fault, as delineated on the most recent	☐	☐	☐	☒

Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of known fault? (Refer to Division of Mines and Geology Special Pub 42)				
b. Strong seismic ground shaking?	☐	☐	☐	☒
c. Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
d. Landslides?	☐	☐	☐	☒
2. Result in substantial soil erosion, or the loss of topsoil?	☐	☐	☐	☒
3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (2001), creating substantial risks to life or property?	☐	☐	☐	☒
5. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-5 The project does not include any development; therefore, the project would not expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, liquefaction, landslides, or substantial soil erosion or loss of top soil. The Ban on Non-Compostable Plastic Shopping Bags Ordinance would not result in future development that would be located on geologic unit or soil that is unstable, or that would become unstable, or result in offsite landslide, lateral spreading, subsidence, liquefaction or collapse as a result of the project.

Recommended Mitigation Measures:
No mitigation measures are required regarding geology and soils.

Residual Impacts:
The project will not create any potentially significant adverse impacts to geology and soils Citywide. As a result, no residual impacts would occur.

G. HAZARDS AND HAZARDOUS MATERIALS

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials?	☐	☐	☐	☒
2. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
3. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
4. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

5. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
6. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
7. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
8. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-8 The project involves the adoption of an ordinance to ban non-compostable plastic shopping bags and does not involve the use or disposal of hazardous materials or create a public or safety hazard or affect existing emergency response plans or routes. The Malibu City limits are not within an airport land use plan or within two miles of a public airport and the project would not create or result in a safety hazard for people residing or working in the project area. The proposed ordinance would not result in exposure of people or structures to a significant risk of loss, injury or death involving wildland fires.

Recommended Mitigation Measures:
No mitigation measures are required regarding hazards and hazardous materials.

Residual Impacts:
The project will not create any potentially significant adverse impacts regarding hazards and hazardous materials Citywide. As a result, no residual impacts would occur.

H. HYDROLOGY AND WATER QUALITY

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
2. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off site?	☐	☐	☐	☒
4. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in substantial erosion or siltation on or off site?	☐	☐	☐	☒
5. Create or contribute runoff water, which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
6. Otherwise substantially degrade water quality?	☐	☐	☐	☒

7. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
8. Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?	☐	☐	☐	☒
9. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
10. Inundation by seiche, tsunami or mudflow?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002; Federal Emergency Management Agency Flood Hazard Boundary Map.

Impact Discussion

1-10 The proposed project does not involve any development; therefore, the project would not violate water quality standards and water discharge requirements. Furthermore, the proposed ordinance would not impact groundwater resources, alter existing drainage patterns, increase the rate or amount of surface runoff resulting in erosion or siltation on or off site, create or contribute runoff water, or degrade water quality. The project does not involve placing structures within a 100-year flood hazard area or impede and redirect flood flow. The project would not expose people or structures to a significant risk of lost, injury or death involving flooding, or inundation by seiche, tsunami or mudflow. The proposed project is anticipated to have a positive impact on water quality by eliminating a known pollutant from storm drain catch basins.

Recommended Mitigation Measures:
No mitigation measures are required regarding hydrology and water quality.

Residual Impacts:
The project will not create any potentially significant adverse impacts to hydrology and water quality Citywide. As a result, no residual impacts would occur.

I. LAND USE AND PLANNING

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Physically divide an established	☐	☐	☐	☒

community?				
2. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the Comprehensive Plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
3. Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1 The proposed project involves the adoption an ordinance which would ban non-compostable plastic shopping bags Citywide. The project does not physically divide an established community.

2-3 The proposed ordinance would not conflict with any applicable land use plan and policy or conflict with any habitat or natural community conservation plans. Furthermore, it would complement the conservation objectives and policies of the City of Malibu General Plan to protect marine habitats and wildlife by decreasing the prevalence of plastic shopping bag litter. The project would result in beneficial impacts to conservation plans Citywide.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to land use and planning.

Residual Impacts:
The project will not create any potentially significant adverse impacts to land use and planning Citywide. As a result, no residual impacts would occur.

J. MINERAL RESOURCES

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

2. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local Comprehensive Plan, specific plan or other land use plan?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-2 The proposed project is the adoption of an ordinance and does not affect known or locally important mineral resources. No impacts to mineral resources are anticipated.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to mineral resources.

Residual Impacts:
The project will not create any potentially significant adverse impacts to mineral resources Citywide. As a result, no residual impacts would occur.

K. NOISE

Would the proposed project result in:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
2. Exposure of people to excessive ground borne vibration or noise levels?	☐	☐	☐	☒
3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
5. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the	☐	☐	☐	☒

project expose people residing or working in the project area to excessive noise levels?				
6. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Sources: City of Malibu General Plan, City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-4 The project would not expose people to, or generate, noise levels in excess of standards established in the General Plan Noise Element or the Malibu Noise Ordinance (Malibu Municipal Code Chapter 8.24). The proposed ordinance would not expose people to excessive ground vibration or result in a substantial permanent or a temporary increase of ambient noise.

5-6 The proposed ordinance is effective Citywide. The Malibu City limits are not located within two miles of an airport or near an airstrip; therefore, no impacts are anticipated.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to noise.

Residual Impacts:
The project will not create any potentially significant adverse impacts to noise Citywide. As a result, no residual impacts would occur.

L. POPULATION AND HOUSING

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through an extension of roads or other infra-structure)?	☐	☐	☐	☒
2. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
3. Displace substantial numbers of people,	☐	☐	☐	☒

necessitating the construction of replacement housing elsewhere?				

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-3 The proposed project includes the adoption of an ordinance and would not increase, decrease, or otherwise affect population or local population growth rates. Therefore, no impacts to population or housing would occur as a result of the proposed project.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to population and housing.

Residual Impacts:
The project will not create any potentially significant adverse impacts pertaining to population and housing Citywide. As a result, no residual impacts would occur.

M. PUBLIC SERVICES

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Fire protection?	☐	☐	☐	☒
2. Police protection?	☐	☐	☐	☒
3. Schools?	☐	☐	☐	☒
4. Parks?	☐	☐	☐	☒
5. Other Public Services?	☐	☐	☒	☐

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-5 The proposed project is the adoption of an ordinance to ban non-compostable plastic shopping bags Citywide and no development is proposed. The implementation of the ordinance will involve education outreach to residents and business owners to encourage usage of reusable bags as the alternative. The implementation of the ordinance is anticipated to have less than significant effects on existing levels of service, response times or performance objectives for fire, police, schools, parks, or other government services. Also, new facilities are not necessary to adopt the proposed ordinance.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to public services.

Residual Impacts:
The project will not create any potentially significant adverse impacts pertaining to public services Citywide. As a result, no residual impacts would occur.

N. RECREATION

Would the proposed project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
2. Include recreational facilities or require the construction of expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-2 The proposed project is the adoption of an ordinance and would not increase the use of recreational facilities. The project does not require the construction or expansion of recreational facilities or otherwise affect existing recreational facilities.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to recreation.

Residual Impacts:
The project will not create any potentially significant adverse impacts pertaining to recreation Citywide. As a result, no residual impacts would occur.

O. TRANSPORTATION/TRAFFIC

Would the proposed project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
2. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
3. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
5. Result in inadequate emergency access?	☐	☐	☐	☒
6. Result in inadequate parking capacity?	☐	☐	☐	☒
7. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Sources: City of Malibu General Plan, City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-3 The proposed project involves the adoption of an ordinance to ban non-compostable shopping bags Citywide and would not affect current traffic loads, the street system capacity, existing levels of service, or air traffic patterns.

4-6 The project is the adoption of an ordinance, and does not include any development; therefore, no increase in traffic hazards, impacts to emergency access or parking capacity are anticipated.

7 The project would not conflict with adopted policies, plans, or programs supporting alternative transportation.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to transportation/traffic.

Residual Impacts:
As proposed, the project will not have significant impacts to transportation/traffic in the City. As a result, no residual impacts would occur.

P. UTILITIES AND SERVICE SYSTEMS

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
2. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
3. Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
4. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
5. Result in a determination by the wastewater treatment provider, which serves or may serve the projects that it has adequate capacity to serve the	☐	☐	☐	☒

project's projected demand in addition to the provider's existing commitments?				
6. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
7. Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-5 The proposed project involves the adoption an ordinance to ban non-compostable plastic shopping bags Citywide. The adoption of the proposed ordinance would not affect wastewater treatment requirements of the Regional Water Quality Control Board or result in construction of a new water or wastewater treatment facility or expansion of existing facilities. The project does not require any additional water supply or wastewater capacity.

6 While the ordinance would ban non-compostable plastic shopping bags, it would allow compostable shopping bags and paper bags made from recycled materials to be used Citywide. Since these bags can also become litter, education programs will be launched to encourage patrons to choose and use reusable bags, and thereby offset any increased demand for and impacts from compostable plastic or paper bags. Although paper shopping bags are not banned, the ordinance would require paper bags to be made from at least 40 percent of post-consumer recycled materials. The project would not significant impact a landfill capacity to accommodate the project's solid waste disposal needs.

7 The proposed ordinance complies with federal, state, and local statues and regulations related to solid waste.

Recommended Mitigation Measures:
No mitigation measures are required pertaining to utilities and service systems.

Residual Impacts:
As proposed, the project will not have significant impacts to utilities and service systems in the City. As a result, no residual impacts would occur.

Q. MANDATORY FINDINGS OF SIGNIFICANCE

Does the proposed project:	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact

1. Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
2. Have impacts that are individually limited, but cumulatively considerable *("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?*	☐	☐	☐	☒
3. Have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Sources: City of Malibu General Plan; City of Malibu Municipal Code; City of Malibu Local Coastal Program, 2002.

Impact Discussion:

1-3 The proposed project involves the adoption of an ordinance to ban non-compostable plastic shopping bags and does not include any development. The proposed ordinance does not have the potential to degrade the quality of the environment or substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop, or threaten to eliminate a plant or animal community. The project would not eliminate important examples of the major periods of California history or prehistory. The project would not have environmental effects or substantial adverse effects on human beings, either directly or indirectly. Furthermore, the proposed ordinance would decrease the prevalence of plastic bag litter in the marine environment, which adversely impact marine wildlife. The proposed ordinance would decrease the prevalence of plastic bag litter in the City.

Recommended Mitigation Measures:

No mitigation measures are required pertaining to mandatory findings of significance.

Residual Impacts:

As proposed, the project will not have significant impacts pertaining to mandatory findings Citywide. As a result, no residual impacts would occur.

REFERENCES

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Ordinance No. ______, An Ordinance of the City of Malibu, California, establishing a ban on non-conpostable, plastic shopping bags Citywide.

Attachment 1 – Draft Ban On Non-Compostable Plastic Shopping Bags Ordinance

ORDINANCE NO. XXX

AN ORDINANCE OF THE CITY OF MALIBU PROHIBITING THE USE OF NON-COMPOSTABLE PLASTIC SHOPPING BAGS

The City Council of the City of Malibu does ordain as follows:

Section 1. Chapter 9.28 of the Malibu Municipal Code is hereby added to the Malibu Municipal Code to read as follows:

"Chapter 9.28 Ban on Non-Compostable Plastic Shopping Bags"

Section 9.28.010 Definitions

For purposes of this chapter, the following terms shall have the following meanings:

"Affected Retail Establishment" means any retail establishment located within or doing business within the geographical limits of the City of Malibu.

"ASTM Standard" means the American Society for Testing and Materials (ASTM)'s International standard D6400 for compostable plastic, as that standard may be amended from time to time.

"City Sponsored Event" means any event organized or sponsored by the City of Malibu or any Department of the City of Malibu.

"Compostable Plastic Bag" means a plastic bag that (1) conforms to California labeling law (Public Resources Code Section 42355 et seq.), which requires meeting the current ASTM-Standard Specifications for compostability; (2) is certified and labeled as meeting the ASTM-Standard by a recognized verification entity such as the Biodegradable Product Institute; (3) contains no petroleum derived content; and (4) displays the word "Compostable" in a highly visible manner on the outside of the bag.

"Customer" means any person obtaining goods from an Affected Retail Establishment, Vendor or Non-Profit Vendor.

"Grocery Store" means a dealer in staple foodstuffs, meats, produce, and dairy products and usually household supplies.

"Non-Profit Vendor" means a recognized tax exempt organization which provides goods as a part of its services.

"Person" means any natural person, firm, corporation, partnership, or other organization or group however organized.

"Pharmacy" means a retail use where the profession of pharmacy by a pharmacist licensed by the State of California in accordance with the Business and Professions Code is practiced and where prescription medications are offered for sale.

"Plastic Bag" means any bag made from non-compostable plastic provided by an Affected Retail Establishment, Vendor or Non-Profit Vendor to a customer at the point of sale for the purpose of carrying away goods, excluding reusable bags.

"Produce Bag" means any plastic bag exclusively used to transport produce to the point-of-sale, excluding reusable bags.

"Recyclable" means material that can be sorted, cleansed, and reconstituted using Malibu's available recycling collection programs for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, converting, or otherwise thermally destroying solid waste.

"Recyclable Paper Bag" means a paper bag that meets all of the following requirements: (1) contains no old growth fiber, (2) is 100% recyclable overall and contains a minimum of 40% post-consumer recycled content, and (3) displays the words "Reusable" and "Recyclable" in a highly visible manner on the outside of the bag.

"Retail Establishment" means any commercial business facility that sells goods directly to the ultimate consumer including but not limited to grocery stores, pharmacies, liquor stores, "mini-marts," and retail stores and vendors selling clothing, food and personal items.

"Reusable Bag" means a bag with handles that is specifically designed and manufactured for multiple reuse and is either (1) made of cloth or other machine washable fabric or (2) made of durable plastic that is at least 2.25 millimeters thick.

"Vendor" means any store, shop, restaurant, sales outlet or other commercial establishment located within or doing business within the City of Malibu, which provides perishable or non-perishable goods.

9.28.020 Non-Compostable Plastic Shopping Bags Prohibited.

A. No Affected Retail Establishment, Restaurant, Vendor or Non-Profit Vendor shall provide Plastic Bags to customers.

B. Nothing in this section shall be read to preclude Affected Retail Establishments, Vendors and Non-Profit Vendors from making Recyclable Paper Bags available to customers.

C. No person shall distribute Plastic Bags at any City facility or any event held on public property.

D. This Chapter shall apply only to Plastic Bags provided at the point of sale for the purpose of carrying away goods. This Chapter shall not apply to single-use plastic produce bags distributed in a grocery store exclusively for the purpose of transporting produce to the point of sale.

Section 2. Section 1.10.040.A of the Malibu Municipal Code shall be amended by adding new paragraph (8) to read as follows and to renumber existing paragraphs (8) through (13) as (9) through (14):

1.10.040 Code Violations Subject to Administrative Penalty Procedures.

(8) Chapter 9.28: Ban on Non-Compostable Plastic Shopping Bags.

Section 3. The City Manager, or his or her designee, may exempt an Affected Retail Establishment, Vendor or Non-Profit Vendor from the requirements of this Chapter for a period of up to one additional year after the operative date of this Ordinance, upon sufficient showing by the applicant that the provisions of this Chapter would cause undue hardship. This request must be submitted in writing to the City within 60 days of the effective date of this Chapter. The phrase undue hardship includes without limitation:

1. Situations where there are no acceptable alternatives to Plastic Bags for reasons which are unique to the Retail Establishment, Vendor, or Non-Profit Provider;

2. Situations where compliance with the requirements of this Code would deprive a person of a legally protected right.

Section 4. Affected Retail Establishments, Vendors and Non-Profit Vendors that have entered into agreements for the purchase of Plastic Bags within the year prior to the effective date of this Ordinance are exempt from the provisions of this Chapter for one additional year following its operative date.

Section 5. Operative Date.

This Ordinance shall become operative as to 1) Grocery Stores, Food Vendors, Restaurants, Pharmacies and City facilities six (6) months after its effective date, and 2) all remaining Affected Retail Establishments, Vendors and Non-Profit Vendors one (1) year after its effective date.

Section 6. California Environmental Quality Act (CEQA) Findings

Pursuant to the authority and criteria contained in CEQA, the City Council has analyzed the proposal as described above. The City Council hereby finds that the proposed ordinance is listed among the classes of projects that have been determined not to have a significant adverse effect on the environment and therefore, the proposed ordinance is exempt from the provisions of CEQA. Specifically, the City Council finds that the ordinance qualifies for a Class 8 categorical exemption. Pursuant to the Class 8, exemption, the proposed ordinance is presumed not to have a significant effect on the environment. The proposed ordinance, consisting of a citywide prohibition on the use of non-compostable plastic shopping bags qualifies for this exemption pursuant to CEQA Guidelines. City Council has also considered each of the potential exceptions to categorical exemptions set forth in CEQA Guidelines section 15300.2 and determined that there is no evidence to support application of the exceptions to the Class 8 categorical exemption.

Without waiving the right to rely on any applicable categorical or statutory exemption and in the interest of providing meaningful information to the City Council and to foster the most informed decision making process practicable, the Planning Division has nevertheless conducted an initial study of the proposed ordinance. The initial study confirmed that the action does not have the potential to result in a significant impact on the environment. Consequently, a negative declaration was prepared and is hereby adopted.

Section 7. The City Clerk shall certify the adoption of this ordinance.

PASSED, APPROVED AND ADOPTED this ______ day of ________________, 2008.

____
, Mayor

ATTEST:

____
LISA POPE, City Clerk

APPROVED AS TO FORM:

____
CHRISTI HOGIN, City Attorney

I CERTIFY THAT THE FOREGOING ORDINANCE NO. XXX was passed and adopted at the regular City Council meeting of ____________________, 2008, by the following vote:

AYES: X
NOES: X
ABSTAIN: X
ABSENT: X

____
LISA POPE, City Clerk
(seal)

Attachment No. 3

STATE OF CALIFORNIA Arnold Schwarzenegger, Gove

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390
Web Site www.nahc.ca.gov
e-mail: ds_nahc@pacbell.net

RECEIVED
APR 11 2008
PLANNING DIV.

April 7, 2008

Ms. Ha Ly, Planner
CITY OF MALIBU
23815 Stuart Ranch Road
Malibu, CA 90265

Re: SCH#2008031120; CEQA Notice of Completion; Proposed Negative Declaration for the Plastic Bag Ordinance; City of Malibu; Los Angeles County, California

Dear Ms. Ly:

The Native American Heritage Commission is the state agency designated to protect California's Native American Cultural Resources. The California Environmental Quality Act (CEQA) requires that any project that causes a substantial adverse change in the significance of an historical resource, that includes archaeological resources, is a 'significant effect' requiring the preparation of an Environmental Impact Report (EIR) per the California Code of Regulations §15064.5(b)(c (CEQA guidelines). Section 15382 of the 2007 CEQA Guidelines defines a significant impact on the environment as "a substantial, or potentially substantial, adverse change in any of physical conditions within an area affected by the proposed project, including ... objects of historic or aesthetic significance." In order to comply with this provision, the lead agency is required to assess whether the project will have an adverse impact on these resources within the 'area of potential effect (APE)', and if so, to mitigate that effect. To adequately assess the project-related impacts on historical resources, the Commission recommends the following action:
√ Contact the appropriate California Historic Resources Information Center (CHRIS) for possible 'recorded sites' in locations where the development will or might occur. Contact information for the Information Center nearest you is available from the State Office of Historic Preservation (916/653-7278)/ http://www.ohp.parks.ca.gov. The record search will determine:

- If a part or the entire APE has been previously surveyed for cultural resources.
- If any known cultural resources have already been recorded in or adjacent to the APE.
- If the probability is low, moderate, or high that cultural resources are located in the APE.
- If a survey is required to determine whether previously unrecorded cultural resources are present.

√ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.

- The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for pubic disclosure.
- The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.

√ Contact the Native American Heritage Commission (NAHC) for:

- A Sacred Lands File (SLF) search of the project area and information on tribal contacts in the project vicinity that may have additional cultural resource information. Please provide this office with the following citation format to assist with the Sacred Lands File search request: USGS 7.5-minute quadrangle citation with name, township, range and section; .

- The NAHC advises the use of Native American Monitors to ensure proper identification and care given cultural resources that may be discovered. The NAHC recommends that contact be made with Native American Contacts on the attached list to get their input on potential project impact (APE). In some cases, the existence of a Native American cultural resources may be known only to a local tribe(s).

√ Lack of surface evidence of archeological resources does not preclude their subsurface existence.

- Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5 (f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
- A culturally-affiliated Native American tribe may be the only source of information about a Sacred Site/Native American cultural resource.
- Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.

√ Lead agencies should include provisions for discovery of Native American human remains or unmarked cemeteries in their mitigation plans.

- CEQA Guidelines, Section 15064.5(d) requires the lead agency to work with the Native Americans identified by this Commission if the initial Study identifies the presence or likely presence of Native American human remains within the APE. CEQA Guidelines provide for agreements with Native American, identified by the NAHC, to assure the appropriate and dignified treatment of Native American human remains and any associated grave liens.

√ Health and Safety Code §7050.5, Public Resources Code §5097.98 and Sec. §15064.5 (d) of the California Code of Regulations (CEQA Guidelines) mandate procedures to be followed, including that construction or excavation be stopped in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery until the county coroner or medical examiner can determine whether the remains are those of a Native American. Note that §7052 of the Health & Safety Code states that disturbance of Native American cemeteries is a felony.

<u>√ Lead agencies should consider avoidance, as defined in §15370 of the California Code of Regulations (CEQA Guidelines), when significant cultural resources are discovered during the course of project planning and implementation</u>

Please feel free to contact me at (916) 653-6251 if you have any questions.

Sincerely,

Dave Singleton

Dave Singleton
Program Analyst

Attachment: List of Native American Contacts

Cc: State Clearinghouse

Native American Contacts
Los Angeles County
April 7, 2008

Charles Cooke
32835 Santiago Road
Acton , CA 93510
(661) 733-1812 - cell
suscol@intox.net
Chumash
Fernandeno
Tataviam
Kitanemuk

Patrick Tumamait
992 El Camino Corto
Ojai , CA 93023
yanahea2@aol.com
(805) 640-0481
(805) 216-1253 Cell
Chumash

Beverly Salazar Folkes
1931 Shadybrook Drive
Thousand Oaks , CA 91362
(805) 558-1154 - cell
805 492-7255
Chumash
Tataviam
Fetrnandeño

LA City/County Native American Indian Comm
Ron Andrade, Director
3175 West 6th Street, Rm. 403
Los Angeles , CA 90020
(213) 351-5324
(213) 386-3995 FAX

Fernandeno Tataviam Band of Mission Indians
William Gonzalaes, Cultural/Environ Depart
601 South Brand Boulevard, Suite 102
San Fernando , CA 91340
ced@tataviam.org
(818) 837-0794 Office
(818) 581-9293 Cell
(818) 837-0796 Fax
Fernandeno
Tataviam

Owl Clan
Qun-tan Shup
48825 Sapaque Road
Bradley , CA 93426
(805) 472-9536
(805) 835-2382 - CELL
Chumash

Julie Lynn Tumamait
365 North Poli Ave
Ojai , CA 93023
jtumamait@sbcglobal.net
(805) 646-6214
Chumash

Carol A. Pulido
165 Mountainview Street
Oak View , CA 93022
805-649-2743 (Home)
Chumash

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native American with regard to cultural resources for the proposed, SCH#2008031120; CEQA Notice of Completion; Proposed Negative Declaration for the Plastic Ban Ordinance; City of Malibu; Los Angeles County, California.

Native American Contacts
Los Angeles County
April 7, 2008

Melissa M. Para-Hernandez
119 North Balsam Street — Chumash
Oxnard , CA 93030
805-988-9171

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native American with regard to cultural resources for the proposed, SCH#2008031120; CEQA Notice of Completion; Proposed Negative Declaration for the Plastic Ban Ordinance; City of Malibu; Los Angeles County, California.

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

Main Office
818 West Seventh Street
12th Floor
Los Angeles, California
90017-3435

t (213) 236-1800
f (213) 236-1825

www.scag.ca.gov

RECEIVED
APR 21 2008
PLANNING DIV.

April 17, 2008

Mr. Ha Ly
City of Malibu City Hall
Planning Division
23815 Stuart Ranch Road
Malibu, CA 90265-4861

RE: **SCAG Clearinghouse No. I 20080178 Plastic Bag Band Ordinance**

Dear Mr. Ly:

Thank you for submitting the **Plastic Bag Band Ordinance** for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

We have reviewed the **Plastic Bag Band Ordinance**, and have determined that the proposed Project is not regionally significant per SCAG Intergovernmental Review (IGR) Criteria and California Environmental Quality Act (CEQA) Guidelines (Section 15206). Therefore, the proposed Project does not warrant comments at this time. Should there be a change in the scope of the proposed Project, we would appreciate the opportunity to review and comment at that time.

A description of the proposed Project was published in SCAG's **March 16-31, 2008** Intergovernmental Review Clearinghouse Report for public review and comment.

The project title and SCAG Clearinghouse number should be used in all correspondence with SCAG concerning this Project. Correspondence should be sent to the attention of the Clearinghouse Coordinator. If you have any questions, please contact me at (213) 236-1857. Thank you.

Sincerely,

Laverne Jones

LAVERNE JONES, Planning Technician
Program Development and Evaluation Division

Heal the Bay
1444 9th Street
Santa Monica CA 90401
ph 310 451 1550
fax 310 496 1902
info@healthebay.org
www.healthebay.org

April 24, 2008

Ha Ly, Assistant Planner and Jennifer Voccola, Environmental Programs Coordinator
City of Malibu
Planning Division
Attn: Plastic Bag Ban Ordinance
23815 Stuart Ranch Road
Malibu, CA 90265

Re: Plastic Bag Ban Ordinance, Initial Study No. 08-002 and Negative Declaration No. 08-001

Dear Ha Ly and Jennifer Voccola:

On behalf of Heal the Bay and our over 12,000 members, we urge you to continue your ongoing environmental leadership and ban the free distribution of single use plastic (including biodegradable plastic) carryout bags at all stores within Malibu. We further encourage you to include a provision in your proposal that would require retailers to charge a fee on single use paper bags.

An estimated 6 billion plastic bags are used each year in Los Angeles County. Unfortunately, these bags are seldom recycled.[1] It is likely that millions of plastic carryout bags are used annually in the City of Malibu, as an estimated 23 million plastic bags are used each year at only 25 grocery stores in neighboring Santa Monica.[2] Millions of barrels of oil are used each year in the United States to manufacture plastic bags. Designed only for single-use, these bags have a high propensity to become litter. In fact, data from the 2006 International Coastal Clean-up Day show that over 120,000 discarded bags were collected in California, making bags one of the most abundant types of litter found in the State.[3]

Plastic marine debris is an increasing concern locally, statewide, and internationally. It is estimated that 80% of marine debris comes from land-based sources.[4] Despite past efforts to control marine debris, the quantity of trash in the coastal and ocean environment is increasing dramatically world-wide. The majority of marine debris is comprised of plastic materials. It is

[1] US EPA 2005 Characterization of Municipal Solid Waste, Table 4.
[2] City of Santa Monica Staff Recommendation Regarding a Ban on Plastic Bags for Commercial Establishments in Santa Monica, approved February 26, 2008.
[3] Ocean Conservancy, 2006 International Coastal Cleanup Day Report.
[4] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Public and Constituent Affairs, (1999) "Turning to the Sea: America's Ocean Future;" United Nations Environment Programme (1995) "Global Programme of Action for the Protection of the Marine Environment from Land-based Activities." Note by the secretariat. UNEP (OCA) /LBA/IG.

Heal the Bay

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estimated that 60–80% of all marine debris, and 90% of floating debris is plastic.[5] Because of its durability, plastic can take hundreds of years to break down at sea, and some kinds never truly biodegrade in the ocean.[6] The world's largest ocean garbage dump in the North Pacific is currently estimated to be over twice the size of Texas, where densities of bits of plastic trash have tripled during the last decade. In some parts of the North Pacific, there is six times as much plastic by mass as there is plankton.[7]

Furthermore, plastic bags severely threaten wildlife and degrade the environment. For months after a storm, streamside vegetation, in-stream habitats, and creek bottoms are littered with seemingly endless piles of plastic shopping bags. Streams and storm drains carry plastic bags to the ocean where they are frequently mistaken as food and ingested by marine life. Over 267 species worldwide have been impacted by plastic litter such as plastic bags.[8]

To tackle the plastic bag litter problem, public agencies collectively spend millions of dollars each year on clean-up, enforcement, and prevention.[9] Santa Monica spends over $500,000 each year to clean-up plastic debris, including plastic bags from only 2.5 miles of beach. The City of Malibu also spends significant resources to keep the city's beaches clean. Unfortunately, despite this effort, plastic bags remain ubiquitous in the environment, partially because of careless consumer treatment of single-use plastic bags and also due to the difficulty associated with their clean-up. In addition, plastic bags litter our beaches, and threaten California's $46 billion ocean-dependent, tourism-oriented economy. Beachgoers and tourists are likely to avoid beaches strewn with trash, which would impact the largely beach-based Malibu economy.

The City of Malibu has an opportunity to be a true leader in dealing with plastic bag pollution. Voluntary recycling programs do <u>not</u> work. A voluntary program implemented by the City of San Francisco in 2006 was not effective in reaching City-mandated reduction targets, and led the City to adopt a ban in March 2007.[10] A nationwide voluntary program in Australia that began in 2002 resulted in moderately increased recycling rates of plastic bags, but had no effect on reducing letter and had little positive influence on consumer behavior despite an expenditure of

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[5] California Coastal Commission, (2006) "Eliminating Land-based Discharges of Marine Debris in California: A Plan of Action from The Plastic Debris Project"
[6] California Coastal Commission, (2006) "Eliminating Land-based Discharges of Marine Debris in California: A Plan of Action from The Plastic Debris Project"
[7] C.J. Moore et al., (2001) "A Comparison of Plastic and Plankton in the Pacific Central Gyre," Marine Pollution Bulletin 42: 297-1300; 11US Commission on Ocean Policy, An Ocean Blueprint for the 21st Century. Final Report. Washington, DC, 2004 ISBN#0–9759462–0–X..102006 PPIC Poll data)
[8] N. Wallace. "Debris entanglement in the marine environment: A review" (985) pp. 259-277 in: R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, U.S. Department of Commerce, NOAA Technical Memorandum. NMFS, NOAA-TM-NMFS-SWFC-5.
[9] Californians Against Waste, http://www.cawrecycles.org/plastic_campaing/plastic_bags/problem
[10] City of Santa Monica Staff Recommendation Regarding a Ban on Plastic Bags for Commercial Establishments in Santa Monica, approved February 26, 2008.

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over $50 million for public outreach on the program.[11] In distinction to merely voluntary measures (such as those approved by Los Angeles County recently), a comprehensive plastic bag ban such as that being proposed in your staff report will best help leverage the funds already spent by the city on programs and efforts to comply with litter reduction regulations and will provide additional litter reduction at a minimal cost.

Furthermore, we urge the City of Malibu to include biodegradable plastic carryout bags in the bag ban ordinance. Biodegradable plastic bags do not decompose on land or in aquatic environments. Instead, they require high heat and bacteria, such as those present in industrial composting facilities, to break down into constituents that assimilate back into the environment. If the city allows continued use of biodegradable plastic bags but bans plastic carryout bags, it is likely that retailers will shift to the biodegradable alternative, which will not alleviate the environmental blight and impacts caused by single-use bag litter. The allowance of biodegradable bag alternatives would also likely complicate compliance and enforcement, as it is difficult to distinguish these bags from their synthetic plastic counterparts.

We also recommend the City of Malibu include a retail fee on paper carryout bags in its ordinance, consistent with the City of Santa Monica staff recommendation for action on single-use carryout bags. A paper bag fee is critical in driving the use of the most sustainable option, reusable bags, rather than shifting consumer use from plastic to paper carryout bags. As the most ubiquitous alternative to plastic, paper bags are themselves fraught with environmental impacts.

The urgency for local government to take action has never been greater. The legacy of our growing addiction to single-use plastic packaging will be felt in the environment for centuries to come. Banning plastic bags in the City of Malibu will help enhance the city's recreational and tourism economy, improve the quality of life for residents, free valuable landfill space, and restore our environment to a cleaner and healthier state. We urge you make the City of Malibu an international leader on this issue and adopt a ban on single-use plastic and biodegradable plastic bags.

Sincerely,

Sarah Abramson
Coastal Resources Director

---

[11] An Overview of Carryout Bags in Los Angeles County, A Staff Report to the Los Angeles County Board of Supervisors, August 2007.

State of California • The Resources Agency
Arnold Schwarzenegger, *Governor*
DEPARTMENT OF PARKS AND RECREATION
Ruth Coleman, *Director*
Angeles District
1925 Las Virgenes Road
Calabasas, California 91302

RECEIVED
APR 25 2008
PLANNING DIV.

April 22, 2008

City of Malibu
Planning Division
Attn: Plastic Bag Ban Ordinance
23815 Stuart Ranch Road
Malibu, CA 90265

To Whom It May Concern:

The California Department of Parks and Recreation was pleased to learn that the City of Malibu has proposed adopting a Plastic Bag Ban Ordinance. As stated in the Plastic Bag Ban Ordinance Initial Study/Negative Declaration (IS/ND), non-compostable plastic shopping bags area a significant component of litter in the environment. Non-compostable plastic bags find their way from urban developed areas in to wildlands and open space. Plastic bags can pose a serious threat to wildlife as they do not biodegrade in the environment, and animals often mistaken them for food. The California Department of Parks and Recreation supports the City of Malibu in adopting a Plastic Ban Ordinance and its associated IS/ND.

Thank you for consideration of these comments.

Sincerely,

Ron Schafer
District Superintendent

CHAPTER 17: PLASTIC BAG REDUCTION ORDINANCE

SEC. 1701. SHORT TITLE.

This Ordinance shall be entitled the "Plastic Bag Reduction Ordinance."

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1702. DEFINITIONS.

For the purposes of this Ordinance, the following words shall have the following meanings:

(a) "ASTM Standard" means the American Society for Testing and Materials (ASTM)'s International standard D6400 for compostable plastic, as that standard may be amended from time to time.

(b) "Compostable Plastic Bag" means a plastic bag that (1) conforms to California labeling law (Public Resources Code Section 42355 et seq.), which requires meeting the current ASTM-Standard Specifications for compostability; (2) is certified and labeled as meeting the ASTM-Standard by a recognized verification entity such as the Biodegradable Product Institute; (3) conforms to requirements to ensure that the renewable based product content is maximized over time as set forth in Department of the

Environment regulations; (4) conforms to requirements to ensure that products derived from genetically modified feedstocks are phased out over time as set forth in Department of the Environment regulations; and (5) displays the phrase "Green Cart Compostable" and the word "Reusable" in a highly visible manner on the outside of the bag.

(c) "Checkout bag" means a carryout bag that is provided by a store to a customer at the point of sale.

(d) "Department" means the Department of the Environment.

(e) "Director" means the Director of the Department of the Environment.

(f) "Highly visible manner" means (1) for compostable plastic bags, displaying both of the following in green lettering contrasting with the bag's background color that is at least two inches high: (i) the phrase "Green Cart Compostable" "either on the front and back of the bag together with a solid green band at least one-half inch thick circling the circumference of the bag, or repeatedly, as a band of text or text alternating with solid stripe, circling the circumference of the bag, and (ii) the word "Reusable" displayed on the front and/or back of the bag; and (2) for recyclable paper bags, displaying the words "Reusable" and "Recyclable" on the front and/or back of the bag in blue lettering contrasting with the bag's background color that is at least two inches high, and (3) for both compostable plastic bags and recyclable paper bags, as otherwise required by Department of the Environment regulations.

(g) "Person" means an individual, trust, firm, joint stock company, corporation, cooperative, partnership, or association.

(h) "Pharmacy" means a retail use where the profession of pharmacy by a pharmacist licensed by the State of California in accordance with the Business and Professions Code is practiced and where prescriptions (and possibly other merchandise) are offered for sale, excluding such retail uses located inside a hospital.

(i) "Recyclable" means material that can be sorted, cleansed, and reconstituted using San Francisco's available recycling collection programs for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, converting, or otherwise thermally destroying solid waste.

(j) "Recyclable Paper Bag" means a paper bag that meets all of the following requirements: (1) contains no old growth fiber, (2) is 100% recyclable overall and contains a minimum of 40% post-consumer recycled content, and (3) displays the words "Reusable" and "Recyclable" in a highly visible manner on the outside of the bag.

(k) "Reusable Bag" means a bag with handles that is specifically designed and manufactured for multiple reuse and is either (1) made of cloth or other machine washable fabric, and/or (2) made of durable plastic that is at least 2.25 mils thick.

(l) "Store" means a retail establishment located within the geographical limits of the City and County of San Francisco that meets either of the following requirements:

(1) is a full-line, self-service supermarket with gross annual sales of two million dollars ($2,000,000), or more, and which sells a line of dry grocery, canned goods, or nonfood items and some perishable items. For purposes of determining which retail establishments are supermarkets, the City shall use the annual updates of the Progressive Grocer Marketing Guidebook and any computer printouts developed in conjunction with the guidebook;, or

(2) is a retail pharmacy with at least five locations under the same ownership within the geographical limits of San Francisco.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1703. MANDATORY USE OF RECYCLABLE AND COMPOSTABLE CHECKOUT BAGS.

(a) All Stores shall provide only the following as checkout bags to customers; recyclable paper bags, and/or compostable plastic bags, and/or reusable bags.

(b) Violation of the requirements set forth in subsection (a) shall subject a Store to penalties set forth in Section 1705.

(c) Nothing in this section shall be read to preclude Stores from making reusable bags available for sale to customers.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1704. IMPLEMENTATION.

The Director, after a public hearing, may adopt and may amend guidelines, rules, regulations and forms to implement this Ordinance.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1705. ENFORCEMENT AND PENALTIES.

(a) Any person who violates this Ordinance shall be guilty of an infraction. If charged as an infraction, upon conviction thereof, said person shall be punished by (1) a fine not exceeding $100.00 for a first violation, (2) a fine not exceeding $200.00 for a second violation within the same year, and (3) a fine not exceeding $500.00 for each additional violation within the same year.

(b) In the event that the City adopts an ordinance creating a procedure for the City Administrator to impose and review Administrative Penalties pursuant to California

Government Code Section 53069.4, the City may impose Administrative Penalties for violation of this Ordinance as follows: (1) in an amount not exceeding $100.00 for the first violation, (2) in an amount not exceeding $200.00 for the second violation in the same year, and (3) in an amount not exceeding $500.00 for each subsequent violation in the same year.

(c) The City Attorney may seek legal, injunctive, or other equitable relief to enforce this Ordinance, including without limitation, civil penalties in an amount not exceeding $200.00 for the first violation, $400.00 for the second violation, and $600.00 for each subsequent violation in any given year.

(d) The City may not recover both administrative and civil penalties for the same violation.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1706. OPERATIVE DATE.

All of the requirements set forth in this Ordinance shall become operative as to Stores that are supermarkets six (6) months after its effective date. All of the requirements set forth in this Ordinance shall become operative as to Stores that are pharmacies one (1) year after its effective date.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1707. SEVERABILITY.

If any section, subsection, sentence, clause, or phrase of this Ordinance is for any reason held to be invalid or unconstitutional by a decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of the Ordinance. The Board of Supervisors hereby declares that it would have passed this Ordinance and each and every section, subsection, sentence, clause, or phrase not declared invalid or unconstitutional without regard to whether any portion of this Ordinance would be subsequently declared invalid or unconstitutional.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1708. NO CONFLICT WITH FEDERAL OR STATE LAW.

Nothing in this Ordinance shall be interpreted or applied so as to create any requirement, power or duty in conflict with any federal or state law.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

SEC. 1709. UNDERTAKING FOR THE GENERAL WELFARE.

In undertaking the implementation of this Ordinance, the City is assuming an undertaking only to promote the general welfare. It is not assuming, nor is it imposing on its officer and employees, an obligation for breach of which it is liable in money damages to any person who claims that such breach proximately caused injury.

(Added by Ord. 81-07, File No. 070085, App. 4/20/2007)

Chapter 8.11 NON-COMPOSTABLE PLASTIC CARRYOUT BAGS

8.11.010 Definitions.

A. "Affected retail establishment" means any retail establishment, excluding restaurants, located within the geographical limits of the City of Oakland that has gross annual sales of one million dollars ($1,000,000) or more.
B. "City sponsored event" means any event organized or sponsored by a City of Oakland Department or Agency.
C. "Compostable bag" means a carry out bag that is certified and labeled as meeting the current ASTM-Standard Specification for compostability by a recognized verification entity such as the Biodegradable Product Institute and which can be easily differentiated, through color coding and other markings, from non-compostable plastic carry-out bags.
D. "Customer" means any person purchasing food or other materials from an affected retail establishment.
E. "Operator" means a person in control of having daily responsibility for, the daily operation of an affected retail establishment, which may include, but is not limited to, the owner of the affected retail establishment
F. "Plastic carryout bag" means a non-compost-able plastic bag provided by a store to a customer at the point of sale. These bags are often referred to as "T-shirt" bags.
G. "Recyclable paper bag" means a paper carry-out bag provided by an affected retail establishment to a customer at the point of sale for purposes of transporting groceries or other goods and meets all of the following requirements: (1) contains no old growth fiber, (2) is one hundred percent (100%) recyclable, and (3) contains a minimum of forty percent (40%) post-consumer recycled content.
H. "Reusable bag" means a bag that is specifically designed and manufactured for multiple reuse and is (1) made of cloth or other machine washable fabric, or (2) made of other durable material suitable for re-use.
(Ord. 12818 § 2, 2007)

8.11.020 Prohibitions and requirements.

A. Affected retail establishments are prohibited from providing plastic carryout bags to their customers at the point of sale. Reusable bags, recyclable paper bags, and compostable plastic bags are allowed alternatives.
B. Affected retail establishments are strongly encouraged to provide incentives for the use of reusable bags through the use of education and credits, rebates, or tokens for individuals who bring reusable bags.
C. Nothing in this section shall be read to preclude affected retail establishments from making reusable, compostable, or recyclable paper bags available for sale or free to customers. (Ord. 12818 § 3, 2007)

8.11.030 Liability and enforcement.

A. The City Administrator or his/her designee will have primary responsibility for enforcement of this chapter. The City Administrator or his/her designee is authorized to promulgate regulations and to take any and all other actions reasonable and necessary to enforce this chapter, including, but not limited to, entering the premises of any affected retail establishment to verify compliance.
B. An affected retail establishment that is operated in violation of any of the requirements of this chapter is deemed a public nuisance and any person who causes or permits such violations shall be subject to the civil penalties authorized in Chapter 1.08 of this code.
C. The City Attorney may seek legal, injunctive, or other equitable relief to enforce this chapter. (Ord. 12818 § 4, 2007)

8.11.040 Violations—Penalties.

A. If the City Administrator or his/her designee determines that a violation of this chapter occurred, he/she will issue a written warning notice to the operator of an affected retail establishment that a violation has occurred.
B. If the affected retail establishment has subsequent violations of this Chapter, the following penalties will apply:
1. A fine, payable by the owner of the affected retail establishment or the corporation itself, not exceeding one hundred dollars ($100.00) for the first violation after the warning notice is given.
2. A fine not exceeding two hundred dollars ($200.00) for the second violation after the warning notice is given.
3. A fine not exceeding five hundred dollars ($500.00) for the third and any future violations after the warning notice is given.
C. Affected retail establishments may request an administrative hearing to adjudicate any penalties issued under this chapter by filing a written request with the City Administrator, or his or her designee. The City Administrator, or his or her designee, will promulgate standards and procedures for requesting and conducting an administrative hearing under this chapter. Any

determination from the administrative hearing on penalties issued under this chapter will be final and conclusive. (Ord. 12818 § 5, 2007)

8.11.050 Exemptions.

A. Retail establishments in the City of Oakland with gross annual sales of less than one million dollars are exempted from the provisions of this chapter. All retail establishments in the City of Oakland are encouraged to comply with the provisions of this chapter.
B. This chapter applies only to non-compostable carryout plastic bags provided at the point of sale, otherwise known as "t-shirt" bags. The provisions of this ordinance do not apply to single-use plastic bags exclusively used to transport produce such as apples, oranges, grapes, carrots and other similar fruits or vegetables to the point-of-sale counter of the affected retail establishment. (Ord. 12818 § 6, 2007)

8.11.060 No conflict with federal or state law.

Nothing in this chapter shall be interpreted or applied so as to create any requirement, power or duty in conflict with any federal or state law. (Ord. 12818 § 7, 2007)

Attachment No. 6

City of Santa Monica

City Council Report

February 26, 2008

City Council Meeting: ~~February 19, 2008~~

Agenda Item: ~~8-C~~

8-B

To: Mayor and City Council

From: Craig Perkins, Director - Environmental and Public Works Management

Subject: Recommendations Regarding a Ban on Plastic Bags for Commercial Establishments in Santa Monica

Recommended Action

Staff recommends that City Council:

1) direct the City Attorney to draft an ordinance banning the free distribution to customers of single use plastic (including biodegradable plastic) carryout bags at stores within Santa Monica; and

2) provide staff with direction on a proposal to require retailers to charge a fee on single use paper bags in addition to the ban on plastic bags.

Executive Summary

This report presents the results of a staff analysis, requested by City Council on October 9, 2007, to generate recommendations to develop an effective ban on single use plastic carryout bags in Santa Monica. The analysis determined that plastic bags are responsible for significant negative environmental impacts and that preferable alternatives are readily available and currently in use. Because California Assembly Bill 2449, which went into effect on July 1, 2007, specifically prohibits local governments from imposing a fee on plastic carryout bags, it was determined that the most effective way to reduce the environmental impacts related to plastic bags (including biodegradable plastic) is to ban their use in Santa Monica and promote the use of reusable carryout bags. Single use paper carryout bags should be allowed as an alternative to plastic bags, but should be required to meet certain requirements to minimize the environmental impacts related to their manufacture and transportation. It is recommended that the ordinance provide at least six months prior to taking effect following Council adoption to allow stores to transition. Staff seeks direction from Council on a proposal from the Task Force on the Environment that would require stores to impose a fee on single use paper bags in addition to the ban on plastic bags. The intent of this proposal would be to accelerate a shift away from single use bags towards reusable bags. Budgetary impacts from the adoption of a ban would include costs to prepare and distribute outreach materials for use by stores affected by the ordinance, and staffing costs for implementation and enforcement.

Background

On July 16, 2007, the City's Task Force on the Environment unanimously approved a motion requesting that City Council consider banning plastic bags, citing concerns that plastic bags create significant litter problems; that they pollute the beach and marine environments; because they are expensive and difficult to recycle; and because they contaminate other recyclable and compostable material that is collected by the City. On October 9, 2007, City Council directed staff to perform an analysis and generate recommendations to develop an effective ban on plastic bags for commercial establishments in Santa Monica. This report transmits the results of that analysis and recommended actions.

Environmental Issues Associated with Plastic Bags

Plastic carryout bags were first introduced by retail stores in the United States in 1975 and began to be distributed to customers at the point of sale in supermarkets in 1977. Today these bags are ubiquitous in the marketplace because they are light-weight, strong, inexpensive and convenient.

Plastic carryout bags are made in a number of different sizes and thicknesses and are typically manufactured from either high density polyethylene (HDPE - recycling symbol #2) or from low density polyethylene (LDPE - recycling symbol #4). The LDPE bags are thicker and are generally used by department stores and other commercial retail outlets. The HDPE bags are typically thinner, cheaper and are used much more widely by supermarkets, pharmacies, convenience stores and restaurants. These bags are termed "single-use" bags because they are intended for one time use for customers to carry their purchases from the store, followed by disposal or recycling. The thin, light duty plastic that the bags are made from is not durable enough for them to be repeatedly used for carryout. The California Integrated Waste Management Board (CIWMB) estimates that Californians use approximately 19 billion of the light weight HDPE bags each year[1[1]], with approximately 6 billion of these being consumed within Los Angeles County. A survey conducted by City Solid Waste Management division staff in December 2005 solicited plastic bag information from 25 Santa Monica grocery stores and food markets. The survey concluded that these 25 businesses use approximately 23 million plastic bags each year.

Plastic bags are a significant component of litter in the environment primarily due to their durability and light weight. Even when disposed of properly, plastic bags are often blown out of trash receptacles and are easily carried by wind and water to become entangled in vegetation, clog stormdrains and contribute to free floating plastic debris in the marine environment. A waste characterization study conducted by the City of Los Angeles in June 2004 found that plastic bags made up 25% by weight (and 19% by volume) of litter found in 30 storm drain catch basins[2[2]]. Recently the Los Angeles Regional Water Quality Control Board (LARWQCB) established a Zero Trash TMDL (total maximum daily load) for the Ballona Creek Watershed. This TMDL requires a 10% annual reduction of trash entering the water body until zero trash is reached by 2014. Santa Monica, as one of the agencies within the Ballona Creek watershed, can be held jointly liable for failing to meet these targets and will likely have to spend increasing amounts of money to comply with these requirements in the coming years.

[1[1]] California Integrated Waste Management Board, Resolution, Agenda Item 14, June 12, 2007 Board Meeting

[2[2]] "An Overview of Carryout Bags in Los Angeles County", staff report to the Los Angeles County Board of Supervisors, August 2007

Plastic bags are a significant source of marine debris and are hazardous to birds and marine animals. The California Coastal Commission estimates that 60% to 80% of all marine debris, and 90% of all floating debris is plastic. Plastic bags do not biodegrade in the environment, but they do break into smaller pieces that are often mistaken for food by birds and marine animals[3][3]. Studies have estimated that more than 1 million sea birds, 100,000 marine mammals and countless fish die annually through ingestion of and entanglement in marine debris, including plastic bags[4][4].

Plastic bags are recyclable, however very few are actually recycled. Research conducted by the County of Los Angeles in 2007 found that this is largely due to the logistics of sorting, high contamination rates that reduce the quality of the recycled resin produced, the low quality of plastic used in the bags, and the lack of cost efficiency due to lack of suitable markets for the recycled resin. Various estimates suggest that only 1% to 5% of the 19 billion bags used annually in California are being recycled in any way[5][5]. A recent survey by the County of Los Angeles found that only 25 of the 89 jurisdictions within the County offer residential curbside collection for plastic bag recycling. The City of Santa Monica does provide curbside collection of plastic bags, but does not encourage it because the bags are often contaminated by the time they reach the City's transfer station, and because the bags create litter and handling issues at the transfer station. A Los Angeles County survey of recycling and material recovery facilities found that over 90% of the plastic carryout bags taken to these facilities were not recycled but instead taken to landfills for disposal. Reasons cited include high contamination rates, the tendency of the bags to jam the screens used to separate materials, and the lack of suitable markets for the recycled material.

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[3][3] C. Moore, "Pelagic Plastics", Algalita Marine Research Foundation,www.algalita.org/pelagic_plastic.html

[4][4] N. Wallace. "Debris Entanglement in the Marine Environment: A Review" pp 259-277 in Proceedings of the Workshop on the Fate and Impact of Marine Debris, U.S. Department of Commerce, NOAA Technical Memorandum, 1985

[5][5] Californians Against Waste http://www.cawrecycles.org/issues/plastic_campaign/plastic_bags : and US EPA 2005 Characterization of Municipal Solid Waste, Table 7

Plastic Bag Costs and Alternatives

The primary alternatives to HDPE plastic carryout bags are single use paper carryout bags, biodegradable (starch-based) plastic carryout bags, and reusable carryout bags made from cloth or durable plastic. All of these options are widely available in the marketplace and are currently being used throughout the region and the state at grocery stores, restaurants and other retail stores. The approximate costs of plastic bags and various alternatives (based on current prices obtained from a variety of bag suppliers in December 2007) are listed below in Table 1.

Table 1

Type of carryout bag	Approximate cost per bag	Approximate annual usage per person
HDPE plastic	1 to 5 cents	500 - 600
Paper	5 to 25 cents	500 - 600
Biodegradable	10 to 21 cents	500 - 600
Reuseable (cloth or plastic)	99 cents to $10	2 - 4

Environmental Issues Associated with Alternatives to Plastic Bags

The primary environmental impacts of carryout bags fall in to two areas: 1) the impacts related to the manufacture, transportation and consumption of the bags, and 2) the end of use impacts related to the disposal of the bags, recycling and recyclability, and litter.

A study published by the Australian Department of the Environment and Heritage in 2002[6[6]] evaluated the life cycle environmental impacts of plastic carryout bags

[6[6]] Australian Department of the Environment and Heritage Plastic Shopping Bags – Analysis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002 and alternatives. The study found that reusable bags made of polypropylene have the least overall environmental impact, largely due to the small number of bags consumed per year. The study found that single use plastic bags have a lower embodied energy content than both biodegradable bags and paper bags, due to their light weight which facilitates transportation, and lower material use in manufacture. However the end of use impacts related to plastic bags are significant, as described in detail above. The end of use impacts of paper bags are much lower than for plastic bags because 1) paper bags are less likely to be littered due to heavier weight, 2) they are readily recyclable and universally collected in curbside recycling programs, and 3) they will biodegrade in the marine environment, minimizing negative environmental impacts. The end of use impacts for biodegradable plastic bags is mixed. These bags can be composted, along with green waste, at the commercial composting facility used by the City of Santa Monica; however, they do have the potential to contaminate plastic recycling programs because they are easily mistaken for plastic bags unless clearly identified as biodegradable. And like plastic bags, they are designed for single use and have similar characteristics that contribute to their likelihood to become littered and end up in the marine environment. While they may partially biodegrade in the marine environment over the course of several months, they still have the potential to negatively impact marine life.

On balance, the Australian study found that the greatest environmental benefits when evaluating manufacture, transportation, use and disposal of carryout bags are achieved when replacing single use disposable bags with reusable bags. Of the single use bags, paper bags have a much lower impact on the marine environment than plastic or biodegradable bags; however, they require more resources to manufacture and transport. Paper bags containing high levels of post-consumer recycled content would lessen the resource load of these bags.

Regulation of Plastic Bags in other Jurisdictions

Internationally there have been many bans or other regulation on single-use plastic carryout bags, primarily in response to litter and marine pollution issues. The countries of Taiwan, Kenya, Rwanda, Bangladesh, Germany and Sweden, as well as thirty towns in Alaska, have all banned the use of plastic carryout bags in recent years. In January 2008 the Chinese government announced a nationwide ban on the free distribution of single-use plastic carryout bags which will take effect on June 1, 2008. Ireland, Denmark and Switzerland have all instituted a "tax" on plastic carryout bags to encourage the use of alternatives. The program in Ireland, which imposed a fee of 20 cents (Euro) on each plastic carryout bag consumed, resulted in a 95% reduction in the use of the plastic bags since the fee was imposed in March 2002[7[7]]. Follow up studies of this policy in Ireland indicate that it has been very effective at changing consumer behavior and the use of reusable bags by consumers in Ireland is now commonplace.

In 2002, the Australian federal government began a voluntary initiative to reduce the consumption of HDPE plastic carryout bags by 50% and plastic bag litter by 75% by December 2005. Follow-up studies found that the voluntary efforts resulted in significant reductions in plastic bag consumption (up to 45%) but that they did not appear to have had a noticeable impact on litter with the levels remaining approximately the same[8[8]]. A report by Australian retailers indicated that plastic bag recycling rates increased to 14%, but noted that the retailers spent $50 million on public education efforts over two years and that "the majority of consumers have yet to alter their behavior." [9[9]] In January 2008 the Australian federal government announced that it plans to completely phase out the use of plastic carryout bags by the end of 2008, in part because the voluntary program has not achieved the desired results.

[7[7]] http://www.environ.ie/en/Environment/Waste/PlasticBags/News/MainBody,3199,en.htm, May 2007

[8[8]] "Consultation Regulatory Impact Statement: Investigation of Options to Reduce the Environmental Impact of Plastic Bags", Environment Protection and Heritage Council, January 2007

[9[9]] http://www.ephc.gov.au/pdf/Plastic_Bags/ANRA_Report_to_EPHC_Chair_22_May_2006.pdf

Within California, the cities of San Francisco and Oakland have recently banned the distribution of non-biodegradable plastic carryout bags in response to negative environmental impacts, litter problems and recycling issues related to plastic bags. San Francisco adopted its ordinance on March 22, 2007, banning the distribution of non-biodegradable plastic carryout bags. This followed the failure by supermarkets in the City to meet agreed upon targets for reducing plastic bag consumption by consumers under a voluntary program. The San Francisco ordinance requires all supermarkets (with gross annual sales of more than $2 million) and all retail pharmacy chains with at least 5 stores under the same ownership within the City to provide their customers with one or more of the following: 1) biodegradable carryout bags (that include the words "green cart compostable" and "reusable" and display a solid green line encircling the bag; 2) paper carryout bags (that do not contain old growth fiber, are 100% recyclable and contain at least 40% post consumer recycled content); 3) reusable bags made from cloth or from durable plastic greater than 2.25 mils thick. The ordinance went into effect on November 20, 2007. The City of Oakland adopted a similar ban on July 17, 2007, which was scheduled to take effect on January 17, 2008. Oakland's ordinance applies to all stores generating $1 million or more in annual sales with the exception of restaurants. In August 2007, the City of Oakland was sued by the Coalition to Support Plastic Bag Recycling which argued that the City failed to complete an environmental impact report as required by CEQA before adopting its ordinance. In response to the lawsuit, the City of Oakland has agreed not to enforce its ordinance until the suit is resolved. A hearing is scheduled for January 29, 2008.

Within Southern California, the County of Los Angeles Board of Supervisors voted on January 22, 2008 to ban the free distribution of single use plastic carry out bags in unincorporated areas of the County if voluntary programs by retailers in those areas to reduce plastic bag use do not result in decreases of at least 30% by July 2010 and 65% by July 2013.

Assembly Bill 2449

On September 30, 2006, Governor Schwarzenegger signed into law AB 2449 which regulates plastic carryout bags statewide. The new law went into effect on July 1, 2007, and requires the operators of supermarkets and retail businesses greater than 10,000 square feet with a licensed pharmacy to establish an in-store recycling program that provides an opportunity for a customer of the store to return clean plastic carryout bags to that store. The law requires a plastic carryout bag provided by a store to have specified information printed or displayed on the bag, and requires the placement of a plastic carryout bag collection bin in each store greater than 10,000 square feet that is visible and easily accessible to the consumer. The regulated stores must send these collected bags for recycling. The law also requires the operator of a store to make reusable bags made from cloth, fabric or plastic with a thickness of 2.25 mils or greater available to customers for purchase. The law requires manufacturers of plastic carryout bags to develop educational materials to encourage the reducing, reusing, and recycling of the bags and to make the materials available to stores. The law did not establish at-store recycling or consumption goals; however, in June, 2007, the California Integrated Waste Management Board (CIWMB) adopted emergency regulations establishing reporting requirements to aid in evaluating the effectiveness of the law[10[10]].

AB 2449 specifically prohibits a city, county, or other public agency from adopting, implementing, or enforcing an ordinance, resolution, regulation, or rule that requires a store to collect, transport, or recycle plastic carryout bags or conduct additional auditing or reporting, or imposing a plastic carryout bag fee upon a store. The law does not prohibit a public agency from banning plastic bags outright. The law will remain in effect through January 1, 2013, when it is scheduled to sunset.

[10[10]] California Integrated Waste Management Board, Resolution, Agenda Item 14, June 12, 2007 Board Meeting

Discussion

Based on the research reviewed and summarized above, single use plastic carryout bags generate significant negative environmental impacts because:

- they are consumed in extremely high volumes
- they are produced from non-renewable resources
- they are designed to be disposable (rather than reusable)
- they are difficult to recycle
- they are a significant and very visible component of litter
- they do not biodegrade in the environment
- they represent a significant hazard to marine animals and birds

Single use alternatives to plastic carryout bags include paper bags and biodegradable plastic bags. Of these, paper bags are the best alternative from a marine environment and litter perspective. They are made from renewable resources, are readily recyclable, are widely available and are currently used in most retail stores throughout Santa Monica and the region. However, they are more expensive than plastic bags and require more resources to manufacture and transport than plastic bags. Biodegradable bags present many of the same environmental litter and marine environment problems as plastic bags, and they can contaminate plastic recycling waste streams. While they are compostable and are made from renewable resources, they are relatively expensive and are somewhat resource intensive in their manufacture. From an overall environmental and economic perspective, the best alternative to single use plastic carryout bags is a major shift to reusable bags.

As noted above, government agencies worldwide have taken numerous actions to address the significant problems with plastic bags in recent years. These actions fall into three main categories:

1. Voluntary programs (on the part of retailers) to reduce bag use and increase recycling of bags
2. Plastic bag fees or "taxes"

3. Plastic bag bans

Of these actions, voluntary programs are demonstrably the least effective at reducing the use of plastic bags. A voluntary program in San Francisco in 2006 was not effective in reaching City-mandated reduction targets, and led the City to adopt a ban in March 2007. A nationwide voluntary program in Australia begun in 2002 resulted in moderately increased recycling rates of plastic bags but had no effect on reducing litter and had little positive influence on consumer behavior despite an expenditure of over $50 million for public outreach on the program.

Both voluntary and mandatory plastic bag fees and taxes have proven to be very effective at significantly reducing the amount of plastic bags consumed, provided that the fees are high enough to provide an incentive for consumers to alter their behavior. A voluntary fee program implemented by a supermarket in Byron Bay, Australia beginning in 2002 resulted in an 83% reduction in plastic bag use[11][11]. A voluntary bag fee program begun by the retail company IKEA in Australia in 2002 and in England in 2006 resulted in 95% to 97% reduction in plastic bag consumption[12][12]. IKEA began a similar program at its stores in the United States in March 2007. None of these voluntary initiatives resulted in decreases in sales at the stores where they were implemented. And as noted above, the mandatory plastic bag fee initiated in Ireland in March 2002 resulted in a 95% reduction in plastic bag consumption.

Based on the negative environmental impacts related to single use plastic bags, staff recommends that City Council direct the City Attorney to draft an ordinance banning the free distribution to customers of single use plastic carryout bags at stores within Santa Monica. The ordinance would only apply to bags distributed at the point of sale and would not apply to plastic bags used for produce and other bulk items in stores. Staff recommends that single use biodegradable

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[11][11] Australian Department of the Environment and Heritage Plastic Shopping Bags – Analysis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002
[12][12] http://www.treehugger.com/files/2007/02/ikea_us_to_bag.php

plastic bags be included in this ban because they present many of the same environmental litter and marine environment problems as plastic bags, and they can contaminate plastic recycling waste streams. The ordinance should specify that single use paper carryout bags are acceptable alternatives provided they do not contain old growth fiber, are 100% recyclable, and contain a minimum of 40% post consumer recycled content. In order to minimize the use of single use bags, the ordinance should require all affected stores to provide reusable carryout bags for sale and, with assistance from the City, promote their sale and use. The ordinance should provide at least 6 months prior to taking effect following Council adoption to allow stores to transition.

Staff also requests that City Council provide direction on a recommendation unanimously adopted by the Task Force on the Environment on December 17, 2007. The Task Force recommends that in addition to banning single use plastic carryout bags, the ordinance should require stores to impose a fee on single use paper bags, which would be collected and retained by the store. The intent of the fee would be to discourage the use of single use bags and accelerate a switch by consumers to reusable bags. Staff believes that such a fee would be allowed under the terms of AB 2449 and, if it was set at a sufficient level, would likely be effective at influencing a significant shift in consumer behavior away from single use bags in favor of reusable bags.

Staff has not investigated the volume of plastic bags distributed by various sizes and types of stores; however, bans in San Francisco and Oakland address only large grocery stores and pharmacies. Based on personal conversations with staff in the cities of Oakland and San Francisco, these types of stores appear to be the highest volume distributors of single use plastic carryout bags by a large margin. If Council approves this recommendation, staff will conduct additional research into the volume of plastic bags distributed by various outlets and use that information to determine the scope of the draft ordinance for Council review and approval.

Policy Alternatives

Alternatives to the recommended actions include 1) impose a ban on single use plastic carryout bags only if certain plastic bag recycling targets are not reached by stores in Santa Monica by a certain date; and 2) take no action. Based on review of plastic bag diversion and recycling programs implemented by the stores distributing the bags, these types of programs are not effective at significantly increasing recycling rates or reducing litter, even with large, well funded campaigns. It is not likely that this option would be successful in significantly reducing the environmental impacts of single use disposable plastic bags. Option 2 would require the City to rely on the existing AB2449 legislation, which doesn't include any targets for diversion or recycling of single use disposable plastic bags. Approving this option would likely have little to no impact on reducing environmental impacts of plastic bags in Santa Monica.

Financial Impacts & Budget Actions

The primary budgetary impacts from adoption of the recommended ordinance would include costs to prepare and distribute outreach materials for use by stores affected by the ordinance, and staffing costs for implementation and enforcement. If Council directs staff to prepare an ordinance, a final fiscal impact analysis and recommendations related to supplies and materials as well as staff costs will be presented to Council for review and action at the meeting for the first reading of a proposed ordinance. This will include additional detail regarding the costs and staffing impact of enacting ban on single use disposable plastic carryout bags. All efforts would be made to combine enforcement activities with existing on-site inspections currently conducted by City staff.

Prepared by: Dean Kubani, Environmental Programs Manager

Approved:	**Forwarded to Council:**
Craig Perkins Director- Environmental and Public Works Management Department	P. Lamont Ewell City Manager

Attachment J:

Materials regarding the use and impact of carry-out plastic bags.

Includes:

An Overview of Carryout Bags in Los Angeles County, A staff report to the Los Angeles County Board of Supervisors, August 2007.

National Oceanic and Atmospheric Administration, Marine Debris Program, http://marinedebris.noaa.gov/

California Integrated Waste Management Board, http://www.ciwmb.ca.gov/Plastic/

Agalita Marine Research Foundation, http://www.algalita.org/research.html

> "Pelagic Plastics", www.algalita.org/pelagic_plastic.html
>
> *Moore, C.J., Lattin, G.L., Zellers, A.F.,.Working Our Way Upstream: A Snapshot of Land-based Contributions of Plastic and other Trash to Coastal Waters and Beaches of Southern California., 2005*
>
> Moore, C.J., Lattin, G.L., Zellers, A.F., *A Brief Analysis of Organic Pollutants Sorbed to Pre and Post-Consumer Plastic Particles from the Los Angeles and San Gabriel River Watersheds*, 2005
>
> Moore, C.J., Lattin, G.L., Zellers, A.F., *Density of Plastic Particles Found in Zooplankton Trawls from Coastal Waters of California to the North Pacific Central Gyre.* -.2006

Californians Against Waste http://www.cawrecycles.org/issues/plastic_campaign/plastic bags

US EPA 2005 Characterization of Municipal Solid Waste, http://www.epa.gov/msw/facts.htm

Environmental Ministry of Ireland, http://www.environ.ie/en/Environment/Waste/PlasticBags/

"The Problem With Marine Debris", California Coastal Commission Public Education Program's web article, http://www.coastal.ca.gov/publiced/marinedebris.html.

Woods Hole Oceanographic Institution: Plastics in Our Oceans, http://www.whoi.edu/science/B/people/kamaral/plasticsarticle.html (June 16, 2008).

Earth 911: Facts About Plastic Bags, http://earth911.org/plastics/facts-about-plastic-bags/ (June 16, 2008).

Ocean Conservancy: Marine Debris, http://www.oceanconservancy.org/site/PageServer?pagename=issues_debris (June 16, 2008).

National Geographic: Are Plastic Grocery Bags Sacking the Environment?, John Roach for National Geographic News, September 2, 2003, http://news.nationalgeographic.com/news/pf/80107147.html (June 16, 2008).

An Overview of Carryout Bags in Los Angeles County

"To Enrich Lives Through Effective and Caring Service"

A Staff Report to the Los Angeles County Board of Supervisors

COUNTY OF LOS ANGELES

LOS ANGELES COUNTY BOARD OF SUPERVISORS

County's Plastic Bag Working Group

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Chief Executive Office
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Preface

Report Mandate

On April 10, 2007, the Los Angeles County Board of Supervisors instructed the Chief Executive Officer to work with the Director of Internal Services and the Director of Public Works to solicit input from environmental protection and grocer organizations to:

- Investigate the issue of polyethylene plastic and paper sack consumption in the County, including the pros and cons of adopting a policy similar to that of San Francisco;
- Inventory and assess the impact of the current campaigns that urge recycling of paper and plastic sacks;
- Investigate the impact an ordinance similar to the one proposed in San Francisco would have on recycling efforts in Los Angeles County, and any unintended consequences of the ordinance; and,
- Report back to the Board with findings and recommendations to reduce grocery and retail sack waste within 90 days.

This report is in response to this Motion. Although the report to the Board of Supervisors was due on July 9, 2007, a memorandum was sent to the Board of Supervisors on July 12, 2007 requesting a 45-day extension to incorporate feedback from interested stakeholders, consumers, industry, and environmental representatives.

Solid Waste Management Responsibilities of the County of Los Angeles

Pursuant to the California Integrated Waste Management Act of 1989 (Assembly Bill 939), the County of Los Angeles undertakes the following solid waste management functions:

Unincorporated County Areas

- Implements source reduction and recycling programs in the unincorporated County areas to comply with the State's 50 percent waste reduction mandate. In 2004, the County was successful in documenting a 53 percent waste diversion rate for the unincorporated County areas.
- Operates seven Garbage Disposal Districts, providing solid waste collection, recycling, and disposal services for over 300,000 residents.
- Implements and administers a franchise solid waste collection system which, once fully implemented, will provide waste collection, recycling, and disposal services to over 700,000 residents, and will fund franchise area outreach programs to enhance recycling and waste reduction operations in unincorporated County areas that formerly operated under an open market system.

Countywide

- Implements a variety of innovative Countywide recycling programs, including: SmartGardening to teach residents about backyard composting and water wise gardening; Waste Tire Amnesty for convenient waste tire recycling; the convenient Environmental Hotline and Environmental Resources Internet Outreach Program; interactive Youth Education/Awareness Programs; and the renowned Household Hazardous/Electronic Waste Management and Used Oil Collection Programs.
- Prepares and administers the Countywide Siting Element, which is a planning document which provides for the County's long-term solid waste management disposal needs.
- Administers the Countywide Integrated Waste Management Summary Plan which describes how all 89 of the jurisdictions Countywide, acting independently and collaboratively, are complying with the State's waste reduction mandate.
- Provides staff for the Los Angeles County Solid Waste Management Task Force (Task Force). The Task Force is comprised of appointees from the League of California Cities, the County Board of Supervisors, the City of Los Angeles, solid waste industries, environmental groups, governmental agencies, and the private sector. The County performs the following Task Force functions:
    - Reviews all major solid waste planning documents prepared by all 89 jurisdictions prior to their submittal to the California Integrated Waste Management Board;
    - Assists the Task Force in determining the levels of needs for solid waste disposal, transfer and processing facilities; and,
    - Facilitates the development of multi-jurisdictional marketing strategies for diverted materials.

Report Organization

The Executive Summary provides an overview of the report; Chapter 1 contains an introduction and description of the report's methodology; Chapter 2 provides the history and overview of plastic carryout bags; Chapter 3 discusses the litter impacts from plastic carryout bags; Chapter 4 includes general ecosystem, environmental and public health issues; Chapter 5 compares types and costs of some reusable bags; Chapter 6 summarizes case studies on plastic carryout bags in other countries and jurisdictions, including a discussion on San Francisco's Ordinance and California's new at-store recycling program; Chapter 7 provides a summary of stakeholder comments; Chapter 8 contains the report's findings and options for the Board of Supervisors to consider.

Table of Contents

List of Figures

List of Tables

EXECUTIVE SUMMARY

Key Findings

- **Plastic carryout bags have been found to significantly contribute to litter and have other negative impacts on marine wildlife and the environment.**
- **Biodegradable carryout bags are not a practical solution to this issue in Los Angeles County because there are no local commercial composting facilities able to process the biodegradable carryout bags at this time.**
- **Reusable bags contribute towards environmental sustainability over plastic and paper carryout bags.**
- **Accelerating the widespread use of reusable bags will diminish plastic bag litter and redirect environmental preservation efforts and resources towards "greener" practices.**

Background

Increasing Environmental Awareness and Recycling Efforts

In 2006, despite achieving a 50 percent Countywide recycling rate (one of the highest in the nation), Los Angeles County still disposed over 12 million tons of trash – this is equivalent to filling the Rose Bowl 34 times. Currently, about 20 percent (7,400 tons per day) of the County's trash is exported for disposal to other counties, including Riverside, Orange, and Ventura Counties. By 2020, this figure could rise to 80 percent due to anticipated population/economic growth and landfill closures, assuming no landfill expansions or alternatives to landfills such as conversion technologies are developed. This means more trash being transported over long distances to other counties, leading to higher trash rates and added traffic congestion and air pollution.

To reduce the environmental impact of solid waste disposal, the County of Los Angeles, in partnership with the 88 cities and the private sector, is aggressively expanding and implementing new source reduction and recycling programs. Such programs are geared towards raising environmental awareness; promoting environmental stewardship; and, promoting sustainable uses of resources.

Figure 1 -- Typical Landfill Activity

Need to Reduce Plastic Bag Litter

Each year, approximately 6 billion plastic carryout bags are consumed in Los Angeles County.[1] This is equivalent to 600 bags per person per year. If tied together, these bags would form a string long enough to reach the moon and back, five times.[2]

Most plastic carryout bags are disposed (less than 5 percent are recycled[3]) due to lack of facilities needed to recycle plastic carryout bags. As a result, approximately 45,000 tons of plastic carryout bags are disposed by residents countywide each year, comprising approximately 0.4 percent of the 12 million tons of solid waste disposed each year.[4]

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[1] California Integrated Waste Management Board, Resolution, Agenda Item 14, June 12, 2007 Board Meeting. Countywide figure is prorated.
[2] http://sse.jpl.nasa.gov/planets/profile.cfm?Object=Moon, May 15, 2007. Assumes each bag is 1 foot wide and distance to moon is 238,855 miles.
[3] California Integrated Waste Management Board, Staff Report, Agenda Item 14, June 12, 2007 Board Meeting.
[4] California Integrated Waste Management Board's 2004 Statewide Characterization Study, Table 7. Countywide figure is prorated.

Although paper carryout bags have a higher recycling rate (21 percent nationally[5]), approximately 117,000 tons of paper carryout bags are disposed by residents countywide each year, comprising approximately 1 percent of the total 12 million tons of solid waste disposed each year.[6] This tonnage is higher than the amount of plastic carryout bags disposed because each paper bag weighs more than a comparable plastic carryout bag.

The indiscriminate littering of plastic carryout bags is an increasing blight problem. Although plastic carryout bags are inexpensive and have other useful qualities, they have a propensity to become litter, thus overshadowing these benefits. Due to their expansive and lightweight characteristics, wind easily carries these bags airborne like parachutes. They end up entangled in brush, tossed around along freeways, and caught on fences. Because it is often white or brightly colored and difficult to collect, plastic carryout bag litter is a greater eyesore and nuisance than other littered materials. For this reason, there is an increasing need to diminish the prevalence of plastic carryout bags to maintain a clean and healthy environment, positively enhance the County's recreational and tourism economy, and improve the quality of life for all residents countywide.

Figure 2 -- Seal Chewing on a Plastic Bag
(Courtesy of the Whale Rescue Team)

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[5] US EPA 2005 Characterization of Municipal Solid Waste, Table 4.
[6] California Integrated Waste Management Board's 2004 Statewide Characterization Study, Table 7. Countywide figure is prorated.

Public agencies collectively spend tens of millions of dollars annually on litter prevention, cleanup, and enforcement activities. The litter collected is composed of constituents including plastic carryout bags. Additionally, the cost to local governments in Los Angeles County is expected to dramatically rise over the next few years in order to comply with Federal Clean Water Act. For example, the County of Los Angeles Department of Public Works and the Flood Control District annually spend $18 million per year on, but not limited to, street sweeping, catch basin cleanouts, cleanup programs, and litter prevention and education efforts.

Communities within close proximity to landfills and other solid waste processing facilities are especially impacted as plastic carryout bags escape from trash trucks while traveling or emptying their loads. Although trucks and facilities are required to provide cover and fences, carryout bags manage to escape despite Best Management Practices (BMPs) including using roving patrols to pickup littered bags. Inevitably the cost for cleanup is passed on to residents in the form of higher disposal costs. Despite the efforts of various cleanup activities and thousands of residents who annually volunteer countless hours in beach, roadside (e.g., Adopt-A-Highway programs), park, and neighborhood cleanups, plastic carryout bag litter remains a significant problem.

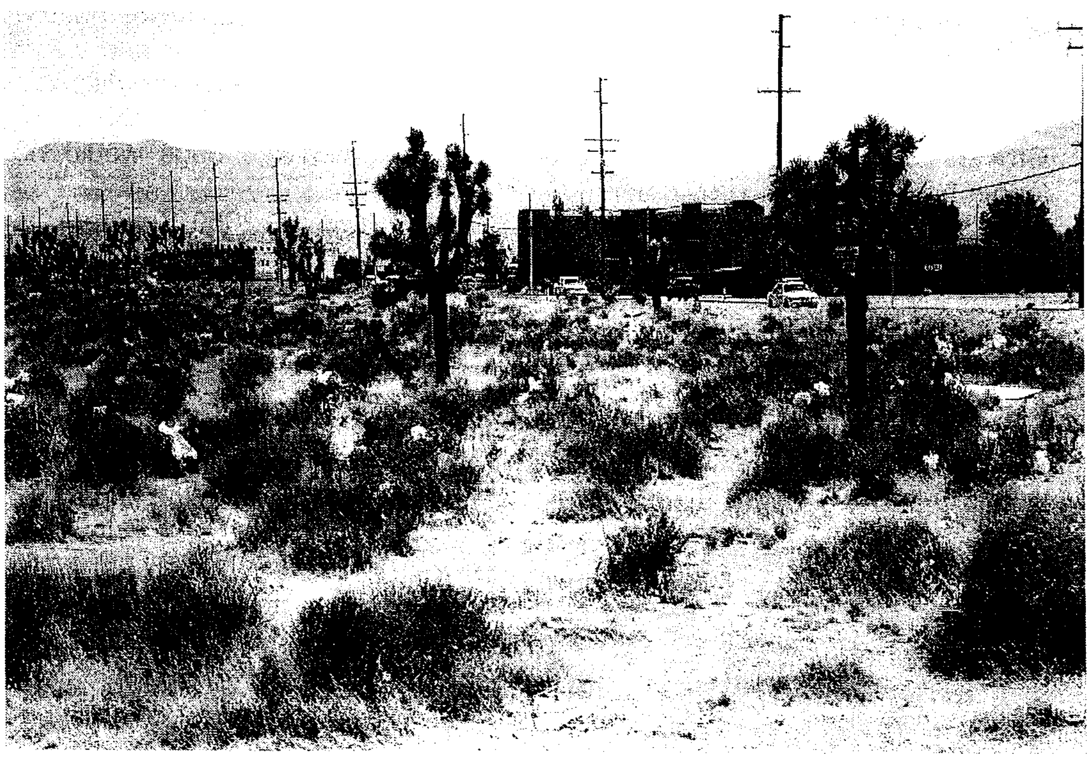


Figure 3 -- Plastic Carryout Bags Ruin The Otherwise Scenic Landscape Along Columbia Way In Palmdale

Reusable Bags

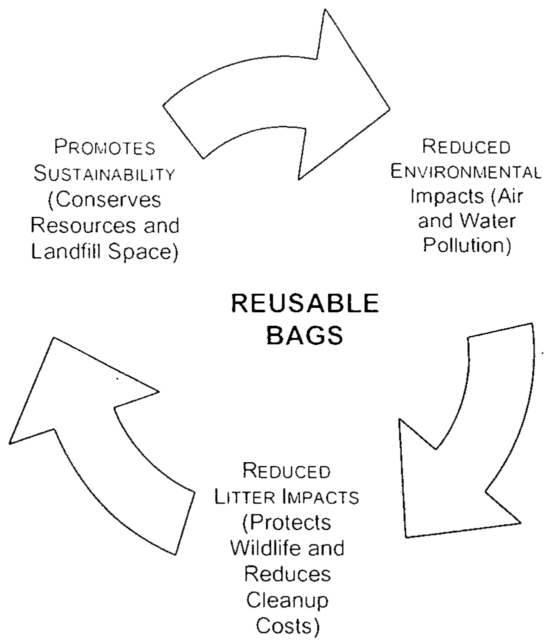
Upon comprehensively evaluating the environmental, ecological, and litter impacts of various types of carryout bags, it is conclusive that the widespread use of reusable bags in lieu of plastic and paper carryout bags would be socially, ecologically and economically beneficial. Facilitating the increased use of reusable bags would conserve energy and natural resources, reduce the total volume of waste disposed in landfills, diminish plastic bag litter, and invite citizens to actively participate in practices that promote a clean and sustainable environment.

Specifically, benefits of widespread use of reusable bags include the following:

- Fewer plastic carryout bags littering neighborhoods.
- Decreased likelihood of plastic bag litter negatively impacting the marine environment (marine wildlife, such as sea turtles and whales, ingest littered plastic carryout bags, which they mistake for food).
- Significant cost savings to taxpayers (e.g., less money spent on litter prevention/cleanup/enforcement resulting from plastic bag litter).
- An environmental cycle motivated by less waste generated, fewer natural resources consumed, reduced energy consumption, and less air and water pollution from manufacturing, transportation, and recycling/disposal processes.
- Grocers' costs for purchasing plastic and paper carryout bags would no longer be passed on to customers.
- Consistent with the intent of Assembly Bill 2449 (Levine, 2006 Statutes) "to encourage the use of reusable bags by consumers and retailers and to reduce the consumption of single-use bags." [7]
- Assists in the development of the emerging "green economy" by spurring the reusable bag industry.

As environmental awareness gains momentum, the timing is optimal for instilling the importance of sustainable practices. One of the most pressing needs now, as landfill capacity become scarce, is to maximize our waste reduction and reuse efforts.

[7] Assembly Bill 2449, Chapter 845, Statutes of 2006.



Biodegradable Carryout Bags

Biodegradable carryout bag usage in Los Angeles County is not practical at this time, due to the lack of commercial composting facilities needed to process the biodegradable carryout bags. The nearest facilities are located in Kern and San Bernardino Counties.[8] Since transporting biodegradable carryout bags to distant commercial composting facilities involves higher services rates, increased traffic congestion and adds to air pollution, it is less ideal in comparison to other alternatives that involve local operations.

Additionally, the use of biodegradable carryout bags would not alleviate the litter problem or potential harm to marine wildlife since they have the same general characteristics of plastic carryout bags (lightweight, persistent in the marine environment, etc.). Furthermore, the presence of biodegradable carryout bags in the recycling stream could potentially jeopardize plastic recycling programs through contamination, and reduce the quality of plastic resins. This contamination could ultimately result in batches of recyclable plastic materials or biodegradable carryout bags being landfilled.

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[8] California Integrated Waste Management Board's Solid Waste Information System (SWIS), www.ciwmb.ca.gov/SWIS/Search.asp

State Law and Other Relevant Issues

The majority of plastic carryout bags consumed in the County are distributed at supermarket checkout stands. Because supermarket bags are lighter and thinner than bags used at other retail stores, they have a higher propensity to become litter. To address this and other issues, California adopted Assembly Bill 2449 (Levine, 2006 Statues) in 2006, whose goal was to "encourage the use of reusable bags by consumers and retailers and to reduce the consumption of single-use carryout bags."[9]

AB 2449, which became effective July 1, 2007, requires all large supermarkets and retail stores to make available at-store containers for the collection and recycling of plastic carryout bags, and reusable bags for purchase. Although this requirement may increase the recycling rate of plastic carryout bags (currently at less than 5 percent), no recycling rate benchmarks were established. Moreover, AB 2449 also included a clause which prohibits local governments from imposing a fee on plastic carryout bags or otherwise "interfering" with the at-store plastic bag recycling program.

Since a fee cannot be imposed on plastic carryout bags, another option for local governments to reduce the consumption of plastic carryout bags is to implement a ban. The implementation of such a ban, in conjunction with supplementary measures not pre-empted by AB 2449, are described below.

Alternatives for the Board of Supervisors to Consider

Since plastic carryout bags distributed at supermarkets and other large retail outlets contribute disproportionately to the litter problem, the County plastic bag working group recommends reducing the prevalence of these bags as a first priority. The working group seeks to subsequently investigate measures to reduce the consumption of plastic and paper carryout bags at the remaining retail establishments throughout the County.

Based on the above factors, the following alternatives are presented to the Board for consideration. Supplementary measures are also provided below to further strengthen the main alternatives.

- **ALTERNATIVE 1 – Ban Plastic Carryout Bags at Large Supermarkets and Retail Stores One Year After Adoption of Ordinance**

  To reduce plastic bag litter, request the County's plastic bag working group (consisting of the Chief Executive Office, County Counsel, Internal Services Department, Public Works, and other County departments/agencies as

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[9] Assembly Bill 2449, Chapter 845, Statutes of 2006.

appropriate) to draft an ordinance banning plastic carryout bags at large supermarkets and retail stores. All large supermarkets and retail stores voluntarily applying a point of sale fee (e.g., 10¢) on each plastic carryout bag consumed would be exempt from the Ordinance. This exemption would provide more flexibility to affected stores, while providing a mechanism (the consumption fee) with proven effectiveness in reducing overall consumption. The consumption fee is to be retained by the affected store. The Ordinance would also define "large supermarkets and retail stores."

Delay implementation of the ban for one year to allow the working group to work with affected stakeholders, conduct additional outreach efforts and promote awareness of the upcoming ban.

- **ALTERNATIVE 2 – Ban Plastic Carryout Bags At Large Supermarkets And Retail Stores Effective:**
  - **July 1, 2010, If The Bag Disposal Rate Does Not Decrease By A Minimum Of 35%.**
  - **July 1, 2013, If The Bag Disposal Rate Does Not Decrease By A Minimum Of 70%.**

To reduce plastic bag litter, request the County's plastic bag working group to draft an ordinance banning plastic carryout bags at large supermarkets and retail stores. The ban would go into effect automatically, effective:

- July 1, 2010 if the disposal rate of plastic carryout bags does not decrease by a minimum of 35%, using FY 2007-08 as the baseline, by January 1, 2010.
- July 1, 2013 if the disposal rate of plastic carryout bags does not decrease by a minimum of 70%, using FY 2007-08 as the baseline, by January 1, 2013.

All large supermarkets and retail stores voluntarily applying a point of sale fee (e.g., 10¢) on each plastic carryout bag consumed would be exempt from the Ordinance. This exemption would provide more flexibility to affected stores, while providing a mechanism (the consumption fee) with proven effectiveness in reducing overall consumption. The consumption fee is to be retained by the affected store. The Ordinance would also define "large supermarkets and retail stores."

To achieve these goals, the working group shall coordinate with grocers/industry to establish the aforementioned baseline (the difference between total consumption and recycling), reduce the consumption of plastic carryout bags, and increase the recycling rate of plastic carryout bags (within the constraints of Assembly Bill 2449).

The County may accelerate the ban on plastic carryout bags if cities containing a majority of the County's population adopt an ordinance or enter into a Memorandum of Understanding with the County banning plastic carryout bags.

- **ALTERNATIVE 3 – Status Quo**

  Request the County's plastic bag working group to monitor the effects of Assembly Bill 2449 and other related actions.

Supplementary Measures

To complement the alternatives identified above, the working group also recommends implementing all of the following supplementary measures. Each of these measures may be implemented in addition to whichever alternative is selected by the Board:

A. Direct the Department of Public Works, in consultation with the County plastic bag working group, to implement a comprehensive public education campaign, and create partnerships with large supermarkets, retail stores, and elementary schools to promote reusable bags over plastic and paper carryout bags.

B. Direct the plastic bag working group to draft a resolution for Board consideration prohibiting the purchase and use of plastic carryout bags at all County-owned facilities and County offices.

C. Direct the County's plastic bag working group to actively work with the 88 cities in Los Angeles County to implement measures which reduce the consumption of plastic and paper carryout bags.

D. Direct the Department of Public Works, to aggressively pursue grants and other funding opportunities to fund the comprehensive public education campaign as described in Supplementary Measure A above.

E. Direct the Chief Executive Office, Department of Public Works, and the County's Legislative Advocates to work with the State legislature to:

   - Repeal the provision of Assembly Bill 2449 which prohibits local governments from imposing a fee on plastic carryout bags or implementing other at-store recycling measures;
   - Implement either a statewide fee on each plastic bag used with funds directed to local governments on a per-capita basis for litter prevention and cleanup efforts; or implement statewide

benchmarks to reduce the consumption of plastic carryout bags; or implement a statewide ban on plastic carryout bags.

F. Direct the County's plastic bag working group to investigate measures to reduce the consumption of plastic carryout bags at other retail establishments, as well as evaluate paper bag usage throughout the County.

G. Direct Public Works to work with the State, solid waste industry and other stakeholders to develop markets and other programs to reduce plastic bag litter.

H. Direct the County's plastic bag working group to establish a Subcommittee to assist in carrying out the functions of the working group, including tracking the reduction of plastic bag litter to comply with the Federal Clean Water Act.

I. Direct the County's plastic bag working group to provide a semi-annual progress report to the Board describing progress and efforts to reduce the consumption of plastic and paper carryout bags in Los Angeles County.

CHAPTER 1

INTRODUCTION AND METHODOLOGY

Introduction

Description of Motion

On April 10, 2007, the Los Angeles County Board of Supervisors instructed the Chief Executive Officer to work with the Director of Internal Services and the Director of Public Works to solicit input from outside environmental protection and grocer organizations to:

- Investigate the issue of polyethylene plastic and paper sack consumption in the County, including the pros and cons of adopting a policy similar to that of San Francisco;
- Inventory and assess the impact of the current campaigns that urge recycling of paper and plastic sacks;
- Investigate the impact an ordinance similar to the one proposed in San Francisco would have on recycling efforts in Los Angeles County, and any unintended consequences of the ordinance; and,
- Report back to the Board with findings and recommendations to reduce grocery and retail sack waste within 90 days.

This report is in response to this Motion. Although the report to the Board of Supervisors was due on July 9, 2007, a memorandum was sent to the Board of Supervisors on July 12, 2007 requesting a 45-day extension to incorporate feedback from interested stakeholders, consumers, industry, and environmental representatives.

Background on Current Disposal Conditions

Los Angeles County has the most extensive and complex solid waste system in the nation. It covers an area of 4,752 square miles and encompasses 88 cities and 140 unincorporated communities. Home to more than 10.2 million people, Los Angeles County is the most populous county in the nation, having a larger population than 42 states and 162 countries.[10] One in three Californian's live in Los Angeles County. The County's population is expected to increase to

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[10] Los Angeles County Economic Development Corporation, Los Angeles County Profile, May 2006.

approximately 11 million people by 2020.[11] If it were a country, Los Angeles County would rank 17th in the world in terms of Gross Domestic Product.[12] This vigorous population growth, coupled with comparable increases in economic activity, will have a major impact on the solid waste management infrastructure in Los Angeles County.

In 1989, the California Legislature passed the California Integrated Waste Management Act (Assembly Bill 939). Assembly Bill 939 requires every city and county to divert 50 percent of solid waste generated from landfill disposal, otherwise face a fine of $10,000 per day. Counties have the added responsibility of managing the residual trash that remains after recycling.

Since 1990, numerous programs have been implemented at the city and County levels, including curbside recycling, construction and demolition waste recycling, and business recycling enhancement programs. In addition, the County has implemented Countywide recycling programs to assist jurisdictions to comply with Assembly Bill 939, such as the Countywide Household Hazardous Waste/Electronic Waste Management Program, the Waste Tire Collection Program, and the SmartGardening Program.

In 2006, despite achieving a 50 percent Countywide recycling rate (one of the highest in the nation), Los Angeles County disposed over 12 million tons of trash – this is equivalent to filling the Rose Bowl 34 times. Currently, about 20 percent (7,400 tons per day) of the County's trash is exported for disposal to other counties, including Riverside, Orange, and Ventura Counties. By 2020, this figure could rise to 80 percent due to anticipated population/economic growth and landfill closures, assuming no landfill expansions or alternatives to landfills such as conversion technologies are developed. This means more trash being transported over long distances to neighboring counties, leading to higher trash rates and added traffic congestion and air pollution.

To reduce the environmental impact of solid waste disposal, the County of Los Angeles, in partnership with the 88 cities and the private sector, is aggressively expanding and implementing new source reduction and recycling programs. Such programs are geared towards raising environmental awareness; promoting environmental stewardship; and, promoting sustainable uses of resources.

Methodology Used

To comprehensively assess the ecological, environmental, and financial impacts of carryout bags on Los Angeles County, published studies from around the

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[11] Los Angeles County Economic Development Corporation, L.A. Stats, June 2006.
[12] http://lacounty.info/miscellany.pdf, May 15, 2007.

world were reviewed and analyzed. In addition, surveys of major grocery and retail stores, solid waste facilities, Caltrans, cities, and County departments were conducted to gather information on prevailing recycling, litter, and cleanup methods and costs. Several public and environmental interest groups, industry and manufacturing trade organizations were also consulted regarding plastic carryout bag consumption and management, litter impacts, and cleanup efforts.

CHAPTER 2

OVERVIEW OF PLASTIC CARRYOUT BAGS

Overview

Plastic carryout bags were first introduced into the marketplace in 1975.[13] Since then, plastic carryout bags have become an integral part of our everyday custom because they are convenient, inexpensive, and functional. They are sometimes reused to line trash cans, collect pet waste, and for general storage purposes. Below is a history of plastic carryout bags as well as relevant facts and figures.

Plastic Bag History

1975: Montgomery Ward, Sears, J.C. Penny, Jordan Marsh, and other large retail stores were the first to switch to plastic merchandise bags.[14]

1977: Supermarkets began offering plastic carryout bags.[15]

1996: Four of every five grocery stores use plastic carryout bags.[16]

2002: Ireland introduced the first consumer plastic carryout bag fee (20¢ [U.S.] per bag).[17]

2006: California passed legislation mandating at-store recycling of plastic carryout bags, by all large supermarkets and retail businesses beginning July 1, 2007.[18]

2007: San Francisco becomes the first U.S. city to ban the use of non-biodegradable plastic carryout bags at all large supermarkets and pharmacy chains.

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[13] www.plasticsindustry.org/about/fbf/environment.htm#plasticbaghistory, May 3, 2007.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] http://www.environ.ie/en/Environment/Waste/PlasticBags/News/MainBody,3199,en.htm, May 1, 2007.
[18] Assembly Bill 2449, Chapter 845, Statutes of 2006.

Table 1 -- Plastic and Paper Bag Statistics

Item	Statistic
Annual Plastic Bag Consumption Rate	
Worldwide	Between 500 billion and 1 trillion[19]
National	380 billion plastic carryout bags, sacks, wraps per year[20]
California	<20 billion[21]
Countywide	6 billion[22]
Unincorporated County area	600 million[23]
Percentage of Overall Disposal Waste Stream[24]	
Plastic Carryout Bags	0.4 percent by weight
Paper Carryout Bags	1 percent by weight
Annual Rate of Disposal at Landfills[25]	
Plastic Carryout Bags	
California	147,038 tons
Countywide	45,000 tons
Paper Carryout Bags	
California	386,097 tons
Countywide	117,000 tons
Annual Rate of Recycling	
Plastic Carryout Bags	
National	<5 percent[26]
California	<5 percent[27]
Countywide	<5 percent[28]
Paper Carryout Bags	

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[19] http://www.epa.gov/oamsrpod/hcsc/0613326/att10.pdf May 2007
[20] http://www.epa.gov/region1/communities/shopbags.html, May 14, 2007.
[21] California Integrated Waste Management Board, Resolution, Agenda Item 14, June 12, 2007 Board Meeting.
[22] Prorated from the State figure.
[23] Ibid.
[24] California Integrated Waste Management Board's 2004 Statewide Characterization Study, Table 7.
[25] California Integrated Waste Management Board's 2004 Statewide Characterization Study, Table 7. Countywide figures are prorated from State figures.
[26] US EPA 2005 Characterization of Municipal Solid Waste, Table 7.
[27] California Integrated Waste Management Board, Staff Report, Agenda Item 14, June 12, 2007 Board Meeting.
[28] Assumed State rate applies to Los Angeles County.

Item	Statistic
National	21 percent[29]
California	21 percent[30]
Countywide	21 percent[31]
Cost to Purchase	
Plastic Carryout Bags	2 – 5 cents each[32]
Paper Carryout Bags	5 – 23 cents each[33]
Biodegradable Carryout Bags	8 – 17 cents each[34]

How Are Plastic Carryout Bags Manufactured?

Plastic resin is created by taking chemical chains called polymers commonly found in petroleum and natural gas processing, and connecting them together using heat and pressure to create plastic resins. The plastic resin is heated in a chamber and pushed through an opening (called a die) by air, which cools the heated plastic, and creates the air pocket of the plastic bag. After the plastic sheet is cooled, it is guided through several rollers to flatten and stretch the film to size the width of the bag. Once properly sized, the final step is to cut the plastic sheet into appropriate size bags.[35]

It is estimated that there are at least nine companies in Southern California, and three companies in Northern California that manufacture plastic carryout bags.[36]

[29] US EPA 2005 Characterization of Municipal Solid Waste, Table 4.
[30] Assumed National rate applies to California.
[31] Assumed National rate applies to Los Angeles County.
[32] www.usplastic.com (May 22, 2007), www.restockit.com (May 22, 2007).
[33] www.mrtakeoutbags.com (May 22, 2007), www.restockit.com (May 22, 2007).
[34] www.ecoproducts.com (May 22, 2007).
[35] www.Plasticresources.org (May 22, 2007).
[36] www.Thomasnet.com (May 22, 2007).

Figure 4 -- Plastic Pellets Used to Make Plastic carryout bags

What Types of Plastic Carryout Bag Are Commonly Used by Supermarkets, Food Establishments and Retail Stores?

Published studies and reports show that there are two main types of plastic carryout bags on the market. The first type of bag is HDPE 2 which is thin, lightweight and found in most grocery stores. The second type of bag is LDPE 4 which is thicker and glossier and found in retail stores. A random survey of major supermarkets, food establishments, and retail stores countywide, and site visits to plastic bag manufacturers confirmed this information.

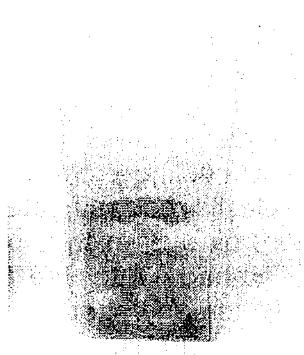

Figure 5 -- HDPE 2 Plastic Carryout Bag

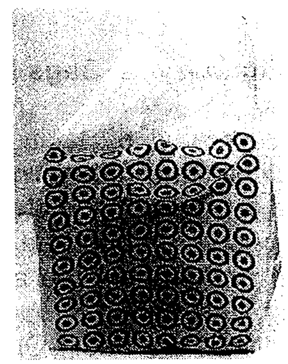

Figure 6 -- LDPE 4 Plastic Carryout Bag

Table 2 -- Types of Plastic Carryout Bags Used

Store	Type of Plastic Bag Used?
Grocery	
Albertsons	HDPE 2
Food4Less	HDPE 2
Ralphs	HDPE 2
Safeway	HDPE 2
Stater Bros.	HDPE 2
Vons	HDPE 2
Wild Oats	HDPE 2
Retail	
99 Cent Store	HDPE 2
CVS	HDPE 2
Kmart	HDPE 2
RiteAid	HDPE 2
Target	LDPE 4
Walmart	HDPE 2

Do Local Jurisdictions Collect Plastic Carryout Bags at Curbside?

A survey of the 89 jurisdictions in Los Angeles County revealed that 25 cities currently allow their residents to recycle their plastic carryout bags at curbside.

Table 3 -- Curbside Collection of Plastic Carryout Bags

Jurisdiction	Existing Plastic Carryout Bag Recycling at Curbside
Agoura Hills	Yes
Alhambra	No
Arcadia	No
Artesia	Yes
Avalon	No
Azusa	No
Baldwin Park	No
Bell	Yes
Bell Gardens	No
Bellflower	No
Beverly Hills	Yes
Bradbury	No
Burbank	No
Calabasas	Yes
Carson	No
Cerritos	No
Commerce	No
Claremont	No
Compton	No
Covina	Yes
Cudahy	No
Culver City	No
Diamond Bar	No
Downey	No
Duarte	No
El Monte	No
El Segundo	No
Gardena	Yes
Glendale	No
Glendora	Yes

Jurisdiction	Existing Plastic Carryout Bag Recycling at Curbside
Hawaiian Gardens	No
Hawthorne	No
Hermosa Beach	Yes
Hidden Hills	No
Huntington Park	No
Industry	No
Inglewood	No
Irwindale	Yes
La Canada Flintrige	Yes
La Habra Heights	No
La Mirada	No
La Puente	No
La Verne	No
Lakewood	Yes
Lancaster	No
Lawndale	Yes
Lomita	No
Long Beach	No
Los Angeles	Yes
Lynwood	Yes
Malibu	No
Manhattan Beach	No
Maywood	No
Monrovia	Yes
Montebello	No
Monterey Park	Yes
Norwalk	Yes
Palmdale	No
Palos Verdes Estates	No
Paramount	Unknown
Pasadena	No
Pico Rivera	No
Pomona	No
Rancho Palos Verdes	No
Redondo Beach	No
Rolling Hills	No
Rolling Hills	Yes

Jurisdiction	Existing Plastic Carryout Bag Recycling at Curbside
Estates	
Rosemead	No
San Dimas	No
San Fernando	No
San Gabriel	No
San Marino	Yes
Santa Clarita	No
Santa Fe Springs	No
Santa Monica	No
Sierra Madre	Yes
Signal Hill	Yes
South El Monte	Yes
South Gate	No
South Pasadena	Yes
Temple City	No
Torrance	No
Vernon	No
Walnut	No
West Covina	No
West Hollywood	Yes
Westlake Village	No
Whittier	No
Uninc. County	No
TOTAL	25 responded Yes

The collected plastic carryout bags are taken to a recycling or materials recovery facility (depending on the jurisdiction's collection system) where they are either sent for disposal, or in some cases sorted, baled, and sold on the open market. The facility's main objective is to maximize diversion of recyclables from the waste stream, while reducing cost and maximizing revenue from those materials targeted for recovery. The most commonly recovered materials include plastic containers, paper, aluminum cans, and cardboard because they are easy to collect, have an available market, and provide the most revenue without specialized sorting machinery. Like most plastics, the majority of plastic carryout bags that are recovered are sold to foreign markets, where anecdotal accounts reveal that the material is converted to plastic resin for remanufacturing or incinerated for energy. Policy makers have begun to take notice of this issue for all commodities, not just plastics, because commodities managed overseas do not meet the same level of standards for environmental protection as in the U.S.

Based on a survey of recycling and materials recovery facilities (and field visits of selected facilities), it was revealed that over 90 percent of the plastic carryout bags taken to these facilities are *not* recycled, but instead taken to landfills for the following reasons:

- Plastic carryout bags usually have a high contamination rate due to reuse as a household trash bin liner or by coming into contact with other contaminants (e.g., pet waste) when placed in the collection bin. As the contamination rate increases, the quality of the plastic resin is reduced.

- Plastic carryout bags interfere with machinery and have a tendency to jam the screens used to separate materials.

- It is not cost efficient to recycle plastic carryout bags due to lack of suitable markets. The domestic market for plastic carryout bags are extremely limited, especially in California, requiring recycling facilities and materials recovery facilities to truck plastic carryout bags over long distances, making the recycling of plastic carryout bags economically unfeasible. Foreign markets have shifted to using local markets due to quality concerns and transportation costs.

Figure 7 -- Typical Waste Stream Traveling Along a Conveyor Belt

Do County Departments Use Plastic Carryout Bags?

Based on a survey of County departments, it was revealed that plastic carryout bags are rarely used (see below).[37]

Table 4 -- Use of Plastic Carryout Bags by County Department

County Department	Use Plastic Carryout Bags?	If Yes, How Much?
Child Support Services	No	N/A
Coroner	No	N/A
Community Development Commission	No	N/A
LACERA	No	N/A
Community Senior Services	Yes	Don't know
Superior Court	No	N/A
Grand Jury	No	N/A
Chief Information Office	No	N/A
Public Defender	No	N/A
Fire Department	No	N/A
Sheriff	Yes	20-30 lbs
Registrar Recorder/County Clerk	No	N/A
Treasurer and Tax Collector	No	N/A
Internal Services	No	N/A
Assessor, Office of	No	N/A
LACMA	No	N/A
Affirmative Action Compliance, Office of	No	N/A
Mental Health	No	N/A
Animal Care and Control	No	N/A
District Attorney's Office	No	N/A
Parks and Recreation	Yes	36700/month
Regional Planning Dept.	No	N/A
Public Health	No	N/A
Health Services	No	N/A
Alternate Public Defender	No	N/A

[37] Of the 56 County Departments, only 25 responded to the survey. The Department of Community Senior Services indicated that they utilize plastic carryout bags to carry food in their food pantry program once a week.

CHAPTER 3

LITTER IMPACT OF PLASTIC CARRYOUT BAGS

Litter Impact

The indiscriminate littering of plastic carryout bags is an increasing blight problem. Although plastic carryout bags are inexpensive and have other useful qualities, they have a propensity to become litter, thus overshadowing these benefits. Due to their expansive and lightweight characteristics, wind easily carries these bags airborne like parachutes. They end up entangled in brush, tossed around along freeways, and caught on fences. Because it is often white or brightly colored and difficult to collect, plastic carryout bag litter is a greater eyesore and nuisance than other littered materials. For this reason, there is an increasing need to diminish the prevalence of plastic carryout bags to maintain a clean and healthy environment, positively enhance the County's recreational and tourism economy, and improve the quality of life for all residents countywide.

Public agencies collectively spend tens of millions of dollars annually on litter prevention, cleanup, and enforcement activities. The litter collected is composed of constituents including plastic carryout bags. Additionally, the cost to local governments in Los Angeles County is expected to dramatically rise over the next few years in order to comply with Federal Clean Water Act. For example, the County of Los Angeles Department of Public Works and the Flood Control District annually spend $18 million per year on, but not limited to, street sweeping, catch basin cleanouts, cleanup programs, and litter prevention and education efforts.

Communities within close proximity to landfills and other solid waste processing facilities are especially impacted as plastic carryout bags escape from trash trucks while traveling or emptying their loads. Although trucks and facilities are required to provide cover and fences, carryout bags manage to escape despite Best Management Practices (BMPs) such as using roving patrols to pickup littered bags. Despite litter control devices (e.g., litter fences), local landfills and solid waste transfer station operators estimate they spend approximately $25,000 and $1,500 per month at each facility, respectively, to send roving patrols to pickup littered plastic carryout bags. Even with these measures, it is very difficult to pick up the errant plastic carryout bags. Inevitably the cost for cleanup is passed on to residents in the form of higher disposal costs. Despite the efforts of various cleanup activities and thousands of residents who annually volunteer countless hours in beach, roadside (e.g., Adopt-A-Highway programs), park, and neighborhood cleanups, plastic carryout bag litter remains a significant problem.

Plastic carryout bags that make their way into the storm drain system,impact the system's ability to efficiently channel storm water runoff. The County Department of Parks and Recreation, confers that plastic carryout bags contribute to litter within local lakes, and negatively impacts the environment and wildlife. Furthermore, plastic carryout bag litter inhibits proper landscape maintenance operations as it becomes entangled in the turf mowing machinery.

While the exact percentage of plastic carryout bags in the total litter stream is not definitively quantified, below is a summary of several studies conducted on plastic litter.

Table 5 -- Summary of Litter Studies

	All Plastic Film		**Plastic Bags**	
	Weight %	**Volume %**	**Weigh %**	**Volume %**
Caltrans Litter Management Pilot Study (1998-2000)	7	12		
Great Los Angeles River Clean Up (4/30/04)		34		
City of Los Angeles Catch Basin Cleaning (6/10/04) (Note, plastic carryout bags listed separately; not included under All Plastic Film)	30	24	25	19
Hamilton Bowl Project-Street Sweeping (2006)	20			
Hamilton Bowl Project-Trash Capture Devices (Feb. 2007)	30			

- Caltrans Litter Management Pilot Study -- The purpose of the study was to investigate the characteristics of litter in freeway stormwater and the effectiveness of BMPs. The study was conducted from 1998 through 2000 on a freeway in the Los Angeles area. Results showed that plastic film, which includes plastic carryout bags, was 7 percent by mass of the litter collected and 12 percent by volume. These percentages do not include moldable plastics, which was a separate category.

- On April 30, 2004, during the Great Los Angeles River Clean Up, organized by the Friends of Los Angeles River, a waste characterization study was conducted. Approximately 60 cubic feet of litter was collected and sorted. Results showed plastic film to be 34 percent of the total litter by volume. This percentage does not include moldable plastics, which was a separate category.

- On June 10, 2004, the City of Los Angeles conducted a waste characterization study. Litter was cleaned from 30 storm drain catch basins and characterized for plastic film and plastic carryout bags separately, among other litter types. The plastic film was found to be 30 percent by weight and 24 percent by volume of the litter. Plastic bags were 25 percent by weight and 19 percent by volume.

- The Hamilton Bowl Trash Reduction Project -- The purpose of the study was to investigate the costs and efficiency of three end-of-pipe and one catch basin structural trash capture systems. The Hamilton Bowl is a 15 acre storm detention basin containing 15 water outfalls in the City of Long Beach.

  The Hamilton Bowl Project characterized trash collected from street sweeping and trash capture systems. In summer 2006, trash from street sweeping from various land uses was collected and sorted. The composition was classified into glass, paper, yard waste, and plastic. Plastic consisted of bags, bottles, jugs and Styrofoam. It ranged from 5 percent of the total trash from open space and commercial land uses to 20 percent from institutional land use.

  Then in December 2006 and February 2007, trash from the Hamilton Bowl's trash capture system was characterized. This trash was sorted and found to consist of up to 30 percent plastics.

Financial Impact

County of Los Angeles' Litter Cleanup/Prevention Costs

The Los Angeles County Department of Public Works, as the lead County agency responsible for implementing litter reduction and education programs, implements a variety of programs to reduce the impact of litter on our communities. This includes litter collection along roadways, channel inverts, street sweeping, emptying public trash containers, catch basin cleanouts, flood control channel cleanups, stormwater pollution prevention activities, capital improvement projects, implementing best management practices, and implementing public education and outreach activities. The County of Los Angeles Department of Public Works and the Flood Control District spends approximately $18 million per year to carryout these responsibilities.

For example, the County sweeps over 81,000 miles of streets on a weekly basis. Street sweeping is an effective means to collect litter before it enters catch basins and the storm drain system, thus reducing possible impacts to the environment.

In addition, in order to maintain the integrity of the County storm drain system and meet the National Pollutant Discharge Elimination System (NPDES) permit requirements, the Department of Public Works cleans out litter from its 78,000 catch basins and additional city owned catch basins at least once a year. In addition, catch basins which receive considerable litter are cleaned up to three additional times a year. Over 644 tons of litter was removed from County and city catch basins in the 2005-2006 rain year.

Furthermore, Public Works installs and maintains numerous devices to allow for the removal of litter from the storm drain system. They include 1,026 catch basin inserts and 1,826 curb inlet catch basin retractable screens, 61 "full capture" hydrodynamic separators, 4 end-of-pipe screens, and 21 in-stream floating booms or nets.

End-of-Pipe Net at Hamilton Bowl

In-Stream Floating Net

Figures 8 and 9 -- Sample Litter Capture Devices

Caltrans Costs

The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, and maintaining the State's highway system. Caltrans District 7, which consists of Los Angeles and Ventura Counties is the second largest of the 12 workforce districts. It is responsible for maintaining 915 freeway and highway miles in Los Angeles County alone. In fiscal year 2005-2006, District 7 collected 50,000 cubic yards of litter and debris at a cost of $12 million, not including the tens of thousands of man hours spent by community service workers collecting litter along the highways.

Zero Trash TMDL

The quality of storm water and urban runoff is fundamentally important to the health of the environment and quality of life in Southern California. Polluted storm water runoff is a leading cause of water quality impairment in the Los Angeles Region. Storm water and urban runoff (during dry and wet weather) are often contaminated with pesticides, fertilizers, animal droppings, trash, food wastes, automotive byproducts, and many other toxic substances generated by our urban environment. Water that flows over streets, parking lots, construction sites, and industrial, commercial, residential, and municipal areas carries these untreated pollutants through the storm drain networks directly into the receiving waters of the Region.

A watershed is the land area where water collects and drains onto a lower level property or drains into a river, ocean or other body of water. There are 8 watersheds in Los Angeles County: The Los Angeles River, Sun Valley, San Gabriel River, Ballona Creek, North Santa Monica Bay, Dominguez, Santa Clara River, and Antelope Valley.

The Los Angeles County Flood Control District, the County of Los Angeles, and cities within the County are required to by their National Pollutant Discharge Elimination System (NPDES) permit to prevent discharges into its rivers, lakes, and ocean, *including the above watersheds*. In addition, the Regional Water Quality Control Board recently imposed a total maximum daily load (TMDL) for what can enter these water bodies. Therefore, the County must implement BMPs to meet these TMDL requirements. The County has for years implemented and maintained numerous BMPs to prevent littering and to remove the litter from its right-of-ways and its storm drain system.

Recently, the Regional Water Quality Control Board established a Zero Trash TMDL for the Los Angeles River and Ballona Creek watersheds. These TMDLs require a 10 percent annual reduction of trash entering the water body until zero trash is reached by 2014. These TMDLs not only affect the County of Los Angeles, but also many other agencies. For example, the Ballona Creek Trash TMDL also applies to Caltrans and the cities of Los Angeles, Culver City, Beverly Hills, Santa Monica, West Hollywood, and Inglewood. The Los Angeles River Trash TMDL also affects Caltrans, the City of Los Angeles, and 41 other municipalities within the Los Angeles River watershed. The estimated annual operation and maintenance costs to comply with these requirements for the County of Los Angles and other agencies is expected to exponentially increase in coming years.

Anti-littering Law

State law requires any person convicted for littering to pay the following fine:

- Between $250 and $1,000 (first conviction)
- Between $500 and $1,500 (second conviction)
- Between $750 and $3,000 (third conviction)

The court may require a person to perform 8 hours of community service by picking up litter.[38]

However, this law is difficult to enforce because a law enforcement officer must observe the person in the act of littering. In addition, inadvertent plastic carryout bag litter (which is a significant source) is extremely difficult to enforce because it is not possible to identify and fine the person causing the inadvertent litter.

[38] Section 374.4 of the Penal Code.

CHAPTER 4

ECOSYSTEM, ENVIRONMENTAL AND PUBLIC HEALTH ISSUES

Ecosystem Impacts From Littered Carryout Bags

Plastic Carryout Bags

Although plastic bag litter creates blight, it also has many adverse effects on marine- and land-based wildlife. Due to the County's extensive and diverse watersheds, many of the littered plastic carryout bags find their way into local beaches, and eventually the ocean.

Several studies have reported that up to 90 percent of marine debris is plastic, with plastic carryout bags making up a portion of the litter.[39] It is estimated that over 267 species of wildlife have been affected by plastic bag litter, including birds, whales, turtles and many others.[40]

Although the impacts of plastic carryout bags on the ecosystem are not precisely quantified, several anecdotal reports have documented numerous health impacts on wildlife attributed to plastic carryout bag litter. For example, ingested plastic carryout bags have impacted marine life in the following unintended ways:

- Clogging the throat, thus choking the animal
- Artificially filling the stomach so that the animal cannot consume food, depriving them of nutrients
- Infecting them with harmful toxins that can poison the animal
- Entangling the animal, leading to choking, cuts, and even restricting growth[41]

Whales and large birds often swallow plastic carryout bags inadvertently during feeding, which become permanently lodged in the stomach. Turtles swallow plastic carryout bags, since they resemble their main food source, jellyfish.[42] Similarly, plastic bags can smother plants, restricting growth and destroying the

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[39] www.cawrecycles.org (May 15, 2007), www.plasticdebris.org (May 15, 2007).
[40] http://www.mcsuk.org/mcsaction/pollution/litter (May 15, 2007), http://www.plasticdebris.com/PRDS_Brochure_DOWNLOAD.pdf (May 15, 2007).
[41] www.marinedebris.noaa.gov (May 15, 2007), http://www.plasticdebris.com/PRDS_Brochure_DOWNLOAD.pdf (May 15, 2007).
[42] http://www.seaworld.org/animal-info/Animal-Bytes/animalia/eumetazoa/coelomates/deuterostomes/chordata/craniata/reptilia/testudines/sea-turtles.htm (August 1, 2007)

natural habitats of many different species of marine wildlife.[43] Recent studies indicate that plastic carryout bags also contain many different additives such as PCBs, DDT and nonylphenols and in turn can seep into marine animals that inadvertently ingest them, which endangers their health.[44]

Figure 10 -- Seal Entangled in Plastic Bag
(Courtesy of the Whale Rescue Team)

Plastic carryout bags also affect domestic land animals such as cows, goats, and horses, which occasionally eat plastic carryout bags found on the ground or entangled in brush.[45] Plastic bag litter is found to have similar undesirable health impacts on these animals.[46]

The North Pacific Gyre is an area located roughly 1,000 miles from the California coast line, where several ocean circular currents meet, creating an accumulation of marine debris, especially plastics. Since plastics do not biodegrade, they are often accumulated in the Gyre from multiple northern Pacific Rim countries. The table below summarizes the results from an August 1999 research expedition.

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[43] www.nos.noaa.gov/education/kits/corals/coral09_humanthreats.html (July 1, 2007)
[44] A Brief Analysis of Organic Pollutants Absorbed to Pre and Post Production Plastic Particles from the Los Angeles and San Gabriel River Watersheds. C.J. Moore, G.L Lattin, A.F Zellers, Algalita Marine Research Foundation, Long Beach, CA.
[45] www.Reusablebags.com (May 15, 2007), www.epa.com/jtr/jtrnet/plastic.htm (May 15, 2007).
[46] www.plasticbageconomics.com (May 15, 2007).

Plastic film, which includes plastic carryout bags, makes up approximately 29% of the plastic pieces collected.

Table 6 -- Abundance (pieces/km^2) by type and size of plastic pieces and tar found in the North Pacific gyre

Mesh-size (mm)	Fragments	Styro-foam Pieces	Pellets	PP/Mono -filament	Thin Plastic Films	Tar	Misc./ Unid.	Total
>4.760	1,931	84	36	16,811	5,322	217	350	24,764
4.759-2.800	4,502	121	471	4,839	9,631	97	36	19,696
2.799-1.000	61,187	1,593	12	9,969	40,622	833	72	114,288
0.999-0.710	55,780	591	0	2,933	26,273	278	48	85,903
0.709-0.500	45,196	567	12	1,460	10,572	121	0	57,928
0.499-0.355	26,888	338	0	845	3,222	169	229	31,692
Total	195,484	3,295	531	36,857	95,642	1,714	736	334,270

Paper Carryout Bags

Littered paper carryout bags do not have the same impact on the ecosystem as plastic carryout bags for the following reasons:

- Paper carryout bags are less likely to be littered because they are heavier and less likely to become airborne, as well as have a higher recycling rate (e.g., they are universally collected at curbside and have a recycling rate of 21 percent[47]); and,
- Paper carryout bags will biodegrade in the marine environment, minimizing the negative environmental impacts.

Biodegradable Carryout Bags

Although biodegradable carryout bags will only decompose in a commercial composting facility, no such facilities exist in Los Angeles County. In addition, reports have shown that biodegradable carryout bags can take over five months to partially decompose in marine environments; thus, it is assumed that these biodegradable carryout bags would have similar impacts as regular plastic carryout bags.[48]

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[47] US EPA 2005 Characterization of Municipal Solid Waste, Table 4.
[48] The Biodegradation of Mater-Bi Starch-Based Polymer in Freshwater and Sea Water Project Report, December 1996. Dr. Nick McClure, Finders University of South Australia.

Environmental Impacts From Carryout Bags

To comprehensively evaluate the environmental impacts of various carryout bags, published studies were reviewed and analyzed that investigated air quality impacts and energy consumption from different phases of the lifecycle.[49] Although we were unable to locate any current U.S. research publication detailing these impacts, we were able to locate several published studies conducted overseas.[50] Based on our review of these studies, the study prepared in 2002 for the Australian Department of the Environment and Heritage[51] was the most comprehensive and comparable report. The report included a computer model that simulated the life-cycle impacts of various carryout bags. Below is a summary table detailing the environmental findings from this life cycle analysis.[52]

Table 7 -- Australia's Assessment of Alternatives

Type of Carryout Bag	Bags Used per Year	Material Consumed (kg)	Greenhouse Gas Equivalent (CO2) For One Year	Primary Energy Use For One Year (MJ)
Reusable (PP fiber bag)	4.15	0.48	1.96	46.3
Biodegradable (starch based)	520	6.5	6.61	61.3
Single HDPE	520	3.12	6.08	210
Kraft Paper Bag (with handles)	520	22.15	11.8	721
Boutique LDPE	650	11.77	29.8	957

Based on the information above, reusable bags made of polypropylene have the least environmental impact due to the reduced number of bags consumed per year. However, it must be noted that the study may not represent actual conditions in Los Angeles County. For example, the study assumed the following information regarding manufacturing/transportation and disposal:

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[49] Australian Department of the Environment and Heritage Plastic Shopping Bags – Anaylsis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002, page 28.

[50] Australian Department of the Environment and Heritage Plastic Shopping Bags – Anaylsis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002; SOCIO Economic Impact of the Proposed Plastic Bag Regulations by Bentley West Management; and, Environmental Group Research Report: Proposed Plastic Bag Levy – Extended Impact Assessment Volume 1: Main Report 2005.

[51] Plastic Shopping Bags – Analysis of Levies and Environmental Impacts, prepare by Nolan-ITU.

[52] Australian Department of the Environment and Heritage Plastic Shopping Bags – Anaylsis of Levies and Environmental Impacts Final Report, prepared by Nolan-ITU, December 2002, page 36.

Manufacturing/Transportation

- 67% of HDPE plastic carryout bags were imported from South-east Asia
- 66% of LDPE plastic carryout bags were imported from South-east Asia
- 0% of paper carryout bags were imported
- 100% of biodegradable carryout bags were imported from Italy (but made in Australia)
- 0% of reusable bags imported

End-of-Life (Disposal) Assumptions

- 78.5%, 2%, 0.5%, and 19% of HDPE plastic carryout bags were landfilled, recycled, littered, and reused per year
- 80.5%, 0%, 0.5%, and 19% of LDPE plastic carryout bags were landfilled, recycled, littered, and reused per year
- 39.5%, 60%, 0.5%, and 0% of paper carryout bags were landfilled, recycled, littered, and reused per year
- 80.5%, 0%, 0.5%, and 19% of biodegradable carryout bags were landfilled, recycled, littered, and reused per year
- 99.5%, 0%, 0.5%, and 0% of reusable bags were landfilled, recycled, littered, and reused per year

Public Health Impact of Carryout Bags

Most plastic carryout bags carry a voluntary warning label which typically states, "Warning: To Avoid Danger of Suffocation, Keep This Plastic Bag Away From Babies and Children. Please Do Not Use This Bag in Cribs, Beds, Carriages and Playpens."

Despite the above safety warning, according to the United States Consumer Product Commission, the Commission receives "an average of about 25 reports a year [nationwide] describing deaths to children who suffocated due to plastic carryout bags. Almost 90 percent of them were under one year of age. Recent reports often describe bags originally used for dry cleaning or storage. Some may have been used to protect bedding and furniture, and others just were not carefully discarded."[53]

[53] http://www.cpsc.gov/CPSCPUB/PUBS/5064.html, April 30, 2007.

CHAPTER 5

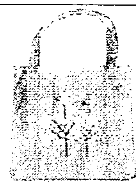
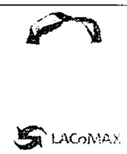
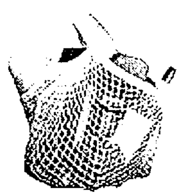
TYPE AND COST OF REUSABLE BAGS

Reusable Bag Types

Reusable bags are a viable option for consumers because they are typically recyclable, lightweight, durable, washable, and can carry three to four times that of a plastic carryout bag. Reusable bags can be purchased from a number of locations, including grocery and retail stores, and internet websites such as www.reusablebags.com and www.earthwise.com. Below is list of common reusable bags.

Table 8 -- Types of Reusable Bags

Type	Store	Avg. Cost	Contents
	**Whole Foods** (Gives 5¢ back for each reusable bag used)	$2.99	Non-woven polypropylene (Plastic #5) 100% recyclable
	**Ralphs** (Gives 5¢ back for each reusable bag used)	$1.50 (50¢ will be donated to environmental groups)	Non-woven polypropylene (Plastic #5) 100% recyclable
	**Vons**	99¢	Non-woven polypropylene (Plastic #5) 100% recyclable
	**Albertsons**	99¢	Non-woven polypropylene (Plastic #5) 100% recyclable

Type	Store	Avg. Cost	Contents
	Target	$1.49	Non-woven polypropylene (Plastic #5) 100% recyclable
	Recycled Products.com	$5.00	Cotton canvas
	Etcetera, Etcetera, Etcetera	$6.00	100% recycled water/soda bottles
	Papernorplastic.com	$9.99 (4th free)	600 Denier Polyester backed with Vinyl (similar to school backpacks)
	Ecobags.com	$10	100% cotton

Economics of Reusable Bags

Although reusable bags cost between 99¢ and $10 each, the savings to consumers can be significant since grocers/retailers cost for purchasing single use carryout bags is no longer passed along to customers (see table below).

Table 9 -- Cost Comparison of Carryout Bags

Type of Carryout Bag	Annual Consumption Rate	Average Cost Per Bag	Annual Cost To Consumers
Plastic Bag	600	3¢ (ranges between 2 - 5¢)[54]	$18 (in hidden costs)
Paper Bag	300 (consumption rate is unknown, assumed ½ of plastic carryout bags due to size)	10¢ (ranges between 5 - 23¢)[55]	$30 (in hidden costs)
Biodegradable Bag	600	15¢ (ranges between 8 - 17¢)[56]	$90 (in hidden costs)
Whole Food Reusable Bag	1 (assumes avg. consumer will use 3 bags/year and will last 2 years before replacement)	$2.99	$4.50 (direct cost)

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54 www.usplastic.com (May 22, 2007), www.restockit.com (May 22, 2007).
55 www.mrtakeoutbags.com (May 22, 2007), www.restockit.com (May 22, 2007).
56 www.ecoproducts.com (May 22, 2007).

CHAPTER 6

CASE STUDIES

City/County of San Francisco

In 2005, the City of San Francisco considered imposing a 17¢ fee on non-biodegradable plastic carryout bags before reaching an agreement with the California Grocers Association. The agreement called for large supermarket stores to voluntarily reduce the number of plastic bags consumed by 10 million in 2006. Although the California Grocers Association claimed that supermarket stores reduced plastic bag consumption by 7.6 million, the City disputed this figure since it was not verifiable. This disagreement led to a renewed interest in banning non-biodegradable plastic carryout bags.[57]

On March 22, 2007, San Francisco adopted an ordinance banning the distribution of *non-biodegradable* plastic carryout bags. Effective September 22, 2007, all supermarket stores (generating $2 million or more) must provide their customers one (or a combination) of the following 3 choices:

- Biodegradable carryout bags – the bags must display the words "green cart compostable" and "reusable," and display a solid green line that circles the bag.
- Paper carryout bags -- the bags must display the words "reusable" and "recyclable," cannot contain old-growth fiber, and be made of 40 percent post-consumer recycled content.
- Reusable bags – the bags must be cloth or plastic (greater than 2.25 mils thick) bags.[58]

In addition, effective March 22, 2008, all pharmacy chains (with more than 5 stores located in San Francisco) must also comply with the above requirement. Supermarkets or pharmacies failing to comply with the Ordinance may face civil liabilities of $100, $200, or $500 for the first, second, or third violation, respectively.[59]

According to the Biodegradable Products Institute, San Francisco is promoting the use of biodegradable carryout bags because it has an advanced residential and commercial food scrap diversion program.[60] However, Biodegradable

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[57] San Francisco Chronicle, March 28, 2007, San Francisco First City to Ban Shopping Bags.
[58] Plastic Bag Reduction Ordinance, San Francisco County Board of Supervisors, March 22, 2007.
[59] Ibid.
[60] http://www.bpiworld.org/Files/PressRelease/PRsxdBPP.pdf, May 20, 2007

carryout bags usage in Los Angeles County is not practicable at this time, due to the lack of commercial composting facilities necessary to process the biodegradable carryout bags. The nearest facilities are located in Kern and San Bernardino Counties.[61] Since transporting biodegradable carryout bags to distant commercial composting facilities involves higher service costs, and adds to traffic congestion and air pollution, it is less ideal in comparison to other alternatives that involve local operations.

Additionally, the use of biodegradable carryout bags would not alleviate the litter problem or potential harm to marine wildlife since they have the same general characteristics of plastic carryout bags (lightweight, persistent in the marine environment, etc.). Furthermore, the presence of biodegradable carryout bags in the recycling stream could potentially jeopardize plastic recycling programs through contamination and reduce the quality of plastic resins. This contamination could ultimately result in batches of recyclable plastic materials or biodegradable carryout bags being landfilled.

City of Oakland

On July 17, 2007, the City of Oakland adopted an ordinance banning the distribution of *non-biodegradable* plastic carryout bags. Effective January 17, 2008, all stores (generating $1 million or more), except restaurant and fast food establishments, must provide their customers one (or a combination) of the following 3 choices:

- Compostable or biodegradable carryout bags.
- Paper carryout bags -- the bags cannot contain old-growth fiber, and be made of 40 percent post-consumer recycled content.
- Reusable bags – the bags must be (1) cloth or other machine washable fabric, or (2) made of other durable material suitable for reuse.[62]

Stores failing to comply with the Ordinance will be given a written warning. If a store continues to violate the Ordinance, the owner may face civil liabilities of $100, $200, or $500 for the first, second, or third violation, respectively, following the initial warning[63]

According to City of Oakland's Resolution accompanying the Ordinance, Oakland is banning non-biodegradable plastic carryout bags because:

- Of its negative impacts on the environment and wildlife;

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[61] California Integrated Waste Management Board's Solid Waste Information System (SWIS), www.ciwmb.ca.gov/SWIS/Search.asp
[62] Ordinance Banning Plastic Carry-out Bags, City of Oakland, July 3, 2007.
[63] Ibid.

- It's consistent with the City's adopted policy to reduce its reliance on oil; and,
- It's consistent with Assembly Bill 2449 (Levine, 2006 Statutes), which "encourage[s] the use of reusable bags by consumers and retailers and reduce the consumption of single-use bags."[64]

All City sponsored events are also prohibited from distributing non-biodegradable plastic carryout bags effective October 17, 2007.[65]

On August 3, 2007, the "Coalition to Support Plastic Bag Recycling" filed a petition for writ of mandate under the California Environmental Quality Act (CEQA) in Alameda Superior Court. The coalition alleges that Oakland failed to analyze the ordinance's potential environmental impact as required by CEQA.

Other States and Cities Considering Restrictions

Since San Francisco's move to ban *non-biodegradable* plastic carryout bags in March 2007, and the Los Angeles County Board of Supervisors request to investigate the feasibility of banning plastic carryout bags in April 2007, a number of U.S. cities and states have also begun investigating similar measures.

State
Alaska
New York

Cities
Annapolis, MD
Austin, TX
Bakersfield, CA [Issue placed on hold]
Baltimore, MD
Berkeley, CA
Boston, MA
Fairfax, CA
Maui, HI
New Haven, CT
Oakland, CA [Banned non-biodegradable plastic carryout bags on July 17, 2007]
Portland, OR
Phoenix, AZ
Santa Cruz, CA
Seattle, WA

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[64] Ibid.
[65] Ibid.

Elsewhere

Several countries have restricted the consumption of plastic carryout bags, through bans, taxes, and/or increased public awareness and recycling. Litter, conservation of natural resources, and negative impacts on the marine environment were the primary reasons of this action. Below is a brief description of several actions.

Ireland

Effective 2002, Ireland imposed a fee of 20 cents (U.S.) on each plastic carryout bag consumed.[66] The primary purpose of the tax, commonly known as PlasTax, was to shift public behavior towards greater use of reusable bags, and reduce plastic carryout bag litter which was impacting the Country's coastline and tourism industry. The collected monies are used to fund litter, waste management, and other environmental initiatives.[67]

The Minister for the Environment determined that a consumer fee would be the most effective way to change shopping habits and break consumer reliance on plastic carryout bags. Therefore, a decision was made to impose a fee on consumers.

Prior to the PlasTax, an estimated 1.2 billion plastic carryout bags were consumed annually. Within months of its inception, the consumption rate dropped precipitously – studies found a dramatic reduction from 328 bags used per person per year to 21 (a 95 percent drop).[68]

The use of reusable bags has become widely accepted and consumers now carry reusable bags when they go grocery shopping. Moreover, even people who use reusable bags support the PlasTax model because it allows a 'safety net' in case they do not have their reusable bags at the time of purchase.

To further reduce plastic carryout bag consumption, effective July 1, 2007, Ireland increased the PlasTax to 25 (U.S.) cents per bag.[69]

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66 www.environ.ie/en/Environment/Waste/PlasticBags/News/MainBody,3199,en.htm, May 1, 2007.

67 www.environ.ie/en/Environment/Waste/PlasticBags/PublicationsDocuments/FileDownLoad,1386,en.pdf, May 1, 2007.

68 www.environ.ie/en/Environment/Waste/PlasticBags/News/MainBody,3199,en.htm, May 1, 2007.

69 http://www.ireland.com/newspaper/breaking/2007/0701/breaking27.htm, July 17, 2007.

Australia

In 2002, it was estimated that Australians were using approximately 6.9 billion plastic carryout bags each year, of which 50 to 80 million bags ended up as litter. In October 2002 the Australian government convened a stakeholder working group consisting of state and local governments, industry, retailers, recyclers, and environmental groups. This stakeholder group established a national voluntary goal to reduce plastic carryout bag litter by 75% and reduce the consumption of HDPE type plastic carryout bags by 50% (by December 31, 2005).[70]

Retailers were categorized in two groups

- Group One retailers (major supermarkets)
- Group Two retailers (all others providing plastic carryout bags)

Since then, a number of initiatives have been implemented, including voluntary at-store recycling of plastic HDPE type carryout bags.

According to a report from the Australia Retailers Association, as of December 31, 2005, **Group One** retailers spent $50 million on public education efforts over two years which resulted in a 45% reduction in the issuance of plastic carryout HDPE bags and a 14 percent in-store recycling rate. The report concluded that "despite these major achievements, the majority of consumers have yet to alter their behavior," and plastic carryout bag "litter remains static over the five year life . . . at around 2% of the total litter stream."[71] This finding is supported by a subsequent report which found "in Australia, voluntary efforts have seen significant reductions in plastic bag consumption; however ***these do not appear to have had a noticeable impact on litter with levels remaining approximately the same***."[72] (emphasis added)

Regarding **Group Two** retailers, "identifying target retailers and activities to gain their attention, and subsequent commitment to act, proved challenging. . ." Thus, it's estimated that Group Two retailers reduced their consumption by only 23%.[73]

Currently, the Australian Retailers Association continues to advocate for more education, and the Australian government continues to examine other options to

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[70] Consultation Regulatory Impact Statement: Investigation of Options to Reduce The Environmental Impact of Plastic Bags, Environment Protection and Heritage Council, January 2007, page 37.
[71] http://www.ephc.gov.au/pdf/Plastic_Bags/ANRA_Report_to_EPHC_Chair_22_May_2006.pdf.
[72] Consultation Regulatory Impact Statement: Investigation of Options to Reduce The Environmental Impact of Plastic Bags, Environment Protection and Heritage Council, January 2007, page 23.
[73] Ibid, page 38.

phase out plastic carryout bags by 2009, including banning them or levying a fee on each plastic carryout bag consumed (similar to Ireland's PlasTax).[74 75 76]

South Africa

In 2003, the South African government adopted regulations impacting the manufacture, trade, and commercial distribution of plastic carryout bags in order to combat the plastic carryout bag litter problem. The problem was so pervasive that plastic bag litter was commonly referred to as 'the new national flower.'

Under the new regulations, all plastic carryout bags must now have a minimum thickness of 24 micrometers (microns). In addition, all monies collected from a 3 cent levy are used to fund cleanup efforts, and promote reuse and recycling.[77]

California's New At-Store Recycling Program

To increase the plastic carryout bag recycling rate (currently less than 5 percent), in 2006, California passed Assembly Bill 2449 to "encourage the use of reusable bags by consumers and retailers and to reduce the consumption of single-use carryout bags."[78] Effective July 1, 2007, all large supermarkets and retail businesses (of at least 10,000 square feet with a licensed pharmacy) are required to:

- Establish a plastic carryout bag recycling program at each store;
- Make the recycling bin easily accessible and identifiable to customers;
- Ensure that each plastic carryout bag provided to customers be labeled, "Please Return To A Participating Store For Recycling;"[79]
- Make available reusable bags which are made of cloth, fabric or plastic with a thickness of 2.25 mils or greater. The stores may charge for reusable bags; and,
- Maintain program records for a minimum of three years and make the records available to the California Integrated Waste Management Board or the host jurisdiction.

It is estimated that 7,000 stores statewide are affected.[80] If large supermarkets or manufactures fail to comply, they may face a fine of $500, $1,000, or $2,000 for the first, second, or third violation, respectively.

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[74] http://www.ephc.gov.au/pdf/Plastic_Bags/ANRA_Report_to_EPHC_Chair_22_May_2006.pdf.
[75] Consultation Regulatory Impact Statement: Investigation of Options to Reduce the Environmental Impact of Plastic Bags, Environment Protection and Heritage Council, January 2007, page 70.
[76] The Daily Telegraph - Australia, July 21, 2007, Plastic Bags Ban Rubbished.
[77] http://www.lib.uct.ac.za/govpubs/plasticbags.htm
[78] Assembly Bill 2449, Chapter 845, Statutes of 2006.
[79] Ibid.

Although Assembly Bill 2449 does not establish an at-store recycling rate goal or a consumption reduction goal, on June 12, 2007, the California Integrated Waste Management Board adopted emergency regulations establishing reporting requirements to evaluate the effectiveness of the program.[81]

However, of most interest to local governments is Assembly Bill 2449's preemption clause which prohibits local governments from interfering in the above at-store recycling program, imposing a plastic carryout bag fee on the affected stores, or increasing the above reporting requirements.

While it is unclear where the collected plastic carryout bags are taken for recycling, a few businesses indicated that the bags are taken to their distribution centers and shipped to various recyclers throughout the country.

Assembly Bill 2449 sunsets on January 1, 2013.[82]

Ikea's Self-Imposed Fee On Plastic Carryout Bags

On March 15, 2007, to reduce plastic carryout bag consumption, IKEA became the first major retailer in the United States to voluntarily no longer offer a 'free' plastic bag to customers. Instead, customers are given a choice of purchasing a plastic carryout bag for 5 cents each (all proceeds in the first year would go towards American Forests to plant trees), or purchasing a 'big blue' reusable bag for 59 cents (down from 99 cents).[83] After IKEA introduced a similar program in the United Kingdom last year, IKEA's plastic carryout bag consumption dropped 95 percent.[84]

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[80] California Integrated Waste Management Board. Staff Report, Agenda Item 14, June 12, 2007 Board Meeting.
[81] Ibid.
[82] Assembly Bill 2449, Chapter 845. Statutes of 2006.
[83] http://www.ikea.com/ms/en_US/about_ikea/social_environmental/environment.html, July 17, 2007.
[84] http://www.sltrib.com/ci_6384558, July 17, 2007.

CHAPTER 7

STAKEHOLDER COMMENTS

Industry/Grocer Concerns

While many plastic products play a vital and important role in enhancing our quality of life, recent proposals by local and state governments to ban plastic carryout bags to reduce litter and increase recycling have concerned the plastic and grocer industries. Although these industries acknowledge that plastic carryout bags are a contributor to the litter problem, they believe that plastic carryout bags are unfairly targeted because the problem is not with the plastic carryout bags themselves, but with the lack public education regarding recycling programs. Industries believe that increasing plastic carryout bag recycling programs at stores and at curbside is the key to reducing litter. Industry also believes that a lack of litter prevention programs is the main cause of litter around parks and beaches (e.g., trash cans often don't have lids or are overfilled, causing trash to spill on the ground and plastic carryout bags to be blown away).

In addition, grocers fear a plastic carryout bag ban will result in increased paper bag use, which are heavier, cost more, and ultimately increase the cost to consumers. A rise in cost may also drive consumers to shop at stores not affected by the ban. In addition, grocers fear reusable bags would increase check-out times, thus negatively impacting their business operations. Grocers are quick to point out that many stores already stock reusable bags for consumers to purchase, and that large grocery stores are now required to offer plastic carryout bag recycling stations effective July 1, 2007 as a result of Assembly Bill 2449 (see Chapter 6) – thus, providing consumers more opportunities to recycle and curbing plastic carryout bag litter. Industry believes that with proper public education and promotion, AB 2449 will be successful in reducing the number of plastic carryout bags littered.

Examples of Alternative Products Advocated by Industry

Crown Poly

Crown Poly, a local manufacturer, has created a plastic carryout bag with a reinforced strip on the bottom and reinforced hold handles called the Hippo Sak™.

Because the Hippo Sak™ is slightly larger then the conventional plastic carryout bag, coupled with the aforementioned qualities, it allows consumers to carry more items in each bag and is capable of being reused as a trash can liner.

Although the number of conventional plastic carryout bags consumed may be reduced if the Hippo Sak^{TM} was widely distributed, the litter and environmental impacts associated with conventional plastic carryout bags continue to be applicable to the Hippo Sak^{TM}.

DePoly Degradable Solutions

DePoly Degradable Solutions, a company based in England, specializes in making plastic products biodegradable by introducing an additive into the manufacture process. The technology, OXO-degradation, is capable of making plastic carryout bags biodegradable, thus allowing it to breakdown in the natural environment. Because it takes many months for the biodegradable plastic carryout bags to partially degrade in the natural environment, it would not reduce plastic bag litter.

Stripes2Stripes^{TM}

Stripes2stripes™ is an emerging company which advocates a system for recycling plastic carryout bags. Under the company's system, plastic carryout bags would have three identifiable diagonal stripes in the lower right-hand corner imprinted with a 1-800 number; consumers would be given a larger plastic bag to store their used Stripes2stripes™ bags; and, when the larger plastic bag is full, consumers would be encouraged to call the 1-800 number or visit the company's website for instructions on where to take their bag for recycling.

Upon evaluating the Stripes2stripes™ program, plastic carryout bag litter would not be reduced since the amount of plastic carryout bags consumed would remain the same; and, the program may contribute to litter since it introduces a larger recycling bag into the marketplace instead of encouraging consumers to store Stripes2stripes™ bags within the same bags.

Consumer and Environmental Groups Perspective

Plastic carryout bags, although convenient, have numerous adverse environmental impacts, including litter and harming marine wildlife. Consumer and environmental groups cited many of the same studies used throughout this report to support their claims.

In addition, these groups also emphasize that local governments should further promote a "reduce, reuse, and recycle" philosophy that educates consumers and businesses on the need to reduce overall plastic carryout bag usage through the use of reusable bags. To discourage the use of plastic carryout bags and curb litter, consumer and environmental groups support a ban or fee on each plastic carryout bag consumed.

List of Contacted Stakeholders

A number of stakeholders were contacted to participate in preparation of this report. Below is a list of those stakeholders.

Table 10 -- Stakeholder List

Organization
1 Bag at a Time
Algalita Marine Research Foundation
Ballona Creek Renaissance
Californians Against Waste
California Coastal Commission
California Grocers Association
California Integrated Waste Management Board
California Restaurant Association
City of Los Angeles (Public Works/Sanitation Department)
Command Packaging
Crown Poly
DePoly Degradable Solutions
Earth Resource Foundation
Ek & Ek, A Lobbyist and Public Advocacy Firm
Environmental Charter High School/Green Ambassadors
Friends of Ballona Wetlands
Keep California Beautiful
Heal the Bay
Los Angeles Audubon Society
Los Angeles Chamber of Commerce
Los Cerritos Wetlands Stewards
Natural Resources Defense Council
Parent Teachers Association Representative
Plastic Recycling Corporation of California
Progressive Bag Alliance
Rose & Kindel/Plastics Association
Santa Monica Baykeepers
Sierra Club, Los Angeles Chapter
Stephen Joseph "Stripes to Stripes"

CHAPTER 8

FINDINGS AND OPTIONS

Key Findings

- **Plastic carryout bags have been found to significantly contribute to litter and have other negative impacts on marine wildlife and the environment.**

- **Biodegradable carryout bags are not a practical solution to this issue in Los Angeles County because there are no local commercial composting facilities able to process the biodegradable carryout bags at this time.**

- **Reusable bags contribute towards environmental sustainability over plastic and paper carryout bags.**

- **Accelerating the widespread use of reusable bags will diminish plastic bag litter and redirect environmental preservation efforts and resources towards "greener" practices.**

Alternatives for the Board of Supervisors to Consider

Since plastic carryout bags distributed at supermarkets and other large retail outlets contribute disproportionately to the litter problem, the County plastic bag working group recommends reducing the prevalence of these bags as a first priority. The working group seeks to subsequently investigate measures to reduce the consumption of plastic and paper carryout bags at the remaining retail establishments throughout the County.

Based on the above factors, the following alternatives are presented to the Board for consideration. Supplementary measures are also provided below to further strengthen the main alternatives.

- **ALTERNATIVE 1 – Ban Plastic Carryout Bags at Large Supermarkets and Retail Stores One Year After Adoption of Ordinance**

  To reduce plastic bag litter, request the County's plastic bag working group (consisting of the Chief Executive Office, County Counsel, Internal Services Department, Public Works, and other County departments/agencies as appropriate) to draft an ordinance banning plastic carryout bags at large supermarkets and retail stores. All large supermarkets and retail stores voluntarily applying a point of sale fee (e.g., 10¢) on each plastic carryout bag consumed would be exempt from the Ordinance. This exemption would provide more flexibility to affected stores, while providing a mechanism (the consumption fee) with proven effectiveness in reducing overall consumption. The consumption fee is to be retained by the affected store. The Ordinance would also define "large supermarkets and retail stores."

Delay implementation of the ban for one year to allow the working group to work with affected stakeholders, conduct additional outreach efforts and promote awareness of the upcoming ban.

- **ALTERNATIVE 2 – Ban Plastic Carryout Bags At Large Supermarkets And Retail Stores Effective:**
  - **July 1, 2010, If The Bag Disposal Rate Does Not Decrease By A Minimum Of 35%.**
  - **July 1, 2013, If The Bag Disposal Rate Does Not Decrease By A Minimum Of 70%.**

To reduce plastic bag litter, request the County's plastic bag working group to draft an ordinance banning plastic carryout bags at large supermarkets and retail stores. The ban would go into effect automatically, effective:

- July 1, 2010 if the disposal rate of plastic carryout bags does not decrease by a minimum of 35%, using FY 2007-08 as the baseline, by January 1, 2010.
- July 1, 2013 if the disposal rate of plastic carryout bags does not decrease by a minimum of 70%, using FY 2007-08 as the baseline, by January 1, 2013.

All large supermarkets and retail stores voluntarily applying a point of sale fee (e.g., 10¢) on each plastic carryout bag consumed would be exempt from the Ordinance. This exemption would provide more flexibility to affected stores, while providing a mechanism (the consumption fee) with proven effectiveness in reducing overall consumption. The consumption fee is to be retained by the affected store. The Ordinance would also define "large supermarkets and retail stores."

To achieve these goals, the working group shall coordinate with grocers/industry to establish the aforementioned baseline (the difference between total consumption and recycling), reduce the consumption of plastic carryout bags, and increase the recycling rate of plastic carryout bags (within the constraints of Assembly Bill 2449).

The County may accelerate the ban on plastic carryout bags if cities containing a majority of the County's population adopt an ordinance or enter into a Memorandum of Understanding with the County banning plastic carryout bags.

- **ALTERNATIVE 3 – Status Quo**

  Request the County's plastic bag working group to monitor the effects of Assembly Bill 2449 and other related actions.

Supplementary Measures

To complement the alternatives identified above, the working group also recommends implementing all of the following supplementary measures. Each of these measures may be implemented in addition to whichever alternative is selected by the Board:

A. Direct the Department of Public Works, in consultation with the County plastic bag working group, to implement a comprehensive public education campaign, and create partnerships with large supermarkets, retail stores, and elementary schools to promote reusable bags over plastic and paper carryout bags.

B. Direct the plastic bag working group to draft a resolution for Board consideration prohibiting the purchase and use of plastic carryout bags at all County-owned facilities and County offices.

C. Direct the County's plastic bag working group to actively work with the 88 cities in Los Angeles County to implement measures which reduce the consumption of plastic and paper carryout bags.

D. Direct the Department of Public Works, to aggressively pursue grants and other funding opportunities to fund the comprehensive public education campaign as described in Supplementary Measure A above.

E. Direct the Chief Executive Office, Department of Public Works, and the County's Legislative Advocates to work with the State legislature to:

   - Repeal the provision of Assembly Bill 2449 which prohibits local governments from imposing a fee on plastic carryout bags or implementing other at-store recycling measures;
   - Implement either a statewide fee on each plastic bag used with funds directed to local governments on a per-capita basis for litter prevention and cleanup efforts; or implement statewide benchmarks to reduce the consumption of plastic carryout bags; or implement a statewide ban on plastic carryout bags.

F. Direct the County's plastic bag working group to investigate measures to reduce the consumption of plastic carryout bags at other retail establishments, as well as evaluate paper bag usage throughout the County.

G. Direct Public Works to work with the State, solid waste industry and other stakeholders to develop markets and other programs to reduce plastic bag litter.

H. Direct the County's plastic bag working group to establish a Subcommittee to assist in carrying out the functions of the working group, including tracking the reduction of plastic bag litter to comply with the Federal Clean Water Act.

I. Direct the County's plastic bag working group to provide a semi-annual progress report to the Board describing progress and efforts to reduce the consumption of plastic and paper carryout bags in Los Angeles County.

MARINE DEBRIS FACTS

What Is Marine Debris?

The National Oceanic and Atmospheric Administration defines marine debris as any man-made object discarded, disposed of or abandoned that enters the coastal or marine environment. It may enter directly from a ship, or indirectly when washed out to sea via rivers, streams and storm drains. Since the 1960s, the world's dependence upon natural materials has been largely replaced with durable, highly buoyant synthetic items. Once they enter the ocean environment these products – such as cigarette filters, food wrappers, beverage bottles and cans, grocery and trash bags, and fishing line, nets and gear – can travel for hundreds of thousands of miles on ocean currents, posing a threat to ocean ecosystems and wildlife along the way. Consequently, marine debris has become one of the most widespread pollution problems facing the world's oceans and waterways.

MARINE DEBRIS HAS BECOME ONE OF THE MOST PERVASIVE POLLUTION PROBLEMS FACING THE WORLD'S OCEANS AND WATERWAYS.

Where Does It Come From?

While the types of debris are as diverse as the products found around the world, it all shares a common origin – people. Since trash can travel long distances before settling on shorelines or the ocean floor, determining exactly how debris reaches the ocean can be difficult. In an effort to understand the activities that cause debris, researchers traditionally classify marine debris as coming from **land-** or **ocean/waterway-based** sources.

Land-based sources
People's mishandling of waste materials and a host of other items while on land constitutes the bulk of the marine debris problem. Debris is also blown into the water or carried by creeks, rivers, storm drains and sewers into the ocean.

Sources of land-based debris include:

- Inappropriate disposal of trash from many land-based activities, including picnicking, beachgoing, fishing and waterside sporting events;
- Debris items from lawns, parking lots, streets and storm drains being blown, swept or washed out to sea;
- Inappropriate handling of packaging materials;
- Inadvertent or intentional release of waste from shore-based solid waste disposal and waste processing facilities; and
- Sewage overflows.

Ocean/waterway-based sources
People also generate debris while at sea. Like land-based debris, the majority of ocean/waterway-based debris reaches the ocean through people's failure to properly dispose of or stow their trash while onboard their boats and vessels. National disasters, such as hurricanes and storms, can also deposit debris into the ocean.

Sources of ocean/waterway-based debris include:

- Abandoning fishing gear, including line, nets, ropes, bait boxes, fish tags and trawl floats;
- Intentional or inadvertent discharge of trash, galley waste and boating materials, including oil lube bottles, engine cleaning and maintenance products; and
- Inappropriate handling of undersea exploration and oil and gas extraction items, including hard hats, sheeting and tarps, computer equipment and survey materials.

MARINE DEBRIS FACTS

Impacts of Marine Debris

In addition to being unsightly, marine debris poses significant threats to ocean ecosystems, wildlife and human health and safety.

Effects on ocean ecosystems

- Abandoned nets, plastic tarps, fishing gear and other debris can smother and crush sensitive coral reef and seagrass bed ecosystems and their benthic (bottom-dwelling) species.

Effects on marine wildlife

- Fishing line, nets, rope and grocery and trash bags can entangle, maim and even drown many wildlife species, including sea turtles, marine mammals, sea birds, fish and other species.
- Cigarette filters, food bags, pieces of plastic and packaging look like food to many animals. Once ingested, these materials can cause starvation and/or choking.

Effects on people

- Medical and personal hygiene debris can enter waterways when sewer systems fail or overflow. These items often contain harmful bacteria and pathogens.
- Syringes, broken glass and other hazardous items pose obvious dangers to bare-footed beachgoers.
- Grocery and trash bags, fishing line, nets, rope and other debris can wrap around boat propellers and clog seawater intakes, causing costly damage and becoming a safety hazard.

Working Toward Solutions

While an important first step, physically removing existing debris only provides temporary relief to the problem. The only way to truly manage the marine debris pollution issue is through prevention – changing the behaviors that cause marine debris to enter the environment. Consequently, multiple organizations and local, regional and state agencies are collaborating on outreach projects designed to bring awareness to and alleviate the problem of marine debris. Several efforts are focusing on monitoring the behaviors and activities that result in marine debris and developing prevention strategies that educate people on marine debris issues, their role in the problem and how to prevent it. For more information on programs that are working to foster change, visit **www.marinedebris.noaa.gov**.

What You Can Do

Here are some steps that you can take to help solve the marine debris problem:

- Reduce, reuse, recycle. Choose reusable items and use fewer disposable ones (e.g., use fewer disposable bags when shopping, or bring your own reusable bags).
- Retain all pieces of fishing line, net or other litter for proper disposal in trash containers.
- Keep streets, sidewalks, parking lots and storm drains free of trash – they empty into our oceans.
- Stow all trash on your boat for proper disposal on land. At the beach, park or playground, dispose of all trash in the proper receptacles or take your trash home with you. Pick up any debris you see while out.
- Serve as an example to others. Get involved in cleanups in your area and encourage others to help keep the beaches and oceans clean.

California
Integrated Waste
Management Board

Plastics Information and Resources

California is faced with the daunting challenge of managing millions of tons of postconsumer plastic annually generated in the state. The California Integrated Waste Management Board's (CIWMB) 2003 Waste Characterization Study found that plastic film, packaging containers, durable goods, and other plastic items make up 9.5 percent, or 3.8 million tons, of the disposed waste stream in California. [redacted]

Program News...

- Information about the At-Store Recycling Program for Plastic Carryout Bags is now available.

The characteristics that increasingly make plastic the manufacturing and packaging material of choice, i.e. light weight, durable, less expensive, also make it a challenge to collect and recycle. Plastic materials when released into the environment c[redacted]s.

The CIWMB is actively working toward developing more comprehensive solutions for managing plastic materials, and to mitigate for the adverse environmental impacts associated with plastic discards by effectively implementing its mandatory plastic programs. For more information, please read about our priority programs and initiatives and/or see the links to your left.

Last updated: May 28, 2008
Plastic Recycling http://www.ciwmb.ca.gov/Plastic/
Melissa Vargas, Sustainability: mvargas@ciwmb.ca.gov (916) 341-6271
Michelle Marlowe-Lawrence, Compliance: mmarlowe@ciwmb.ca.gov (916) 341-6512

About Us - Agalita Marine Research Foundation

Mission Statement

The Algalita Marine Research Foundation is dedicated to the protection of the marine environment and its watersheds through research, education, and restoration.

Download AMRF's 2006 Annual Report

A Non-profit, Independent Research Foundation

Algalita Marine Research Foundation (AMRF) is a Long Beach, California-based non-profit environmental organization. AMRF is a registered 501c(3) organization and all contributions are tax deductible.

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AMRF's Strategic Plan

Our plan is a working document, updated annually or when there are significant influences to the direction of the Foundation. This provides a clear direction for our foundation, creating common goals and strategies. By sharing our Strategic Plan, we let others see that our movement forward is through a series of logical, professional steps that will improve the world in which we live. We welcome others with a similar point of view to join us, either through action or funding.

Download AMRF's Strategic Plan
Download AMRF's White Paper on Pelagic Plastics
AMRF's Comments/Recommendations on the Ocean Research Priorities Plan

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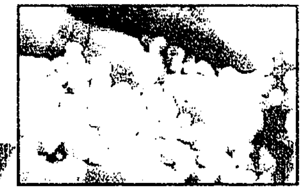
[redacted]



Plastic in the ocean may be one of the most alarming of today's environmental stories. Plastic, like diamonds, are forever! [redacted] When plastic debris meets the sea it can remain for centuries causing untold havoc in ecosystems.

Studies indicate less than 5% of plastic ever gets recycled, while each American is said to contribute some 65 lbs. of plastic into landfills each year. [redacted]

Storms flush plastics down stream and ultimately into the ocean. Plastic debris looks bad, but it behaves worse. Far worse! Plastic pollution negatively effects trillions upon trillions of ocean inhabitants and ultimately humans.

"Synthetic Sea" shows how many marine birds and fishes ingest plastic, because it mimics the food they eat. [redacted] a result, new research regarding endocrine disrupters in floating plastic debris is being planned by the Algalita Marine Research Foundation.. "Synthetic Sea" is a documentary based on scientific findings backed by published scientific papers.

Updated: 2/08

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WORKING OUR WAY UPSTREAM: A SNAPSHOT OF LAND-BASED CONTRIBUTIONS OF PLASTIC AND OTHER TRASH TO COASTAL WATERS AND BEACHES OF SOUTHERN CALIFORNIA

C.J. Moore, G.L. Lattin, A.F. Zellers

Algalita Marine Research Foundation. 148 N. Marina Drive. Long Beach, CA 90803, USA

Introduction

The most abundant type of debris impacting coastal beaches in Southern California's Orange County is pre-production plastic pellets, the plastic industry's principal feedstock. Hard plastic objects and pieces are over a hundred times less common but weigh one and a half times as much as the pellets[1]. The presence of pre and post consumer plastics in the marine environment and on beaches is not only a Southern California phenomenon. [redacted]. [redacted] showed in 1989 that plastic debris can be found throughout the southwest Pacific, with high densities of plastic in surface waters north of New Zealand, and abundant plastic pellets on New Zealand beaches adjacent to manufacturing centers.[3] [redacted]lastic debris has also been shown to occur at subsurface depths of 10m and 30m in the NPCG,[6] Southern California coastal waters, and near the bottom of the sea floor off Ballona Creek.[7]

Most studies of marine debris have focused on easily visible and identifiable plastic objects. The studies by AMRF and Southern California Coastal Water Research Project (SCCWRP), however, have shown that plastic fragments less than 5mm have a mass that is 30% of the mass of the associated zooplankton in the NPCG. In near coastal waters off the San Gabriel River, the mass of plastic less than 5 mm was found to be 60% of the mass of the associated zooplankton. [7]

Policies in California have been established to restrict trash and plastic greater than 5 mm in size through the process of regulating Total Maximum Daily Loads (TMDLs). In order to quantify debris not subject to regulation by TMDLS, this study analyzed plastic trash between 1 and 5mm in size as well as that >5mm from two Southern California Rivers; the Los Angeles River and the San Gabriel River. The goal of this study was to answer the following questions:

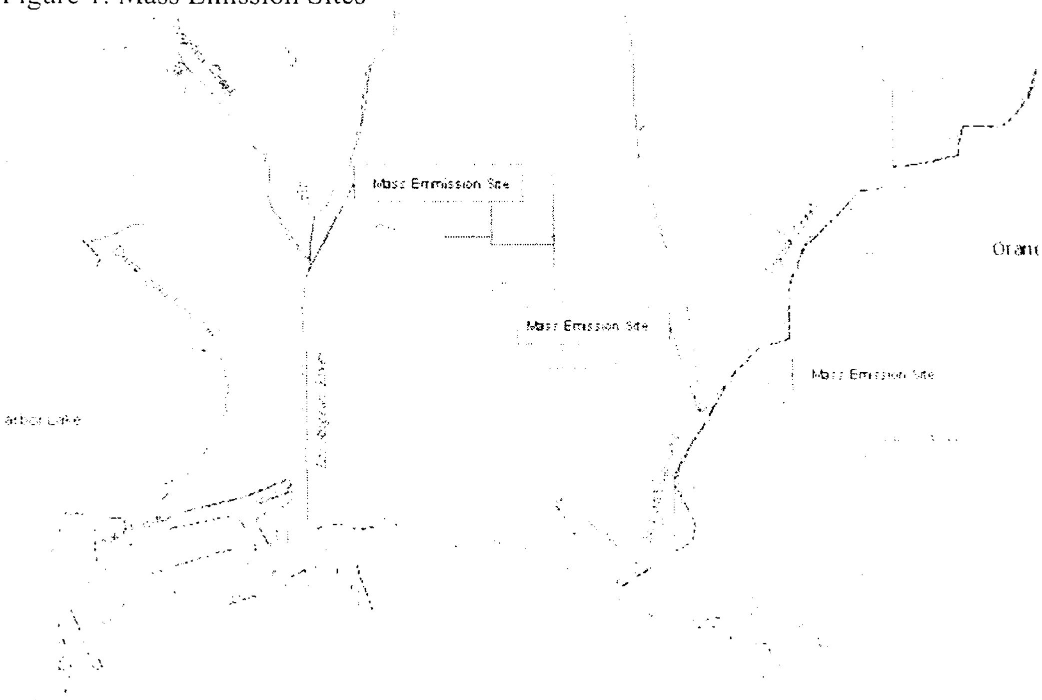
1) What are the amounts of different types of debris flowing down the rivers to the sea?
2) What are the quantities of debris in two size classes (1-4.75mm and >4.75mm) flowing down the rivers to the sea?
3) What is the weight of the debris flowing down the rivers to the sea?
4) What differences in the above quantities are observed in dry vs wet conditions?

Methods

Monitoring sites were selected in each watershed that represent a point at which all materials coming down the river from the watershed have to pass before reaching the ocean. Such sites are known as "mass emission" sites. Each was also chosen because it had access for sampling, and was above the area of tidal influence.

In the Los Angeles River one mass emission site was adequate, however, in the San Gabriel River two mass emission sites were necessary. One was located on the San Gabriel River and the other on Coyote Creek (see Fig. 1). These two sites are slightly upstream from where the Creek and the River merge. The reason for having two sites is that after they merge, they are subject to tidal influence.

Figure 1. Mass Emission Sites



The mass emission sites were sampled during both a dry and a wet period. The dry period was considered to be at least two weeks without 0.25" of rain, after which the dry period sample could be taken. The wet period samples were taken within 24 hours of a 0.25" rainfall. At each site grab samples were collected at the middle and edge of the channel, and at the surface and depth. For both wet and dry weather sampling, surface samples were collected at the center of the river using a manta trawl (see Table 1). Surface samples were also collected at the river/bank interface, and in laminar flow near the mid channel (Nov. 22 only) using two different sized hand nets. All nets used had less than a 1mm mesh. Mid-depth to bottom samples were collected using a heavy streambed sampler. A large crane was used to lower the manta net and the streambed sampler for sampling. During the high flow of the wet period, the use of a crane was not possible, instead, a heavily weighted rectangular net was dropped from an upstream bridge nearby, allowed to extend to the length of the rope, then pulled to the side of the river for the collection of the sample. The hand nets were again used along the side of the river/bank interface. Table 1 summarizes the characteristics of our collection devices.

Table 1. Collection Device Characteristics

Collection Device	Handnets	Manta Trawl	Streambed	Rectangular net
Net Aperture Dimensions (m)	.46 x .25 .43 x .22	.9 x .15	.15 x .15	.46 x .25
Mesh Size (mm)	.800 .500	.333	.333	.333
Usage	Surface Edge	Surface Middle	Bottom Middle	Surface Middle Subsurface Bottom(mostly)

Flow rate was determined by using a General Oceanics flowmeter, or the time and distance method of a floating object. The original sampling time was 15 minutes; however, due to fouling of the net and flowmeter by algae and debris in the Spring samples, some deployment times were as short as 30 seconds. Three sample replicates were collected with each device. All sampling times and devices were normalized to obtain count or weight per cubic meter of river water.

All samples were taken to the AMRF Lab and analyzed. The samples were sorted wet. The large debris was sorted out first and placed in the appropriate category, either natural, plastic, or manmade items. A dissecting scope was used to sort out the rest of the smaller plastic and manmade items from the natural debris. Tyler sieves were then used to size class the small plastic items (4.75mm, 2.8mm, 1.0mm). The sieved items were oven dried at 65°C. Further sorting separated the plastic into types (fragments, foams, pellets, line, and films). Each type was counted, weighed, and recorded.

After each sample was sorted, the density or load of plastic per cubic meter of river water was determined by dividing the quantity of plastic (count or mass) collected by the product of the flow rate of the river, the area of the opening of the sampling device and the length of time the device was deployed. The three replicate samples were then averaged for that sampling device.

Wet period samples were collected first (November 22 and December 28, 2004) at all three sites. Dry period samples were collected on April 11, 2005.

Results

Results are shown in the following tables for the counts and weights of debris by their size class and type on each of the three sample dates.

Tables 2 and 3 present our mass emission density findings by size class for the three sampling sites. Data is presented for count density (pieces/m^3), and weight density (g/m^3), with the indicated collection method.

Tables 4 and 5 present our mass emission density findings by type of plastic debris.

Tables 6-9 show estimates for a one-day (24 hr) total of each debris category using flow data taken from available Flood Control Agency river-flow totals for that date.

The total count density of particles in the Los Angeles River between 1 and 4.75mm in size, collected on 11-22-04 from all sampling devices was 12,933 pieces/m^3, while particles and whole objects greater than 4.75 mm from all sampling devices was 820/m^3. The highest count density from any sampling device used in the Los Angeles River was on 11-22-04 with the hand net in laminar flow near mid-channel at 12,652 pieces/m^3.

The total count density of particles in the San Gabriel River, including the Coyote Creek tributary, between 1 and 4.75mm in size, collected on 11-22-04 from all sampling devices was 411 pieces/m^3, while particles and whole objects greater than 4.75 mm from all sampling devices was 125/m^3. The highest count density from any sampling device used in the San Gabriel River or its Coyote Creek tributary was on 11-22-04 with the manta net; 171 pieces/m^3.

Table 2. Total Count Density (number/m^3)

	Coyote Creek		San Gabriel River		Los Angeles River	
	1 - 4.75 mm	>4.75 mm	1 - 4.75 mm	>4.75 mm	1 - 4.75 mm	>4.75 mm
November 22, 2004 (wet)						
Handnet	74	10	61	76	271	42
Manta	< 1	< 1	153	18	9	< 1
Streambed	< 1	< 1	123	21	< 1	< 1
Handnet Laminar	--	--	--	--	12652	777
December 28, 2004 (wet)						
Handnet	14	2	29	4	35	4
Thrownet	4	< 1	4	< 1	1	< 1
April 11, 2005 (dry)						
Handnet	2	< 1	< 1	0	22	22
Manta	5	< 1	<1	0	0	< 1
Streambed	< 1	0	0	0	<1	< 1

The highest weight density for any river sampled was in the San Gabriel River on 11-22-04, with the manta net at 81 g/m^3. The handnet data for the same date and location was half as much, and the laminar net on the LA River was 56 g/m^3.

Table 3. Total Weight Density (g/m^3)

	Coyote Creek		San Gabriel River		Los Angeles River	
	1 - 4.75 mm	>4.75 mm	1 - 4.75 mm	>4.75 mm	1 - 4.75 mm	>4.75 mm
November 22, 2004 (wet)						
Handnet	< 1	2	< 1	40	< 1	< 1
Manta	< 1	< 1	< 1	81	< 1	< 1
Streambed	< 1	2	< 1	< 1	< 1	< 1
Handnet Laminar	--	--	--	--	43	13
December 28, 2004 (wet)						
Handnet	< 1	< 1	< 1	1	< 1	1
Thrownet	< 1	< 1	< 1	< 1	< 1	< 1
April 11, 2005 (dry)						
Handnet	< 1	< 1	< 1	0	< 1	1
Manta	< 1	< 1	< 1	< 1	< 1	< 1
Streambed	< 1	0	0	0	0	< 1

Table 4 presents the total count density by material type in each river, and Table 5 presents the total weight density by type in each river. The Los Angeles River in November had the greatest number of particles, with foam as the most abundant material. Foamed plastics were also the most abundant particles in the San Gabriel River on that date.

Table 4. Total Count Density (number/m^3) by Type

	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
Coyote Creek							
November 22, 2004	0.04	53.00	10.82	0.00	10.38	10.42	84.66
December 28, 2004	0.19	12.24	2.47	1.86	1.75	1.79	20.30
April 11, 2005	0.02	0.23	7.09	0.11	0.00	0.03	7.48
San Gabriel River							
November 22, 2004	17.95	177.24	208.26	0.00	11.91	36.32	451.68
December 28, 2004	0.68	19.48	9.71	3.14	0.84	3.75	37.60
April 11, 2005	0.00	0.12	0.37	0.00	0.00	0.00	0.48
Los Angeles River							
November 22, 2004	0.00	823.59	11,410.15	1,459.03	23.50	35.48	13,751.75
December 28, 2004	0.56	5.57	28.06	4.33	0.36	1.51	40.39
April 11, 2005	0.00	0.31	23.00	0.00	0.02	22.52	45.85

Table 5. Total Weight Density (g/m^3) by Type

	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
Coyote Creek							
November 22, 2004	1.72	0.06	0.01	0.00	0.00	2.11	3.89
December 28, 2004	0.40	0.15	0.00	0.04	0.00	0.01	0.61
April 11, 2005	0.00	0.01	0.01	0.00	0.00	0.00	0.02
San Gabriel River							
November 22, 2004	118.75	0.29	1.99	0.00	0.00	0.03	121.07
December 28, 2004	0.41	0.84	0.11	0.07	0.00	0.00	1.45
April 11, 2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Los Angeles River							
November 22, 2004	0.00	9.73	14.92	31.91	0.00	0.15	56.71
December 28, 2004	0.32	0.72	0.25	0.11	0.00	0.09	1.48
April 11, 2005	0.00	0.00	0.01	0.00	0.00	0.97	0.97

Pellets were found in both rivers, and were the second most abundant material found after expanded polystyrene in the LA River. Small plastics, 1-4.75mm diam. were the most common debris item in this study, constituting approximately 80% of all plastics sampled, but were outweighed 6 to1 by debris >4.75 mm in diameter.

Discussion

California policy defines trash as debris that is trapped by a 5 mm mesh screen (Trash TMDL). Our data confirms the abundance of plastic debris greater than 5 mm; however, our data shows that plastic particles less than 5 mm in size are far more abundant. The most common plastics found were bits of foamed polystyrene (commonly but incorrectly called Styrofoam, which is a patented insulation made by Dow Chemical Co.), followed by pre-production plastic pellets, hard plastic fragments, thin films, line, and whole items. Our findings indicate that there is a significant amount of plastic debris, which, due to its size, is not subject to regulation under current TMDLs for trash, passing our sampling stations and discharging to the estuaries.

Abundant plastic debris was found in both rivers, during wet and dry periods. The first wet period sampling in November 2004 was after a couple of rain events had moved through the area, so a lot of debris that had been collecting in the rivers since the last notable rain had already washed down the river. Also, the samples were not taken at the crest of each river's flood stage, so our estimates likely underestimate the actual storm water loading of plastic debris. The dry period sample was taken after the highest annual rainfall in over 100 years, which was the second highest annual rainfall in recorded history for this area. Again, a lot of debris had passed through the rivers before samples were taken, and there was considerable loading from the masses of filamentous algae that proliferated and broke loose along the river's course, filling sampling nets quickly and making debris separation and quantification difficult. Short deployment times may have allowed nets to miss debris present in the rivers. Nevertheless, there were substantial amounts of plastic debris in both rivers during each of the sampling events, including the Spring sampling when flow was low and algae abundant.

The highest total count density was found on the Los Angeles River on November 22, 2004, with 13,752 pieces collected in our samples. Based on data furnished by the Los Angeles Department of Public Works, the mean flow for 24 hours on the LA River on November 22, 2004 was 354,592 cubic meters near where our samples were collected. Extrapolation from our collected samples would likely underestimate the total count of debris since our sampling devices collected from a small proportion of the total river cross section. Applying the total flow to our average collected debris counts per cubic meter on that day yields the data set in Table 6. Applying the same flow total to our average weight density yields the weights for debris listed in Table 7. It is unlikely that these tables exaggerate the actual totals. With more systematic and comprehensive monitoring it should be possible to obtain a fairly complete picture of how much debris is being transported by the rivers. Such data could form a baseline to support decisions by policy makers regarding how to reduce trash and plastic entering our rivers and estuaries. Unless measures are taken to control debris less than 5 mm in diameter, billions of plastic particles per day will make their way to the marine ecosystem, where they exist in all strata of the water column[7], have been observed to be readily ingested by a wide variety of marine invertebrates[8], firmly embed themselves in the tissue of filter feeding organisms[4], and appear in the stomach contents of many species of marine fishes and birds[2].

Table 6. Average Count (number * 10^4) by Size Class in 24 hours

	Coyote Creek		San Gabirel River		Los Angeles River		Total
	1.0 - 4.75mm	>4.75 mm	1.0 - 4.75mm	>4.75 mm	1.0 - 4.75mm	>4.75 mm	
November 22, 2004	499.39	70.04	5,166.51	1,749.84	106,058.73	15,847.86	129392.37
December 28, 2004	15208.93	2133.07	2,389.07	331.97	74,830.33	8,314.48	103207.85
April 11, 2005	140.66	3.46	42.72	7.96	330.10	319.70	844.60
Total	15848.99	2206.56	7598.31	2089.76	181219.16	24482.04	233444.82

Table 7. Average Weight Density (kg) by Size Class in 24 hours

	Coyote Creek		San Gabirel River		Los Angeles River		Total
	1.0 - 4.75mm	>4.75 mm	1.0 - 4.75mm	>4.75 mm	1.0 - 4.75mm	>4.75 mm	
November 22, 2004	4.19	257.61	18.54	18,520.06	3,851.29	1,176.51	23828.20
December 28, 2004	789.35	4403.75	97.36	949.54	3,360.31	27,187.99	36788.30
April 11, 2005	3.35	0.35	0.01	0.00	0.96	136.54	141.21
Total	796.89	4661.71	115.91	19469.60	7212.57	28501.03	60757.71

Table 8. 24 Hour Average Count (N * 10^4) estimate by type.

Coyote Creek							
	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
November 22, 2004	0.27	356.48	72.78	0.00	69.85	70.06	569.43
December 28, 2004	163.91	10,451.03	2,106.26	1,591.23	1,497.28	1,532.29	17,342.00
April 11, 2005	0.26	3.94	120.51	18.90	0.00	0.51	144.12
San Gabriel River							
	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
November 22, 2004	274.87	2,714.01	3,188.94	0.00	182.45	556.07	6,916.35
December 28, 2004	49.29	1,410.02	702.84	226.90	60.43	271.55	2,721.04
April 11, 2005	0.00	38.58	12.10	0.00	0.00	0.00	50.68
Los Angeles River							
	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
November 22, 2004	0.02	7,300.96	101,148.72	12,934.01	208.32	314.56	121,906.59
December 28, 2004	1,148.64	11,463.78	57,759.41	8,915.36	743.12	3,114.51	83,144.81
April 11, 2005	0.00	4.42	324.82	0.00	2.53	318.03	649.80

Tabel 9. 24 Hour Average Weight (kg) estimate by type..

	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
Coyote Creek							
November 22, 2004	115.9	3.7	0.3	0.0	0.1	141.8	261.8
December 28, 2004	3,425.0	1,315.3	17.1	350.2	17.1	68.3	5,193.1
April 11, 2005	0.4	1.3	1.4	0.5	0.0	0.0	3.7
San Gabriel River							
	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
November 22, 2004	18,183.4	45.2	304.7	0.0	0.5	4.9	18,538.6
December 28, 2004	298.2	608.0	82.5	54.2	0.6	3.5	1,046.9
April 11, 2005	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Los Angeles River							
	Whole Items	Fragments	Foam	Pellets	Line	Film	Total
November 22, 2004	0.0	862.5	1,322.6	2,828.8	0.3	13.6	5,027.8
December 28, 2004	6,690.1	14,759.4	5,125.7	2,202.6	0.2	1,770.3	30,548.3
April 11, 2005	0.0	0.1	0.9	0.0	0.0	136.4	137.5

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A Brief Analysis of Organic Pollutants Sorbed to Pre and Post-Production Plastic Particles from the Los Angeles and San Gabriel River Watersheds

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Abstract

Plastics as a means to transport pollutants in aquatic and marine ecosystems have become the focus of scientific research as levels of macro and micro plastics in these environments increase.[1,2,3,4] Hideshige Takada and colleagues at the Tokyo University of Agriculture and Technology have studied how polypropylene (PP) pellets in the marine environment adsorb, (with adsorption coefficients of 10^5-10^6 from ambient seawater), and transport PCBs, DDE and nonylphenols (NP).[5] Trawls conducted in 1999 by Algalita Marine Research Foundation (AMRF) in the eastern North Pacific found that plastic pellets made up 0.17% of neuston micro plastics 1-5mm in diameter.[6] Polypropylene pellets, therefore, may make up less than two tenths of one percent of marine micro plastic abundance in the 1-5 mm size class. This size class of plastic debris, not regulated under current Total Maximum Daily Loads (TMDLs) for trash, was the focus of a recent AMRF study funded by the State of California Water Resources Control Board.[15] In the study, plastic particles of that size class were found to be the major component of the debris stream in the Los Angeles and San Gabriel Rivers. The particles consisted of both pre-production plastic pellets and post-production plastic fragments of unknown origin.

To begin to assess the role of micro plastic debris in the transport of aquatic and marine environmental pollutants, pellets and fragments between one and five millimeters in diameter were sampled from river banks and beaches in the Los Angeles and San Gabriel Rivers' Watersheds, and subjected to Gas Chromatography-Mass Spectrometry (GCMS) analysis. It was not feasible to trawl up enough pellets and particles from rivers and bays for analysis due to time and equipment constraints. Two samples were also collected from the driveway of a pellet transporter during a rain event. No PCBs or DDE were detected in any of our field samples, but all samples contained Polycyclic Aromatic Hydrocarbons (PAHs) and Phthalates. Nonylphenols were not analyzed, but three chlorinated pesticides (chlordanes), and four base neutral compounds, two Chlorophenyl Phenylethers, Hexachlorobenzene, and n.Nitrosodimethylamine were found in some samples. Field samples were compared to virgin plastic pellets from a plastic bag processor that had never entered the production stream. Analysis of the virgin pellets found that the only compounds present from the list of analytes (see appendix) were phthalates.

Introduction

Many studies have documented the role of air, water and sediments in the transport of Persistent Organic Pollutants (POPs), but few have looked at the role of a relatively new component of these systems, plastics. Mato et al. analyzed pellets from beaches in Japan and floated virgin pellets in laboratory preparations of seawater to determine sorbtion coefficients[5]. "Field adsorption experiments using PP virgin pellets demonstrated ... increase in PCBs and DDE...indicating that the source...is ambient seawater and that adsorption to pellet surfaces is the mechanism of enrichment. Comparison of PCBs and DDE concentrations in PP resin pellets with those in seawater suggests their high degree of accumulation (apparent adsorption coefficient: $10^5 - 10^6$). The high accumulation potential suggests...pellets serve as both a transport medium and a potential source of toxic chemicals in the marine environment." It is unclear whether similar results can be obtained from post consumer plastic fragments. In this paper, we analyze pre-production plastic pellets and broken fragments of post-production plastic products, collected from Southern California rivers and beaches in Los Angeles and Orange Counties for sorbed POPs. Quantities of these target plastics taken in trawl nets from the rivers and their forebays are normally insufficient for laboratory analysis. Samples were collected from river banks and beaches shortly after rain events to maximize the probability that these plastics had spent time afloat. Pellets were also collected from a catch basin insert located in the driveway of a pellet transporter during a rain event. These field samples are compared to virgin pellets from a bag manufacturer.

Methods

Samples of plastic pellets and plastic fragments from rivers and beaches were collected separately by hand using sterile forceps and sterile glass jars with Teflon lids and stored on ice at 4 C, then delivered to an EPA certified analytical lab for analysis within 48 hours of collection. Because of solvent and equipment limitations, expanded polystyrene (Styrofoam) was eliminated from the samples. Two sets of wet weather samples were collected. The dates of collection were March 4, 2004 and October 18-23, 2004.

1) River Samples: River samples were collected along the wrack (strand) line of the river within 48 hours of cresting after a greater than 0.25" rain event. Note: River samples were collected from October 18-23 only.

2) River Mouth Samples: River mouth samples were collected along the high tide/strand line within 8 hours of high tide. One site near each river mouth was sampled within 48 hours of a 0.25" rain event.

3) Beach Samples: Beach samples were collected at a distance of 500 to 1500 meters downcurrent from the river mouth. Pellets and pieces/fragments of plastics were collected at the high tide/strand line within 8 hours after a high tide and within 48 hours of a 0.25" rain event.

On January 7, 2005, heavy rains in the early AM flooded the loading area and driveway of a transporter of pre-production plastic pellets voluntarily taking part in this study. Per agreement with management, project personnel arrived to take two samples from the 1mm mesh storm drain insert placed by the project and remove it to alleviate the flooding. Pellets were scooped from the insert with a glass jar, covered and placed on ice for delivery to the lab. Virgin polyethylene plastic pellets were obtained from a manufacturer of plastic bags for comparison with field samples. These virgin pellets were delivered in bulk by rail to the bag manufacturing facility and transferred directly from the rail car to the premises by a vacuum hose system. The pellets were held at room temperature in a polyethylene zip lock bag until delivered to the lab for analysis. Sample sizes varied from 1-13 grams of plastic particles. Each sample was extracted for 18 hours by Sohxlet using n-Hexane. The extracts were concentrated using a Bucchi Roto-evaporator and transferred into autosampler vials to a final volume of ca. 500 μL. A 2.5 μL aliquot injected into Shimadzu GCMS temp. programmed from 125° to 295°C at 2.5°C/min was held for 15 min. A list on analytes and their values for each sample can be found in the appendix (on floppy disk).

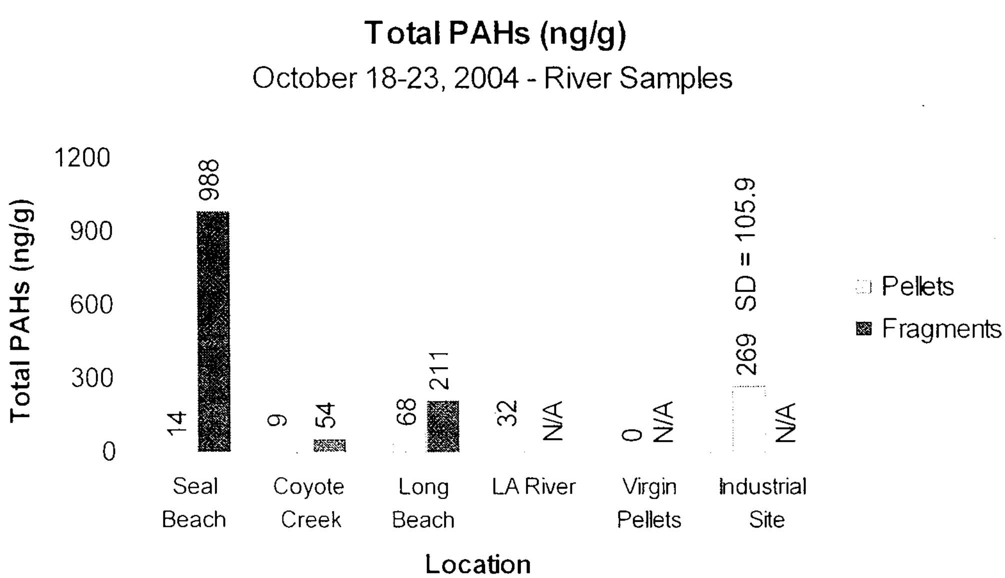
Results

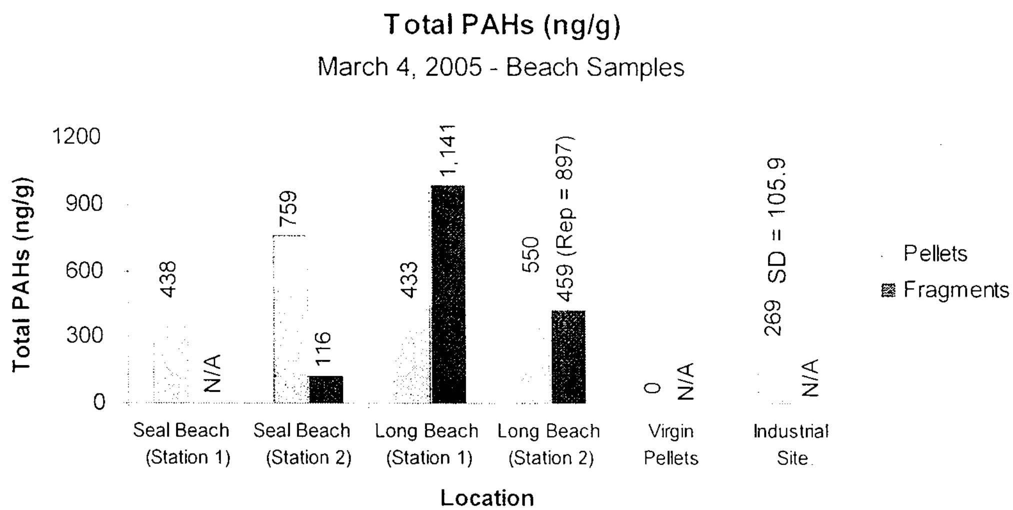
The samples from the transport facility were determined to be 90% (PE) and 10% polyurethane (PU) by use of a "Plastics Identification Chart" provided by Performance Engineered Products of Pomona, CA. Using the same chart, the river and beach samples of pellets and fragments were found to be varying mixtures of (PP) and (PE). In some samples PP predominated, while others were mostly PE. Only one sample had 10% ABS plastic, which is slightly heavier than water. Both PE and PP float. No attempt was made to determine the molecular weight of the individual plastics making up the samples. In general, the higher the molecular weight of the plastic polymer, the slower the uptake of hydrocarbons.[10] The same polymer may have different molecular weights, e.g. Low Density Polyethylene (LDPE), and High Density Polyethylene (HDPE).

No PCBs or DDE were detected in any of the samples, but all contained Polycyclic Aromatic Hydrocarbons (PAHs) and Phthalates. Nonylphenols were not analyzed, three chlorinated pesticides (chlordanes), and four base neutral compounds (two Chlorophenyl Phenylethers, Hexachlorobenzene, and n.Nitrosodimethylamine), were found in some samples. Thirteen grams of virgin PE pellets from a plastic bag manufacturer were analyzed and found to have no detectable PAHs or any other analytes except for phthalates, which are plastic conditioners probably added at the time of manufacture. The following three phthalates were present in the virgin PE pellets: 1) Bis(2-Ethylhexyl) Phthalate or DEHP at 33.8 ng/g, 2) Diethyl Phthalate estimated at 9.9 ng/g, and 3) Di-n-butyl Phthalate estimated at 5.4 ng/g.

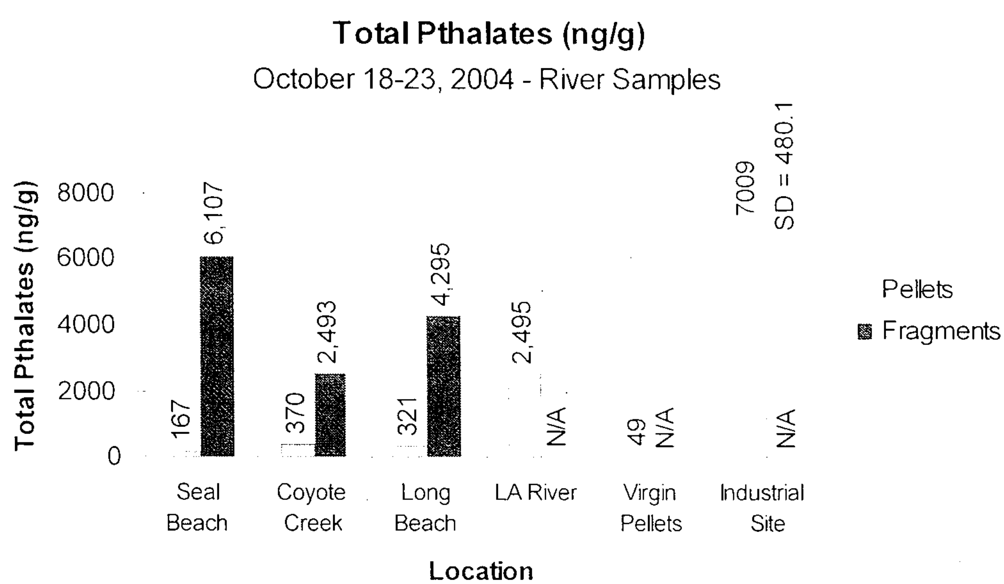
Plastic resin pellets (90% PE, 10% PU), which landed on a transporter's asphalt loading area and were washed into a catch basin had phthalate levels much higher than the virgin PE pellet phthalate levels cited in the preceding paragraph. The levels were from 7100 ng/g for Bis-2 to 33 ng/g for di-n-butyl. It is doubtful that these higher levels were from environmental sorption. The particular additive profile designed for the plastic processor who was to receive the shipment likely called for these phthalate levels in the virgin pellets.

Total PAH levels in the transporter's catch basin pellets were: Sample 31-1, 344.2 ng/g; Sample 31-2, 194.4 ng/g, for an average of 269 ng/g +/- SD 105.9. The following graphs summarize the results for all samples.

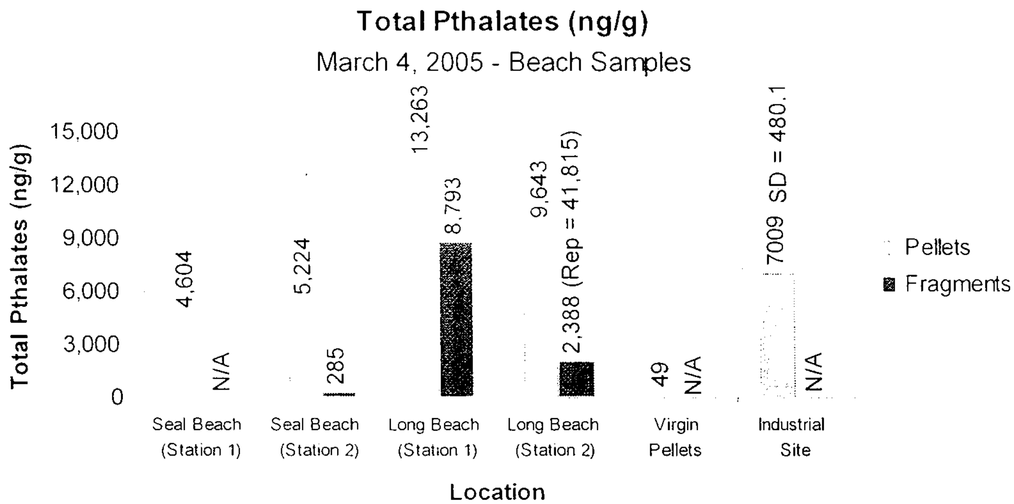




Total PAHs (ng/g)
March 4, 2005 - Beach Samples
Total PAHs (ng/g)
1200
900
600
300
0
438
N/A
759
116
433
1,141
550
459 (Rep = 897)
0
N/A
269
SD = 105.9
N/A
Seal Beach (Station 1)
Seal Beach (Station 2)
Long Beach (Station 1)
Long Beach (Station 2)
Virgin Pellets
Industrial Site
Location
Pellets
Fragments



Total Pthalates (ng/g)
October 18-23, 2004 - River Samples
Total Pthalates (ng/g)
8000
6000
4000
2000
0
167
6,107
370
2,493
321
4,295
2,495
N/A
49
N/A
7009
SD = 480.1
N/A
Seal Beach
Coyote Creek
Long Beach
LA River
Virgin Pellets
Industrial Site
Location
Pellets
Fragments



Discussion

PAHs have both petrogenic (lower molecular weights from petroleum) and pyrogenic (higher molecular weights from burning and incomplete combustion) sources and can enter the marine and aquatic environments via air-water exchange or storm system runoff. Both of these routes facilitate their global distribution. [7] "Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers...Some PAH particles can readily evaporate into the air from soil or surface waters." [8]

Plastic resin pellets from the industry sites surveyed in this study would generally reach the storm drain system after traveling less than 100 meters. Many broken pieces of consumer plastics would have traveled further than 100 meters over urban streets, increasing their exposure to PAHs, before reaching a delivery conduit as runoff or blowing into the storm drain system. This may account for, with one exception, the higher PAH loads in fragments compared to pellets in our study. It is interesting to note that all three types of PAHs; volatile, low molecular weight and high molecular weight were present in all samples, and that pellets from the transporter's facility had higher PAH totals than some pellets from rivers and beaches. It is not known how much of this variability is due to loss of PAHs to the water column and atmosphere during transport by storm drains and rivers, or how much is due to the fact that different pellets from different sources are of differing composition.

Chlordanes are non-polar organic molecules, which were used as pesticides until banned for all uses in 1988. [8] They were found in several of our samples at levels not exceeding 37 ng/g.

4-Chlorophenyl Phenylether and **Hexachlorobenzene** are semi-volatile target compounds in EPA Superfund lists. They were found in several of our samples at levels not exceeding 233 and 24 ng/g respectively. (http://www.epa.gov/superfund/programs/clp/svtarget.htm)

"**Phthalates**, also known as phthalate esters, are the dialkyl or alkyl aryl esters of 1,2-benzenedicarboxylic acid. The name phthalate is derived from phthalic acid + -ate. When added to plastics, they allow the long polyvinyl molecules to slide against one another. The phthalates show low water solubility, high oil solubility, and low volatility." (http://www.answers.com/topic/phthalates) The highest levels of phthalates in our study were found in broken pieces of consumer plastics on beaches near river mouths, but high levels existed in pellets as well. In spite of their low solubility in water, it is possible that plastic particulates accumulate phthalates from within the water column. ... [non-polar organic]..."compounds tend to be concentrated in the seasurface microlayer and in the bottom sediments and since plastics are usually less dense than water, they most likely are adsorbing compounds from the surface microlayer."[9] Another possibility is that the mix of consumer plastic bits is more diverse in the beach samples than in the riverbank samples, and reflects increased use of phthalates in some of those products. The levels of PAHs found in this study sorbed to plastics is less than the levels found in stormwater in the rivers sampled in our study: 9 - 988 ng/g vs 1000 -3000 ng/g in stormwater.[10]

Conclusions and Areas for Further Study

Plastic resin pellets and broken bits of consumer plastics carry certain classes of Persistent Organic Pollutants (POPs) in greater concentrations than virgin polyethylene pellets. Further studies are needed to determine the extent to which these plastic particles transport the sorbed pollutants from urban centers, down rivers to the ocean, and onto adjacent beaches. With continued quantitation of river borne micro plastics and their PAH loads, it should be possible to determine if plastics sorb PAHs more or less than other sediments in the water column, and what percentage of total PAHs transported by the Los Angeles and San Gabriel rivers is transported by plastics. Further research could target other compounds sorbed by these plastic particles. In general, concentrations on the pellets are comparable to those found in stormwater in the same locations (around 2.5 ppb)[10] This is consistent with the conclusions of Mato et al., who found that resin pellets from industrialized areas contained larger amounts of PCBs than those from a remote site, suggesting that contaminant concentrations in resin pellets are determined by their levels in the surrounding environment[5].

Many plastic resin pellets resemble fish eggs in size, shape and color and have been eaten by at least eight species of fish.[11] Broken and weathered plastic fragments have been found in shapes, sizes and colors resembling various species of zooplankton during separation of trawl samples by AMRF marine biologists, who have also found zooplankton with ingested plastic, and plastic embedded in zooplankton tissue.[6]

Richard Thompson and colleagues ..."kept amphipods (detritivores), lugworms (deposit feeders), and barnacles (filter feeders) in aquaria with small quantities of microscopic plastics. All three species ingested plastics within a few days."[1] Bioaccumulation of POPs in fatty tissue or serum of organisms consuming contaminated micro plastics is a possibility, but no studies have been done demonstrating that this actually takes place in fish or marine invertebrates, although increased consumption of plastics has been shown to elevate PCB levels in seabirds. [12]

Every plastic object is produced to fill a particular perceived need and is given unique properties by the producer to fulfill its purpose. These properties are often achieved by the use of additives, which are extremely diverse and include compounds used to assist in processing the polymers involved.[13] Further research needs to be done to determine if plastic additives transported by plastic fragments leach into the water column or contribute to POPs levels in the sea surface microlayer or in sediments. The idea that plastics should be found in sediments runs counter to the common perception that they are positively buoyant, but only 46% of plastic resin pellets actually are (USEPA, 1992). Many objects are products such as Styrofoam, in which injected air makes the objects buoyant. As these products break down, they lose air pockets, and may eventually lose their buoyancy. Furthermore, small particles of heavier sediments such as sand, can be caught in plastic bags and other plastics and cause them to settle to the bottom. [14] Fouling organisms such as diatoms and bryozoans contain carbonates and silicates, which are heavier than seawater and may also contribute to the settling of pelagic plastics. Furthermore, plastics that float in the surface microlayer may be creating a sort of "floating sediment'" whose characteristics warrant further study.

Micro plastics in the North Pacific have tripled during the last decade[2], and near the coast of Japan, gone up by a factor of 10 every 2-3 years during the same period.[3] If this trend continues, the importance of understanding their effects on aquatic and marine environments will also increase. Notwithstanding the likelihood of increasing pelagic plastics, no government or industry programs for monitoring micro plastics in the environment currently exist, in sharp contrast to the widespread efforts that monitor airborne contaminants, sewage, and stormwater runoff. Without such programs, the unintended consequences to the environment of the "Plastic Age" will never be known, nor will strategies be developed to mitigate them.

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Appendix (available from AMRF upon request)

P2454 Algalita Final Report

P2454c CRG Final Report

P2538 CRG Final Report

Density of Plastic Particles found in zooplankton trawls from Coastal Waters of California to the North Pacific Central Gyre

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Introduction

Neuston (surface) trawls for plastic particles and debris in the North Atlantic Ocean were conducted in the 1970's[1] and in the North Pacific Ocean in the 1980's[19]. Although significant levels of plastic particulates were found, these studies failed to generate any regular monitoring program to assess plastic particulate levels in the marine environment. In response to the fact that plastic debris is increasing in the marine environment[3], Algalita Marine Research Foundation (AMRF), developed and tested protocols for monitoring this "major threat to marine life."[3] Although many studies have been done documenting quantities of plastic debris on beaches, floating on the ocean surface and found on the seafloor, the methods for conducting these studies have not been assessed to determine comparability.[3] Furthermore, plastic debris in smaller size classes is often ignored in beach cleanup[4] and ship board sighting surveys[2,5] [redacted]he question: How much plastic debris is in the marine environment?, merits an answer for several reasons. Entanglement of marine mammals in derelict fishing gear and ingestion of plastics by seabirds are well documented and may contribute to the decline of these species.[3] The effects of small plastic particulates on the marine ecosystem is less well known, but plastic bits have been found to accumulate polycyclic aromatic hydrocarbons, chlorinated and legacy pesticides and other Persistent Organic Pollutants (POPs), and to contain hormonally active additives[9]. Furthermore, fish and marine invertebrates as well as seabirds have been found to ingest them.[3] This suggests that plastic particles may be considered a mimic of natural food, such as zooplankton, in marine habitats. In order to assess the potential for this to occur, AMRF, in collaboration with the Southern California Coastal Water Research Project (SCCWRP)[10], began assessing plastic particulate pollution by comparing it to the available food of a similar size class in neuston trawls. The size class sampled was greater than 333 microns in diameter, the size associated with most zooplankton. During elaboration of this methodology, it was determined that surface trawls alone were inadequate to assess the ocean's plastic particulate load[18]. According to the EPA, over half (54%) of plastic resins sold sink in seawater, 46% float, and the majority are almost neutrally buoyant (within 0.1g/mL of seawater density)[11]. When these resins are processed into products, fillers are often used which may increase (e.g., calcium carbonate, silica) or decrease (e.g., wood flour) their density[12]. In an AMRF study off Ballona Creek, which drains much of Los Angeles, CA, an epibenthic sled was used to obtain samples 20 cm above the ocean floor, and paired bongo nets were used to assess debris quantities in the water column down to 30 meters, areas of the water column which had not previously been assessed.[13]

To investigate plastic particulate distribution over a wide area of the Eastern North Pacific down to a depth of 30 meters, AMRF conducted zooplankton trawls in nearshore and offshore waters totaling over 12,000 miles aboard its chartered Oceanographic Research Vessel (ORV) *Alguita* from 1999-2004. The study area included an accumulation center for debris known as the "Eastern Garbage Patch" (roughly located in an area bounded by 135 to 155 W Lo and 35 to 42 N Lat), and most of the Hawaiian Archipelago. (Fig. 1)

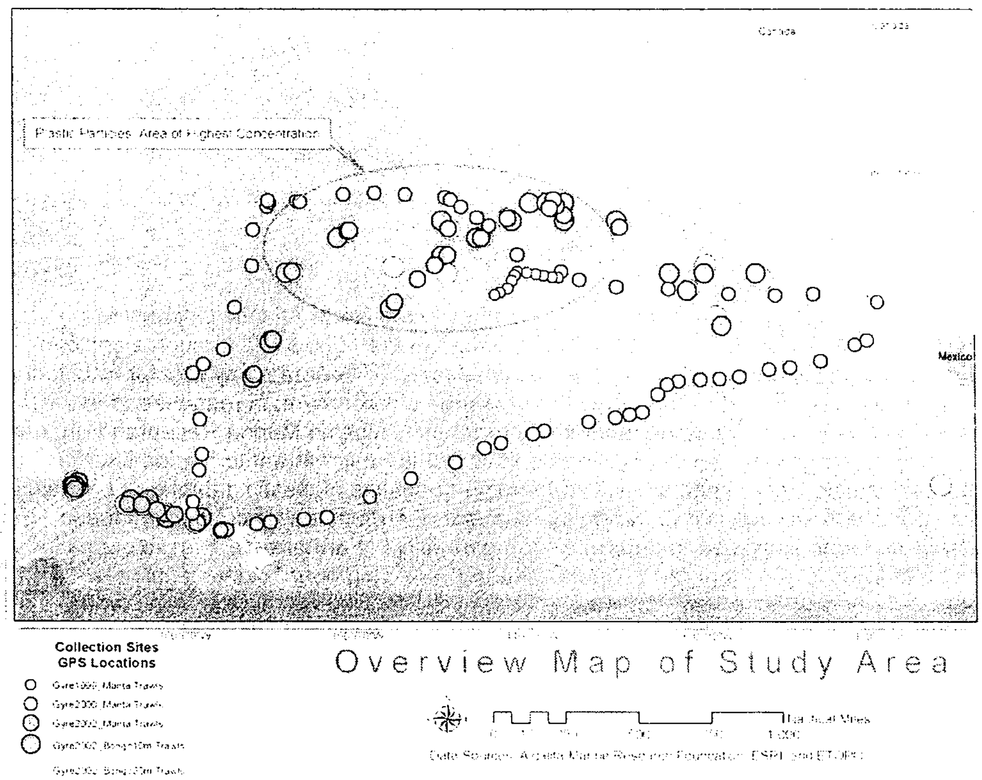

Figure 1

Methods

Surface samples were collected using a 0.9 x 0.15 m^2 rectangular opening manta trawl with a 3.5 m long, 333 micron net and a 30 x 10 cm^2 collecting bag. Mid-depth samples were collected using paired 61 cm diameter bongo nets with 3 m long, 333 micron nets and 30 x 10 cm^2 collecting bags. Bottom samples were collected using a 31cm^2 rectangular opening epibenthic sled with a 1 m long, 333 micron net and a 30 x 10 cm^2 collecting bag (Ballona study only). All nets were fitted with GO flowmeters. Samples were preserved with formalin, then rinsed and stored in isopropyl alcohol. In the laboratory, samples were placed in fresh water and floating plastic removed. A dissecting microscope was used to remove remaining debris and plankton. Debris was sorted by category (plastics, tar, rust, paint chips, carbon fragments, and feathers) and plastics were further categorized (fragments, Styrofoam, pellets, polypropylene/monofilament line, thin plastic films, and resin). Each category was sorted through Tyler sieves of 4.75, 2.80, 1.00, 0.70, 0.50 and 0.35 mm and counted. Plastic, plankton and plant material then oven dried at 65° C for 24 h and weighed.

Publication	Date of Study	Location	Sample Depths		
Marine Pollution Bulletin 44	1999	Offshore	Surface		
	2000	Offshore	Surface		
Marine Pollution Bulletin 41	2000	Nearshore	Surface		
Marine Pollution Bulletin 49	2001	Nearshore	Surface	Water Column	Epibenthic
	2002	Offshore	Surface	Water Column	

Results

The results are presented for each study. Offshore, the 1999 survey was designed to survey an area suspected to accumulate debris, which has become known as the "Eastern Garbage Patch."(EGB) The 2000 survey sampled debris outside this area except for approximately 20 stations, which were within the EGB. The 2002 survey included trawls within the Northwest Hawaiian Islands archipelago and the EGB. This was the only offshore survey to use paired bongo nets to sample subsurface waters. (see map) The 2000 offshore survey had the lowest average surface density of plastic particles over the entire study area at 0.43 pieces/m^3. This is consistent with the trawls falling mostly outside the EGB. The 2002 survey found an average of 1.52 pieces/m^3 at the surface. The 1999 survey had the highest surface density offshore at 2.23 pieces/m^3. Both nearshore surveys, conducted in 2001, were designed to assess land based sources of debris by sampling before and after rain events. The first was located near the mouth of the San Gabriel River, which drains southern Los Angeles and northern Orange Counties, and had the highest average density of 7.25 pieces/m^3. The second nearshore survey was conducted off Ballona Creek, which drains the west side of Los Angeles. On the surface the average density was 5.0 pieces/m^3. The Ballona survey was the only nearshore survey to obtain subsurface samples. Midwater bongo net samples off Ballona Creek averaged 3.05 pieces/m^3. The epibenthic average density was slightly higher at 3.8 pieces/m^3. All the nearshore average densities include the pre and post rain event trawl data. Offshore subsurface average densities were much less. Paired Bongo nets found plastic particulates in every trawl sample taken at 10 and 30 meters depth in the North Pacific. Both the 10 meter and 30 meter bongo net trawls yielded an average density of 0.017 pieces/m^3. This result is approximately a factor of 10^2 less than densities found at the surface.

The lowest average ratio of plastic to plankton dry weight at the surface was 5.44:1 for the 2000 survey. The 2002 survey surface ratio was 6.90:1 and the 1999 surface ratio was 6.1:1. The average ratio over all depths from the Ballona Creek study was 1.40:1 and for the San Gabriel River study was 2.5:1 plastic to plankton at the surface.

The highest ratio of plastic to plankton dry weight at any one station, 128:1, was found in the nearshore during the 2000 dry season off the mouth of the San Gabriel River. The highest ratio of plastic to plankton offshore, 112:1, was found in calm conditions northeast of Hawaii (wind 7kn) during AMRF's 2000 Gyre voyage (station 44 located 1700 nautical miles to the west northwest of Los Angeles at 40 degrees N. Latitude and 153 degrees W. Longitude). The highest count of plastic particulates in the nearshore, 60 pieces/m^3, was found at the mouth of the San Gabriel River (SGR) after a rain event in 2000. The highest count of plastic particulates offshore, 11 pieces/m^3, was found during AMRF's 2002 Gyre voyage (station 7, located 1300 nautical miles to the west of the SGR at 37 degrees N. Latitude and 144 degrees W. Longitude). A plastic to Plankton mass ratio greater than 6.9:1(the highest offshore surface average) was found near French Frigate Shoals in 2002 (20.04:1) at station 25, 23 degrees N. Lat., 166 degrees W. Long. 1800 nautical miles northeast, at station 1, 39 degrees N. Lat., 137 degrees W. Long., a plastic to plankton ratio of 16.96:1 was found. These two stations represent high plastic/plankton ratio stations with the greatest distance between them. For the three studies, ratios greater than 5.44:1 (the lowest offshore surface average) were found at 34 stations widely dispersed around and within the central gyre.

AMRF's three offshore voyages between 1999-2002 found an average of 191,457 plastic pieces per square kilometer on the surface.

Date of Study	Sample Average Density pieces/m^3			Plastic:Plankton Mass Ratio		
	Surface	Water Column	Epibenthic	Surface	Water Column	Epibenthic
1999 EGB	2.23	-	-	6.1:1	-	-
2000 Offshore & Gyre	0.43	-	-	5.44:1	-	-
2000 San Gabriel	7.25	-	-	2.5:1	-	-
2001 Ballona	5.00	3.05	3.80	1.4:1	-	-
2002 Gyre	1.52	1.52	-	6.90:1	-	-

Discussion

Whether in the deep ocean or close to shore near an urban center, and whether at the surface or in the water column down to 30 meters, plastic particulates greater than 333 microns are present. All of the samples taken during the study contained particles of plastic, and during calm conditions in the nearshore, more plastic particles were found suspended above the seafloor than near the surface.[13]

Overall, the surface had about a hundred times more particles than the depths surveyed, but the 20 meters of separation between water column samples made no difference in the densities found. Nearshore, plastic pieces suspended 20 cm above the ocean floor at 3.8 pieces/m^3 were comparable to levels found at the surface offshore.

Several factors contribute to the wide distribution of plastic particulates in the marine environment In the nearshore environment, where suspended sediments are prevalent, plastic bags and objects may accumulate sediments, making plastics that would otherwise float, sink. As soon as a plastic object enters the marine environment, it begins a fouling process which includes the creation of surface films, followed by the attachment of diatoms, algae, bryozoans, crustaceans and other organisms.[7] The exact fouling sequence and its timing varies, and is still subject to debate.[14] At different stages of fouling, the associated organisms may make the plastic object more likely to sink or float. Floating plastics that become fouled and sink below the photic zone may lose their fouling organisms when they are deprived of sunlight. The organisms may be consumed or slough off and the object may then float back to the surface. Should this fouling cycle repeat itself, a sort of 'yoyo" effect could take place, with plastics sinking and rising indefinitely[14]. Adding to the uncertainty of where to sample for plastic particulates is the fact that significant mixing can occur due to wave activity at the surface. Thompson, et al. found the same types of plastic particles and fibers to be present in both the water column and in marine sediments (benthos), which suggested that "polymer density was not a major factor influencing distribution[8]." According to a study of vertical mixing of oil droplets by breaking waves, droplets smaller than a typical 50μm threshold radius "will permanently remain in the water column[15]." Since many types of petroleum at typical SSTs for our study area are within 0.14 of the specific gravity of seawater[16], it may be that many plastic particles undergo a similar fate. Ocean currents disperse and concentrate plastic particulates in ways that need further study, especially since there is no simple dispersion model for plastic debris. Both mainland and island coasts appear to serve as sieves, sources and sinks for ocean borne plastic debris.

AMRF has taken more than 200 samples from over 15,000 miles of the North Pacific Ocean to quantify neuston plastics, however, a greater number and variety of studies is needed to assess the threat posed by ocean borne plastic particulate debris, which we show exists in all trawls down to 30 meters. No studies have been done on fish or other pelagic marine life in the deep ocean, which in many areas are now exposed to more plastic particulates by weight than available zooplankton food. Many salps and even some Valella in our trawls had plastic particles firmly embedded in their tissues, and we also found them to have ingested plastic. Further research needs to be done on microplastics in zooplankton tissue

In the offshore, calm conditions appear to allow debris to surface and increase amounts per sample, especially of the smaller size class particles, but further studies focusing on the sea state at the time of sampling need to be done in order to confirm this result. Sampling at 50 and 100 meters needs to be done to determine if greater depths continue to produce similar densities as those found at 10 and 30 meters in this study. The great depths encountered offshore in the Eastern Pacific make it difficult to quantify plastics on the ocean floor, but studies on sediments nearshore have found plastics.[8]

The issue of uniformity among methods for sampling marine debris is of increasing importance as levels of marine debris and its impacts increase. Some issues that need to be resolved are: 1) sea state and its relation to mixing of debris 2) how to sample for the presence of debris at different depths in the water column 3) how to sample for different size classes of plastic debris, from the very large to the very small, since there appears to be no lower limit, and individual molecules of plastic polymers may be present.[7]

So far, no work on POPs accumulation on plastics found in the water column, or in sediments has been done. Determining the effects of ingestion of plastics both from an ecological and toxicological perspective was identified as a top research priority at a recent conference of researchers in this field.[17]

Acknowledgements

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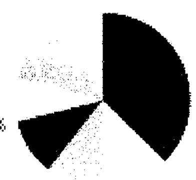
Municipal Solid Waste (MSW)

Basic Information

Municipal Solid Waste (MSW)

MSW—more commonly known as trash or garbage—consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. To learn more about MSW, view our interactive presentation about Milestones in Garbage: 1990–Present.

2006 Total Waste Generation– 251 Million Tons (before recycling)



In 2006, US residents, businesses, and institutions produced more than 251 million tons of MSW, which is approximately 4.6 pounds of waste per person per day.

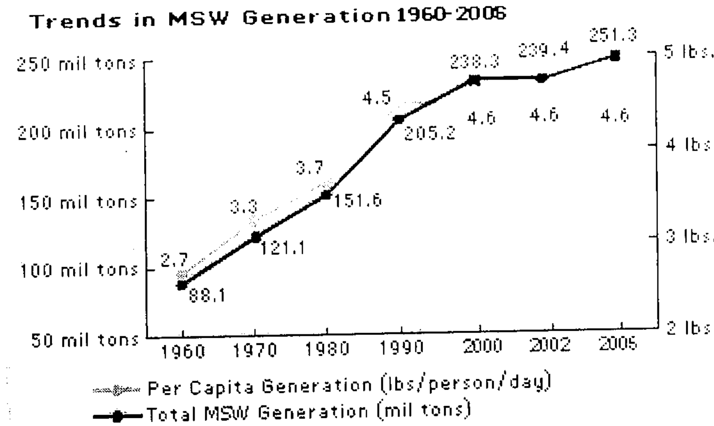
Several MSW management practices, such as source reduction, recycling, and composting, prevent or divert materials from the wastestream. Source reduction involves altering the design, manufacture, or use of products and materials to reduce the amount and toxicity of what gets thrown away. Recycling diverts items, such as paper, glass, plastic, and metals, from the wastestream. These materials are sorted, collected, and processed and then manufactured, sold, and bought as new products. Composting decomposes organic waste, such as food scraps and yard trimmings, with microorganisms (mainly bacteria and fungi), producing a humus-like substance.

Other practices address those materials that require disposal. Landfills are engineered areas where waste is placed into the land. Landfills usually have liner systems and other safeguards to prevent groundwater contamination. Combustion is another MSW practice that has helped reduce the amount of landfill space needed. Combustion facilities burn MSW at a high temperature, reducing waste volume and generating electricity.

Solid Waste Hierarchy

EPA has ranked the most environmentally sound strategies for MSW. Source reduction (including reuse) is the most preferred method, followed by recycling and composting, and, lastly, disposal in combustion facilities and landfills.

Currently, in the United States, 32.5 percent is recovered and recycled or composted, 12.5 percent is burned at combustion facilities, and the remaining 55 percent is disposed of in landfills.



Source Reduction (Waste Prevention)

Source reduction can be a successful method of reducing waste generation. Practices such as grasscycling, backyard composting, two-sided copying of paper, and transport packaging reduction by industry have yielded substantial benefits through source reduction.

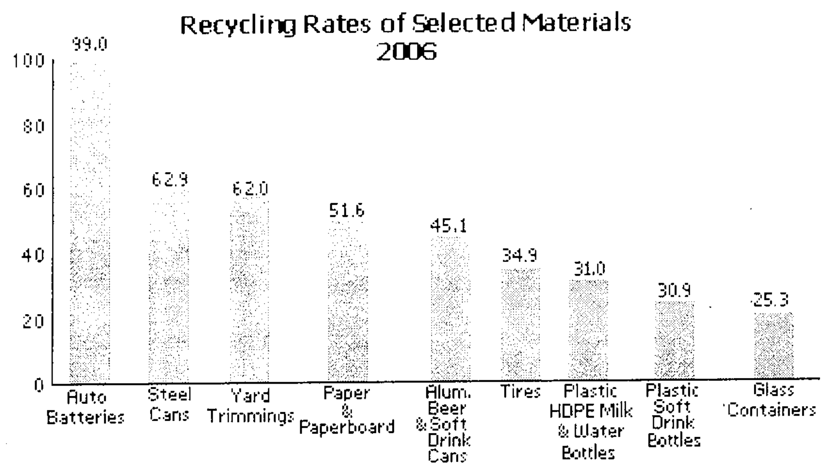
Source reduction has many environmental benefits. It prevents emissions of many greenhouse gases, reduces pollutants, saves energy, conserves resources, and reduces the need for new landfills and combustors.

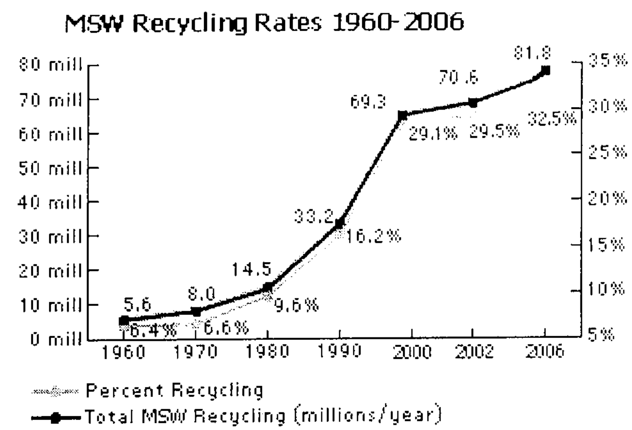
Recycling

Recycling, including composting, diverted 82 million tons of material away from disposal in 2006, up from 15 million tons in 1980, when the recycle rate was just 10% and 90% of MSW was being combusted with energy recovery or disposed of by landfilling.

Typical materials that are recycled include batteries, recycled at a rate of 99%, paper and paperboard at 52%, and yard trimmings at 62%. These materials and others may be recycled through curbside programs, drop-off centers, buy-back programs, and deposit systems.

Recycling prevents the emission of many greenhouse gases and water pollutants, saves energy, supplies valuable raw materials to industry, creates jobs, stimulates the development of greener technologies, conserves resources for our children's future, and reduces the need for new landfills and combustors.





Recycling also helps reduce greenhouse gas emissions that affect global climate. In 1996, recycling of solid waste in the United States prevented the release of 33 million tons of carbon into the air-roughly the amount emitted annually by 25 million cars.

Combustion/Incineration

Burning MSW can generate energy while reducing the amount of waste by up to 90 percent in volume and 75 percent in weight.

EPA's Office of Air and Radiation is primarily responsible for regulating combustors because air emissions from combustion pose the greatest environmental concern.

Recycling also helps reduce greenhouse gas emissions that affect global climate. In 2006, the national recycling rate of 32.5 percent (82 million tons recycled) prevented the release of approximately 49.7 million metric tons of carbon into the air--roughly the amount emitted annually by 39 million cars, or 1,300 trillion BTUs, saving energy equivalent to 10 billion gallons of gasoline.

Landfills

Under the Resource Conservation and Recovery Act (RCRA), landfills that accept MSW are primarily regulated by state, tribal, and local governments. EPA, however, has established national standards these landfills must meet in order to stay open. Municipal landfills can, however, accept household hazardous waste.

The number of landfills in the United States is steadily decreasing—from 8,000 in 1988 to 1,754 in 2006. The capacity, however, has remained relatively constant. New landfills are much larger

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was enacted by Congress in 1976 and amended in 1984. The act's primary goal is to protect human health and the environment from the potential hazards of than in the past.

waste disposal. In addition, RCRA calls for conservation of energy and natural resources, reduction in waste generated, and environmentally sound waste management practices.

Household Hazardous Waste

Households often discard many common items such as paint, cleaners, oils, batteries, and pesticides, that contain hazardous components. Leftover portions of these products are called household hazardous waste (HHW). These products, if mishandled, can be dangerous to your health and the environment.

Environmental Terms, Abbreviations, and Acronyms

EPA provides a glossary that defines in non-technical language commonly used environmental terms appearing in EPA publications and materials. It also explains abbreviations and acronyms used throughout EPA.

Recommended Sources for MSW Information

- Municipal Solid Waste in the United States: 2006 Facts and Figures: Describes the national MSW stream based on data collected between 1960 and 2006. Includes information on MSW generation, recovery, and discard quantities; per capita generation and discard rates; and residential and commercial portions of MSW generation.
- Decision-Maker's Guide to Solid Waste Management, Volume II: Contains technical and economic information to assist solid waste management practitioners in planning, managing, and operating MSW programs and facilities. Includes suggestions for best practices when planning or evaluating waste and recycling collection systems, source reduction and composting programs, public education, and landfill and combustion issues.
- Reporter's Guide to Municipal Solid Waste: Presents background information to assist print and broadcast media in understanding municipal solid waste (MSW) issues.

Additional MSW materials can be found at Publications.

Plastic Bags

The Plastic Bag Levy will increase to 22 cent on Sunday 1st July 2007.

[redacted] – with plastic bag [redacted] Income from the levy has been increasing in the recent past. Data from levies remitted and the results of the 2006 Census, would indicate that plastic bag usage rose to 31 bags per capita during the course of 2006. It is vital that the levy's positive effect on the environment is maintained. To that effect the levy will be increased to 22 cent on Sunday 1st July 2007. The aim of the increase is to reduce the per capita usage to the level achieved in 2002 or lower. If this is achieved, the levy increase will not generate any additional revenue for the Environment Fund.

- Plastic Bag Regulations (S.I. No. 605 of 2001)
- Plastic Bag (Amendment) (No. 2) Regulations (S.I. 167 of 2007), amending SI No. 605 of 2001(Available in the Publications Documents box on the right).
- Public Notice Announcing Increase in Plastic bag Levy. (Available in the Publications Documents box on the right).
- Revenue Commissioners Information Leaflet (PB1) on the Increase in Plastic bag Levy. (Available in the Publications Documents box on the right).

Background to the Plastic Bag Levy

Plastic bag consumption increased alarmingly in Ireland in the 1990s. Retail outlets placed no limits on the amount of bags consumers could use when doing their shopping. One of the most significant side effects of this trend was the careless disposal of plastic bags by consumers after use – a significant proportion of which ended up as highly visible components of litter. Furthermore, because of their composition, nearly all plastic bags do not degrade. Thus, in addition to being highly visible because of the volumes being carelessly disposed, they also became highly persistent pollutants in urban, rural and coastal settings. This trend was also undermining Ireland's clean, green image on which the Irish tourism industry depends.

The primary purpose of the plastic bag levy is to reduce the consumption of disposable plastic bags by influencing consumer behaviour. Since its introduction on the 4 March 2002 the levy has been an outstanding success.

Prior to the introduction of the levy it is estimated that over 1.2 billion plastic bags were dispensed free of charge at retail outlets annually, equating to roughly 328 bags per inhabitant per year.

The fall in the consumption of plastic bags has been considerable with the reduction being estimated at over 90%. Our environment has also benefited – with a decrease in excess of 95% in plastic bag litter. All levies are remitted into the Environment Fund.

Litter Arising from Plastic Bags

Prior to the Levy	5%
December 2002	0.32%
August 2003	0.25%
August 2004	0.22%
August 2005	0.22%

Biodegradable Bags

[redacted]

Alternatives to Disposable Plastic Shopping Bags

Alternatives to disposable plastic shopping bags, such as reusable boxes, and reusable bags are now available in many shops. The consumer has, by and large, changed to using these alternatives. In the grocery sector disposable plastic bags have largely been replaced by reusable "long life" shopping bags.

Plastic shopping bags designed for re-use are exempt from the levy provided that the retailer charges at least 70 cent for the bag.

You are here. Home > About Us > History of Department

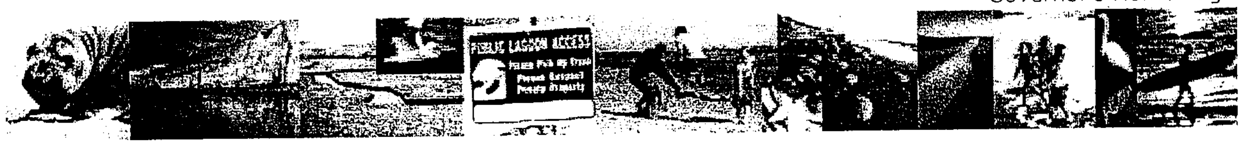
History of Department

The Department is unique among [redacted] in the way that its programmes and activities impinge on the lives of every citizen in the State. Through our responsibility for the quality of the environment in which we live, for housing and other infrastructure, for physical and spatial planning, and for local government, we impact significantly on the daily lives of all people in this country. Our mission is to promote sustainable development and improve the quality of life through protection of the environment and heritage, infrastructure provision, balanced regional development and good local government. This mission embraces our responsibilities and summarises our intent. In our Strategy Statement:, we have defined the objectives which flow from our mission and the key strategies that we will pursue over the next three years to support the achievement of these objectives.

State of California Home Page

Governor's Home Page

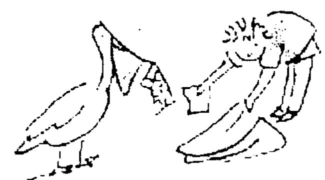
CALIFORNIA COASTAL COMMISSION
PUBLIC EDUCATION PROGRAM



The Problem with Marine Debris

About Us
Programs & Contests
Coastal Cleanup Day
Adopt-A-Beach
Coastweeks
Boating Clean & Green
Resource Directory
For Educators
For Youth
How can I help?
Whale Tail Grants
Whale Tail License Plate
Coastal Stewardship Pledge
Upper Newport Bay Restoration
Coastal Careers
Event Calendars
Coastal Government Links
Shop for the Coast

Millions of Californians enjoy the state's coastline and waterways everyday. However, many of those people are unaware how their daily activities, from driving a car, to not properly disposing of their garbage, or even throwing a cigarette butt on the ground, can impact the plants and animals off our shores. This debris can harm or kill beach organisms. Pollution also makes using the beach less enjoyable for humans. Solving our water pollution problems requires everyone's involvement.



How Does Trash Become Marine Debris?

Look around the next time you walk down the street. When it rains, trash on sidewalks and streets accumulates in the gutter and is swept into your city's storm drain system. Most storm drain systems discharge directly into the nearest waterway, which eventually flows to the ocean. Trash may also be dumped directly into the ocean by recreational and commercial boaters, and it is often left on the beach by beach-goers.

Trashing California's Beaches

Californian's love their coast and ocean — nine out of ten will visit the beach at least once this year. When they arrive at the beach, they are finding a lot more than sand and surf. During a recent summer, Orange County collected enough garbage from six miles of beach to fill ten garbage trucks full of trash every week, at a cost to taxpayers of $350,000. Other California counties spend even more.

In 1975, the National Academy of Sciences estimated that ocean-based sources, such as cargo ships and cruise liners, dumped 14 billion pounds of garbage into the ocean. In 1988, the U.S. signed onto MARPOL Annex V, joining 64 other countries that signed the international protocol that regulates ocean dumping and made it illegal to dump plastic into the ocean. Laws like MARPOL have reduced the amount of trash on our beaches and in our ocean. Even so, plastic pollution is still a major problem. A recent study found an average of 334,271 pieces of plastic per square mile in the North Pacific Central Gyre, which serves as a natural eddy system to concentrate material.[1] Results of more than 10 years of volunteer beach cleanup data indicate that 60 to 80 percent of beach debris comes from land-based sources. And debris in the marine environment means hazards for animals and humans. Plastic marine debris affects at least 267 species worldwide, including 86 percent of all sea turtle species, 44 percent of all sea bird species, and 43 percent of marine mammal species.[2]

[1] Moore, C. J., S. L. Moore, M. K. Leecaster, and S. B. Weisberg, 2001. A comparison of plastic and plankton in the North Pacific Central Gyre. In: Marine Pollution Bulletin 42, 1297-1300.

[2] Laist, D. W., 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J. M. and D. B. Rogers (Eds.), Marine Debris -- Sources, Impacts and Solutions. Springer-Verlag, New York, pp. 99-139

How Marine Debris Harms Wildlife

Entanglement

Common items like fishing line, strapping bands and six-pack rings can hamper the mobility of marine animals. Once entangled, animals have trouble eating, breathing or swimming, all of which can have fatal results. Plastics take hundreds of years to breakdown and may continue to trap and kill animals year after year.

Ingestion

Plastic

Almost 90 percent of floating marine debris is plastic. Due to its durability, buoyancy, and ability to absorb and concentrate toxins present in the ocean,

Birds, fish and mammals often mistake plastic for food. Some birds even feed it to their young. With plastic filling their stomachs, animals have a false feeling of being full, and may die of starvation. Sea turtles mistake plastic bags for jellyfish, one of their favorite foods. Even gray whales have been found dead with plastic bags and sheeting in their stomachs.

plastic is especially harmful to marine life.

How Marine Debris Harms People

Glass

Glass can be recycled to make new glass, insulation, and asphalt. In 1993, we recycled more than 600 tons of glass, sustaining 4,320 jobs

Beachgoers can cut themselves on glass and metal left on the beach. Marine debris also endangers the safety and livelihood of fishermen and recreational boaters. Nets and monofilament fishing line can obstruct propellers and plastic sheeting and bags can block cooling intakes. Such damage is hazardous and costly in terms of repair and lost fishing time. In one Oregon port, a survey revealed that 58 percent of fishermen had experienced equipment damage due to marine debris. Their average repair cost was $2,725.

How Does Reducing, Reusing, and Recycling Help?

Use Less Stuff

Many of our pollution problems are really problems of misplaced resources. For every item we recycle or reuse, that's one less piece of trash that can become a part of the marine debris cycle threatening people and wildlife.

Metal

Nearly 75% of all metal is used just once. Recycling steel reduces air and water pollution and requires 70% less energy than producing it from raw materials.

Everything we use in our daily lives is made from natural resources such as trees, petroleum, sand, water, soil, and metals, many of which are non-renewable.

By throwing these materials into our landfills, we drastically reduce the remaining supply of non-renewable natural resources.

Be Part of the Solution

Paper

Waste paper can be turned into raw material for new paper and paper products. Every 2,000 pounds of paper recycled saves 17 trees.

The debris that we collect from our beaches is a symptom of a much larger water pollution problem that is caused by everyday people doing every day things. Rain scours oil from parking lots, fertilizer from lawns, pet droppings from sidewalks and other contaminants from "nonpoint" sources and transports this toxic stew down storm drains and over land into the ocean. These toxins are poisoning marine life and our water sources. We can all be part of the solution by recycling used motor oil and repairing car leaks, picking up after our pets and switching to non-toxic products and improve other everyday practices to help keep our waterways clear and clean.

How Can I Help?

- **Reduce, reuse and recycle at home, work and school.**
- **Buy products made from recycled materials with little or no packaging.**
- **Keep storm drains clean - they drain to beaches.**
- **Keep cigarette butts off streets and beaches.**
- **Properly dispose of fishing lines, nets and hooks.**
- **Participate in the Coastal Commission's programs, call (800) COAST-4U:**
  - **Volunteer for Coastal Cleanup Day, Saturday, September 18, 2004.**
  - **Volunteer for the year 'round Adopt-A-Beach program.**
  - **Buy a "whale tail" license plate.**
  - **Become a "California Coastal Steward".**

RESOURCES

Earth 911

Provides information on where to recycle and how to dispose of household hazardous waste, as well as details on

Ocean Conservancy

The Ocean Conservancy

local environmental events. (800) CLEAN-UP	Pacific Regional Office 116 New Montgomery Street San Francisco, CA 94105 (415) 979-0900
The Marine Mammal Center (415) 289-SEAL	For "Green" shopping: National Green Pages (800) 58-GREEN

Search

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Facts

WHOI at a Glance

Mission Statement

People, Research & Academics

WHOI at a Glance

Printer-friendly E-mail to a friend

font size:

Mission

WHOI is dedicated to research and higher education at the frontiers of ocean science.

» Read mission statement

President & Director

Susan K. Avery, Ph.D.

» View Website

Organization

» View organizational chart

Location

Woods Hole, Massachusetts (on Cape Cod)

» Directions to Woods Hole

Scientists, Technical Staff, Scientific Support Staff, Administrative Staff, & Students

Scientists: 148
Technical: 206
Scientific Support: 183
Marine crew: 107
Graduate Students: 152
Administrative: 249

» People Finder

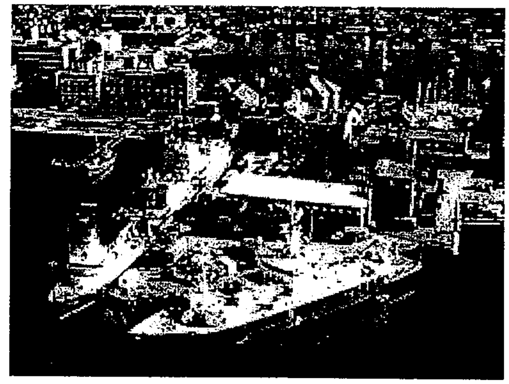
Research

WHOI is comprised of:

» Research Departments
» Ocean Institutes
» Labs, Centers & Programs
» Facilities & Services

Ships & Technology

Atlantis, Knorr, Oceanus, and Tioga are the Institution's main



Enlarge Image

In a rare moment all three WHOI research vessels are in port. *Knorr* is in the foreground with *Oceanus* and *Atlantis* on the opposite side of the pier. (Woods Hole Oceanographic Institution)

Enlarge Image

WHOI has approximately 750 full-time scientists. support staff and students. Above. staff memebers participate in one of the Institution's small boat safety seminars. (Photo by Tom Kleindinst, Woods Hole Oceanographic Institution)

research vessels. WHOI also builds and operates a group of vehicles designed for ocean exploration. These include *Alvin*, *Jason*, and *ABE*.
» Ships
» Underwater Vehicles
» National Deep Submergence Facility
» Instruments
» Observing Systems

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Ph.D. and Master of Science.
In addition, WHOI offers postdoctoral and summer student fellowships and other education programs.
» Educational opportunities

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Funding
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All photos (except where noted) courtesy of Paul Joyce, Sea Education Association

Plastics in Our Oceans

by Kimberly Amaral

Strolling through the average supermarket, shoppers find literally hundreds (if not thousands) of items to make their lives easier. Individually wrapped snack cakes, plastic baggies to store sandwiches for lunch, unbreakable soda bottles, and disposable razors, diapers, and shampoo bottles. Unless specifically requested, even the bags we use to carry home our goods are often plastic.

To humans, these are items of comfort, if not necessity. But to marine animals, they can be a floating minefield.

Photo by K. Amaral

Plastic--whether it be for a container, a wrapper, or the product itself--has become an everyday part of our lives. This isn't necessarily a bad thing--plastic is also the material diabetics use for their disposable syringes; arthritic patients have for their replaced hips; and construction workers wear to protect their heads.

But when plastic reaches our waters, whether it be plastic bags or drifting fish nets, it poses a threat to the animals that depend on the oceans for food. To a sea turtle, a floating plastic bag looks like a jellyfish. And plastic pellets--the small hard pieces of plastic from which plastic products are made--look like fish eggs to seabirds. Drifting nets entangle birds, fish and mammals, making it difficult, if not impossible to move or eat. As our consumption of plastic mounts, so too does the danger to marine life.

Before the days of plastic, when fishermen dumped their trash overboard or lost a net, it consisted of natural materials--metal, cloth or paper that would either sink to the bottom or biodegrade quickly. But plastic remains floating on the surface, the same place where many genuine food sources lie--and can remain so for 400 years. Plastic is durable and strong--precisely the qualities that make it so dangerous if it reaches the ocean.

It *can* get there from here

But how would a syringe that a diabetic uses make it into the ocean? If plastic objects make it into the main sewer system (say, by being flushed down the toilet, or carried by the rain into a street drain), and the water treatment plants are overwhelmed by excessive rain, then those floating objects can float right out to sea.

This is precisely what happened on the New York and New Jersey beaches in 1988, when medical waste was floating up onshore. After an unusually dry spring, litter began accumulating on the streets and in storm sewers. When heavy rains arrived in mid-summer, they swept the streets clean and overloaded combined sewers. After floating out to sea, the debris was blown back onto the shores.

In a more direct route, boaters may dump their trash right into the sea. In the past, this has been the main cause of plastics in the ocean. In 1975, the National Academy of Sciences estimated that 14 billion pounds of garbage was being dumped into the ocean every year. That's more than 1.5 million pounds per hour. More than 85% of this trash was estimated to come from the world's merchant shipping fleet in the form of cargo-associated wastes. According to the Academy, the United States could be the source of approximately one third of this ocean pollution.

Fortunately, since the last day of 1988, it has been illegal for ships to dump plastics into the ocean. But that law is difficult to enforce, and cannot account for the thousands of miles of driftnets and other gear set by fishermen, which can ensnare and kill birds diving for the fish below, or come loose, only to be discovered later by an unfortunate humpback whale.

It's a great big world out there

Anyone who's been on a boat far from the sight of land will tell you how enormous the ocean feels. Wouldn't this debris simply get dispersed, virtually eliminating the possibility of an encounter with a marine animal? The answer is no. While the ocean does disperse the trash, it also runs in currents, which can keep the floating trash traveling constantly in "gyres," concentrating it in areas where currents meet. The largest of these movements, is called the central gyre. It moves in a clockwise circular pattern, moving inside the Gulf Stream, and dominates the western North Atlantic. Studies begun in 1984 have tracked how these currents keep plastics migrating, with heavy concentrations in the northern Sargasso Sea (coincidentally, a favorite spawning place for fish). The Northeast United States, "upstream" of the central gyre, has currents that keep most of the locally generated marine debris local. Usually the only ways to escape this constant circular pattern is if the plastic decays enough to sink, or lands onshore to be (hopefully) picked up by a passer-by.

And apparently, the ocean isn't large enough to avoid marine life encounters with debris. Plastic's devastating effect on marine mammals was first observed in the late 1970s, when scientists from the National Marine Mammal Laboratory concluded that plastic entanglement was killing up to 40,000 seals a year. Annually, this amounted to a four to six percent drop in seal population beginning in 1976. In 30 years, a 50% decline in Northern Fur Seals has been reported.

Elephant seal entangled in fishing line. Photo by John Domont. Courtesy of the Center for Marine Conservation.

These curious, playful seals would often play with fragments of plastic netting or packing straps, catching their necks in the webbing. The plastic harness can constrict the seal's movements, killing the seal through starvation, exhaustion, or infection from deep wounds caused by the tightening material. While diving for food, both seals and whales can get caught in translucent nets and drown.

In the fall of 1982, a humpback whale tangled in 50 to 100 feet of net washed up on a Cape Cod beach. It was starving and its ribs were showing. It died within a couple of hours.

Along Florida's coasts, brown pelicans diving for fish sometimes dive for the bait on a fisherman's line. Cutting the bird loose only makes the problem worse, as the pelican gets its wings and feet tangled in the line, or gets snagged onto a tree.

Plastic soda rings, "baggies," styrofoam particles and plastic pellets are often mistaken by sea turtles as authentic food. Clogging their intestines, and missing out on vital nutrients, the turtles starve to death. Seabirds undergo a similar ordeal, mistaking the pellets for fish eggs, small crab and other prey, sometimes even feeding the pellets to their young. Despite the fact that only 0.05% of plastic pieces from surface waters are pellets, they comprise about 70% of the plastic eaten by seabirds. These small plastic particles have been found in the stomachs of 63 of the world's approximately 250 species of seabirds.

Wildlife is not the only area to suffer from the effects of marine debris. Plastic bags are the leading external cause of marine engine damage in Massachusetts. Other plastic items foul propellers and interfere with fishing tackle.

What's being done about plastics

In 1987, a law was finally passed restricting the dumping of plastics into the ocean. The Marine Plastic Pollution Research and Control Act (MARPOL) went into effect on December 31, 1988, making it illegal for any U.S. vessel or land-based operation to dispose of plastics at sea. It is part of an international treaty, where countries representing at least half of the shipping fleet tonnage in the world agreed to Annex V of the treaty, preventing "pollution by garbage from ships." It prohibits the dumping of plastics anywhere in the ocean, and the dumping of other materials, such as paper, glass, metal, and crockery, closer to shore.

The plastics industry has also stepped in, taking measures to reclaim plastic resin pellets that often get lost during production or transport. The Society of the Plastic Industry has produced many public service ads for trade magazines, and was a strong supporter of MARPOL Annex V.

Plastics manufacturers are also investigating ways to create "degradable" plastics. Although all materials eventually break down, a plastic soda ring can take up to 400 years to biodegrade. So researchers are working with two types of degradable plastics: photodegradable and biodegradable.

Photodegradable plastics are made to become weak and brittle when exposed to sunlight for prolonged periods. At least 16 states--Massachusetts, New York and Rhode Island included--have passed laws requiring six-pack holders be biodegradable (these are marked by a small diamond between the rings).

Biodegradable plastics are made with cornstarch, so bacteria and other organisms eat away at the plastic, breaking it up into smaller pieces. **Neither of these methods, however, solve the problem of plastic in the oceans, since they are only broken up into smaller pieces--creating an even more dangerous situation for animals that mistake smaller plastic pieces for food.**

Perhaps the most effective method right now for solving the persistent plastic problem is beach cleaning. Coastal cleanups gather volunteers to collect trash that has washed up on the beach--or has been left by beachgoers to be carried out by the surf--and removed it from the marine cycle.

The Center for Marine Conservation has been coordinating coastal cleanups since 1986. (The first nationwide cleanup took place in 1988, just four months before the MARPOL treaty took effect. Canada and Mexico joined in on the act in 1989.) The CMC also keeps careful track of all the debris that is collected. Data cards list 85 debris items in eight categories: plastic, styrofoam, glass, rubber, metal, paper, wood and cloth. During the 1993 coastal cleanup, over 3.1 million pounds of trash was collected--more than half of that was plastic.

The CMC also divides their data into debris found, listing the "dirty dozen"--twelve items found most frequently:

1) cigarette butts
2) paper pieces
3) plastic pieces
4) styrofoam
5) glass pieces
6) plastic food bags
7) plastic caps and lids
8) metal beverage cans
9) plastic straws
10) glass beverage bottles
11) plastic beverage bottles
12) styrofoam cups

Debris that can be traced to recreational fishing and boating, galley-type wastes, and cruise ship debris all declined in 1993--perhaps a glimmer of hope resulting from the MARPOL treaty. The laws, enforced by the Coast Guard in the United States, are difficult to monitor. Instead, they rely heavily on an educational campaign, bringing about "voluntary compliance through awareness."

There is still much debris floating around our seas and endangering marine animals. But as more laws arė passed, and as more people become involved in projects like beach clean-ups, perhaps the only plastic will be in our supermarkets.

What you can do

1) Look for alternative materials or avoid excessive packaging when deciding on purchases. Use paper bags, milk and juice in cardboard, and cloth diapers. Insist on paper bags and glass bottles.

2) Recycle. Many communities currently offer pick-up recycling programs for #1 and #2 plastics. Other forms of plastic may be accepted by a

local recycling business. If your community doesn't have a recycling program, contact your city or town hall to request one.

3) Educate others about the problem of marine debris, enhancing "voluntary compliance through awareness."

4) Get involved. Locate or start a coastal cleanup in your area.

For Further Reading:

Campbell, Lee Anne. "Plastics Are Forever." *Nor'easter*. Fall 1989.

Weisskopf, Michael. "Plastic reaps a grim harvest in the oceans of the world." *Smithsonian*. March 1988.

R. Jude Wilber. "Plastic in the North Atlantic." *Oceanus*. Fall 1987.

O'Hara, Kathryn J., Suzanne Iudicello, and Rose Bierce. "A Citizens Guide to Plastics in the Ocean: More Than a Litter Problem." Washington, D.C.: Center for Marine Conservation, 1988.

- Bibliography
- Go to thesis main menu

Facts About Plastic Bags

Most American households have an exponentially growing number of plastic grocery bags stuffed in various nooks throughout the kitchen. We use plastic bags almost daily, yet only a small percentage of them are recycled.

Letting the Cat out of the Bag: The Real Facts

- About **380 billion** plastic bags, sacks and wraps are used each year.
- Only 5.2 percent of the plastic bags and sacks in the municipal waste stream were recycled in 2005.
- Plastic bags are among the 12 items of debris most often found in coastal clean-ups according to the Center for Marine Conservation.
- Plastic bags do not *bio*degrade, they *photo*degrade, which means they slowly break down into smaller and smaller toxic bits that can contaminate soil and waterways.
- Plastic litter can take up to 1,000 years to decompose.

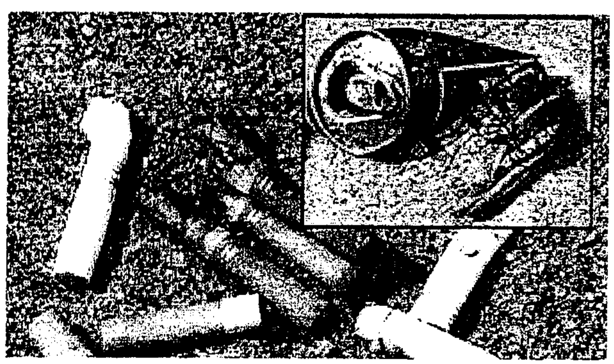
Marine Debris

From urban trash to abandoned fishing gear, marine debris is one of the world's most pervasive marine pollution problems. Every year it injures and kills thousands of marine animals that swallow it or become entangled in it and causes harm to important aquatic habitats, like coral reefs and seagrass beds.

More than an unsightly inconvenience for beach-bound vacationers or pleasure boaters, marine debris is one of the world's most pervasive pollution problems.

A leading cause of marine debris is thoughtlessness — people making the poor decision to litter. Litter on land finds its way to the oceans, being carried by wind or in rivers. The result is literally tons of cigarette butts, tampon applicators, syringes and bottles in the water and on the beaches.

How Marine Debris Kills



Sea turtles often mistake plastic bags for jellyfish and ingest them—blocking their digestive system and potentially killing them.

Fishing line and nets, six-pack rings, rope and other rubbish can wrap around fins, flippers and limbs of other animals, causing drowning or amputation. Some debris can kill for decades — trapped animals often attract predators, which then become entangled too.

What Are We Doing to Help?

Latest News

Ocean Conservancy and Dedicated Volunteers Hold Successful International Coastal Cleanup for 22nd Consecutive Year
Monday, September 17, 2007

Legislation to Prevent Marine Debris from Our Ocean Reduces Threat of Entanglement to Mammals, Fish and Birds
Ocean Conservancy Press Release
Monday, December 11, 2006

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For over two decades, Ocean Conservancy has mobilized volunteers on a global level to help remove trash and debris from coastlines and waterways through the International Coastal Cleanup. To date, 6 million volunteers from around the world have removed over 100 million pounds of marine debris from our ocean, and waterways.

How You Can Help

Prevent litter! By not littering—and picking up litter you see—you may be saving the life of a marine mammal.

Packaging awareness! Be aware of the packaging on products you purchase: opt for products with less packaging. Write letters to companies that use excessive packaging, asking them to change their approach.

Volunteer your time! Take part in our annual International Coastal Cleanup in September.

NATIONAL GEOGRAPHIC NEWS
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Are Plastic Grocery Bags Sacking the Environment?

John Roach
for National Geographic News

September 2, 2003

The "paper or plastic" conundrum that vexed earnest shoppers throughout the 1980s and 90s is largely moot today. Most grocery store baggers don't bother to ask anymore. They drop the bananas in one plastic bag as they reach for another to hold the six-pack of soda. The pasta sauce and noodles will get one too, as will the dish soap.

Plastic bags are so cheap to produce, sturdy, plentiful, easy to carry and store that they have captured at least 80 percent of the grocery and convenience store market since they were introduced a quarter century ago, according to the Arlington, Virginia-based American Plastics Council.

As a result, the totes are everywhere. They sit balled up and stuffed into the one that hangs from the pantry door. They line bathroom trash bins. They carry clothes to the gym. They clutter landfills. They flap from trees. They float in the breeze. They clog roadside drains. They drift on the high seas. They fill sea turtle bellies.

"The numbers are absolutely staggering," said Vincent Cobb, an entrepreneur in Chicago, Illinois, who recently launched the Web site http://Reusablebags.com to educate the public about what he terms the "true costs" associated with the spread of "free" bags. He sells reusable bags as a viable solution.

According to Cobb's calculations extrapolated from data released by the United States Environmental Protection Agency in 2001 on U.S. plastic bag, sack, and wrap consumption, somewhere between 500 billion and a trillion plastic bags are consumed worldwide each year. Of those, millions end up in the litter stream outside of landfills—estimates range from less than one to three percent of the bags.

Laurie Kusek, a spokeswoman for the American Plastics Council, said the industry works with its U.S. retail customers to encourage recycling of plastic bags, which are in high demand from companies such as Trex in Winchester, Virginia, for use in building materials.

"We also feel it is important to understand that plastic grocery bags are some of the most reused items around the house," she said. "Many, many bags are reused as book and lunch bags as kids head off to school, as trash can liners, and to pickup Fido's droppings off the lawn."

But like candy wrappers, chewing gum, cigarette butts, and thousands of other pieces of junk, millions of the plastic bags end up as litter. Once in the environment, it takes months to hundreds of years for plastic bags to breakdown. As they decompose, tiny toxic bits seep into soils, lakes, rivers, and the oceans, said Cobb.

Plastic Fantastic

The Film and Bag Federation, a trade group within the Society of the Plastics Industry based in Washington, D.C., said the right choice between paper or plastic bags is clearly plastic.

Compared to paper grocery bags, plastic grocery bags consume 40 percent less energy, generate 80 percent less solid waste, produce 70 percent fewer atmospheric emissions, and release up to 94 percent fewer waterborne wastes, according to the federation.

Robert Bateman, president of Roplast Industries, a manufacturer of plastic bags—including reusable ones—in Oroville, California, said the economic advantage of plastic bags over paper bags has become too significant for store owners to ignore. It costs one cent for a standard plastic grocery sack, whereas a paper bag costs four cents, he said.

"The plastic bags are so inexpensive that in the stores no one treats them as worth anything ... they use two. three. or four when one would do just as well." he said.

First introduced in the 1970s. plastic bags now account for four out of every five bags handed out at the grocery store. "When you look at it as a product. it is an unbelievable success story." said Cobb.

The success of the plastic bag has meant a dramatic increase in the amount of sacks found floating in the oceans where they choke, strangle, and starve wildlife and raft alien species around the world, according to David Barnes, a marine scientist with the British Antarctic Survey in Cambridge, England, who studies the impact of marine debris.

Barnes said that plastic bags have gone "from being rare in the late 80s and early 90s to being almost everywhere from Spitsbergen 78° North [latitude] to Falklands 51° South [latitude], but I'll bet they'll be washing up in Antarctica within the decade."

Bateman said that plastic bags are becoming a victim of their success. "The industry is at the stage where its success has caused concerns and these concerns need to be addressed responsibly," he said. Among other initiatives, Bateman supports the development of biodegradable plastic bags, a technology that has made strides in recent years.

Plastax to the Rescue?

Plastic bag litter has become such an environmental nuisance and eyesore that Ireland, Taiwan, South Africa, Australia, and Bangladesh have heavily taxed the totes or banned their use outright. Several other regions, including England and some U.S. cities, are considering similar actions.

Tony Lowes, director of Friends of the Irish Environment in County Cork, said the 15 cent (about 20 cents U.S.) tax on plastic bags introduced there in March 2002 has resulted in a 95 percent reduction in their use. "It's been an extraordinary success," he said.

According to Lowes, just about everyone in Ireland carries around a reusable bag and the plastic bags that once blighted the verdant Irish countryside are now merely an occasional eyesore. Cobb believes a similar tax in the U.S. would have a similar effect on reducing consumption.

The American Plastics Council is wary of such a tax in the U.S. They say it would cost tens of thousands of jobs and result in an increase in energy consumption, pollution, landfill space, and grocery prices as store owners increase reliance on more expensive paper bags as an alternative.

Bateman said the Irish tax of about U.S. 20 cents per bag is too high, but that a tax of 3 to 5 cents could have a positive impact on reducing plastic bag consumption by changing people's behavior.

"Having bags charged has some merits because it gets them used more responsibly," he said. For example, instead of a bagger using six bags to package a person's dinner. the bagger might use just two.

As for Cobb, he hopes people will begin to realize that paper and plastic bags both come at great cost to the environment and instead of scratching their head when asked which type they prefer, they'll pull a tightly packed reusable bag from their pocket.

"We want to make it cool to carry reusable shopping bags," he said.

Attachment K:

Formal Objections by the Save the Plastic Bag Coalition Represented by the Law Offices of Stephen L. Joseph, ESQ. – Includes:

- Comments regarding the CEQA analysis
- Letter from Stephen L. Joseph, ESQ. dated June 3, 2008
- Letter from Stephen L. Joseph, ESQ. dated June 10, 2008
- Tentative Decision of the Superior Court in the Oakland Case (see attachment H)
- The London Times Report dated March 8, 2008
- The ULS Media Release dated June 7, 2007
- The ULS Report dated June 2007 (see attachment L)
- The Scottish Report dated June 2005 (see attachment L)

THE SAVE THE PLASTIC BAG COALITION

TO THE CITY OF MANHATTAN BEACH, CALIFORNIA

FORMAL OBJECTIONS BY THE SAVE THE PLASTIC BAG COALITION TO PROPOSED NEGATIVE DECLARATION AND CLAIMS OF EXEMPTION REGARDING PROPOSED ORDINANCE NO. 2115 TO PROHIBIT THE USE OF PLASTIC CARRY-OUT BAGS, AND TO THE PROPOSED ORDINANCE

The Save The Plastic Bag Coalition (the "Coalition") is an unincorporated association of plastic bag manufacturers and distributors. The members include (but are not limited to) Grand Packaging, Inc. and Crown Poly, Inc. which are manufacturers and Elkay Plastics Co., Inc. which is a manufacturer and distributor. Members of the Coalition supply plastic carry-out bags to businesses covered by the proposed ordinance and would be adversely affected by its adoption.

The Coalition hereby responds to the June 12, 2008 Notice Of Intent To Adopt Negative Declaration and asserts the objections herein.

GROUNDS FOR EXEMPTION CITED BY THE CITY

14 CCR §15061(b)(3) and §15308 are cited by the city in the proposed ordinance as the bases for exemption from the California Environmental Quality Act (CEQA) and the requirement that an Environmental Impact Report (EIR) be prepared.

14 CCR §15061(b)(3) is known as the "common sense exemption." It states as follows:

> The activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is *no possibility* that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. [Emphasis added]

Citing 14 CCR §15061(b)(3), the proposed ordinance states that the activity will not result in direct or indirect or reasonably foreseeable direct or indirect physical change to the environment.

14 CCR §15308 is a "categorical exemption." It states that the following category of actions is exempt from CEQA:

> [A]ctions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the

> environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption.

14 CCR §15300.2(c) states an exception to all categorical exemptions, as follows.

> A categorical exemption shall not be used for an activity where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances.

Citing 14 CCR §15308, the proposed ordinance states that the ordinance is exempt as it is a regulatory program designed to protect the environment.

THE SCOTTISH REPORT

In 2005, the Scottish Government issued a full environment impact assessment on the effects of a proposed plastic bag levy (the "Scottish Report"). A copy of the Scottish Report is provided herewith.

The Scottish report states:

> If only plastic bags were to be levied (scenarios 1A and 1B), then studies and experience elsewhere suggest that there would be some shift in bag usage to paper bags (which have worse environmental impacts.)

The Scottish Report compared plastic and paper bags and made the following findings:

> [A] paper bag has a more adverse impact than a plastic bag for most of the environmental issues considered. Areas where paper bags score particularly badly include water consumption, atmospheric acidification (which can have effects on human health, sensitive ecosystems, forest decline and acidification of lakes) and eutrophication of water bodies (which can lead to growth of algae and depletion of oxygen).
>
> [Note: Eutrophication means the process by which a body of water becomes rich in dissolved nutrients, thereby encouraging the growth and decomposition of oxygen-depleting plant life and resulting in harm to other organisms.]

> Paper bags are anywhere between six to ten times heavier than lightweight plastic carrier bags and, as such, require more transport and its associated costs. They would also take up more room in a landfill if they were not recycled.

The Scottish Report contains the following comparison of the environmental metrics of plastic bags and paper bags which is taken from the study done by the French company Groupe Carrefour. The lightweight plastic bag has been given a score of 1 in all categories as a reference point. The report states:

> A score greater than 1 indicates that another bag ('bag for life' or paper) makes more contribution to the environmental problem than a lightweight plastic bag *when normalised against the volume of shopping carried*. A score of less than 1 indicates that it makes less of a contribution, i.e. it has less environmental impact than a lightweight plastic bag." [Emphasis added]
>
> The indicators take account of emissions which occur over the whole lifecycle. They can therefore occur in different locations depending on where different parts of the lifecycle are located. For global environmental problems such as climate change, the location of the emission is not important in assessing the potential environmental impact....

Indicator of environmental impact	**HDPE bag lightweight**	**Paper bag single use**
Consumption of non-renewable primary energy	1.0	1.1
Consumption of water	1.0	4.0
Climate change (emission of greenhouse gases)	1.0	3.3
Acid rain (atmospheric acidification)	1.0	1.9
Air quality (ground level ozone formation)	1.0	1.3
Eutrophication of water bodies	1.0	14.0
Solid waste production	1.0	2.7
Risk of litter	1.0	0.2

Scottish Report at page 22-23.

THE ULS REPORT

In March 2008, use-less-stuff.com ("ULS") issued an updated "Review Of Life Cycle Data Relating To Disposable, Compostable, Biodegradable, And Reusable Grocery Bags" (the "ULS Report"). A copy of the ULS Report and the one-page ULS media release announcing the report are provided herewith.

ULS made the following findings which are contained in the report:

1. Plastic bags generate 39% less greenhouse gas emissions than uncomposted paper bags, and 68% less greenhouse gas emissions than composted paper bags. The plastic bags generate 4,645 tons of CO_2 equivalents per 150 million bags; while uncomposted paper bags generate 7,621 tons, and composted paper bags generate 14,558 tons, per 100 million bags produced.

2. Plastic bags consume less than 6% of the water needed to make paper bags. It takes 1004 gallons of water to produce 1000 paper bags and 58 gallons of water to produce 1500 plastic bags.

3. Plastic grocery bags consume 71% less energy during production than paper bags. Significantly, even though traditional disposable plastic bags are produced from fossil fuels, the total non-renewable energy consumed during their lifecycle is up to 36% less than the non-renewable energy consumed during the lifecycle of paper bags and up to 64% less than that consumed by biodegradable plastic bags.

4. Using paper sacks generates almost five times more solid waste than using plastic bags.

5. After four or more uses, reusable plastic bags are superior to all types of disposable bags -- paper, polyethylene and compostable plastic -- across all significant environmental indicators.

ULS Report at pages 3-4. The ULS report concludes as follows:

> Legislation designed to reduce environmental impacts and litter by outlawing grocery bags based on the material from which they are produced will not deliver the intended results. While some litter

> reduction might take place, it would be outweighed by the disadvantages that would subsequently occur (increased solid waste and greenhouse gas emissions). Ironically, reducing the use of traditional plastic bags would not even reduce the reliance on fossil fuels, as paper and biodegradable plastic bags consume at least as much non-renewable energy during their full lifecycle.

ULS Report at pages 5.

OTHER ENVIRONMENTAL IMPACTS

As stated in my letters dated June 3 and 10, 2008, there are other environmental impacts of a shift to paper bags.

It takes approximately ten times more diesel fuel to transport paper bags than plastic bags, because they are heavier and bulkier.

It takes as much as eighty-five times more energy to recycle a paper bag than a plastic bag.

The manufacture of paper bags generates approximately 70 percent more air pollutants than plastic bags.

Approximately 13 to 17 million trees are chopped down each year to make paper bags, which will multiply if plastic bags are banned. Logging has an impact on climate change. Trees absorb and store CO_2. Logging releases stored CO_2 into the atmosphere. CO_2 is increasing the acidification of the oceans and threatening the ecosystem and entire species of marine life.

A comprehensive review of the impact of the paper industry on the environment is contained in a report entitled "The State of the Paper Industry" by the Environmental Paper Network the "Paper Report"). It can be downloaded at:

www.environmentalpaper.org/stateofthepaperindustry/confirm.htm.

The following findings are stated in the Paper Report:

> [T]he paper industry's activities - and our individual use and disposal of paper in our daily lives - have enormous impacts. These include loss and degradation of forests that moderate climate change, destruction of habitat for countless plant and animal species, pollution of air and water with toxic chemicals such as mercury and dioxin, and production of methane - a potent

> greenhouse gas - as paper decomposes in landfills, to name just a few. (Page iv)
>
> One of the most significant, and perhaps least understood, impacts of the paper industry is climate change. Every phase of paper's lifecycle contributes to global warming, from harvesting trees to production of pulp and paper to eventual disposal. (Page v)
>
> The climate change effects of paper carry all the way through to disposal. If paper is landfilled rather than recycled, it decomposes and produces methane, a greenhouse gas with 23 times the heat-trapping power of carbon dioxide. More than one-third of municipal solid waste is paper, and municipal landfills account for 34 percent of human related methane emissions to the atmosphere, making landfills the single largest source of such emissions. The U.S. Environmental Protection Agency has identified the decomposition of paper as among the most significant sources of landfill methane. (Page v)

Plastic bags are often criticized on the ground that they do not decompose in landfills. In fact, as we can see from the Paper Report, that is a positive attribute of plastic bags, not a negative one.

THE OAKLAND CASE

The issue of the applicability of CEQA to the banning of plastic bags has already been litigated. *Coalition To Support Plastic Bag Recycling v. City of Oakland et al.,* Alameda Superior Court, Case No. RG07-339097 (hereinafter the "Oakland Case"). The City of Oakland passed an ordinance banning plastic bags, citing 14 CCR §15061(b)(3) and §15308 as reasons for not preparing an EIR. The court ruled that the ordinance was invalid as the city could not make the findings required under either section. A copy of the court's ruling is provided herewith.

In the Oakland Case, the court referred to the Scottish Report and an earlier version of the ULS Report.

The court ruled as follows regarding 14 CCR §15061(b)(3):

> The findings of the Scottish report raise a reasonable inference that an outright ban on single-use 100% petroleum plastic bags may result in increased use of paper bags.

> This evidence is sufficient to defeat the assertion of the "common sense exemption" because, with such evidence as part of the record, the City cannot meet the standard that there is no possibility that the Ordinance will cause a significant environmental effect....
>
> It is because of this evidence in the record and unanimity of the uncertainty whether paper bags are less (or more) environmentally friendly than plastic bags that the City cannot assert that there is "no possibility" of any significant environmental effect caused by the ban of the 100% petroleum plastic bags.
>
> Having found evidence to support a fair argument regarding the significant adverse effects of the Ordinance claimed by Petitioner, and no evidence that would permit the City to conclude to a certainty that Petitioner's concerns are unfounded, City's reliance on the common sense exemption was an abuse of discretion.

Ruling at 9-10.

The court ruled as follows regarding 14 CCR §15308:

> [T]here are exceptions to the categorical exemptions. The City cannot rely on a categorical exemption for a project where there is a "reasonable possibility" that the activity will have a significant effect on the environment due to "unusual circumstances." (CEQA Guidelines § 15300.2(c).) The City's determination whether the ordinance will have a significant effect on the environment is reviewed under the fair argument standard. [Citation] The question is whether "on the basis of the whole record, there was *no* substantial evidence that there would be a significant [environmental] effect." [Citation] [Emphasis in original]
>
> A shift in consumer use from one environmentally damaging product to another constitutes an "unusual circumstance" of an activity that would otherwise be exempt from review under CEQA as activity undertaken to protect the environment. [Citation] The court also finds that substantial evidence in the record supports at least a fair argument that single-use paper bags are more environmentally damaging than single-use plastic bags. [Referring to the Scottish Report, the ULS Report, and other documents.]....

> Although City points to evidence in the record that contradicts evidence cited by Petitioner, the court does not address it except to note that none of this evidence negates the evidence cited by petitioner. "If such evidence [supporting a fair argument of significant environmental impact] is found, it cannot be overcome by substantial evidence to the contrary." [Citation]

Ruling at 11-12.

CEQA OBJECTIONS

Based on the foregoing and the documents provided herewith, the Coalition objects to the proposed negative declaration and the proposed ordinance on the following grounds:

A. Based on the Scottish and ULS Reports and common sense, it is clear that the prohibition on the distribution of plastic carry-out bags in Manhattan Beach would result in an increase in the number of paper carry-out bags that would have significant adverse environmental effects. Consequently, the City of Manhattan Beach cannot meet the standard that there is *no possibility* that the proposed ordinance will cause a significant environmental effect.

B. The IES addresses paper bags. The city concedes in the IES that the banning of plastic bags in Manhattan Beach "may result in an increase in paper bag usage." (Page 15) The city also concedes in the IES that "it is well documented that the manufacture and recycling of paper generates more wastewater than plastic bags. The increased use of energy could have an impact on the environment by increasing emissions from paper mills and recycling plants." (Page 15) The city is thereby conceding that there is a *fair argument* and a *possibility* that the proposed ordinance will have a significant environmental effect.

C. The City Attorney admitted at the June 3, 2008 Council hearing that the Coalition had made a "fair argument" in its June 3, 2008 letter. He stated: "They have raised in their [June 3, 2008] letter what's called in CEQA terminology a fair argument that in fact there could be a negative impact from adopting this ordinance."

D. The city states in the IES that Manhattan Beach is a small city with only 217 licensed retail establishments that might use plastic bags. (Page 15) The city concludes as follows: "It *appears* that any increase in the total use of paper bags resulting from the proposed ban on plastic bags...would be relatively small with a minimal or nonexistent increase in pollutants generated from production and recycling." (Page 16) (Emphasis added) This is a bare assertion that is not supported by any facts or evidence in the IES. In any case, the word "appears" is a concession by the city that it is *possible* that the ordinance will have significant environmental effect.

E. The size of the city and the number of retail outlets have nothing to do with whether the activity in question may have a significant negative effect on the environment. If it were otherwise, then each small city could avoid the preparation of an EIR, but the cumulative effect of many small cities doing the same thing would be large. The Coalition hereby makes a *fair argument* that it is *possible* that banning plastic bags in a city with 217 retail outlets would have a significant negative effect on the environment caused by a shift to paper bags.

F. The IES does not satisfy the requirements of 14 CCR §15063 for an Initial Study as it does not state all of the possible negative environmental effects of an increase in the number of paper carry-out bags, including those identified herein and in the Scottish and ULS Reports (which are incorporated in these objections by reference) and the Coalition's letters dated June 3 and 10, 2008.

G. There is substantial evidence in the record that supports a *fair argument* and a reasonable possibility that single-use paper bags are more environmentally damaging than single-use plastic bags, including this document and the Scottish and ULS Reports. Therefore, it cannot be seen *with certainty* that there is *no possibility* that the activity in question may have a significant negative effect on the environment. ***<u>This objection cannot be overcome by substantial evidence to the contrary.</u>*** 14 CCR §15061(b)(3); Oakland Case at 12; *Leonoff v. Monterey County Board of Supervisors* (1990) 222 CalApp.3d 1337, 1348 ("If such evidence [supporting a fair argument of significant environmental impact] is found, it cannot be overcome by substantial evidence to the contrary.").

H. There is substantial evidence in the record that supports a *fair argument* and a reasonable possibility that the activity will have a significant effect on the environment due to "unusual circumstances." A shift in consumer use from one environmentally damaging product to another constitutes an "unusual circumstance." ***<u>This objection cannot be overcome by substantial evidence to the contrary.</u>*** 14 CCR §15308, §15300.2(c); Oakland Case at 12; *Leonoff v. Monterey County Board of Supervisors* (1990) 222 CalApp.3d 1337, 1348 ("If such evidence [supporting a fair argument of significant environmental impact] is found, it cannot be overcome by substantial evidence to the contrary.").

Each of the above objections is a separate and independent ground.

FURTHER OBJECTIONS

The Coalition further objects to the proposed ordinance on the following grounds:

1. Pursuant to California Public Resources Code §§42250-42257 (also known as "AB 2449"), stores (as defined in §42250(e)) are required to install special recycling bins for plastic bags. AB 2449 was intended to address and constitute the state's solution to the perceived problems of plastic carry-out bags, including but not limited to recycling, litter, marine debris, and environmental sustainability issues. It occupies the field and preempts any potential city or county action to address those issues by enacting a plastic bag ban. AB 2449 contains no provision permitting a city or county to ban plastic bags. AB 2449 only reserves the right of cities and counties to adopt, implement, and enforce laws governing curbside or drop off recycling programs for plastic bags. §42250(c).
2. California cities and counties have no right or authority to ban a product simply because it is not recycled to a degree deemed satisfactory by the city or county.
3. California cities and counties have no right or authority to ban a product simply because the product sometimes becomes litter.
4. California cities and counties have no right or authority to ban a product simply because the product sometimes becomes marine debris.
5. California cities and counties have no right or authority to ban a product simply because they believe that it would be the best option for the sustainability of the environment.
6. A California city or county has no right or authority to ban plastic bags on environmental grounds. Other cities and counties may decide to pass laws banning paper bags rather than plastic bags. This would result in a patchwork of competing and conflicting environmental schemes that would cancel each other out and defeat the purposes of such laws. Assuming that it is not exclusively a federal matter under the Commerce Clause, only the California Legislature can enact such a ban.

Each of the above objections is a separate and independent ground.

REQUESTS FOR INCLUSION IN THE RECORD

It is requested that the following documents be made part of the record and the Staff Report:

1. This document.
2. The Oakland Case ruling provided herewith.
3. The Scottish Report provided herewith.
4. The ULS Report provided herewith.
5. The ULS media release provided herewith.
6. The London Times report provided herewith.
7. My letters dated June 3 and 10, 2008 on behalf of the Coalition provided herewith.

CONCLUSION

In the event that the city adopts the proposed ordinance, the Coalition and/or some or all of its members intend to file a lawsuit challenging its validity. The grounds will include (but may not be limited to) the points and objections stated herein and in my June 3 and 10, 2008 letters. No arguments or objections are waived. All rights are reserved.

We request an opportunity for the Coalition to provide oral testimony at the public hearing.

Dated: June 18, 2008

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June 3, 2008

To: City Council
Geoff Dolan, City Manager
Lindy Coe-Juell, Assistant to City Manager
City Attorney

City of Manhattan Beach
City Hall
1400 Highland Avenue
Manhattan Beach, CA 90266

Via fax to (310) 802-5001; (310) 802-5251
Via e-mail to gdolan@citymb.info; lcoe-juell@citymb.info

RE: Legal objection to proposed ordinance to ban plastic bags and proposed hearing; CEQA demand; notice of intent to file lawsuit

Dear Sirs and Madam:

I represent the Save The Plastic Bag Coalition, a newly formed group of companies that will be affected by any ordinance to ban or impose fees on plastic bags.

PURPOSE OF THE COALITION

The Coalition's position on plastic bag bans and fees is as follows:

A. The plastic bag is an excellent product that has been unfairly attacked and stigmatized.

B. The anti-plastic bag campaign is based on myths, misinformation, gross exaggerations, and misconceptions propagated by groups, government officials, and politicians who have shown little or no interest in the facts and demonstrate no serious understanding or concern about the environmental or economic consequences of their actions. Such governmental officials and politicians are overreaching and denying freedom of choice to businesses and consumers.

C. Imposing fees on or banning plastic carryout bags would result in a massive switch to paper carryout bags, notwithstanding the availability of reusable bags. It is therefore critically important to ensure that government officials, politicians, and the public know the truth about both plastic and paper bags and are provided with accurate information about their comparative environmental and economic merits and advantages.

D. In the plastic versus paper debate, there is no reason why paper should be accorded preferential treatment. There is also no reason why consumers should be made to feel guilty about choosing plastic over paper.

E. The Coalition will defend the right of businesses to distribute, and the right of consumers to receive, free plastic bags.

THE STAFF REPORT

The Coalition hereby responds to the City of Manhattan Beach Staff Report on the consideration of an ordinance to prohibit use of plastic carryout bags, dated June 3, 2008.

STAFF REPORT: "Plastic carry-out bags (or plastic bags), which are generally petroleum based…."

RESPONSE: This is incorrect. Plastic bags are made from a gaseous by-product of oil.

STAFF REPORT: "Today these bags are ubiquitous in the marketplace because they are light-weight, strong and inexpensive."

RESPONSE: These are reasons NOT to ban them. They are an excellent and extremely useful product that consumers want, need, and should be entitled to use if they wish.

STAFF REPORT: "According to the California Integrated Waste Management Board (CIWMB), approximately 6 billion plastic bags are consumed in Los Angeles County each year."

RESPONSE: "Plastic bags" includes produce bags, retail bags, newspaper bags, and dry cleaning bags. It is true that many plastic bags are used, because as the Staff Report states they are "light-weight, strong and inexpensive." Coalition members are *proud* that consumers like and choose their products. The plastic bag industry is certainly not going to apologize to anyone for creating a good product that people want and use in large numbers.

STAFF REPORT: "Plastic bags are recyclable, however less than 5 percent are actually recycled."

RESPONSE: Plastic bags are indeed recyclable. However, cities that allow the curbside recycling of plastic bags must ensure that plastic bags are not just thrown in recycling bins. Unfortunately, the City of Manhattan Beach does not have a good curbside program for plastic bags. The Coalition is ready to have discussions with you on ways to improve your curbside program. The Coalition has a lot of expertise in this area.

AB 2449 came into effect in July 2007, mandating the placement of plastic bag recycling bins in large stores. The City of Manhattan Beach should be promoting this program instead of disregarding it. It could also encourage smaller stores not covered by AB 2449 to participate.

In any event, burying plastic bags in landfills is not a significant issue. Less than 0.3 percent of landfills consist of plastic bags (including produce bags, retail bags, newspaper bags, and dry cleaning bags). Plastic bags take up very little space in landfills because they are thin.

Is the City of Manhattan Beach proposing to ban all of the items that make up the remaining 99.97% of landfills?

Fortunately, plastic bags do not break down in landfills. Virtually nothing breaks down in a landfill because the contents are not exposed to air or light. Products that do break down in landfills emit methane, a climate-changing gas. Moreover, when plastic bags are in landfills, they are not causing litter or any other kind of problem.

The issue of burying plastic bags in landfills has been grossly exaggerated.

STAFF REPORT: "Plastic bags have a propensity to become litter and to adversely affect the marine environment. Due to their expansive and lightweight characteristics, they are easily windblown and end up littering landscaping, streets, streams, storm drain systems and, ultimately, the ocean. Plastic bags are a significant source of marine debris and are hazardous to birds and marine animals. The California Coastal Commission estimates that 60-80 percent of all marine debris, and 90 percent of floating debris, is plastic."

RESPONSE: Some plastic bags end up as litter, obviously. Out of the 6 billion bags that the Staff Report says are used in Los Angeles County each year, it would be fair to assume that *at least* 99.9999% do *not* end up as litter.

Plastic bags are not alone in the litter stream. Cigarette butts, soda cans, bottles, and many other items become litter. Is the City of Manhattan beach proposing to ban all such items? Why are plastic bags being singled out for unique and special treatment?

We do not understand why the report states that 60-80 percent of all marine debris is "plastic" and 90 percent of floating debris is "plastic." Why is that relevant? Not all plastic is plastic bags. There are many thousands of other products made from plastic too.

STAFF REPORT: "Plastic bags pose a particular problem for wildlife that mistake the bags for food, and as a result, ingest the bags thereby starving or suffocating. It is estimated that more than 1 million sea birds, 100,000 marine mammals and countless fish die annually through ingestion of an entanglement in marine debris, including plastic bags. Whales and birds often swallow plastic bags inadvertently during feeding. Turtles swallow the bags since they resemble their main food source, jellyfish. Plastic bags are also known to smother plants, restricting growth and destroying the natural habitat."

RESPONSE: When we complain about myths, misinformation, errors, and misconceptions propagated by groups, government officials, and politicians who have shown little or no interest in the facts, it is exactly this kind of defamatory and baseless statement that we are talking about.

The London Times is one of the most respected newspapers in the world. No one accuses the Times of a pro-business or anti-environmental bias. Along with this letter, I am sending you a Times article published on March 8, 2008 entitled: "Series of blunders turned the plastic bag into global villain." The reports states:

> "The central claim of campaigners is that the bags kill more than 100,000 marine mammals and one million seabirds every year. However, this figure is based on a misinterpretation of a 1987 Canadian study in Newfoundland, which found that, between 1981 and 1984, more than 100,000 marine mammals, including birds, were killed by discarded nets. The Canadian study did not mention plastic bags.
>
> Fifteen years later in 2002, when the Australian Government commissioned a report into the effects of plastic bags, its authors misquoted the Newfoundland study, mistakenly attributing the deaths to "plastic bags".
>
> The figure was latched on to by conservationists as proof that the bags were killers. For four years the "typo" remained uncorrected. It was only in 2006 that the authors altered the report, replacing "plastic

> bags" with "plastic debris". But they admitted: "The actual numbers of animals killed annually by plastic bag litter is nearly impossible to determine."
>
> In a postscript to the correction they admitted that the original Canadian study had referred to fishing tackle, not plastic debris, as the threat to the marine environment.
>
> Regardless, the erroneous claim has become the keystone of a widening campaign to demonise plastic bags."
>
> A marine biologist from Greenpeace told The Times: "It's very unlikely that many animals are killed by plastic bags," he said. "The evidence shows just the opposite." A marine biologist from the British Natural History Museum told The Times: "I've never seen a bird killed by a plastic bag."

In response to the article, the embarrassed British government minister charged with eliminating plastic bags wrote to The Times stating:

> "We have never said that plastic bags were a leading cause of death in marine animals, though general plastic waste does make a contribution. There are nonetheless serious reasons for our aim to end the practice of dispensing for free, single use bags. They are a significant cause of litter.... Most of the rest of the 13 billion bags used each year end up in landfill. They are a potent *symbol* of our throwaway society and public opinion recognizes this. Of course, these bags contribute only a small part of the waste that leads to climate-changing emissions, but we need to change the small things as well as the large and to work with the grain of public opinion." [Emphasis added.]

Ideological symbolism, not truth and environmental protection, is driving the anti-plastic bag campaign.

We know how your residents love the ocean, but getting them agitated about the effects of plastic bags on marine life based on misinformation is highly irresponsible.

STAFF REPORT: The primary alternatives to plastic bags are reusable bags, made from cloth or other durable materials, and paper bags.... Although reusable bags are the preferred option, paper bags do not have the same impact on the environment as plastic bags do."

RESPONSE: If plastic bags are banned, it is obvious that paper bag usage will massively increase. Here are the facts about paper bags.

- It takes 13 to 17 trees to make one ton of paper bags. [Source: EPA] Over a million tons of paper bags are used in the United States each year. That's 13 to 17 million trees annually.

- At least four out of five carryout bags used at present are plastic. If plastic carryout bags are banned, the number of trees that would have to be chopped down, turned to pulp, and treated with chemicals to create paper bags would multiply. Nobody knows the number, but it could exceed 50 million every year.

- It takes more than four times more energy to manufacture a paper bag than a plastic bag. [Source: EPA] It takes 85 times more energy to recycle paper bags than plastic bags. [Source: USA Today]

- Paper bags are about 10 times heavier than plastic bags. [Source: EPA] That means it takes about 10 times more diesel fuel consuming trucks to deliver paper bags. *At a time when fuel prices are sky high, and diesel could soon cost $6 per gallon or more, this is a very serious concern.*

- The manufacture of paper bags generates 70 percent more air pollutants and 50 times more water pollutants than plastic bags. [Source: Comparison of the Effects on the Environment of Polyethylene and Paper Carrier Bags, Federal Office of the Environment, August 1988.]

- Paper bags produce 80% more solid waste than plastic bags. [Source: EPA] Paper bags take up about nine times more space in landfills than plastic bags. [Source: USA Today]

- Current research demonstrates that paper in today's landfills does not degrade or break down at a substantially faster rate than plastic does. [Source: EPA]

Paper bags cost up to five times more for stores to purchase than plastic bags, a fact that is not even mentioned in the Staff Report. Your staff may not consider it significant, but your residents will think it is *very* significant if they have to pay more for their groceries at a time when food prices are escalating.

The impact of a massive switch to paper bags would be enormous. Are these the results that the City of Manhattan Beach is looking for?

FURTHER COMMENT ON STAFF REPORT

The Staff Report makes no mention of the economic impact of its recommendation. This is an inexcusable omission. There will be an effect on the cost of shopping and an impact on jobs if plastic bag bans are passed. We hope that the City Council is sensitive to this issue that the staff apparently believes is not important enough to mention.

Americans are very protective of their right to make choices and deeply resent the government interfering with or removing those choices. This too is not mentioned in the Staff Report, signifying that the staff attaches no importance to it whatsoever. This is a serious misreading of public sentiment.

The Staff Report is packed with bare assertions, misinformation, and illogical conclusions. We have not responded to all of them in this letter, because (as discussed below) the City of Manhattan Beach is *required by law* to do a proper environment study before holding a hearing and passing an ordinance. If and when that study is done, we will respond to the findings therein at that time.

LEGAL OBJECTIONS AND CEQA DEMAND

Section 1(A) of the proposed Ordinance reads as follows:

> "This ordinance is not subject to the California Environmental Quality Act ("CEQA") pursuant to Section 15061(b)(3) in that the activity will not result in direct or indirect or reasonably foreseeable direct or indirect physical change to the environment. Additionally this ordinance is exempt from CEQA Guidelines Section 15308 as a regulatory program to protect the environment."

The Alameda Superior Court has ruled that no city or county in California may ban plastic bags without first doing an environmental study pursuant to the California Environmental Quality Act (CEQA). *The City of Oakland passed a plastic bag ban without doing a CEQA environmental study first and the court struck the law down.* The court stated as follows in its ruling:

> "The court also finds that substantial evidence in the record supports at least a fair argument that single-use paper bags are more environmentally damaging that single use plastic bags."

Incredibly, there is no mention in the Staff Report of the Alameda Superior Court's decision on this point. A copy of the ruling is provided herewith for your review.

The purpose of CEQA is to make absolutely sure that cities like Manhattan Beach fully research and analyze the facts and evidence before making decisions that affect the environment, rather than relying on poorly researched and erroneous staff reports. The CEQA law was created with the support of the environmental community to ensure that local governments did not inadvertently enact laws that hurt the environment.

The Coalition and its members *strongly object* to any attempt by the City of Manhattan Beach to disregard the environmental review requirements of CEQA. We will file a lawsuit against the City of Manhattan if an ordinance banning plastic bags is passed without a prior environmental study that conforms fully with all of the CEQA requirements.

The Staff Report states that "staff believes that a ban of plastic bags is the best option for the sustainability of our environment." Even if a CEQA study is done, the City of Manhattan Beach has no legal authority to ban products based on "sustainability of our environment."

Plastic bags are the least of our problems. We are an industrial and consumer society with many thousands of products. According to the staff's philosophy, in order to sustain the environment our society should produce nothing.

This is not intended to be an exhaustive statement of our legal objections to a proposed ordinance. No waiver is intended. All rights are reserved.

CONCLUSION

We trust that the City Council will make the right decision and discontinue the plastic bag ban initiative.

Thank you for your consideration. Please contact me if you have any questions.

Sincerely,

Stephen L. Joseph

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June 10, 2008

City Council
City of Manhattan Beach
1400 Highland Avenue
Manhattan Beach, CA 90266

RE: Proposed plastic bag ban ordinance and CEQA demand

Dear Council Members:

I represent the Save The Plastic Bag Coalition.

On June 3, 2008, I wrote to the city stating the coalition's legal objections to the proposed plastic bag ban ordinance. In response to my letter, the Council deferred consideration of the proposed ordinance until its next meeting. I am writing to respond to some surprising and disturbing statements made at the June 3 Council meeting. Also, I wish to respond to a comment made by a Council Member regarding the coalition.

INAPPROPRIATE STATEMENTS MADE AT JUNE 3 MEETING

In my letter, I informed the city that it must comply with the California Environmental Quality Act (CEQA). My understanding is that the city does not dispute that point, nor could it in view of the Alameda Superior Court ruling.

At the June 3 meeting, the City Attorney informed the Council that the city would not need to write a full Environmental Impact Report ("EIR"). He indicated that the purpose of the exercise is merely to "beef up the record" to justify a plastic bag ban. He said that as long as a study is not "obviously flawed," it would be good enough. The following exchange took place:

> Lindy Coe-Juell: I don't know that we would go to a full EIR in our study…."
>
> City Attorney: "We can do it in two weeks."

> Council Member: "Seriously?"
>
> City Attorney: "Yeah I don't think that we would need an EIR for this. They've just simply raised an issue. It would depend on what information is out there. But if we can come up with studies that contradict the argument they've made about paper bags being more negative to the environment than plastic bags then I think we can move forward rather quickly on it."
>
> ....
>
> City Attorney "What we are looking for is studies that say why plastic is bad."

These statements are inappropriate and legally wrong. We believe that the City Attorney's position regarding CEQA was flippant and dismissive. The last people who should be undermining CEQA are those who profess to be concerned about protecting the environment.

The purpose of the EIR is not to prove that plastic bags or paper bags are good or bad, or any other preconceived conclusions. The purpose is to obtain reliable information on all sides of the issue and conduct an objective analysis.

The EIR must be prepared in good faith. *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692. It informs governmental decision-makers and the public of the significant environmental effect of a project, identifies possible ways to minimize the significant effects, and describes reasonable alternatives. 14 CCR §15121.

Title 14, Chapter 3 of the California Code of Regulations contains legal requirements about the EIR process and the contents of an EIR. We are very concerned, based on the City Attorney's statements, that the city does not intend to comply with the legal requirements. The coalition will seek judicial enforcement if necessary.

CEQA is critically important legislation for the protection of the environment. It ensures that governmental actions are based on sound environmental information, thorough analysis, and consideration of the alternatives, not myths and misinformation. I hope that you will make it clear at the next Council meeting that the city takes its obligations under CEQA seriously.

The Council needs an EIR because the city is intentionally disregarding the facts. For example, in my June 3 letter, I quoted from a report in the London Times establishing that the statements in the Staff Report about marine mammals and seabirds were incorrect and based on a typographical error. The London Times report was never mentioned at the June 3 meeting.

INAPPROPRIATE STATEMENT TO THE MEDIA

The following appeared in a report in *Easy Reader* on June 5.

> "Councilman Jim Aldinger said the coalition was hijacking environmental law, harboring ulterior motives other than the improvement of the environment. "Using CEQA for this purpose is ridiculous," he said.

It is not the coalition that is hijacking environmental law. It is the city that is undermining it. The city assumes that it already knows everything on this subject, even though it has done zero research and zero analysis. Selectively copying inaccurate one-liners from the Internet and calling it a "Staff Report" does not qualify as legitimate research. Calling the requirement of a CEQA analysis "ridiculous" is irresponsible and suggests that Council Member Aldinger is not seriously interested in investigating the facts or facing up to the consequences of the proposed ordinance.

LACK OF LEGAL AUTHORITY TO BAN

In my June 3 letter, I stated that even if an EIR is completed, the City of Manhattan Beach has no legal authority to ban plastic bags. Unfortunately, this point was not mentioned by anyone at the June 3 meeting. In the event that an ordinance is passed banning plastic bags, you should expect this issue to be litigated.

THE INCONVENIENT TRUTH ABOUT PAPER BAGS

Plastic is not perfect, nothing is, but it is far better for the environment than paper. It would be ludicrous to ban the environmentally superior alternative. We will provide support for the following information upon request and as part of the EIR process.

Plastic is far more energy efficient. It takes approximately four times more energy to create a paper bag. It takes approximately ten times more diesel fuel to transport paper bags, because they are heavier and bulkier. It takes as much as eighty-five times more energy to recycle a paper bag. Think of the CO_2 emissions.

Plastic is far cleaner. The manufacture of paper bags generates approximately 70 percent more air pollutants and 50 times more water pollutants than plastic bags.

Plastic saves trees. What is happening in the oceans is important, but so too is what is happening on land and in the atmosphere. Approximately 13 to 17 million trees are chopped down each year to make paper bags, which will multiply if plastic bags are banned. Logging has an impact on climate change. Trees absorb and store CO_2. Logging releases stored CO_2 into the atmosphere. CO_2 is increasing the acidification of the oceans and threatening the ecosystem and entire species of marine life.

The June 3 Staff Report is full of assertions about the negative environmental impacts of plastic bags. The report does not contain a single word about the negative environmental impacts of paper bags. Not one word! Why?

Taking the position that paper bags have no negative environmental impact is intellectually dishonest and absurd. Is this the quality of information that the City of Manhattan Beach considers acceptable when it makes its decisions?

We are not suggesting that the city must accept as true our information about the environmental impacts of paper bags. Far from it. The city should not accept anything as true just because someone has said it or it is on the Internet. We are saying that the city must conduct a proper investigation of all the ramifications of the proposed ordinance through the mandatory EIR process. Burying the facts is not acceptable.

DRIVING UP THE COST OF GROCERY SHOPPING

Paper bags are far more expensive for stores to purchase than plastic bags. Ultimately, the extra cost will be passed on to the consumer. Food costs are rising. Many people in the community are struggling to pay the costs of groceries. Passing a plastic bag ban would be economically damaging to these people and incredibly insensitive.

CEQA states that a finding of a significant effect on the environment "shall" be made if the "the environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly." Public Resources Code §21083(c). These effects include "adverse economic or social effects on people." *Citizens Assn. For Sensible Development of Bishop Area v. County of Inyo* (1985) 172 Cal.App.3d 151, 170.

We demand that the EIR include an examination of the economic and social effects of the higher cost of paper bags.

OUR PROPOSAL: REDUCE, REUSE, RECYCLE, PUBLICIZE

Banning plastic bags is a bad idea. This is what we propose.

Reduce: Stores should be asked to reduce the number of bags they hand out by putting more items in them and avoiding double-bagging.

Reuse: The city should ask residents to take their own reusable bags to the store. If they forget and have to obtain bags at the checkout, they should be encouraged to choose plastic over paper because it is the environmentally superior choice.

Recycle: Consumers should be asked to take their used plastic bags back to the store and deposit them in the special plastic bag recycling bins that were installed statewide last year. The city should also be working to improve the curbside recycling of plastic bags.

Publicize: The city should put posters up, do mailings, and get the word out through the media encouraging reduction, reuse, and recycling.

CONCLUSION

The coalition was formed to make people ask questions, look at *all* of the facts, consider *all* of the consequences, and think for themselves rather than believing everything they hear and jumping on the anti-plastic bag bandwagon. Being factually correct is more important than being politically correct. That is why the coalition is demanding an EIR.

I request that you make this letter and my June 3 letter part of the public record. Thank you for your consideration. All rights are reserved.

Sincerely,

Stephen L. Joseph

Copies to:

Geoff Dolan, City Manager
Lindy Coe-Juell, Assistant to City Manager
City Attorney Robert V. Wadden, Jr. Esq.

http://www.timesonline.co.uk/tol/news/environment/article3508263.ece

News Site of the Year | The 2008 Newspaper Awards

TIMES ONLINE

March 8, 2008

Series of blunders turned the plastic bag into global villain

Alexi Mostrous

Scientists and environmentalists have attacked a global campaign to ban plastic bags which they say is based on flawed science and exaggerated claims.

The widely stated accusation that the bags kill 100,000 animals and a million seabirds every year are false, experts have told The Times. They pose only a minimal threat to most marine species, including seals, whales, dolphins and seabirds.

Gordon Brown announced last month that he would force supermarkets to charge for the bags, saying that they were "one of the most visible symbols of environmental waste". Retailers and some pressure groups, including the Campaign to Protect Rural England, threw their support behind him.

But scientists, politicians and marine experts attacked the Government for joining a "bandwagon" based on poor science.

Lord Taverne, the chairman of Sense about Science, said: "The Government is irresponsible to jump on a bandwagon that has no base in scientific evidence. This is one of many examples where you get bad science leading to bad decisions which are counter-productive. Attacking plastic bags makes people feel good but it doesn't achieve anything."

Campaigners say that plastic bags pollute coastlines and waterways, killing or injuring birds and livestock on land and, in the oceans, destroying vast numbers of seabirds, seals, turtles and whales. However, The Times has established that there is no scientific evidence to show that the bags pose any direct threat to marine mammals.

They "don't figure" in the majority of cases where animals die from marine debris, said David Laist, the author of a seminal 1997 study on the subject. Most deaths were caused when creatures became caught up in waste produce. "Plastic bags don't figure in entanglement," he said. "The main culprits are fishing gear, ropes, lines and strapping bands. Most mammals are too big to get caught up in a plastic bag."

He added: "The impact of bags on whales, dolphins, porpoises and seals ranges from nil for most species to very minor for perhaps a few species.For birds, plastic bags are not a problem either."

The central claim of campaigners is that the bags kill more than 100,000 marine mammals and one million seabirds every year. However, this figure is based on a misinterpretation of a 1987 Canadian study in Newfoundland, which found that, between 1981 and 1984, more than 100,000 marine mammals, including birds, were killed by discarded nets. The Canadian study did not mention plastic bags.

Fifteen years later in 2002, when the Australian Government commissioned a report into the effects of plastic bags, its authors misquoted the Newfoundland study, mistakenly attributing the deaths to "plastic bags".

The figure was latched on to by conservationists as proof that the bags were killers. For four years the "typo" remained uncorrected. It was only in 2006 that the authors altered the report, replacing "plastic bags" with "plastic debris". But they admitted: "The actual numbers of animals killed annually by plastic bag litter is nearly impossible to determine."

In a postscript to the correction they admitted that the original Canadian study had referred to fishing tackle, not plastic debris, as the threat to the marine environment.

Regardless, the erroneous claim has become the keystone of a widening campaign to demonise plastic bags.

David Santillo, a marine biologist at Greenpeace, told The Times that bad science was undermining the Government's case for banning the bags. "It's very unlikely that many animals are killed by plastic bags," he said. "The evidence shows just the opposite. We are not going to solve the problem of waste by focusing on plastic bags.

"It doesn't do the Government's case any favours if you've got statements being made that aren't supported by the scientific literature that's out there. With larger mammals it's fishing gear that's the big problem. On a global basis plastic bags aren't an issue. It would be great if statements like these weren't made."

Geoffrey Cox, a Tory member of the Commons Environment Select Committee, said: "I don't like plastic bags and I certainly support restricting their use, but plainly it's extremely important that before we take any steps we should rely on accurate information. It is bizarre that any campaign should be endorsed on the basis of a mistranslation. Gordon Brown should get his facts right."

A 1968 study of albatross carcasses found that 90 per cent contained some form of plastic but only two birds had ingested part of a plastic bag.

Professor Geoff Boxshall, a marine biologist at the Natural History Museum, said: "I've never seen a bird killed by a plastic bag. Other forms of plastic in the ocean are much more damaging. Only a very small proportion is caused by bags."

Plastic particles known as nurdles, dumped in the sea by industrial companies, form a much greater threat as they can be easily consumed by birds and animals. Many British groups are now questioning whether a ban on bags would cost consumers more than the environmental benefits.

Charlie Mayfield, chairman of retailer John Lewis, said that tackling packaging waste and reducing carbon emissions were far more important goals. "We don't see reducing the use of plastic bags as our biggest priority," he said. "Of all the waste that goes to landfill, 20 per cent is household waste and 0.3 per cent is plastic bags." John Lewis added that a scheme in Ireland had reduced plastic bag usage, but sales of bin liners had increased 400 per cent.

The ULS Report

FOR IMMEDIATE RELEASE
Contact: Bob Lilienfeld
Phone: 248-726-9729
E-mail: use-less-stuff@comcast.net

Not So Fast: Research Reveals the Ironies in Plastic Bag Bans

Data Shows that Bans on Plastic Bags May Cause More Harm than Good

(June 7, 2007 – Rochester, MI) A review of highly credible, third-party research has revealed that banning traditional plastic bags from retail stores will probably not produce the intended results, and in the case of greenhouse gas generation, may actually harm the environment. Conducted by *The ULS Report,* the study was done after the city of San Francisco banned plastic bags in an effort to reduce environmental impacts and litter. Other communities around the country are considering similar bans.

The research, which was in large part commissioned and/or reviewed and published by the U.S. EPA and its French and Swiss governmental counterparts, points out a number of rather ironical facts:

- Although they are made from natural gas or oil, plastic bags actually consume less fossil fuels during their lifetime than do compostable plastic and paper bags. (The reasons are that compostable plastic bags use far more material than do traditional plastic bags, and it takes significant fossil fuel energy to convert trees into paper.)
- Plastic bags generate 60% less greenhouse gas emissions than do paper bags. And because composting creates carbon dioxide, a greenhouse gas, the plastic sacks generate 79% fewer greenhouse gas emissions than do paper bags after the latter are composted!
- The best environmental choice is a reusable bag, as long as you actually reuse (or recycle) it.
- Cigarette butts, chewing gum, and candy wrappers account for about 97% of all litter. Paper and plastic bags are generally a very small part of the total.

According to Bob Lilienfeld, Editor of *The ULS Report*, "Frankly, these findings are a proverbial whack on the side of the head. While counterintuitive, they do indicate that bans on specific materials aren't likely to either help the environment or significantly reduce litter. They also reinforce our decade-long belief that the best way to accomplish both of these worthy goals is by using less stuff in the first place. This means putting more items in fewer bags, avoiding double bagging, reusing bags at home, switching to reusable bags, and recycling disposable bags. Doing so should produce significant reductions in material and nonrenewable energy consumption, pollution, solid waste, greenhouse gas emissions, and litter."

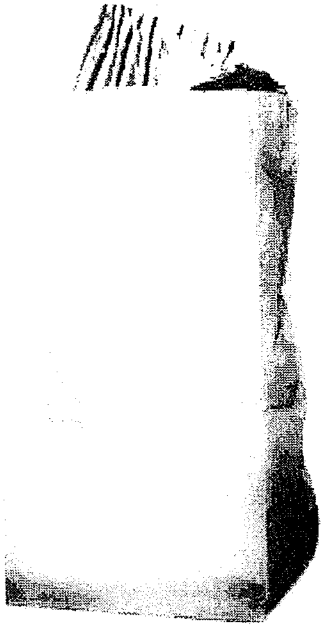
The ULS Report was published on a regular basis between 1994 and 2000. Editor Bob Lilienfeld, who co-authored the book *Use Less Stuff: Environmental Solutions for Who We Really Are*, is in the process of re-launching the report. The full report and research archive is at www.use-less-stuff.com.

# # # # #

Attachment L:

Life Cycle Assessment Reports – Includes:

- "Paper or Plastic", Washington Post.com, http://www.washingtonpost.com/wp-dyn/content/graphic/2007/10/03/GR2007100301385.html?referrer=emaillink (June 25, 2008).
- The ULS Report, "Review of Life Cycle Data Relating to Disposable, Compostable, Biodegradable, and Reusable Grocery Bags", March 2008.
- Franklin Associates, LTD., "Resource and Environmental Profile Analysis of Polyethylene and Unbleached Paper Grocery Sacks", June 1990.
- Fund for Research into Industrial Development, Growth and Equity (FRIDGE), "Socio-Economic Impact of the Proposed Plastic Bag Regulations", excerpt related to the lifecycle analysis chapter of the report accessed from the City of San Francisco website at http://www.sfenvironment.org/downloads/library/asticlifecycleanalysis.pdf.pdf
- Boustead Consulting & Associates, "Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper, June 2007.
- AEA Technology Environment, Scottish Executive Report, "Proposed Plastic Bag Levy – Extended Impact Assessment Final Report, June 2005.



MORE THAN MEETS THE EYE

An occasional feature that digs deeper into things you've been wondering about

Paper or Plastic?

We hear the question almost every time we go grocery shopping. Some shoppers answer automatically: plastic — convinced that they are making a better choice for the environment. Others ask for paper, believing the very same thing. The reality is that both paper and plastic bags gobble up natural resources and cause significant pollution. When you weigh all the costs to the environment, **you might just choose to reuse:**

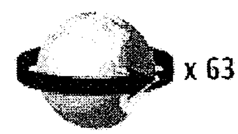
PAPER | PLASTIC

CONSUMPTION

Paper: Americans consume more than **10 billion paper bags** each year. Some **14 million trees** are cut down annually for paper bag production.

Four out of five grocery bags in this country are plastic. The U.S. uses 100 billion plastic bags annually, made from an estimated 12 million barrels of oil.

Plastic: Worldwide, an estimated 4 billion plastic bags end up as litter each year. Tied end to end, **the bags could circle the Earth 63 times.**



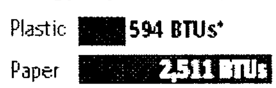
PRODUCTION

Paper, of course, comes from trees. Trees are grown or found, then marked and felled.

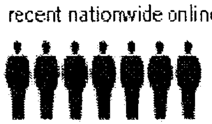
1. Logs are moved from the forest to a mill, where there is a three-year wait for the logs to dry before they can be used.
2. Logs are stripped of bark and chipped into one-inch squares. The chips are "cooked" with tremendous heat and pressure.
3. Then, they are "digested" with limestone and sulfurous acid until the wood becomes pulp.
4. The pulp is washed, requiring thousands of gallons of fresh water and bleach, then pressed into finished paper.
5. Cutting, printing, packaging and shipping to make paper bags require additional time, labor and energy.

It takes more than four times as much energy to manufacture a paper bag as it does a plastic bag.

Energy to produce bags:



7 in 10 Americans do not know that plastic is made from petroleum products, primarily oil, according to a recent nationwide online survey.



* BTU = British thermal unit

Plastic is a by-product of oil refining. Plastic bags are made from polyethylene, which comes from oil refineries as small resin pellets.

1. A machine heats the pellet to about 340 degrees and pulls out from it a long, thin tube of cooling plastic.
2. A hot bar is dropped on the tube at intervals, melting a line.
3. Each melted line becomes the bottom of one bag and the top of another.
4. The sections are cut out and a hole for the bag's handles is stamped in each piece.

1 2 3 4 5 4

RESOURCE AND ENVIRONMENTAL PROFILE ANALYSIS OF POLYETHYLENE AND UNBLEACHED PAPER GROCERY SACKS

Final Report

Prepared for

THE COUNCIL FOR SOLID WASTE SOLUTIONS

by

FRANKLIN ASSOCIATES, LTD.

June 1990

Chapter 1

EXECUTIVE SUMMARY

BACKGROUND

Recently, much attention has been directed at packaging by a variety of interest groups including: environmentalists, government officials, commercial and retail businesses, and legislators. This attention toward packaging has been the result of two issues. First, there is an ever-decreasing landfill capacity in this country, which is being aggravated by an inability to site new landfills. Second, packaging accounts for roughly one-third of the weight of the municipal solid waste that is being landfilled.

Certain packaging materials have come under particular scrutiny and have been singled out by punitive measures such as bans or taxes. Before decisions are made regarding individual packages or materials, a full evaluation should be made of all packaging materials and alternatives. Objective data regarding the energy requirements, environmental emissions, recyclability, incineration impacts, and landfill impacts of different packaging will be crucial in determining solutions to our current and future environmental problems.

PURPOSE OF THE STUDY

The purpose of this study was to determine the energy and environmental impacts of polyethylene and paper grocery sacks. In this study, the term impact refers to the quantities of fuel and raw materials consumed and emissions released to the environment. The comparative recyclability, incineration, and landfill impacts of these sacks were also addressed in this analysis.

SCOPE

The packages examined in this study were chosen due to their predominant visibility and potential for restrictive legislation. The following packages were examined:

used throughout this study to mean the grocery sack itself and all secondary packaging such as overwrap and corrugated boxes.

The two sacks examined in this study are the same size. However, through surveys of major grocery chains, it was determined that more plastic sacks than paper sacks are used to hold the same amount of groceries. The practice of using more plastic to paper sacks is believed to hold true even after taking into account some stores' practices of using double (one sack inside the other) paper sacks.

One reason for the use of more plastic sacks seems to be inexperience on the part of grocery clerks and consumers on how to pack them so that they may hold their designed capacity. Another reason for the use of more plastic sacks could also be a mistaken comparison of smaller plastic sacks, for instance, 1/7 barrel plastic to the standard 1/6 barrel paper sack.

Since the ratio of polyethylene sacks to paper sacks used is crucial to the results of this study, considerable effort has been made to determine this number. Ratios ranging from 1.2:1 to 3:1 have been reported, but there is no industry-wide agreement on a representative ratio. Therefore, the results of this analysis are presented at ratios of 1.5:1 and 2:1 polyethylene to paper since most estimates fall within this range. These ratios were developed based on data collected from supermarket chains and other industry sources.

For this analysis, an equivalent basis of 10,000 uses was utilized. With a 1.5:1 polyethylene to paper sack ratio this equals 15,000 polyethylene sacks and 10,000 paper sacks. With a 2:1 polyethylene to paper sack ratio, this equals 20,000 polyethylene sacks and 10,000 paper sacks.

METHODOLOGY

A cradle-to-grave approach was used to determine the energy and environmental impacts of the packages examined in this study. This methodology measures energy consumption and environmental emissions at each stage of a product's "life cycle," beginning at the point of raw materials extraction from the earth and proceeding through processing, manufacturing, use, and final disposal, recycle, or reuse. A more thorough description of the methodology and assumptions used in this study are presented in Chapter 2.

Energy use was quantified in fuel or electric energy units and converted to British Thermal Units (Btu) for each of the many stages, or industrial processes, required to manufacture a grocery sack. Btu consumption was determined for six basic energy sources (natural gas, petroleum, coal, hydropower, nuclear, and wood) as well as the total for each sack. Since this analysis attempts to measure the total energy impacts associated with each sack, the fuel and electric energy conversion factors to Btu include not only the energy content of the fuels, but also an adjustment which accounts for the energy used to obtain, transport, and process that fuel into a usable form.

As with energy, the environmental wastes from each step or process were determined. Government documents as well as federal regulations, technical literature, and confidential industry sources form the basis for these data. These wastes represent actual discharges into the environment after control devices. The environmental impacts can be classified into three broad categories:

- Solid wastes
- Atmospheric emissions
- Waterborne wastes.

These categories include not only those readily identifiable wastes associated with a specific process, but also the pollutants associated with the fuels consumed in power generation or transportation. The solid waste category includes both industrial solid waste and postconsumer solid waste.

Energy and environmental impacts were determined for various postconsumer recycling rates for both the polyethylene sack and the paper sack. In this analysis the recycled polyethylene or paper is assumed to replace virgin materials in producing new products. Currently, recycled grocery sacks are being made into products which we assume are not further recycled. For this reason both the paper and polyethylene grocery sacks are considered to be recycled in an open-loop recycling system (further discussion can be found in Chapter 2).

The impacts of incineration were also included in this analysis. A national average for solid waste incineration of 15 percent has been determined in the 1990 U.S. EPA Municipal Solid Waste Characterization Study. Thus, the postconsumer solid waste for the sacks was adjusted for 15 percent incineration.

Solid waste in the form of ash resulting from this incineration was estimated from the ash inherent in the materials. However, the atmospheric emissions which result from incineration of the polyethylene and unbleached paper with solid waste could not be estimated due to lack of data. While emissions from municipal solid waste incinerators have been characterized, we have no way to attribute these emissions back to a given material. Some studies have characterized the changes in emissions of average MSW to those of MSW "spiked" with specific materials. However, these types of analyses have not been done for unbleached paper or polyethylene.

Most atmospheric emissions from municipal solid waste incinerators will be treated in the gas scrubbers used in these facilities. These atmospheric emissions will eventually be disposed of in scrubber blowdown as solid waste. Since the atmospheric emissions for paper and polyethylene cannot be quantified, the impact of these emissions on scrubber blowdown also cannot be determined.

For both sacks, the corrugated boxes (for the polyethylene sacks) and paper sleeves (for the paper sacks) are assumed to be recycled because grocery stores typically bale and market their corrugated (the paper sleeves are included with the corrugated material). Because this material is assumed to be recycled, no secondary packaging materials are available for incineration or land disposal.

The margin of error for this study is believed to be plus or minus 10 percent. Therefore, distinctions in energy and environmental impacts will only be noted between packages if the difference is greater than 10 percent. It must be noted that the nature of error in this analysis is systematic and not due to randomness. Thus the margin of error cannot be statistically determined.

RESULTS

The results of this analysis are organized by two categories: energy requirements and environmental impacts.

Energy Requirements

The energy requirements for polyethylene and paper grocery sacks are reported in Table 1-1. These energy impacts are reported in million Btu per 10,000 uses for both 1.5 to 1 and 2 to 1 polyethylene to paper sack ratios at varying recycling rates. Figure 1-1 is a graphic illustration of the energy requirements reported in Table 1-1.

Table 1-1 and Figure 1-1 show that at 0 percent recycling, polyethylene sacks require between 20 and 40 percent less energy than paper sacks. As recycling rates increase for both sacks, this energy difference decreases. This is because the recycling energy savings occur at a greater rate for paper than for polyethylene. As the recycling rate approaches 100 percent, the polyethylene sack continues to have less energy requirements than the paper sack at the 1.5 PE to 1 paper sack ratio. However, at recycling rates of over 60 percent, the paper sack and polyethylene sack have equivalent energy requirements within the margin of error of this study for the 2 PE to 1 paper sack ratio.

Table 1-1

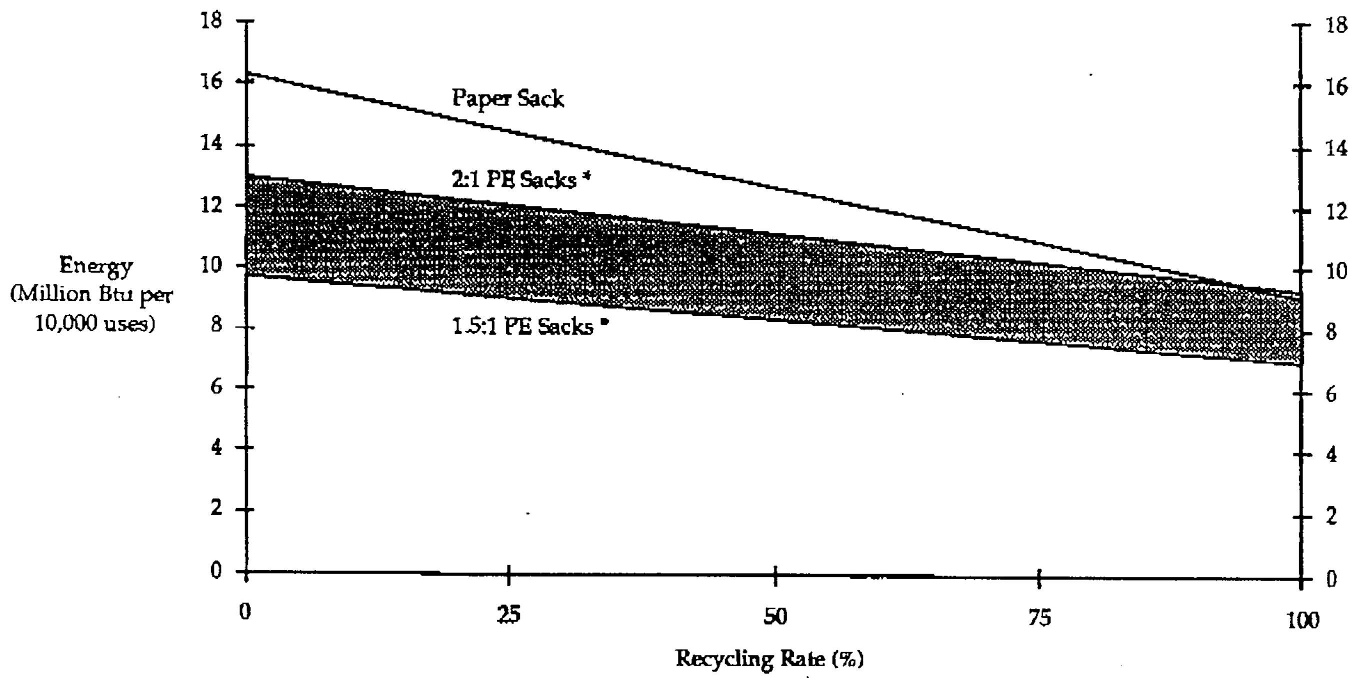
ENERGY REQUIREMENTS FOR 1/6 BARREL POLYETHYLENE AND PAPER GROCERY SACKS AT VARIOUS RECYCLING RATES 1/
(Million Btu per 10,000 uses)

	Recycling Rates				
	0%	25%	50%	75%	100%
1.5 PE to 1 Paper Sack Ratio 2/					
Polyethylene	9.7	9.1	8.4	7.7	7.0
Paper	16.3	14.5	12.7	10.9	9.1
2.0 PE to 1 Paper Sack Ratio 2/					
Polyethylene	13.0	12.1	11.1	10.2	9.3
Paper	16.3	14.5	12.7	10.9	9.1

1/ Assumes 15 percent of postconsumer wastes are incinerated.
2/ Ratio indicates the number of polyethylene (PE) sacks used per one paper sack.

Source: Franklin Associates, Ltd.

Figure 1-1. Energy Requirements For Grocery Sacks At Various Recycling Rates (Assumes 15 percent incineration.)



* Ratio indicates the number of polyethylene (PE) sacks used per one paper sack.

Environmental Impacts

The environmental impacts for the sacks are divided into three groups:

1. Solid wastes
2. Atmospheric emissions
3. Waterborne wastes.

These impacts are reported in Table 1-2.

Solid Wastes. The solid wastes generated by the grocery sacks are reported in Table 1-2 in cubic feet per 10,000 uses and include both postconsumer and industrial solid waste. Postconsumer solid waste volume was derived from weight by applying density factors reported in Chapter 4. A density of 24.8 pounds per cubic foot for polyethylene sacks and 27.4 pounds per cubic foot for paper sacks under landfill conditions were used for this study. Postconsumer solid waste is adjusted for 15 percent incineration of all materials not recycled. For industrial solid waste, a density of 50 pounds per cubic foot was used.

The solid waste data reported in Table 1-2 are also illustrated in Figure 1-2. Both show that at 0 percent recycling, polyethylene sacks contribute between 74 and 80 percent less solid waste by volume than paper sacks. Figure 1-2 also illustrates that the percent difference decreases as recycling increases. However, polyethylene sacks continue to contribute less solid waste than paper sacks at all recycling rates.

Atmospheric Emissions. Six components dominate the category of atmospheric emissions for paper and polyethylene sacks: particulates, nitrogen oxides, hydrocarbons, sulfur oxides, carbon monoxide, and odorous sulfur. For five of these six components, the polyethylene sacks produce less of each emission than do the paper sacks. Hydrocarbons are generated in greater quantities by the polyethylene sacks.

Table 1-2 lists atmospheric emissions for the grocery sacks in pounds per 10,000 uses. Figure 1-3 also illustrates these impacts for both packages. Table 1-2 and Figure 1-3 show that at 0 percent recycling the total atmospheric emissions are between 63 and 72 percent less for polyethylene than for paper sacks. From Figure 1-3, it can be seen that this difference decreases as recycling increases. However, the polyethylene sack continues to have less atmospheric emissions at all rates.

Waterborne Wastes. Four components dominate the category of waterborne wastes for the paper and polyethylene sacks: dissolved solids, biological oxygen demand (BOD), suspended solids, and acids. The polyethylene sack produces less of each of the four emissions than does the paper sack.

The waterborne wastes reported for 10,000 grocery sack uses in Table 1-2 are also graphed in Figure 1-4. Both show that at 0 percent recycling the polyethylene sack contributes over 90 percent less total waterborne wastes than the paper sack. Figure 1-4 shows that as the recycling rate increases for both grocery sacks, the difference in waterborne waste becomes greater because recycled paper contributes more waterborne wastes than paper made from virgin material.

Table 1-2

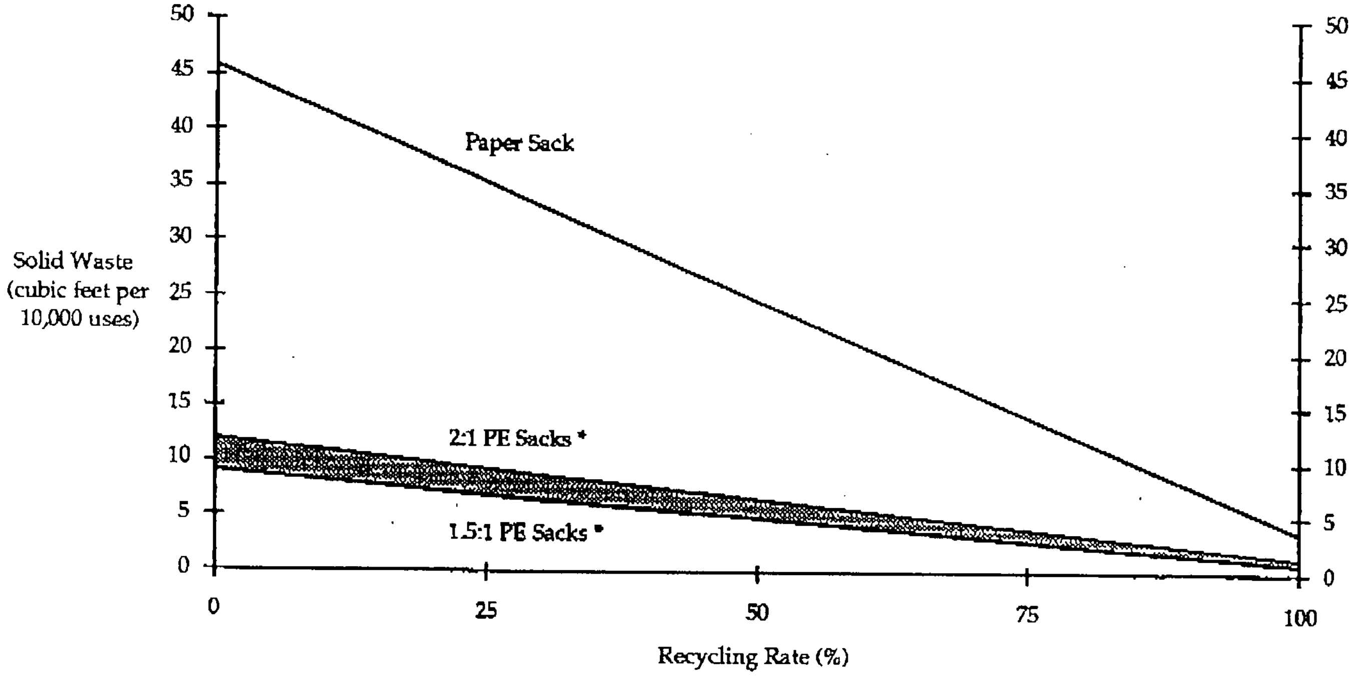
ENVIRONMENTAL IMPACT DATA
FOR 1/6 BARREL GROCERY SACKS
(Impacts per 10,000 uses)

	Solid Waste (cu ft)	Atmospheric Emissions (pounds)	Waterborne Wastes (pounds)
1.5 Polyethylene to 1 Paper Sack Ratio 1/			
Polyethylene sack			
0% recycle	9.1	17.9	1.8
25% recycle	6.9	16.9	1.7
50% recycle	4.9	15.8	1.6
75% recycle	2.9	14.8	1.5
100% recycle	0.9	13.7	1.5
Paper Sack			
0% recycle	45.8	64.2	31.2
25% recycle	35.3	56.2	34.3
50% recycle	24.7	48.2	37.6
75% recycle	14.2	40.2	40.7
100% recycle	3.7	32.2	43.9
2.0 PE to 1 Paper Sack Ratio 1/			
Polyethylene sack			
0% recycle	12.1	23.9	2.4
25% recycle	9.4	22.5	2.3
50% recycle	6.6	21.1	2.2
75% recycle	3.9	19.7	2.0
100% recycle	1.2	18.3	1.9
Paper sack			
0% recycle	45.8	64.2	31.2
25% recycle	35.3	56.2	34.3
50% recycle	24.7	48.2	37.6
75% recycle	14.2	40.2	40.7
100% recycle	3.7	32.2	43.9

1/ Ratio indicates the number of polyethylene (PE) sacks used per one paper sack.

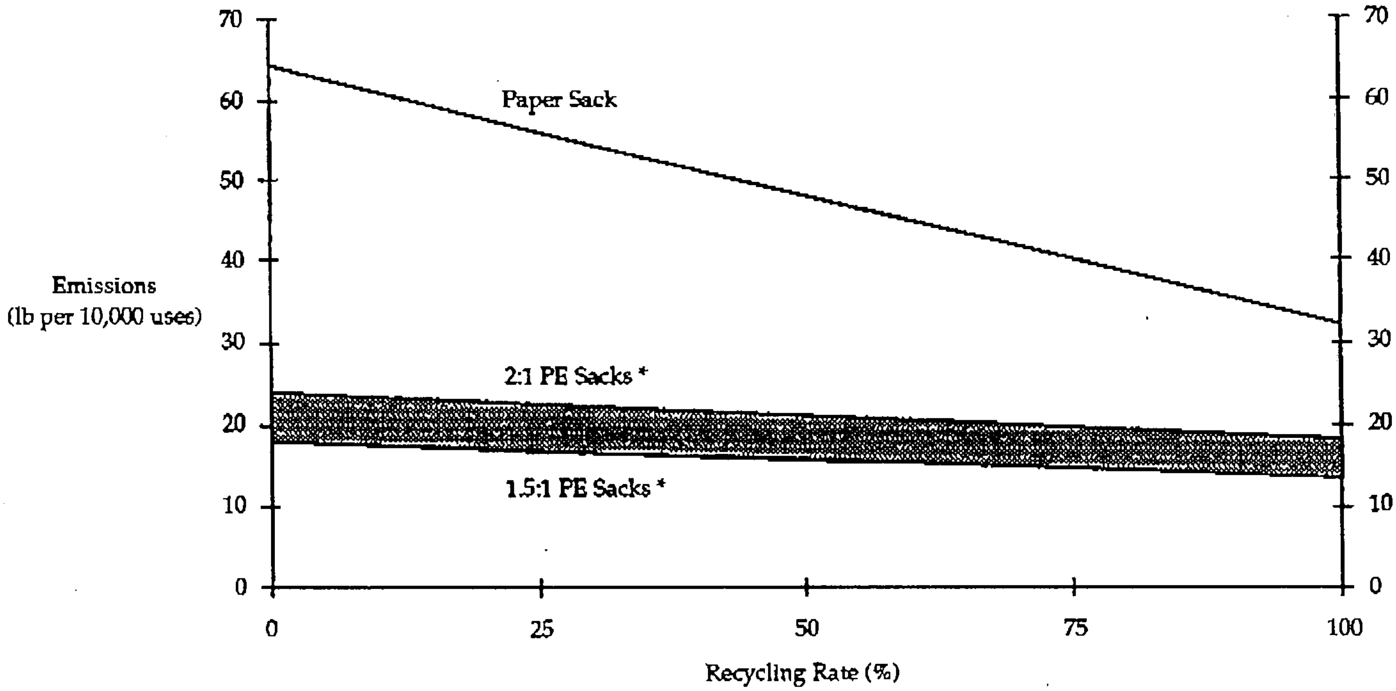
Source: Franklin Associates, Ltd.

Figure 1-2. Total Solid Wastes of Grocery Sacks
At Various Recycling Rates



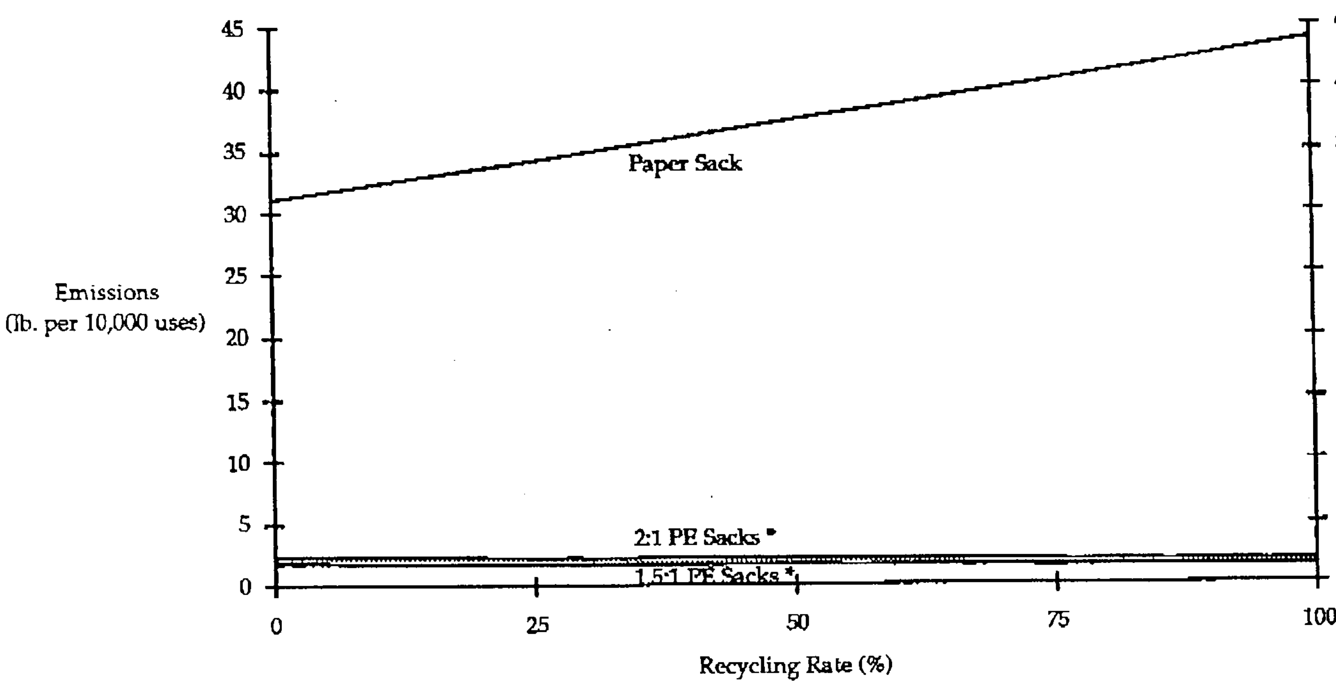
* Ratio indicates the number of polyethylene (PE) sacks used per one paper sack.

Figure 1-3. Atmospheric Emissions of Grocery Sacks
At Various Recycling Rates



* Ratio indicates the number of polyethylene (PE) sacks used per one paper sack

Figure 1-4. Waterborne Wastes For Grocery Sacks
At Various Recycling Rates



* Ratio indicates the number of polyethylene (PE) sacks used per one paper sack.

CONCLUSIONS

The following conclusions were reached regarding the energy and environmental impacts for 10,000 equivalent uses of polyethylene and paper sacks.

Energy

The energy requirements for the polyethylene grocery sacks are between 20 to 40 percent less than for paper sacks at zero percent recycling of both sacks. As recycling increases for both polyethylene and paper sacks at the 2 PE:1 paper sack ratio, the energy requirements become equivalent at approximately a 60 percent recycling rate. At the 1.5 PE:1 paper sack ratio, the polyethylene sack continues to require 23 percent less energy than paper even at 100 percent recycling.

Environmental

1. Polyethylene sacks contribute between 74 and 80 percent less solid waste than paper sacks at zero percent recycling. Polyethylene sacks continue to contribute less solid waste than paper sacks at all recycling rates.

2. Atmospheric emissions for the polyethylene sack are between 63 and 73 percent less than for the paper sack at zero percent recycling. These lower impacts for the polyethylene sack continue throughout all recycling rates.

3. At zero percent recycling rate, the polyethylene sack contributes over 90 percent less waterborne wastes than the paper sack. This percent difference actually increases as the recycling rate for both grocery sacks increases.

Further conclusions regarding the recyclability, incineration, and landfill of these sacks were determined from the detailed discussion of these issues addressed in Chapter 3.

Recyclability

Both polyethylene and paper sacks are recyclable. Manufacturing scrap and trim from the fabrication of the sacks are typically recycled. Postconsumer recycling for both of these sacks has not been significant. In the case of paper sacks, they are most typically recycled during the collection of old newspapers. For polyethylene sacks, efforts are usually concentrated on industrial scrap film However, efforts have recently begun to collect both polyethylene and paper grocery sacks at the postconsumer level.

Incineration Impacts

On a per pound basis, polyethylene releases 2.75 times more energy upon incineration than unbleached paper. However, on an equal use basis, paper grocery sacks weigh 4 to 5 times more than polyethylene grocery sacks. Therefore, on an equivalent use basis, the paper sack has a greater potential for energy released from incineration than the polyethylene sack. The ash content per pound of unbleached paper is greater than that of polyethylene. Thus, even on an equivalent use basis, the paper sack has a greater potential for more ash from incineration than the polyethylene sack.

Landfill Impacts

Volume. The landfill volume occupied by the polyethylene sacks is 70 to 80 percent less than the volume occupied by paper sacks based on 10,000 uses. These landfill volumes were derived from general material's landfill densities determined by Franklin Associates, Ltd. in conjunction with The Garbage Project, University of Arizona, Tucson. Further details of the volume estimates are contained in the section entitled Landfill Volume in Chapter 3.

Degradability. While some degradation occurs in landfills, little data exist regarding what materials degrade and the rate of decomposition. Therefore, the degradability of both paper and polyethylene grocery sacks cannot be predicted. As a consequence, no estimates can be made regarding the potential for impact on landfill leachate or methane gas production.

Proposed Plastic Bag Levy - Extended Impact Assessment Final Report

Volume 1: Main Report

Final Report

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Mike Holland (ERMC)
Richard Boyd (Metroeconomica)

AEA Technology Environment

Scottish Executive 2005
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- Scottish Executive Waste Strategy Team
- Carrier Bag Consortium
- Convention of Scottish Local Authorities (CoSLA)
- Friends of the Earth Scotland
- Scottish Retail Consortium
- Scottish Environment Protection Agency (SEPA)

Glossary

ARA	Australian Retailers Association
BRA	Belgian Retail Association
BRC	British Retail Consortium
CBC	Carrier Bag Consortium
CoSLA	Convention of Scottish Local Authorities
Defra	Department for Environment, Food and Rural Affairs (London)
ERM	Environmental Resources Management
HDPE	high density polyethene (polyethylene)
INCPEN	Industry Council for Packaging and the Environment
KSB	Keep Scotland Beautiful
LCA	Life cycle assessment
LDPE	low density polyethene (polyethylene)
LEAMS	Local Environmental Audit and Management System
MCS	Marine Conservation Society
NO_x	nitrogen oxides
ONS	Office of National Statistics
RMIT	Royal Melbourne Institute of Technology
SME	small-to-medium enterprise
SRC	Scottish Retail Consortium
SWAG	Scottish Waste Awareness Group
UCD	University College Dublin
VOC	volatile organic compound
WRAP	Waste and Resources Action Programme

Executive Summary

Mike Pringle MSP has tabled a Members Bill in the Scottish Parliament to impose an environmental levy on lightweight plastic carrier bags as provided by shops and other retail outlets. It is understood that this would cover all bags made partially or completely of plastic, with the exception of those used for directly packing of fresh meat, fish, fruit and other foods.

This brief study, commissioned by the Scottish Executive and undertaken by AEA Technology Environment and associates, has addressed the likely impacts of such a levy and variants of it on:

- The environment.
- Consumers.
- Business.
- Waste.
- Local authorities.

Advocates of a levy on plastic bags cite the main benefits as being reduced littering (including marine litter), reduced use of resources and energy, lower pollutant emissions and increased public awareness of environmental issues.

Opponents argue that lightweight plastic carrier bags are hygienic, convenient and durable, that they are often reused for other purposes, that they form only a small part of the litter stream and that they have a lower overall environmental impact than paper bags. They also claim that a levy would impact unfairly on poorer households and would lead to job losses in Scotland (from reduced plastic bag manufacturing and importing).

The study has considered these and other arguments for and against a levy, quantifying the probable effects wherever possible. It considered a range of different scenarios:

- Scenario 0: No levy, i.e. business as usual.
- Scenario 1A: A levy of 10p on plastic but not paper bags, covering all businesses (as proposed in the Bill).
- Scenario 1B: A levy of 10p on plastic but not paper bags, covering all businesses except small and medium sized enterprises (SMEs) and charities.
- Scenario 2A: A levy of 10p on plastic and paper bags, covering all businesses.
- Scenario 2B: A levy of 10p on plastic and paper bags, covering all businesses except SMEs and charities.

A wide range of evidence has been used to inform the study. This includes experience from the PlasTax in Ireland and voluntary schemes in the UK along with results from life cycle analysis (LCA) studies from France and Australia.

The study does not make a judgement on whether, on balance, such a levy should be introduced, but provides evidence on the main effects expected under each of the four levy scenarios.

Overall Effects

A levy would cause a set of interacting effects. The study is predicated on evidence that a levy would stimulate a switch away from use of plastic bags (by typically 90%). If only plastic bags were to be levied (scenarios 1A and 1B), then studies and experience elsewhere suggest that there would be some shift in bag usage to paper bags (which have worse environmental impacts). This study is based on this experience of behaviour change.

In each of the areas considered – environment, consumers, business, waste and local authorities - there would therefore be a complicated set of effects, but in general:

Environment The environmental impact of each of the four levy scenarios was assessed using 8 indicators. These include energy, water, waste and litter. Under the levy as proposed (scenario 1A) 5 out of the 8 indicators show an improvement.

There are different impacts under each levy scenario. In particular, including paper bags increases the potential environmental benefits of a levy (e.g. scenario 2A or 2B) where all 8 indicators improve.

In all cases the changes in environmental indicators due to a levy are modest (i.e. 1% or less) in comparison to overall environmental impacts from other activities in Scotland (as shown in Table A3.7).

Consumers Consumers act to reduce the financial impact by switching away from use of carrier bags. This limits the detrimental financial impact for consumers to a maximum of £10 per person per year.

Business The impacts would be positive for food retailers, and detrimental for non-food retailers and other businesses such as plastic bag manufacturers.

Waste Under scenarios 1A and 1B waste increases due to a switch from plastic to paper bags. When paper bags are included in the levy (e.g. scenario 2A or 2B) waste arisings fall. The greatest increase, 5,409 tonnes, is for scenario 1A, while the greatest decrease, 4,993 tonnes, is for scenario 2A. These should be compared against total household waste arisings of 2,094,872 tonnes pa [SEPA], a 0.26% increase and a 0.24% decrease respectively.

In all scenarios litter reduces, but plastic bags are only a small percentage of reported litter.

Local authorities There will be set-up costs and on-going costs to administer the levy. In general the revenue from the levy is expected to cover the on-going administration costs. However there are important differences between the on-going costs and revenues between local authorities. For example smaller authorities could receive lower revenues without a proportional reduction in administration costs.

Impacts on the Environment (Section 4 in the main report)

The study used an LCA approach to evaluate the changes in a range of different environmental indicators (e.g. energy use, water use, waste etc). The analysis shows that there would be an environmental benefit for some of the indicators depending on what consumers choose to use were a levy to be introduced.

In all scenarios where the levy is applied, consumption of non-renewable energy, atmospheric acidification and formation of ground level ozone and the risk of litter would be considerably less than the current situation.

In scenarios 2A and 2B, where the levy is applied to paper bags as well as plastic bags, these environmental benefits increase. In addition there are reduced impacts in terms of consumption of water, emissions of greenhouse gases and eutrophication of water bodies (rivers, lakes, etc.). This is because paper bags have a higher environmental impact in these categories relative to plastic bags.

As these results depend on key assumptions we undertook a sensitivity analysis to assess how this changes the results. This shows that scenarios 1A and 1B, which increase use of paper bags, are more sensitive to key assumptions than scenarios 2A and 2B. Excluding SMEs in the levy (scenarios 1B and 2B) accentuates the impacts.

For each of the environmental indicators used in this study we have assessed the total impact from all activities in Scotland. This analysis shows that the environmental benefits in all indicators from a levy are modest (i.e. 1% or less) when compared to overall environmental impacts from other activities in Scotland.

Impacts on consumers (Section 5 in the main report)

Consumers would obviously have to pay the levy itself overtly, on levied bags they continue to use, but the true additional financial burden of a levy on consumers in Scotland depends on a number of other factors as well. This draws upon experience from Ireland of the change in behaviour and therefore bag use. The total cost was calculated from the amount of levy paid for carrier bags, the relative hidden costs of plastic and paper bags[1], the costs of buying additional heavyweight plastic carrier bags (so-called 'bags for life'), the costs of buying additional bin liners, and additional VAT.

The cost to the consumer also depends on whether or not certain costs (in particular the 'hidden costs/savings') are passed on to the consumer by the retailer.

This leads to a wide range of estimated costs to the consumers, depending on assumptions. In Scenarios 1A and 1B (no levy on paper bags) the estimates ranges from £7.41 to £10.58 per year. In Scenarios 2A and 2B (levy on paper bags as well) the range is from about £2.50 to £6.11 per year.

[1] Hidden costs cover the purchase, transport and storage of bags by a retailer, normally passed on to consumers through the price of goods.

Including paper bags in the levy would therefore reduce the financial burden. Indeed this has a bigger effect on the range than whether or not SMEs are included.

The estimates of financial impact on consumers should be compared with average household expenditure in Scotland, this is £365 per week.

Impacts on business (Section 5 in the main report)

a) Retailers

After taking set-up and administrative costs into account, the food retail industry would benefit from net cost savings from the proposed bag levy. Savings would result from having to buy far fewer plastic carrier bags (now usually given away for free[2]), while sales of 'bags for life' and bin liners would increase.

However, this would not be the case for non-food retailers (e.g. clothing), as experiences in the Republic of Ireland following the introduction of the so-called PlasTax has seen a more pronounced shift to paper bags in these stores.

In terms of systems needed to comply with the proposed levy, larger retailers are expected to find this easier, having computerised systems and greater resource available. Smaller retailers may well not have computerised systems and the levy would thus represent a greater burden

b) Other business

There are an estimated 15–20 manufacturers, importers and distributors of plastic carrier bags in Scotland, most of which are SMEs. All will be affected by the proposed levy. It is believed that the imposition of a plastic bag levy in Scotland would lead to job losses, as it is considered unlikely that plants that currently manufacture plastic carrier bags would switch to alternative products (e.g. production of bin liners). Losses have been estimated at between 300 to 700 direct jobs, with further indirect jobs being affected (e.g. in support and distribution services).

Impacts on Waste (Sections 4 and 5 in the main report)

In all four levy scenarios, the total number of carrier bags (lightweight and heavyweight plastic and paper) used in Scotland per year would decline as a result of the levy. However, if paper carrier bags are not subject to the levy (as in scenarios 1A and 1B), the total tonnage of all carrier bags used and requiring disposal actually increases by 5,409 tonnes for scenario 1A (the proposed levy). Scenario 2A (including paper in the levy) would yield the greatest reduction in the tonnage of waste relative to current levels (a reduction of 4,993 tonnes per year). For comparison, in 2002/03 household waste in Scotland was 2,094,872 tonnes [SEPA] and 5,409 tonnes extra represents a 0.26% increase, whilst 4,993 tonnes less equates to a 0.24% decrease.

[2] Some stores in independent initiatives already charge for their lightweight carrier bags.

This analysis suggests some potential for an increase in solid waste generation for scenarios that favour a switch to paper bags. This is due to different assumptions about the relative weight of plastic and paper bags, and the fact that the LCA looks at solid waste impacts throughout the bag life cycle rather than just the end-of-life disposal phase.

Impacts on local authorities (Section 6 in the main report)

To determine the costs of set up and administration for local authorities would require a detailed specification of the systems and wider discussions. Our preliminary estimates suggest that the application of the levy to all businesses could cost Scottish local authorities, collectively, about £3–4 million to set up and £3.5 million per year to manage. This would reduce to £1.5–2.5 million to set up and £1.75 million per year to manage if the levy was applied selectively, i.e. based on retailer size or function.

These costs could be more than offset by revenues from the levy estimated at £7.75 million per year for all businesses and £5.5 million per year if applied selectively. However, smaller local authorities could receive lower revenues without a proportional reduction in administrative costs.

The Convention of Scottish Local Authorities (CoSLA) has reservations about the duty of collection falling to the local authorities and its concerns regarding the magnitude and potential administrative costs of the Levy, which they believe needs a full investigation.

Alternatives to the levy (Section 3 in the main report)

In addition to the assessment of the impacts of the levy scenarios, the study examined the details of alternatives to the levy.

The Carrier Bag Consortium (CBC) has developed a draft voluntary code to develop waste reduction and reuse initiatives and to continue product engineering to make further savings in the production, transportation and storage of plastic carrier bags. This has been submitted to the Voluntary Code of Conduct working group set up by the British Retail Consortium (BRC) and the Scottish Retail Consortium (SRC).

A voluntary approach has already been adopted in Australia, where use of carrier bags fell by 20.4% between 2002 and 2004.

Report Structure

This summary provides a brief introduction to the analysis methodology and results of the study. The main sections of the report are:

Volume 1

Section 1 reviews the context for the study.

Section 2 sets out background information on the various types of carrier bags and why they would be subject to a potential levy and reviews experience in Ireland.

Section 3 presents an assessment of the views for and against a levy based on experiences from around the world and from a variety of stakeholders.

Section 4 presents the life cycle assessment (LCA) analysis undertaken for different plastic bag levy scenarios.

Section 5 analyses the impacts a levy would have on consumers and businesses.

Section 6 gives a brief review and commentary on levy collection and its potential impact on local authorities.

Section 7 presents our conclusions.

Volume 2

Appendix 1 reviews international experience.

Appendix 2 provides details of the retail context.

Appendix 3 provides detail information on the LCA approach including the sensitivity analysis.

Appendix 4 provides graphs on the distribution of revenue to local authorities.

Both volumes include a glossary and a full set of references.

Contents

1 Report Context

Mike Pringle MSP (www.mikepringlemsp.com) tabled a Members Bill in the Scottish Parliament for a Member's Bill to enable local authorities in Scotland to impose an environmental levy on specified plastic bags [Pringle]. If passed, this legislation would cover all plastic bags provided by retailers at point-of-sale or from other outlets. The inspiration for this bill was taken from the experience of the plastic bags levy (the so-called PlasTax) in the Republic of Ireland.

The Scottish Executive commissioned this brief study from AEA Technology Environment and associates in order to investigate and assess the range of environmental, business and consumer impacts related to the proposal to introduce a plastic bag levy in Scotland. In doing so, other potential options or variants on the proposed levy have also been researched.

In this study, we used the Irish definition of a lightweight plastic carrier bag, i.e. 'any bag made wholly or in part of plastic, suitable for use by a customer at point of sale in a supermarket, service station or retail outlet'. Heavier weight plastic carrier bags, the so-called 'bags for life', costing more than €0.70 (around £0.48) are excluded from the Irish levy.

This Volume of the report is structured as follows:

Section 2 sets out background information on the various types of carrier bags and why they would be subject to a potential levy.

Section 3 presents an assessment of the views for and against a levy based on experiences from around the world and from a variety of stakeholders.

Section 4 presents the life cycle assessment (LCA) analysis undertaken for different plastic bag levy scenarios. As well as the bill tabled by Mike Pringle, we assessed scenarios that looked at the effect of applying the levy to paper bags as well as plastic bags and focusing only on larger retailers. No new LCA was undertaken for this report. Instead, the results from other suitable LCAs were adapted with Scottish data to show the relative environmental effects of a levy or variants thereof.

Section 5 analyses the impacts a levy would have on consumers and businesses.

Section 6 reviews and comments on levy collection and impacts on local authorities.

Section 7 presents our conclusions.

Volume 2 of the report contains the following Appendices:

Appendix 1 reviews international experience.

Appendix 2 provides details of the retail context.

Appendix 3 provides details on the LCA approach including the sensitivity analysis.

Appendix 4 provides graphs on the distribution of revenue to local authorities.

References are designated in square brackets, e.g. [CBC].

2 Introduction

The estimates for the number of lightweight plastic carrier bags issued in the UK vary from 8 billion [Defra 2003] to 10 billion [WRAP 2005]. From these, a range of 690–860 million has been estimated for use in Scotland based on population statistics. The calculations and assumptions behind this range are given in Section 4.3. The estimated cost of these bags to UK retailers also varies. Some sources suggest the cost to UK retailers is around £1 billion per year [BBC, WRAP 2004b], whereas the Carrier Bag Consortium (CBC) suggests that, based on the unit price of bags, the cost is closer to £64–80 million.

2.1 The Different Types of Carrier Bags

Most outlets currently provide free lightweight bags[3] made from conventional polyethene (polyethylene) plastic or bags made from degradable plastic (some outlets do make a charge[4]). Most major supermarket retailers also offer heavyweight reusable bags known as 'bags for life', for which they charge a small sum. Some shops also provide paper bags free of charge. The main types of carrier bags are described below; Table 2.1 summarises their key features.

Disposable High-Density Polyethene (HDPE) Bags

These plastic bags offer a thin, lightweight, high strength, waterproof and reliable means of transporting shopping. Research and development by the industry has reduced the average weight of such a bag by 60% compared with 20 years ago, while retaining the same strength and durability. Such bags are currently found in supermarkets and other food retail outlets.

Disposable Low-Density Polyethene (LDPE) Bags

These bags are currently given away free by many UK retailers (e.g. clothing shops). Like their HDPE counterparts, they are made from a by-product of oil refining.

Reusable Low-Density Polyethene (LDPE) Bags,

These are heavier gauge plastic carrier bags, often called 'bags for life'. Retailers charge for these (typically around 10p). The intention is that the customer uses them repeatedly and then returns them to the store for recycling when they are worn out, receiving a free replacement. Such bags are offered in many UK supermarkets.

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[3] Throughout this report, the term 'lightweight' plastic carrier is used to describe 'disposable' plastic carrier bags available at the checkout as opposed to reusable bags such as 'bags for life'. Bags will vary in size depending upon products purchased. We understand, and have taken into account, the fact that lightweight plastic carrier bags are often reused for a second purpose.

[4] For example, Lidl and B&Q (see Appendix 2).

Paper Bags

The paper bags issued by shops range from very simple ones for small items (e.g. from newsagents and greengrocers) to larger ones (e.g. issued by fashion and shoe retailers). Some paper bags have plastic handles or plastic coatings. Under the terms of the Irish definition of plastic carrier bags (i.e. a bag with a plastic content), it is assumed that paper bags with a plastic content would be subject to the levy.

It is a misconception that paper bags are environmentally friendly because they are biodegradable. The increased volume of waste and the impact of their manufacture and transportation all need to be taken into account.

Polypropylene Bags

Polypropylene[5] has many uses for producing rigid and flexible containers, as well as furniture, and is also derived from oil resources. Non-woven polypropylene bags are available at shops such as Marks and Spencers in the UK, where they retail at more than £1. They are strong and durable and, like 'bags for life', are intended to be used many times.

Woven polypropylene bags are available at J Sainsbury in the UK as well as in the Republic of Ireland at Tesco and Dunnes stores. Woven bags are produced by stretching the polypropylene in production to form "fibres", the result is a stronger bag.

Degradable Bags

Bags that can be broken down by chemical or biological processes are described as degradable. Intuitively, degradable bags are expected to be environmentally friendly and a number of retailers are actively pursuing this option. Thus, there is often some surprise when reports suggest that degradable bags are not such an 'environmentally friendly' option. Waste management protocols emphasise the need to prevent, reduce, reuse, recycle and then recover energy. Encouraging disposal via degradation runs counter to this approach.

It can also be difficult to agree whether a particular type of bag is degradable or not. This could become significant if biodegradable bags were to be exempt from the levy.

Types of degradable bags

There are two main kinds of degradable bags[6].

- **Biodegradable** bags are made from natural starch sources such as maize and synthetic polyesters that degrade through the enzymatic action of micro-organisms (bacteria, fungi and algae), essentially rotting down like vegetable matter. However, starch-based biodegradable carrier bags are not available in significant numbers in the UK. They would only be covered by a potential levy on plastic carrier bags if they contained some plastic (some do for bag-strengthening reasons).

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[5] Correct chemical name is polypropene

[6] Biodegradable bags can be properly classified by how they decompose (either by microbes or through heat, ultraviolet light and water) and by the material they are made from (e.g. natural starch sources such as maize or wheat, or synthetic polymers from oil). Blended materials are also available, e.g. starch with HDPE or polyester [RMIT]

- **Bioerodable** bags are made from synthetic plastics (oil-based) with trace degradation initiators (HDPE with an approximately 3% content of heavy metals such as manganese and iron[7]) and, as such, would be covered by a plastic bags levy. They bioerode primarily by oxidation and erosion of the plastic through the action of light and heat until very small particles of plastic remain (these often degrade biologically). It is reported that, in an anaerobic environment, the degradation process is halted for some types of bioerodable bags [RMIT, Symphony Plastic Technologies].

Concerns Regarding Bioerodable Bags

- **Recycling.** Conventional polyethene plastic bags (HDPE and LDPE) can be recycled into new products such as other bags and solid items such as 'plastic' wood (known as plaswood). It will be difficult to keep the different kinds of bag apart (HDPE and LDPE bags for recycling and bioerodable bags for composting), especially if both are available in the same community. Inevitably, bioerodable bags will get into this plastic bag waste stream and thus contaminate the recyclate. If the resulting recycled item contains a certain percentage derived from bioerodable bags, it will have inherently lower functional properties (i.e. it will start to degrade when in contact with water, ultraviolet light, etc.). This could have serious implications if the recycled plastic is used for pipes for water, gas supply or as fencing posts or seats [RMIT]. Some types of bioerodable bags[8] are reported not to damage the overall value of the reclaimed material as the degradant initiator is destroyed during reprocessing.

- **Shelf-life and storage.** Bioerodable bags may start to decompose early if exposed to high temperatures, light or moisture. This compromises their carrying ability, though vacuum packaging is reported to prevent this [Symphony Plastic Technologies].

- **A solution to littering problems.** This claim is felt to send the wrong message to the consumer, i.e. it is acceptable to discard these bags because they will eventually rot down. The argument is that consumers should be informed of the need to reuse bags to reduce litter and resource consumption [RMIT]. In addition, the Marine Conservation Society (MCS) reports that any littered bioerodable bags based on HDPE will still cause problems to wildlife as they will break down into smaller pieces that can be ingested [MCS 2005]. This is questioned by Symphony Plastic Technologies, which suggests that degradation to carbon dioxide, water and humus is likely and that, should an animal ingest these smaller pieces, the degradation process will actually continue in its gut.

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[7] Also copper, nickel, cobalt and cerium as well as photoactive compounds such as ferrocene.

[8] Oxo-biodegradable plastic bags produced by Symphony Plastic Technologies plc

- **Provision of appropriate conditions for planned benign degradation.** Bioerodable bags are designed to decompose through the action of sunlight, water, stress and, ultimately, the enzymatic action of microbes in an aerobic environment. Where degradable bags are simply disposed of alongside other 'household waste' and then landfilled (like most household waste in Scotland [SEPA]), then the necessary conditions to allow degradation may well be absent and thus the environmental 'benefits' lost.

Certification and Labelling

Manufacturers of degradable polymers have signed a voluntary agreement with the European Commission to use environmentally friendly polymers in packaging that "*will effectively guarantee a biodegradability standard for products such as plastic bags, cups and plant pots, enabling them to be turned into compost and soil improvers.*" The agreement includes a certification and labelling scheme to help consumers and manufacturers identify products made from degradable polymers [EU Commission].

Key Features of Carrier Bags

Table 2.1 summarises some of the key features of the various types of carrier bags available, including their costs and relative sizes compared with conventional lightweight plastic carrier bags.

Table 2.1 Key features of carrier bags

Bag type	Features	Average cost to the retailer per thousand bags *	Average weight per thousand bags (kg)*	Relative bag storage volume**	Recyclability
Lightweight plastic carrier	Light, strong, durable, effective when wet	£7.47	8.4	1	Yes – but not all stores have facilities
'Bag for life'	Light, strong, durable, effective when wet	£60.88	47.4	4	Yes – system of replacement actively encouraged
Fully degradable plastic bag	Light, strong, durable, effective when wet	£6 to £8	6.5	1	Degradable under the right conditions. Problematic if contaminate conventional plastic recycling.
Paper, without handles §	Convenient	£50	51	8	Yes – kerbside collections available
Paper, with handles §	More appealing to customers e.g. for shoes and clothes	£220	124	10	Yes – kerbside collections available but can be more problematic due to mixed materials
Non-woven polypropylene	Durable, strong, effective when wet	£333.33	138.7	20	Not at present
Woven polypropylene	Durable, strong, effective when wet	£433.33	226	20	Not at present

* Data provided by CBC and Symphony Plastic Technologies plc. Based on average price of an average bag.
**The relative volume of bags (to a conventional lightweight bag) is important for transportation and storage units required compared with plastic carrier bags.
§ The average weight of all paper bags available is 99g (arithmetic mean of 51, 81 and 166g). The values of 51g and 99g are used in the LCA in Section 4 for various analysis sensitivities.

2.2 Summary of the Irish Experience

A key motivator for the introduction of a levy on plastic bags in Scotland is the experience from the Republic of Ireland, where a levy known as the PlasTax was introduced in 2002. We consulted the Department of Environment, Heritage and Local Government in the Republic of Ireland for its views on the introduction and operation of the PlasTax. The Department said:

- The PlasTax was primarily an anti-litter measure with the secondary aims of increasing public awareness and changing behaviour. Introduction of the levy coincided with introduction of Ireland's Waste Strategy.
- No documented evidence is available showing a reduction in visible litter in the Republic of Ireland because of the levy. The Department has commented that *"littering of plastic carrier bags is no longer a problem"*.
- Approximately €1 million are raised each month from the levy.
- The decrease in bag usage was initially 90% and is now 95%.
- The main cost to retailers was updating their software so that till receipts would itemise the sale of plastic carrier bags.
- Theft was reported to increase at the outset but, when the Department investigated these claims, they were unable to substantiate them.
- Some increased control measures were introduced to stop trolleys being taken away from stores.
- Although use of paper bags has increased, it is not felt that their exclusion from PlasTax has been to the detriment of the scheme. Paper bags are reported as being used mainly by fashion and shoe shops. The grocery sector has switched largely to reusable bags.
- The advertising campaign, which was high profile and intensive, was considered a successful element in smoothing introduction of the levy.
- There are approximately 30,000 accountable persons registered in the Republic of Ireland. An accountable person is responsible for submitting the required information to the Revenue Commissioners.
- Compliance levels are reported to be very good. There is a facility for 'estimating levy liability' if retailers fail to submit returns or if the return is considered too low.
- There have not been any prosecutions. Any retailer not complying with the law has been visited, their non-compliance verified and a warning issued.

- Funds have been used to support waste recycling infrastructure, ongoing running costs and the introduction of dedicated staff to enforce waste legislation (with a particular focus on illegal waste dumping).

- An independent review of the scheme will be undertaken during 2005, three years after its introduction.

- A voluntary code was considered but the advice received suggested that this would be less effective.

3 The Arguments For and Against a Levy

The focus on plastic bags, in particular, is supported by:

- The high volume used.
- The perception that they are generally supplied 'free of charge'.
- The fact that they are a secondary form of packaging.
- The assertion that they add to litter in a highly visible manner.
- Their persistence in the environment.
- The view that they are potentially easy to replace.
- The view that they represent an 'easy target for visible success'.

3.1 The Arguments For a Levy

A bill for levy for certain plastic carrier bags in Scotland has been presented by Mike Pringle MSP [Pringle] following the introduction of the Irish PlasTax as a means of altering behaviour to help protect the environment. A further benefit stressed by Mike Pringle is the reduction of litter while encouraging the reuse of plastic bags. He argues that many plastic bags are not reused but end up in landfill sites or, worse still, as litter on the streets of Scotland.

Proponents of a levy cite the following potential benefits:

- Reduced resource consumption.
- Reduced energy consumption.
- Reduced emissions of greenhouse gases.
- Less litter.
- Increased public awareness of environmental issues in general.
- Strong message to change behaviour.

A Throwaway Society

Mike Pringle asserts that plastic bags contribute significantly to our throwaway culture of waste and argues that their use needs to be curbed, resulting in benefits for both the environment and business. He hopes that, by extension, people would be encouraged to think more about the other products and services they use and become more aware of reuse and recycling issues in general.

The proponents of a levy suggest that plastic carrier bags are only used twice at the most – to take purchases home and then, largely, for rubbish disposal. As such, they argue that plastic carrier bags are a needless waste of resources. This waste includes both the crude oil by-product resource from which the bags are made and the transport resources to deliver them from the manufacturing site[9] to the retail outlets where they will ultimately be distributed.

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[9] Approximately 90% of plastic carrier bags used in the UK are imported from the Far East/China [CBC, Pringle]

Recycling levels for plastic carrier bags are low in Scotland and supporters of the levy argue that those that are not disposed of responsibly could increase the problems of litter. They often quote the sight and impact of wind-blown bags caught in trees and bushes to illustrate this point.

Litter and Damage to Wildlife

Further problems with littered carrier bags, especially in marine environments, are also cited. The Marine Conservation Society (MCS) conducts annual surveys every September in the UK to collect and remove litter from beaches. During this work, the MCS catalogues the amounts and types of litter found. The results are given in the MCS's Beachwatch reports [MCS 2003, MCS 2004, Independent].

In 2003, the survey covered 135 km of UK coastline and, in 2004, this rose to 145 km. Table 3.1 presents the survey data relevant to plastic bags. This category includes supermarket carrier bags as well as other kinds of plastic bags.

Table 3.1 MCS beach litter survey results

Year	Total number of plastic bags collected	Percentage of total litter	Plastic bags per km of coastline
2003	5,831	2.10%	43.2
2004	5,592	2.03%	38.5

The results show a drop of 4% from 2003 to 2004 in the numbers of plastic bags of all kinds collected. However, it is difficult to say whether this figure is statistically significant as it will depend on which beaches were visited.

It is also stated that a range of marine life such as whales, dolphins and turtles are severely injured or killed because they ingest or become entangled in plastic – as many as a million birds and 100,000 marine mammals worldwide every year [Envt Canada, MCS 2005]. One of the reasons given for why marine wildlife consume plastic bags is that they may mistake them for jellyfish, a main source of food for marine mammals. The consequence of this error is that the bags block the throat preventing normal feeding [Envt Canada, MCS 2005]. In 2004, the helpline run by Scottish Society for the Prevention of Cruelty to Animals (Scottish SPCA) received nine calls relating to animals that had become trapped in plastic bags, this is 0.01% of all calls taken. The Scottish SPCA note that the number of calls received will only represent a fraction of the actual number of wild animals who become entangled.

A survey undertaken in the Bay of Biscay during the early 1990s reported that plastic bags of all kinds, including lightweight plastic carrier bags that had been washed out to sea from land-based sources, accounted for 95% of all litter in sub-surface tows [Galgani].

Charting Progress - An Integrated Assessment of the State of UK Seas [Defra 2005] states:

> *"Marine litter can pose a hazard to beach users and recreational water users. Fish, seals, cetaceans and seabirds can become trapped (e.g. in sections of discarded fishing nets and plastic or rubber rings). They can also ingest plastic particles and objects, which can be fatal. Marine litter can also degrade the aesthetic quality of the environment, particularly in tourist areas."*

Clearly, this is not all due to plastic carrier bags as they make up only a proportion of this litter.

3.2 The Arguments Against a Levy

A number of organisations have lobbied against imposing taxes on plastic bags in many countries. These include the CBC in the UK, the Australian Retailers Association (ARA) and the Belgian Retail Association (BRA).

The Benefits of the Plastic Carrier Bag

The advantages highlighted by proponents of plastic carrier bags [ARA, CBC, EuroCommerce] include:

- Hygiene.
- Convenience.
- Reliability/efficacy/durability (paper bags often rip and are 'double-bagged').
- They can be reused for other purposes in and around the home, e.g.
    - as bin liners;
    - for storing shoes;
    - for collecting pet mess.
- Their disposal results in lower greenhouse gas emissions compared with disposal of bioerodable bags of paper, starch or plastic origin.
- There are lower environmental effects compared with paper bags in terms of production and transport as plastic bags use fewer resources, take up less volume and weigh less.

Hygiene is an important issue and, as is the case in Republic of Ireland, bags for wrapping fresh meat, fish, poultry and loose fruit would need to be excluded and remain free of charge because of their hygienic functional role[10].

Negligible Impacts on the Waste Stream

Plastic films, which include carrier bags and other plastic packaging, make up 4.37% of the household waste stream on average[11] in Scotland [SEPA]. To put these figures in context, paper and card makes up almost 25% of the household waste stream by weight while putrescibles (e.g. waste food) nearly 32%. Furthermore, plastic bags alone constitute about 0.3% of the municipal waste stream in the UK [HM Treasury].

The amount of municipal solid waste (household and commercial waste) collected by local authorities across Scotland for disposal in 2002/03 was 2,589,702 tonnes[12]. Using the UK data, 0.3% of the municipal waste stream by weight equals 7,769 tonnes per year of plastic bags. Any reduction in the amount of plastic bags disposed of would have very little effect on the overall waste disposal figures. Further analysis of the waste issues is provided in sections 4.6 and 5.2.

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[10] It is a statutory requirement under the Food Safety (General Food Hygiene) Regulations 1995 SI 1763 that meats are packed appropriately before supply to the customer

[11] Range of 1.84–6.08% for 2002/03 [SEPA]

[12] Scottish local authorities collected a total of 3,345,458 tonnes of controlled waste (household, commercial and industrial) for disposal or recycling in 2002/03 [SEPA].

One of the aims of the EU Landfill Directive is to reduce the amount of biodegradable municipal waste going to landfill. The imposition of a levy that excluded paper bags is expected to increase the number of paper bags used and disposed. Although some would be recycled by consumers (e.g. through kerbside collections), there would ultimately be more paper bags going to landfill where they would degrade giving off greenhouse gases.

Single Trip or Multi-trip?

The Scottish Waste Awareness Group (SWAG) survey *Public Attitudes to Reduce, Reuse, Recycle in Scotland* (2001) stated that:

> "*The number of people engaging in this range of practices [reuse] was limited, the most commonly practised behaviour was the reuse of materials. This was achieved primarily through the reuse of plastic bags (84% of respondents), although the majority of these were ultimately used as bin liners*". [SWAG]

A Waste Watch study for the UK reported that 54% of people questioned said that they reuse plastic carrier bags, with secondary reuse as bin liners a typical example [Waste Watch]. This study states that:

> "*Recent research suggests that four out of five people reuse products. Plastic bags and glass jars or bottles are reused by around half the public and plastic containers or bottles by one in five.*"

Both the SWAG and Waste Watch studies suggest that a proportion of respondents reuse lightweight plastic carrier bags, often as bin liners. If so, the majority of bags would only be reused once. It must also be made clear that, when the SWAG survey states that 84% of respondents reuse bags, this does not mean that 84% of bags are reused. What it means is that 84% of people reuse some of their carrier bags at some point; a similar logic applies to the results of the Waste Watch study.

A more recent study undertaken by the Waste and Resources Action Programme (WRAP) found that, of the 1,048 people interviewed, 59% said they reuse all their lightweight plastic bags with a further 16% saying they reuse most of them [WRAP 2005]. The main use by far was as a surrogate bin liner, though other uses were reported such as other shopping, collecting pet mess or carrying other things when going out.

Litter Culprits?

A Local Environmental Audit and Management System (LEAMS) report by Keep Scotland Beautiful (KSB) states that the main items of litter in Scotland are:

- Cigarette litter (cigarette ends, matches, matchboxes, cigarette packaging) found at 70% of sites inspected.
- Confectionary litter (sweet wrappers, chewing gum wrappers and crisp packets) found at 50% of the sites inspected.
- Drinks-related litter (cans, bottles, cups, straws and lids) found at 34% of sites.
- Fast food packaging litter (fish & chip wrappers, polystyrene cartons, burger wrappers, plastic cutlery) found at 10% of sites.

Even though those plastic carrier bags that are littered are visible and persistent in the environment, the report did not mention them specifically [KSB].

Windblown plastic litter in the environment is often from other plastic sources such as the agricultural wrappings for hay bales, etc. [CBC]. WRAP has commented that a reduction in plastic bags used would not result in a noticeable improvement in the overall litter situation [WRAP 2004a].

These results have been echoed elsewhere in the UK by ENCAMS[13]. Its surveys have also shown that the main littering problems in England are from smoking products, food and drinks containers (plastic and glass) and dog mess, with the most prominent commercial litter coming from elastic bands dropped by postmen [ENCAMS].

A further recent survey conducted in England, commissioned by the Industry Council for Packaging and the Environment (INCPEN) and carried out by ENCAMS collected 37 carrier bags out of a total of 58,041 items, which equates to 0.064% of all items of litter found [INCPEN-ENCAMS]. The chief culprits were confirmed as chewing gum and cigarette ends. The data show that lightweight plastic carrier bags are not major contributors to reported land litter in Scotland.

A Finite Resource

Plastic bags are made from a by-product of crude oil refining. Supporters of plastic bags would argue that they maximise the benefits from a finite resource, rather than flaring off the excess gases (including ethene) produced by the crude oil cracking process.

Behavioural Change?

Countries that have not introduced a levy have argued that it is people's littering behaviour which needs to be changed and that this will not necessarily come about from the imposition of a levy [ARA]. The Belgian Retail Association agrees; it believes that the main problem and cause of litter is not in the plastic bag per se, but the public's behaviour in simply discarding it rather than disposing of it properly. Education and awareness raising are seen as the key to the litter problem rather than levying the use of lightweight plastic carrier bags [EuroCommerce].

Job Losses

Those against the levy argue that it will lead to job losses in an industry that has successfully developed and optimised its product to provide an efficient and effective means of transporting goods from place of purchase to the home. This topic is discussed in more detail in Section 5.2.

[13] The Keep Britain Tidy Group

3.3 The Voluntary Approach

The introduction of a levy at a UK level was reviewed and rejected in 2003. The Department for Environment, Food and Rural Affairs (Defra) has stated that "*...we have no current plans for a plastic bag tax, but the Government keeps all taxation under review*" [Defra 2003, Hansard 2004]. Various voluntary mechanisms are currently being investigated.

WRAP is working with the British Retail Consortium (BRC) on a 'reusable bags' project. The aim of this project is to achieve a united approach across retailers through the creation of a retail partnership. This will provide a high level exposure of 'reusable bags' to the consumer at most retail outlets. It is hoped that the 'reusable bags' concept can be presented more effectively to consumers, actively encouraging behavioural change in a self-sustaining way that will avoid the introduction of a levy. Actions under consideration include:

- In-store awareness promotions.
- High visibility of store 'reusable bags'.
- Loyalty points for carrier bag reuse.
- Staff training in carrier bag advice.
- Checkouts without lightweight carrier bags.
- A pilot project in Edinburgh and Bristol in Autumn 2005.

In addition, BRC and the Scottish Retail Consortium (SRC) have formed a working group to look at the possibility of developing a voluntary code of conduct. They will be working with members and other key stakeholders including the CBC. The CBC has submitted a draft Voluntary Code on Best Environmental Practice for the Provision, Use and Disposal of Plastic Retail Carrier Bags for consideration by the working group. While the draft code is not yet available, the CBC note that the draft proposal outlines plans for:

- Encouraging industry and retailers to work together to find ways of further reducing energy, material and environmental impacts in the production, transportation and storage of plastic carrier bags.
- Active support and participation in waste reduction and reuse initiatives.
- Development of new schemes to promote recycling.
- A commitment for separate film collection for degradable bags.
- Development of a customer information campaign.
- An independently audited scheme to monitor, measure and report success.

The CBC strongly supports a voluntary approach for Scotland and the UK as a whole. It suggests that reusable bags should be offered, but that free, disposable lightweight plastic carrier bags should also be available so that consumers can make their own choice.

The imposition of a levy in Australia was considered and then postponed for two years (until the end of 2004) to see if the voluntary take-up of reusable bags and increased rates of recycling could reduce the number of lightweight plastic carrier bags by a target of 50%. A report from the Australian consultants Nolan-ITU published in March 2005 states that bag usage fell by 20.4% between 2002 and 2004 through the voluntary code of conduct agreed by retailers [Nolan-ITU].

This reduction is broken down into supermarkets reducing usage by 25% and non-supermarket retailers reducing usage by 10–15%. This result shows that a voluntary scheme can have a significant effect, given the support and time to get its message across. The Australian Government is determined to continue this trend to the extent of reducing use to 50% by the end of 2005 and ultimately phasing out plastic bag use completely by 2008 [Aus Govt].

3.4 Other Alternatives to a Levy for Reducing the Impacts of Plastic Bags

Degradable bags have been suggested as a possible solution. The issues surrounding their disposal, recycling and littering implications are discussed in Section 2.1.

Other ways of reducing usage include promoting the **reuse** of lightweight plastic bags, the purchase of thicker 'bags for life' or rigid boxes as well as recycling plastic bags (either within shops or by local authorities). These alternatives are all fully feasible and in operation, but have only had a small uptake so far.

Recycling is one option for polyethene plastics as a way of reducing their environmental burdens. This would be achieved through replacing raw materials (virgin polymer) with recycled polymer (see Dixons case study below), as well as reducing the (albeit very small) load on landfill at their end-of-life. Recycling of all plastic films – not just carrier bags – currently stands at 300,000 tonnes per year in the UK [CBC].

Dixons plc, in association with Nelson Packaging introduced the UK's first **fully recycled carrier bag** in 2003 [Dixons]. Rather than being sent to landfill, waste plastic collected from commercial back-of-store and post-consumer in-store sources in the UK is used to make bags for Dixons. An independent LCA of these bags has been undertaken by Nottingham University. This estimates that every tonne of recycled bags produced saves around 1.8 tonnes of oil compared with a tonne of bags made from virgin material [Nottingham]. Dixons argues that using recycled material to produce plastic carrier bags not only reduces the environmental burden directly (through the use of less crude oil by-products and less waste being discarded), but it also educates the consumer to some extent.

Some retailers have adopted **voluntary charging**. Lidl currently charges 5p per bag in its UK stores. B&Q has piloted a scheme in its shops in Scotland at the same level, while IKEA charges 5p per lightweight plastic carrier bag at its Edinburgh store with good success (see Appendix 2 for more details). There is a similar story in Australia where European companies based there such as Aldi and IKEA already charge for their bags [RMIT], although this is a voluntary approach rather than mandatory. Consequently, some shoppers are already aware of, and accustomed to, the idea of paying for carrier bags for their goods.

Where incineration is the main disposal method in preference to landfilling, carrier bags offer high calorific values equal to or greater than that of oil. Hence, energy can be recovered from the bags and put back into the national electricity grid. This would reduce the need for conventional fossil fuels for power – again albeit by a small degree. However, there are currently only two energy-from-waste incinerators in Scotland [SEPA].

4 Life Cycle Assessment

A number of LCAs have been undertaken that compare the environmental impacts of the reusable, plastic, degradable and paper bags typically available in high street shops. The studies have been carried out in the USA, France and Australia (see Appendix 3 for a full list). No studies have been carried out based on data from Scotland or the UK.

We reviewed the studies and identified the French study (carried out by Ecobilan for the retailer Carrefour) as the most relevant to the situation in Scotland (the rationale used for this selection is presented in Appendix 3). We believe that the information available from this study is sufficient to provide a good indication of the likely life-cycle environmental impacts of changing plastic bag usage in Scotland. The Carrefour study (as it will be referred to in this report) is used in the following analysis.

4.1 Stages of the LCA for this Report

The analysis proceeds through the following stages:

1. Development of scenarios that will influence the numbers and types of bag used.
2. Quantification of the number of bags of each type (lightweight plastic, reusable plastic, paper, and bin liners) used under each scenario.
3. Review of the Carrefour study to extract the most relevant data for application in Scotland.
4. Sensitivity analysis -- designed to test the robustness of base case results to plausible variations on the assumptions made.

4.2 Plastic Bag Levy Scenarios

Table 4.1 gives details of the five scenarios investigated for this study, including 'business as usual'.

Table 4.1 Scenarios investigated for this study

Scenario	Summary	Description
0	Current situation	Business as usual
1A	As in the proposed Bill	Based on the introduction of a levy on all lightweight plastic carrier bags including degradable plastic bags, but NOT paper bags. It includes all distribution points: shops, petrol stations, charity shops, on-street promotional give-aways, etc.
1B	As in the proposed Bill, but excluding small-to-medium enterprises (SMEs), charities and promotions	Recognises the logistical problems of collecting a levy from all retail outlets. It assesses the extent of the environmental gain for the anticipated large-scale additional effort. The idea is to focus on the larger companies that use the greatest amount of bags and have the resources to enable them to comply more readily with a levy.
2A	As in the proposed Bill + paper bags	Based on applying the levy to all lightweight carrier bags including plastic, degradable plastic and paper. Includes all distribution points: shops, petrol stations, charity shops, on-street promotional give-aways, etc. Recognises that the levy is aiming to achieve behavioural change and encourage the use of re-usable bags and not simply a switch to, for example, paper bags.
2B	As in the proposed Bill + paper bags but excluding SMEs, charities and promotions	This scenario is the same as scenario 2A, but excludes SMEs, charities and promotions. Like scenario 1B, it looks at the extent of the environmental benefits without the logistical problems of trying to police and enforce the levy across the board.

4.3 Consumption Data Used to Quantify Environmental Impacts

To understand plastic bag consumption, we used published data to produce consumption figures for the different scenarios in conjunction with data on the impacts on consumers (see Section 5). These figures were derived as follows.

Existing Lightweight Carrier Bag Usage

- A Defra report stated that 8 billion plastic bags were used in the UK in 2000 [Defra 2003].
- Other sources [BBC, WRAP 2005] put this figure at 10 billion per year, from which it has been stated that Scotland's consumption is 1 billion plastic carrier bags per year [Pringle]. This estimate presumes an approximate factor of 10%.
- There are no actual figures available for the consumption of plastic bags in Scotland. Therefore, we used population statistics [Stats Scot, Stats UK] to scale UK bag

consumption data to Scotland. Population statistics show that 8.6% of the UK's population lives in Scotland.

- Average annual lightweight plastic carrier bag use in Scotland is estimated at 775 million[14].
- In consultation with the BRC and its members, it was agreed that reusable bag consumption ('bags for life') constitutes an additional 1%[15].
- There were no statistics available on the level of consumption of paper bags[16]. We estimated that paper bag consumption is about 5% of all plastic carrier bag consumption[17].

Consumer Behaviour

In essence, the success of the levy will depend upon consumers' wish to avoid paying the levy and the consequent reduction in the use of plastic carrier bags. If fewer people pay the levy, less revenue will be generated.

If a levy is introduced and does not include paper bags, it is anticipated that there will be an increased take-up of paper bags as well as 'bags for life'. Our estimate of the take-up of alternative carrier bag options is based on 'assumed percentage reductions' as used in Australian [DEH] and South African [FRIDGE] studies.

Our interpretation of consumer behaviour is based on the following assumptions:

- A levy would be charged at £0.10 per bag on lightweight plastic or paper carrier bags. This would lead to a 90% reduction in demand for each type of carrier bag, based on the experience in the Republic of Ireland.

- Under scenarios 1A and 1B (in which paper bags are not subject to the levy), it is assumed that of consumers not purchasing a lightweight plastic carrier bag:
  - 30% will not require any type of carrier bag ('no bag');
  - 45% will switch to heavyweight plastic carrier bags (or similar);
  - 25% will switch to paper carrier bags[18].

- Under scenarios 2A and 2B (which include paper bags in the levy base), it is assumed that of consumers not purchasing a lightweight plastic bag:
  - 42.5% of consumers will not require any type of carrier bag;
  - 57.5% of consumers will switch to heavyweight carrier bags (or similar)[19].

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[14] Calculated using population scaling on the upper and lower UK bag consumption figures: 8.6% of 8 billion equals 690 million bags, while 8.6% of 10 billion equals 860 million. The average of these two numbers is 775 million

[15] Waitrose quoted as 1-2%; J Sainsbury's at 0.3%.

[16] Paper bags are normally used in the non-food retail sector for clothing, shoes, etc.

[17] From consultation with BRC

[18] It is assumed that 30% of the total reduction in the use of lightweight plastic and paper carrier bags is transferred to 'no bag', as adopted for a 15 cent levy in the Australian report [DEH]. The remaining 70% reduction is assumed to be split between paper carrier bags and heavyweight plastic carrier bags. Using information from the UK Expenditure and Food Survey 2002/03 [ONS], we calculated expenditure likely to require a carrier bag and then split it according to (a) those retail categories (e.g. footwear, clothing, etc.) thought most likely to accommodate a switch to paper carrier bags (as seen in the Republic of Ireland) and (b) those retail categories (e.g. food, beverages, etc.) most likely to accommodate a switch to heavyweight plastic carrier bags. On this basis, 36% of total household expenditure is sourced from (a) and 64% from (b). It has therefore been assumed that 25% is transferred to paper carrier bags (i.e. 36% × 70% = 25%) and 45% is transferred to heavyweight plastic carrier bags (i.e. 64% × 70% = 45%).

- Under scenarios 2A and 2B, the estimated reduction in paper bags is assumed to result in a 70% switch to heavyweight carrier bags (or similar).

- It has been assumed that a typical heavyweight carrier bag is used 20 times before replacement[20]. Therefore, the 45% of consumers who choose to switch to a heavyweight carrier bag will purchase five such bags in place of 100 lightweight carrier bags. This gives a 1/20th ratio for calculating the numbers of heavyweight carrier bags used under the levy scenarios.

- Spending at SMEs has been assumed to account for 30% of total household expenditure[21]. In order to exclude SMEs from being subject to the levy, we have simply reduced total expenditure by households on items likely to involve the acquisition of a carrier bag (of any type) by 30%.

Bin Liner Consumption

- We included bin liner consumption to account for the displacement effect of people switching to or using additional purpose-made bin liners instead of carrier bags in the event of a levy.

- As no UK or Scotland specific data were available for current bin liner use, Irish data were used and scaled for Scotland along population ratios. An Australian study [DEH] reports a 77% increase bin liner consumption in the Republic of Ireland, from around 91 million to 161 million , following the introduction of the PlasTax. We have assumed a similar 77% increase in bin liner use for Scotland, i.e. from 118 million/year currently to 208 million/year post-levy[22].

- We have not included black refuse sacks and disposable nappy sacks as information on the relevant sales volumes was not available. In addition, there were no statistics available for bags made of polypropylene in Scotland. Although retailers felt that a levy would instigate an increase in sales of kitchen swing bin liners, they did not feel that it would alter their sales of black refuse sacks to any great extent [Nolan-ITU Pty Ltd, personal communication].

We combined the assumptions and data discussed above to give the annual bag and bin liner consumption shown in Table 4.2 for the different scenarios.

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[19] It is assumed that, of those consumers who transferred to paper bags under Scenarios 1A and 1B, half now transfer to heavyweight plastic bags and half transfer to 'no bag'. We made this assumption because no other suitable evidence was available. Thus, the total proportion of the reduction in lightweight carrier bags now transferred to heavyweight bags is equal to 57.5% (i.e. 45% + (50% x 25%)).

[20] Taken from the Carrefour study [Carrefour]

[21] This is based on share of turnover in SIC(92)52, i.e. the retail trade with less than 250 employees, as determined by the Institute of Retail Studies, University of Stirling. Hence, in scenarios 1B and 2B, the levy is assumed to apply to 70% of the retail base in scenarios 1A and 2A. By adjusting the retail base in this fashion, it has been assumed that a £1 expenditure equals a £1 turnover and that the number of bags issued per £ expenditure at a SME equals the number of bags issued per £ expenditure at a non-SME. This is a crude assumption, but necessary without any data available

[22] Scaled for population [CSO.ie2005, Stats Scot]

Table 4.2 Estimated annual carrier bag consumption under the different scenarios[23]

	Total number of bags consumed under each scenario (millions/year)[24]				
	0	**1A**	**1B**	**2A**	**2B**
Plastic carrier bag (HDPE, lightweight)	775	78	287	78	287
Plastic reusable bag (LDPE, heavyweight)	8	23	19	29	23
Paper bag (single use)	39	213	161	4	14
Total bags used	**822**	**314**	**467**	**111**	**324**
Bin liners	*118*	*208*	*181*	*208*	*181*

It is predicted that:

- Under scenarios 1A and 2B, there would be a drop in lightweight plastic carrier bag usage of 697 million/year.
- This decrease would not be so profound if SMEs were excluded (scenarios 1B and 2B) when it would be 488 million/year.
- If paper bags were not included in the levy, there would be annual increases of 174 million paper bags under scenario 1A and 122 million bags under Scenario 1B.
- 'Bags for life' would only increase by 11–21 million/year due to them being reused 20 times.
- Bin liner consumption would increase by 90 million/year if SMEs were included in the levy (scenarios 1A and 2A), or 63 million/year if not (scenarios 1B and 2B).

We combined these data on bag consumption with information on the life-cycle environmental impacts of different types of bags to determine the relative environmental impacts of each scenario in Scotland (Sections 4.5–4.7).

4.4 Relevant Results from the Carrefour LCA

The assumptions and scope of the Carrefour analysis are summarised in Appendix 3.

The Carrefour study considered four types of carrier bag:

- HDPE bags made from virgin polymer (lightweight plastic carrier bags).
- Reusable LDPE bags made from virgin polymer ('bags for life').
- Paper bags made from recycled fibres.
- Biodegradable starch-based bags.

[23] Numbers calculated as described in Section 4.3

[24] Example calculations. For lightweight carrier bags under scenario 1B: (30% × 775) + (70% × 10% × 775) = 287. For heavyweight carrier bags under scenario 2A: 8 + [(775 – 78) × 58% × 5%] + [(39 – 4) × 70% × 5%] = 29

We have not considered biodegradable starch-based bags in the analysis of the Scottish situation because they are not thought to be used in any great numbers. Numbers for plastic bioerodable bags (made from HDPE polymer with trace degradant additives) are used at a few outlets, but considerably more conventional HDPE bags are used. We have assumed that the environmental life-cycle impacts of bioerodable bags are comparable to conventional plastic bags as they are both made from HDPE, albeit with a small addition of degradation-promoting compounds. The consumption of bioerodable bags is included within the consumption of lightweight plastic bags.

The Carrefour study examined energy, resource use and pollutant emissions over the whole lifecycle of the bags, i.e. it included production of the raw materials, manufacture of the bags, transport of the bags to the retailer, and disposal at the bags' end-of-life. For plastic bags, for example, the lifecycle begins with extraction and refining of oil and the production of plastic, pigments ink and glue.

In the Carrefour study, the lightweight plastic bags are manufactured in Malaysia, Spain and France, and the heavyweight 'bags for life' are manufactured in France. Paper bags made from recycled paper are produced in Italy for Carrefour. It has been assumed that the bags are produced from old newspapers/magazines.

The Carrefour study examined both incineration and landfilling of bags at the end of their life. For the base case, we selected data that reflect landfilling of the bags as a large proportion of all waste is sent to landfill in Scotland[25]. However, we have also performed a sensitivity analysis that considers an alternative waste management strategy (see below).

The Carrefour study assessed the environmental impact of the energy use, resource use, waste generation and pollutant emissions from the lifecycle of each type of bag by examining their contribution to eight environmental indicators (see Appendix 3). Table 4.3 shows the environmental indicator score for each of the different types of bags, relative to the lightweight plastic bag, for the base case with all material sent to landfill at the end of the lifecycle.

The lightweight plastic bag has been given a score of 1 in all categories as a reference point. A score greater than 1 indicates that another bag ('bag for life' or paper) makes more contribution to the environmental problem than a lightweight plastic bag when normalised against the volume of shopping carried. A score of less than 1 indicates that it makes less of a contribution, i.e. it has less environmental impact than a lightweight plastic bag.

The indicators take account of emissions which occur over the whole lifecycle. They can therefore occur in different locations depending on where different parts of the lifecycle are located. For global environmental problems such as climate change, the location of the emission is not important in assessing the potential environmental impact. For other regional or local environmental impacts, however, it can be significant. For example, the impact of eutrophication of a water body will depend on the water characteristics. This is a well-known limitation of lifecycle impact assessment methodology: LCA quantifies the potential risk of environmental damage rather than actual harm.

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[25] 88.2% was landfilled in 2002/03. Only 2.2% was incinerated, 5.9% was recycled, 2% was composted and the remaining 1.7% was treated by other means [SEPA].

Table 4.3 Environmental impacts of different types of carrier bag relative to a lightweight plastic carrier bag[26]

Indicator of environmental impact	HDPE bag (lightweight)	Reusable LDPE bag (used 2x)	Reusable LDPE bag (used 4x)	Reusable LDPE bag (used 20x)	Paper bag (single use)
Consumption of non-renewable primary energy	1.0	1.4	0.7	0.1	1.1
Consumption of water	1.0	1.3	0.6	0.1	4.0
Climate change (emission of greenhouse gases)	1.0	1.3	0.6	0.1	3.3
Acid rain (atmospheric acidification)	1.0	1.5	0.7	0.1	1.9
Air quality (ground level ozone formation)	1.0	0.7	0.3	0.1	1.3
Eutrophication of water bodies	1.0	1.4	0.7	0.1	14.0
Solid waste production	1.0	1.4	0.7	0.1	2.7
Risk of litter[27]	1.0	0.4	0.4	0.4	0.2

There are two key stages in the overall production process as laid out in the LCA:

i) Winning the raw materials from nature (e.g. drilling for and then refining crude oil) and converting them into commodities (e.g. polyethene granules).
ii) Manufacturing the bags themselves from these commodities.

The Carrefour study concluded that, for all bags, the main environmental impacts come from the first of these stages, i.e. the extraction and production of the materials (polyethene and paper) that are then used to make bags. The second stage (i.e. the manufacture of the bags themselves) is generally of less importance though not negligible. The study found that transport contributed very little to the environmental impacts. The end-of-life phase also makes a significant contribution to some indicators – most notably, the production of solid waste.

The overall conclusion from the Carrefour study was that reusable plastic bags (so-called 'bags for life') are more sustainable than all types of lightweight carrier bags (plastic, paper, or degradable) if used four times or more (columns 4 and 5 in Table 4.3), offering the greatest environmental benefits over the full lifecycle of any bags used.

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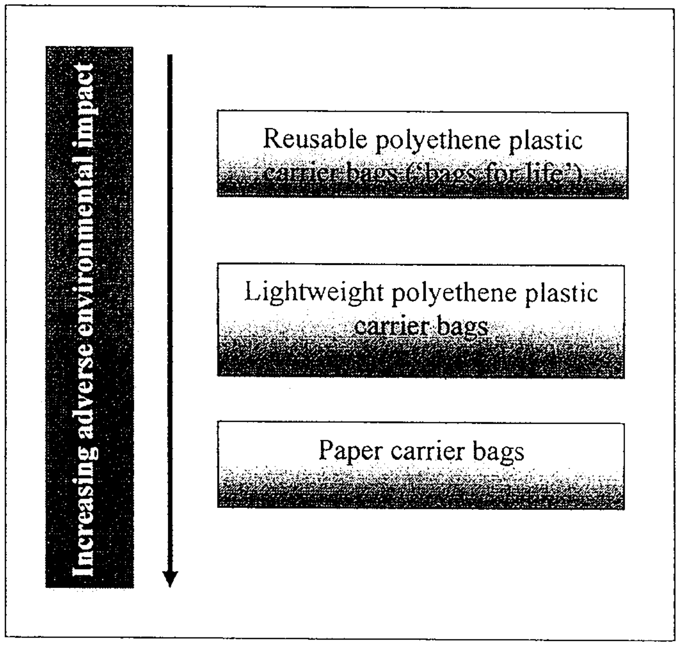
[26] From Table 18 in the Carrefour study. Numbers *greater* than one indicate a *greater* environmental impact compared with lightweight plastic carrier bags and numbers *less* than one indicate a *lesser* environmental impact.

[27] The Carrefour study used the terms 'strong', 'medium–weak' and 'weak' to describe the risk of littering for each of the bags. We interpreted these terms numerically as 1.0, 0.4 and 0.2, respectively, in order to be able to show graphically how the risk of littering may change under the different levy scenarios.

Figure 4.1 summarises these findings. Paper carrier bags have a bigger environmental impact than lightweight plastic bags in all categories apart from risk of litter. Paper bags have a particularly high impact on the environment in terms of[28]:

- Eutrophication of water bodies (rivers, lakes, etc.) due to pollutants released to water during the manufacture of the paper.
- Water consumption.
- Greenhouse gas emissions
- Production of solid waste.

Figure 4.1 Summary of the environmental impacts of different carrier bags from the Carrefour LCA



[28] As noted in Appendix 3, the scores against these environmental indicators reflect potential risk than actual harm. Some indicators such as eutrophication are very site-specific in terms of actual impact, depending on the level of wastewater treatment employed and the state of the receiving environment. Others (e.g. climate change impacts from greenhouse gas emissions) are not site-specific.

4.5 Applying the Results to Scotland

We used data from Table 4.2 on plastic bag and bin liner consumption in conjunction with the relative environmental impact scores in Table 4.3 to assess the relative environmental impacts of the four levy scenarios compared with the current situation (scenario 0, 'business as usual'). We used the assumption from the Carrefour study that a reusable bag is reused 20 times[29].

To allow an assessment of the predicted change in bin liner consumption, it was assumed that the lifecycle impact of manufacturing bin liners is the same as for HDPE carrier bags per unit weight[30]. This is an approximation, which may overestimate the environmental impact of bin liners, and hence underestimate the benefits of the four levy scenarios. More details about the calculations are given in Appendix 3.

The results of the base case comparison are shown in Figure 4.2. The base case applies the results from the Carrefour study (Table 4.3) directly to the bag use data in Table 4.2. This implicitly accepts the use of French data on bag weights and volumes. The results give the percentage change in the environmental impact score for each of the levy scenarios compared with the current situation (scenario 0). In all scenarios where the levy is applied, consumption of non-renewable energy, atmospheric acidification, the formation of ground level ozone and the risk of litter fall considerably compared with the current situation.

In scenarios 1A and 1B where paper bags are exempt from the levy, the impacts are greater than the current situation for the consumption of water and eutrophication. However, they are approximately equivalent for the emission of greenhouse gases and the production of solid waste. This is due to a trade-off between the impacts from the additional paper bags consumed and the environmental benefits from the reduction in the use of lightweight plastic bags. The overall environmental impact from scenarios 1A and 1B is therefore predicted to remain very similar to today's situation. This is because the benefits of reducing plastic carrier bag use are displaced by the increased use of paper bags.

It is only in scenarios 2A and 2B, where the levy is applied to paper as well as plastic carrier bags, that consumption of water, emission of greenhouse gases, eutrophication of water bodies and production of solid waste are significantly reduced. This is because paper bags have a high score in these environmental categories relative to plastic bags (see Table 4.3 and Table A3.1 in Appendix 3).

In all cases, the environmental benefits increase (and environmental impacts reduce) when SMEs are included in the levy.

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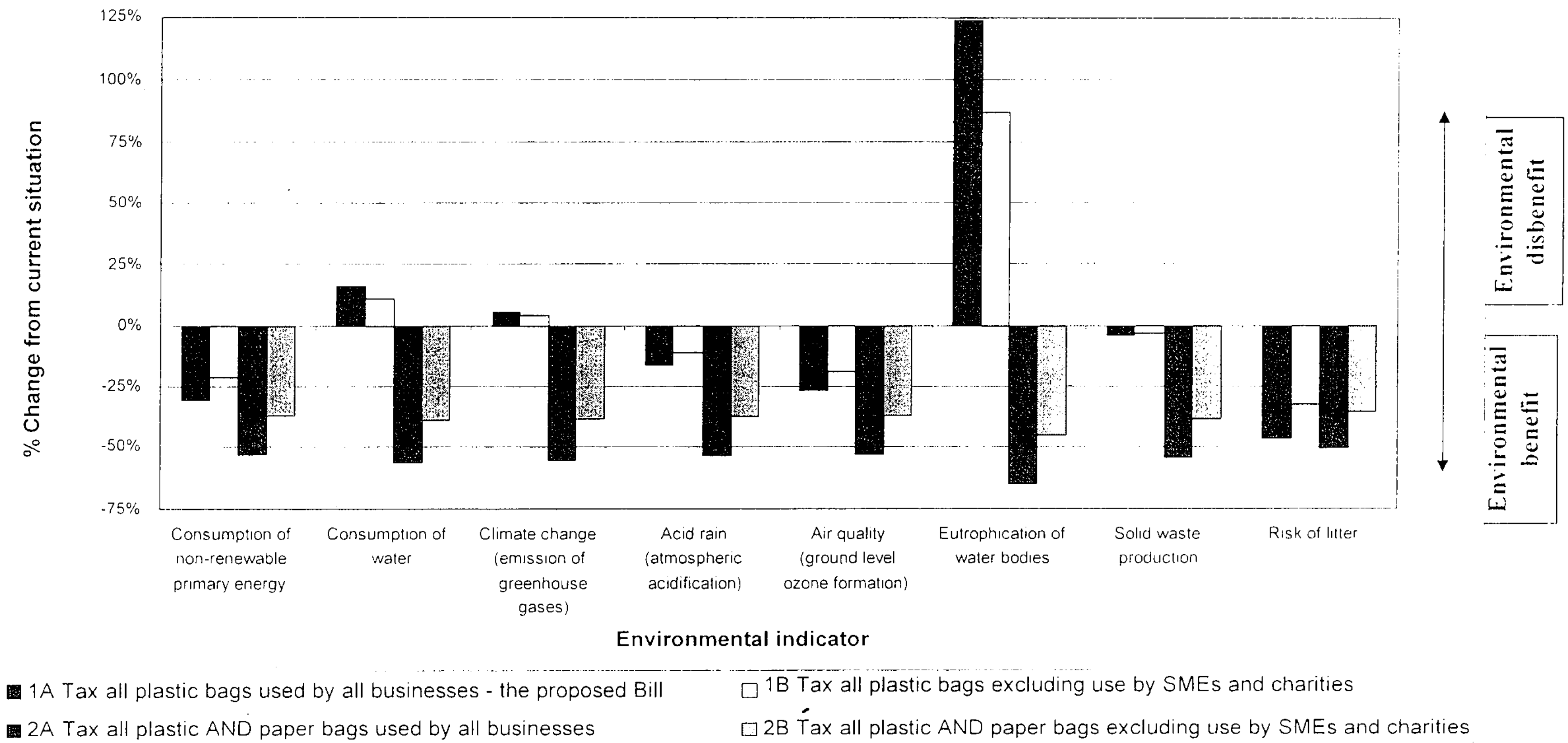
[29] For comparison, the Australian study assumed that reusable 'bags for life' are reused around 52 times before being recycled, i.e. once a week in a given year [Nolan-ITU].

[30] On average, bin liners weigh 15g each and lightweight plastic carrier bags 8g each. Thus, the environmental impacts of a bin liner were assumed to be 1.9 (=15/8) times greater than a lightweight plastic bag, giving an approximate ratio of 2:1. We have used this ratio throughout our analysis.

Figure 4.2 Change in environmental indicators due to a levy



<u>Key assumptions</u>: In scenarios 1A and 1B, there is a 25% switch from lightweight plastic bags to paper bags. In scenarios 2A and 2B, there is a 90% reduction in paper bag use.

These environmental effects will occur at different locations around the globe depending on where the raw materials are derived, where the bags are manufactured and how far they have to travel. The bulk of plastic bags for the Scottish market are made in the Far East and imported, whereas Scotland has a considerable paper bag manufacturing sector. Furthermore, some of the effects (e.g. ground level ozone formation) are more localised and some are regional (e.g. the consumption of water and emission of acidic gases), while others such as climate change resulting from fossil fuel combustion are global problems.

While we believe these broad messages about relative environmental impacts are applicable to the Scottish situation, there are differences between France and Scotland that mean that specific environmental impacts will differ. This is due to inherent France-specific assumptions in the original LCA work such as the characteristics and usage of bags, and to differences in the environmental impacts of manufacturing and waste disposal in the two countries. In particular, we note the following differences between the assumptions made in the French LCA and the situation in Scotland:

- The Carrefour study assumed that plastic bags weigh 6g as opposed to 8g in Scotland.

- The French study states that the paper checkout bags used by Carrefour weigh 52g. Paper checkout bags[31] in Scotland weigh 51g [CBC]. In the LCA base case, the Carrefour value was taken as representative for Scotland as it was assumed that checkout bags would be more affected by a levy, in terms of numbers and nationwide coverage, than boutique paper carriers with handles. In the sensitivity analyses (see below), the test used the average weight of 99g for all types of paper bags.[32]

- The Carrefour study assumed that a plastic bag has a volume of only 14 litres while a paper bag has a volume of 20.5 litres. This means fewer paper bags are required for the same amount of shopping. For Scotland, however, we would expect no significant difference on average in the volume of shopping carried in the two types of bag. One reason for this is the tendency for 'double bagging', where customers use two paper bags instead of one because they are concerned that a single paper bag may rip open.

- The Carrefour study takes for its base case an average waste management scenario for France, i.e. 45% of paper bags being recycled, 25% being incinerated and 26% landfilled. For the base case in this study, we used one of the Carrefour sensitivity analyses in which all waste is sent to landfill; this is much closer to the current Scottish position where 88% of waste is landfilled[33] [SEPA].

[31] Information provided by the CBC showed that there are three kinds of paper bags in general used in Scotland, depending on size and whether they have handles or not. These weigh 51g (checkout bag, no handles), 81g (carrier bag with handles) and 166g (carrier bag with handles). The arithmetic mean of these is 99g.

[32] This analysis suggests some potential for an increase in solid waste generation for scenarios that favour a switch to paper bags. This is due to different assumptions about the relative weight of plastic and paper bags, and the fact that the LCA looks at solid waste impacts throughout the bag life cycle rather than just the end-of-life disposal phase.

[33] Most recent published data (2002/03).

Various sensitivity analyses are presented in Appendix 3 to demonstrate the robustness of results against these factors. These analyses are:

- Sensitivity analysis 1: Assume paper bags weigh 99g instead of 52g.
- Sensitivity analysis 2: Assume on average that paper and plastic bags are used to carry the same volume of shopping.
- Sensitivity analysis 3: Assume lightweight plastic bags weigh 8g instead of 6g.
- Sensitivity analysis 4: Combined effects of sensitivity analyses 2 and 3.
- Sensitivity analysis 5: Assume the same split across recycling, incineration and landfill as in France.

The main results of the sensitivity analyses are:

- Repeating the analysis using a higher bag weight or 'effective' volume of paper bags led to a significant worsening in the performance of scenarios 1A and 1B for all categories except for 'risk of litter'. The categories of solid waste generation and acid rain, for which a small benefit was originally recorded under the base LCA (Carrefour, 100% of end-of-life bags landfilled), became a disbenefit (to a lesser extent for acid rain). The effect on solid waste generation is driven by the greater weight of paper bags compared with plastic bags (this feeds directly through to waste generation at the end of the lifecycle) and by the waste produced during paper production.

- Such effects are counteracted to a large degree by the assumption that lightweight plastic bags in Scotland are 8g compared to 6g in France.

- The assumptions on alternative waste management strategies (sensitivity analysis 5) have little effect on the results.

- The results for scenarios 1A and 1B are affected significantly by the sensitivities explored. This is as a result of encouraging people to switch from plastic bags to paper. Whereas, the results for scenarios 2A and 2B, where paper bags are also subject to the levy, show little change. In all cases studied and for all environmental indicators, scenarios 2A and 2B improved on the business as usual case by between 30% and 70%. The most restrictive scenario (2A, where all outlets including SMEs and charities are subject to the levy) shows a uniform improvement over scenario 2B of around 16% relative to business as usual.

It is important to recognise that the scores from the LCA represent *potential risk* and not actual environmental damage. Quantification of actual damage would require an impact pathway assessment that traces emissions from source to exposure to the quantification of impacts from specific industrial and waste management facilities. Such analysis is outside the scope of this report. It is noted, however, that some categories of effect are much more site-sensitive than others. For example, eutrophication of water bodies is only a problem where effluents are discharged untreated to a nutrient-sensitive water body. Climate change impacts, in contrast, are not sensitive to the site of the greenhouse gas release.

4.6 Displacement of Plastics in Scotland

In this section, we calculate the changes in tonnages of materials consumed in the scenarios based on the bag numbers data from Table 4.2 and the unit weights[34] for bags given in Table 4.4.

Table 4.4 Unit bag weights used in this study

	Weight (grams per unit)
Lightweight plastic carrier bags	8
Paper bags	51
Heavyweight plastic carrier bags	47
Bin liners	15

Table 4.5 shows the estimated changes in the weight of carrier bags (tonnes) used across Scotland in scenario 1A compared with the current pre-levy situation (scenario 0). Note that paper bags are not subject to the levy in scenario 1A.

Table 4.5 Change in annual consumption of materials for scenario 1A*

Bag	Pre-levy consumption (tonnes)	Expected post-levy consumption (tonnes)	Expected absolute change[35] (tonnes)	Expected % change
Lightweight plastic carrier bags	6,200	620	-5,580	-90%
Heavyweight plastic bags; 'bags for life'	364	1,102	+738	+203%
Bin liners	1,764	3,122	+1,358	+77%
Total for polyethene	**8,328**	**4,844**	**-3,484**	**-42%**
Total for paper	**1,976**	**10,869**	**+8,893**	**+450%**

* Numbers have been rounded so may not add up exactly. Negative numbers mean less material used and positive numbers mean more material is used.

For Scotland, there would be a saving of 5,580 tonnes of polyethene from 90% fewer lightweight plastic carrier bags being used. This has to be balanced, however, against the increase in 'bags for life' and bin liners – a total of 2,096 tonnes. Taken together, these data show an estimated net decrease of 3,484 tonnes of polyethene consumed per year in Scotland. Paper bag usage would increase under this scenario by 8,893 tonnes per year.

The summary information for all four levy scenarios is summarised in Table 4.6.

[34] Data from CBC and SRC. For paper bags the checkout bag weighing 51g was used for consistency with the LCA base case. If the average weight of 99g, see footnote 31, was used then the waste implications would be greater

[35] As stated earlier, data on black refuse sacks and disposable nappy sacks were not available. If these figures were included, the net decrease in resource consumption would be less.

Table 4.6 Change in annual consumption of materials for all four levy scenarios across Scotland

	1A: Proposed levy	1B: Proposed levy excluding SMEs	2A: Proposed levy + paper bags	2B: Proposed levy + paper bags excluding SMEs
Decrease in polyethene consumption (tonnes)*	-3,484	-2,439	-3,214	-2,250
Change in paper consumption (tonnes)*	+8,893	+6,225	-1,779	-1,245
Net change (tonnes)	**+5,409**	**+3,786**	**-4,993**	**-3,495**

* Does not account for black refuse sacks or nappy bags.

In summary, it is predicted that polyethene amounts would reduce across all four levy scenarios, but that paper amounts would increase in scenarios 1A and 1B and decrease in scenarios 2A and 2B.

If paper carrier bags are not subject to the levy (as in scenarios 1A and 1B), the total tonnage of carrier bags used actually increases. This is because shoppers will switch from the relatively lighter plastic carrier bags to the much heavier paper carriers. Where paper is included in the levy, both show a decrease in the overall tonnage of waste material (paper and plastic) needing disposal. Scenario 2A, where paper and all businesses are levied, shows the best overall reductions (4,993 tonnes) relative to the situation today. Scenario 1A performs worst – waste actually increases by 5,409 tonnes per year.

4.7 Conclusions on Lifecycle Impacts

This study has used an existing published lifecycle study from France to gain an indication of the relative lifecycle environmental impacts of different types of bag. This has then been combined with estimates of changes in bag use under four levy scenarios to examine the resulting changes in environmental impacts from bag usage.

Using the Carrefour study introduces an element of uncertainty into the results owing to national differences between Scotland and France affecting the lifecycle, i.e. the way in which electricity is generated, the amount of transport required and final disposal methods.

However, based on the results of our various sensitivity analyses, we believe the pattern of environmental impacts described in the Carrefour study will be similar to those in Scotland. It is our view that the results described above are sufficiently relevant to Scotland to serve as a useful guide to decision-making on policies concerning carrier bags. However, for the reasons presented above, the findings in this report cannot be used for a precise quantification of environmental impacts. This would require a full lifecycle analysis based on the Scottish situation, which is outside the scope of this study.

The main conclusions from our analysis are:

- The analysis shows that there would be an environmental benefit for some of the indicators depending on what consumers choose to use were a levy to be introduced.

- More specifically, the biggest environmental improvement is seen in scenarios 2A and 2B where paper bags are included in the levy. These occur for all environmental indicators

- In scenarios where paper bags are excluded, the environmental benefits of reduced plastic bag usage are negated for some indicators by the impacts of increased paper bag usage. This is because a paper bag has a more adverse impact than a plastic bag for most of the environmental issues considered. Areas where paper bags score particularly badly include water consumption, atmospheric acidification (which can have effects on human health, sensitive ecosystems, forest decline and acidification of lakes) and eutrophication of water bodies (which can lead to growth of algae and depletion of oxygen).

- Heavyweight, reusable plastic bags (the so-called 'bags for life') are more sustainable than all types of lightweight plastic carrier bags **if used four times or more.** They give the greatest environmental benefits over the full lifecycle.

- Paper bags are anywhere between six to ten times heavier than lightweight plastic carrier bags and, as such, require more transport and its associated costs. They would also take up more room in a landfill if they were not recycled.

- The analysis demonstrates that SMEs and paper bags should be included to maximise the potential environmental benefit of the levy. The inclusion of paper bags in the levy makes a greater contribution to maximising environmental benefits than inclusion of SMEs.

5 Impacts on Consumers and Business

Our base assumptions (i.e. scenario 0) are as shown in Table 5.1 and stated below.

Table 5.1 Bag consumption by type in Scotland

Bag type	Annual consumption (millions)	Per capita consumption
Plastic carrier	775	153
Paper	38.75	8
Multi-use	7.75	2
Total	**821.5**	**163**

- The population of Scotland is taken as 5,062,011 (from the 2001 census) and the grossed number of households as 2.14 million. This is 2.33 people per household.
- The UK Expenditure and Food Survey 2002/03 [ONS] states that total weekly expenditure in Scotland averaged £365 per household. Of this figure, approximately £110 per week is spent on goods that are likely to be sold with the option of acquiring a carrier bag[36].
- It has been assumed that a £ spent by lower income households requires the same number of bags for purchases as a £ spent by higher income households[37].
- The two largest sources of carrier bags are 'food' and 'clothing' retailers, followed by 'catering services' (e.g. takeaway).
- Current consumption of bin liners is around 118 million per year.

5.1 Determining the Financial Burden on Consumers

We made the following assumptions concerning unit costs:

- A levy would be set at £0.10 on each bag. We derived the amount that would be paid from this value and the numbers of bags used as given in Table 4.2. We have accounted for the fact that, under scenarios 1B and 2B, SMEs are not included in the levy base.
- Consumers are currently not charged for carrier bags[38]. This cost element to retailers (which includes the purchase, transport and storage costs of the bags) is known as the 'hidden' cost and is accounted for. It is passed on to the consumer, embedded within the price of goods.

[36] We assessed the categories within the survey and made a judgement on whether a carrier bag might be required for purchases, e.g. insurance and holidays would not, but household goods and hardware would.
[37] In reality it is more likely that a £ spent by a lower income household buys more goods and this requires more bags than a £ spent by higher income households, since the price paid per unit by the latter will be higher. Sufficiently detailed data were not available however to accommodate this complexity.
[38] Except in some stores such B&Q and Lidl (see Appendix 2).

- The 'hidden' cost of lightweight plastic carrier bags to the retailer is £7.51 per 1,000 bags[39].

- The 'hidden' cost of paper carrier bags to the retailer is £163.69 per 1,000 bags[40].

- Heavyweight plastic carrier bags (or similar) are assumed to sell for £0.65 per bag[41].

- A bin liner is assumed to cost £0.05 per liner. This is the unit price averaged over ten products sold by Tesco.

- For scenarios 1A and 1B, it has been assumed that the additional 'hidden' costs incurred by stores are passed on to consumers as they increase due to additional purchase, transport and storage of paper carrier bags.

- Spending at SMEs has been assumed to account for 30% of total household expenditure[42]. In order to exclude SMEs from being subject to the levy, we have simply reduced total expenditure by households on items likely to involve the acquisition of a carrier bag (of any type) by 30%.

The total additional financial burden incurred by Scottish consumers as a result of the levy is therefore made up of the elements shown in Equation 5.1.

Equation 5.1 Financial burden to consumers

Total additional financial burden of levy
=
Payment of the levy on each levyable plastic carrier bag consumed post-levy
+
'Hidden' cost of carrier bags
+
Cost of **buying additional heavy use carrier bags** (or similar)
+
Cost of **buying additional bin liners** (or similar)
+
Payment of net **additional VAT**[43]

[39] Derived from data provided by the CBC and survey data reported by researchers from University College Dublin [UCD]. The average cost of lightweight carrier bags to the retailer is £7.47 per 1,000 excluding storage and transport [CBC].

[40] Derived from data provided by the CBC and survey data reported by researchers from UCD. The average cost of paper bags to the retailer is £163.33 per 1,000 [CBC]. The switch to paper bags is largely assumed to be by the clothing and shoe retailers

[41] It is recognised that shoppers will have a wide range of options with an equally wide range of unit costs (e.g. currently from £0.10 for a 'bag for life' to £2.00 for an unbleached cotton carrier bag purchased privately). CBC suggested a range from 65p to £1.50; we used the lower figure. In addition, only those bags sold for more than €0.70 (approximately £0.48) are excluded from the levy in Republic of Ireland.

[42] Based on share of turnover in SIC(92) 52 retail trade with less than 250 employees determined by the Institute of Retail Studies, University of Stirling. Hence, in scenarios 1B and 2B, the levy is assumed to apply to 70% of the tax base in scenarios 1A and 2A. By adjusting the tax base in this fashion, it has been assumed that: a £ expenditure = a £ turnover and the number of bags issued per £ expenditure at a SME = the number of bags issued per £ expenditure at a non-SME. This is a crude assumption, but necessary without any data to the contrary.

[43] HM Revenue and Customs levy VAT on environmental taxes such as the climate change levy, the aggregates levy, the landfill tax and the oil duties. It is expected that the proposed carrier bags levy would likewise be subject to VAT

We calculated the total additional financial burden to consumers for the four levy scenarios using:

- Equation 5.1.
- Bag use data under the scenarios from Table 4.2.
- The assumptions outlined above.

Table 5.2 shows how the numbers were derived for scenario 1A.

Table 5.2 Incremental cost to consumers of the levy under scenario 1A

Cost element for Scottish consumers in an average year	Annual cost under scenario 1A (£ million)
Amount of levy paid by consumers (= local authority revenue)	7.75
Additional 'hidden' cost of bags	23.31
Cost of additional heavyweight bags	10.20
Cost of additional bin liners	4.34
Additional VAT	7.98
Total additional financial burden of scenario 1A in Scotland	**53.58**
Total additional financial burden of levy per person	**£10.58/person/year**

Table 5.3 shows the results for all four levy scenarios. The greatest effect on the results is from the additional 'hidden' costs, which can vary significantly. In the first instance, we have assumed that, for all four scenarios, any additional 'hidden' costs or savings are passed on to the consumer (see columns 2–5).

The 'hidden' costs increase significantly for scenarios 1A and 1B as, despite fewer plastic bags being used, far more paper carriers are being used. However, costs go down in the scenarios (2A and 2B) where paper is included in the levy (i.e. *hidden cost savings*), as both paper and plastic carrier bag use declines in these cases. At the discretion of the retailer, these savings could be passed on to the consumer, thus reducing the financial load on consumers (see columns 4 and 5). We have added to Table 5.3 the resulting costs in scenarios 2A and 2B assuming that the retailer does not pass on any savings they may accrue (see shaded columns 6 and 7).

Table 5.3 Incremental cost of the levy to consumers for all scenarios, with sensitivity on 'hidden' costs

	Scenario					
	1A	1B	2A	2B	2A – sensitivity	2B – sensitivity
	'Hidden' costs or savings passed on to consumers				*'Hidden' savings **not** passed on to consumers*	
Total additional financial burden of levy in Scotland (£ million/year)	53.58	37.51	18.05	12.63	30.91	21.64
Total additional financial burden of levy per person (£ /person/year)	10.58	7.41	3.57	2.50	6.11	4.27

The scale of the estimates of financial burden can be gauged by reference to the results in the UK Expenditure and Food Survey 2002/03 [ONS]. This shows that average weekly household expenditure is £365. Our examination of the categories of expenditure shows that £110 of this is likely to require use of a carrier bag. This can be compared with an annual cost of the levy of between £3.57 and £10.58 per person.

Based on data from the annual UK Expenditure and Food Survey 2002/03 [ONS], it is estimated that the costs given in Table 5.3 will represent a higher proportion of final income for households with lower incomes than for higher income households. Excluding paper bags from the levy base increases the financial burden (compare 1A with 2A and 1B with 2B), more than excluding SMEs (compare 1A with 1B and 2A with 2B).

5.2 Impact on the Business Sector

The proposed levy on plastic carrier bags will affect the economy as well as the environment. Our conclusions on the business and industry effects of the proposed levy are based on:

- Contact with industry.
- Examination of raw data.
- Evidence from previous studies on similar measures worldwide.

Scotland and the Plastic Carrier Bag Industry

CBC estimates that there are 15–20 plastic manufacturers, importers and distributors in Scotland, most of which are SMEs. We have validated this estimate through study of the online Applegate directory of plastics companies in the UK [Apgate]. The geographical distribution of these businesses shown in Table 5.4 indicates their wide distribution in Scotland. Both importers and/or distributors of carrier bags, as well as manufacturers, will be affected by the levy. In the Republic of Ireland, one manufacturer closed after PlasTax was introduced.

Table 5.4 Plastics and plastic bag manufacturers, importers and distributors in Scotland by postcode

Postcode	Total plastic	Plastic bags
AB	11	1
DD	8	1
DG	5	1
EH	22	4
FK	6	1
G	36	3
HS	0	0
IV	4	2
KA	9	0
KW	1	0
KY	11	3
ML	6	1
PA	5	0
PH	0	0
TD	5	0
Total	**129**	**17**

Smaller enterprises are considered more likely to suffer greater impacts from a levy as it is anticipated that they have less capacity to adapt. Discussion with industry suggests most of the bin liners produced in the UK are manufactured in England. It is considered unlikely that production could be switched to Scotland to compensate for some of the lost plastic carrier bag production.

Industry estimates that anywhere between 300 to 700 direct jobs could be lost in Scotland alone as a result of a levy being imposed on lightweight plastic carrier bags [CBC]. This estimate is made up of:

- Some 400 jobs at BPI's Greenock plant.
- Some 100 or so jobs at Simpac's plant in Glasgow.
- Jobs at other smaller manufacturers and importers that would either have to:
  - close;
  - move operations to elsewhere in the UK (as in Simpac's case to Hull) or abroad;
  - diversify where possible into other plastic film products.

Another important company that would be affected by a levy is Smith Anderson in Fife[44], which manufactures large volumes of paper bags from both virgin and recycled sources.

There would also be knock-on effects elsewhere in an industry that employs around 2,500 people in the manufacture, import and distribution of carrier bags and around 12,000 in the wider plastic films sector in the UK.

[44] www.smithanderson.com

Paper Sector

The extent to which lightweight plastic carrier bags may be replaced by paper carrier bags is an issue of contention. In the Republic of Ireland, some sectors (e.g. fashion and shoes) have switched to paper bags [BRC]. In the scenarios where paper bags are excluded from the levy (1A and 1B), a 25% switch to paper carrier bags has been assumed. A move towards greater use of paper carrier bags would have consequences for those sectors involved in their manufacture, transport, waste management and import. As mentioned above, Smith Anderson is a major company in the paper recycling and bag manufacturing industry in Scotland.

Retail Sector

The estimated cost to UK supermarkets of giving away lightweight **plastic** carrier bags is reported in Section 2 (see Table 2.1).

Evidence from Republic of Ireland and BRC suggests that the food retail industry would benefit from net cost savings from a levy after taking set-up and administrative costs into account. Savings would result from having to buy far fewer plastic carrier bags, which are then given away for free, while sales of 'bags for life' and bin liners would increase [BRC, ERM, UCD].

However, this would not be the case for non-food retailers. Evidence from the Republic of Ireland from those retailers that switched to paper bags (mainly 'high street' non-food retailers) suggests that greater storage space and more frequent deliveries are now required. This has increased their overhead costs for material purchase and transport by over four-fold [BRC]. There are also different consumption patterns between food and non-food retailers. For the former, people often shop regularly and can thus plan to take reusable bags with them. For the latter, it is often more of an impulse purchase [WRAP 2005].

Larger retailers are expected to find it easier to implement the system needs for compliance as they tend to have computerised systems and greater resources available. There will be a cost associated with administration of the levy, but the experience in the Republic of Ireland suggests that the effects were generally positive or neutral [UCD].

The levy would represent a greater burden to smaller retailers (e.g. newsagents, butchers, etc.) as they may not have computerised systems. As a minimum, it is anticipated that retailers will need to have an auditable system for:

- Recording carrier bags sales.
- Accounting for bags in stock.
- Reconciling sold versus stock remaining.
- Submitting records (quarterly in Republic of Ireland).
- Submitting payments.

Shoplifting and Theft

Theft, as an unwanted side effect of introducing a levy, is often raised as a problem for retailers. Although levels of theft were initially reported to have risen in the Republic of Ireland, they have since gone back to pre-levy levels and are even dropping further (information from the Department of Environment, Heritage and Local Government, Republic of Ireland).

The reported levels of 'shrinkage' (the industry term for theft) are calculated each year in the EU [Retail Research]. Table 5.5 shows shrinkage in percentage terms of turnover for 2003 and 2004 for the UK and Republic of Ireland. It is evident that both countries saw a drop in retail theft between 2003 and 2004.

Table 5.5 Changes in retail theft as a percentage of overall turnover for the UK and Republic of Ireland

Retail Shrinkage (as % of turnover)	2003	2004
UK	1.69%	1.59%
Republic of Ireland	1.35%	1.34%

Increased trolley and basket theft has been highlighted by some as a potential cost to industry caused by people wishing to save on paying for bags. Five months after the introduction of the PlasTax, the Retail, Grocery, Dairy and Allied Trades' Association (RGDATA) for the Republic of Ireland reported that 50 baskets per month were disappearing from shops at a total cost of €450/month.

Impacts for Waste Management

This section uses the changes in the weight and volume of bags under each levy scenario to assess the changes in waste arisings, changes in waste management costs and changes in waste volumes. Note that this is only part of the total waste due to carrier bags, the total waste impact (including waste in the winning of raw materials and production, which will often take place outside of Scotland) is considered in more detail in the LCA and is presented in Figure 4.2 and Appendix 3.

The change in consumption of materials under each levy scenario is considered in section 4.6. To assess the impacts on waste management we then need to add in details of the waste disposal routes.

In 2002/03[45], 88.2% of all waste arisings in Scotland were disposed of to landfill, 2.2% were incinerated, 5.9% were recycled, 2% were composted and the remaining 1.7% was treated by other means [SEPA].

[45] SEPA informed us that recycling rates for 2003/04 were 12.3% nationwide (data to be published in June 2005). However, 2002/03 SEPA statistics were used for consistency

For plastic bags we have assumed that there is a low level of recycling of post-consumer bags and that this would not change significantly if a levy were introduced. Thus, for the purpose of this calculation, all plastic bags would eventually be landfilled or incinerated[46]. We assumed that 97.6% of plastic bags were landfilled and 2.4% were incinerated[47]. It was not possible to estimate the quantity of lightweight plastic carrier bags or heavyweight plastic carrier bags going to each disposal route[48]. Instead, we applied the shares of landfill and incineration in total waste disposal equally to each.

For paper bags we were able to account for recycling in the calculations of waste management using Scottish waste statistic [SEPA][49]. Paper comes under the heading of 'paper and card' in SEPA data. As paper bags are not accounted for separately in SEPA waste statistics, we assumed that recycling rates for paper bags are the same as "paper and card". We made the following calculation:

- 24.26% of household 'bin' waste in Scotland is paper and card.
- 2,094,872 tonnes of household (controlled) waste were collected in 2002/03.
- This means that 508,216 tonnes of paper and card were collected from household waste for disposal (to landfill or incineration).
- 67,660 tonnes of paper and card were collected separately for recycling.
- Therefore, 13.3% of paper and card was recycled (67.660 tonnes/508.216 tonnes).
- The remaining paper is either landfilled (84.6%) or incinerated (2.1%)[50].

We estimated the change in paper bags waste for each disposal route using:

- Our calculation ratios for landfilling, incineration and recycling of paper in Scotland.
- The net total change in annual paper consumption (and hence waste production) under the four levy scenarios given in Table 4.6.

The amounts shown in Table 5.6 represent changes in the disposal of residual household waste and recycling in an average year under each of the levy scenarios.

Table 5.6 Estimated annual changes in waste disposal routes for residual waste in Scotland under the different scenarios

	Disposal route (tonnes per year)			
Scenario	**Landfill**	**Incineration**	**Recycling**	**Net change**
1A	4,122	103	1,184	**5,409**
1B	2,886	72	829	**3,786**
2A	-4,640	-116	-237	**-4,993**
2B	-3,248	-81	-166	**-3,495**

[46] Plastic *films* are recycled in large amounts, though this is mainly back-of-store packaging, estimated at 300,000 tonnes per year [CBC]. There is very little post-consumer recycling of plastic carrier bags and there are very few facilities to do so. For example, the recycling rate for lightweight carrier bags in Australia in 2002 was 2.7% [DEH].

[47] Step 1: 88.2% (landfilled) + 2.2% (incinerated) = 90.4% Step 2: 88.2% / 90.4% = 97.6%

[48] The facility is known to exist in many food retail outlets for the take-back and recycling of heavyweight bags-for-life, but no data on the level or rate of this was available.

[49] Recycling of paper bags was not considered for the LCA in Section 4 due to the assumptions in the Carrefour study. This will lead to a difference in the results presented here with those in section 4 under the 'solid waste' environmental indicator.

[50] 13.3% of paper is recycled. This leaves 86.7% going to another route. 97.6% will be landfilled 97.6 % × 86.7% = 84.6% overall. 2.4% will be incinerated: 2.4% × 86.7% = 2.1 % overall.

Table 5.7[51] shows estimated changes in landfill and incineration costs for household waste in Scotland as a whole, under each levy scenario. Costs increase under scenarios 1A and 1B, while costs decrease under scenarios 2A and 2B. These cost increases or decreases apply to local authorities who are responsible for household waste disposal.

Table 5.7 Estimated changes in waste management costs for Scotland due to the levy[52]

Scenario	Cost (£ per year)		
	Landfill	**Incineration**	**Total**
1A	227,000	7,000	**233,000**
1B	159,000	5,000	**163,000**
2A	-255,000	-8,000	**-263,000**
2B	-179,000	-5,000	**-184,000**

The amount of solid waste generated can also be quantified in terms of volume. The Carrefour study only gives information on weight for the full life cycle, though it is clear that this is dominated by the end of life stage. Using data on relative bag storage volume from Table 2.1 it is possible to estimate the relative difference in volume of material sent for disposal (see Table 5.8), though this ignores wastes generated at stages other than end of life disposal. Results show a significant increase for scenarios 1A and 1B for volume relative to the base case. For scenarios 2A and 2B, however, the volume of bags disposed of relative to the base case falls significantly.

Table 5.8 Estimated changes in waste volumes in Scotland due to the levy

Change in Volume – assuming 50 g paper bag occupying 8 times the volume of HDPE lightweight bags					
As % of base case	100%	167%	148%	20%	44%

Charities

In a submission to Mike Pringle MSP, the Association of Charity Shops expressed its belief that the ability of some charity shops to operate successfully would be jeopardised by the proposed levy[53]. The Association is also concerned that donations by the public would become difficult, as donated stock delivered to shops is usually in plastic carrier bags. These bags are then reused for customer purchases.

[51] Figures have been rounded

[52] Savings based on landfill costs of £55/tonne and incineration costs of £65/tonne. The unit costs include collection, transfer and gate fees (including landfill tax in the case of landfill). However, it has not been possible to separate the fixed from the variable elements of the costs. Given the relatively small scale of the changes in waste tonnages, only the latter will be saved. The cost savings will therefore tend to be overestimates. However, landfill costs are likely to rise during the same period as a result of the landfill tax escalator.

[53] Response by the Association of Charity Shops to consultation paper issued by Mike Pringle MSP.

6 Administration of the Levy

The mechanism by which local authorities would administer the levy falls within an exception to the reservations in the Scotland Act 1998 (Section A1, Part II, Schedule 5 Fiscal, economic and monetary policy). This states that local taxes to fund local authority expenditure fall within devolved competence. It is this exception which is being investigated by Mike Pringle MSP. We have not considered the validity of this exception, but have considered some of the implications for administering the levy should the Bill proceed.

6.1 System Requirements

A system will be required which will allow for:

- Monies to be collected from 'retailers' and held in a local authority account.
- Keeping records of customer transaction.
- Auditing and inspection.
- System checks and interrogation re anticipated income, documentation files and generation of customer queries.
- Development of an appeals system.
- Development of systems to pursue debt and non-payment.

Businesses would need advice on:

- How the levy would operate.
- Definitions of what types of bags the levy covered.
- What information they would be required to submit, e.g. stock of bags at outset, stock remaining at end of submission period and records of bags sold.
- How and when the monies collected should be transferred (ideally electronically) to the administration body.
- The penalties for non-compliance.

System in the Republic of Ireland

In the Republic of Ireland, businesses submit quarterly returns. There are separate and distinct roles and bodies for collection and enforcement. Payment is by electronic debiting of the retailer's bank account. An online system that allowed this, the Revenue Online System (ROS), was in place prior to the introduction of the PlasTax.

So far, there has been one prosecution for non-compliance. Any retailer not complying with the legislation has been visited, their non-compliance verified and a warning issued. Warnings have been issued to a few hundred out of around 50,000 retailers [communication from Terry Sheridan, the Department of Environment, Heritage and Local Government, Republic of Ireland].

Small changes in the way we perform everyday tasks can have huge impacts on Scotland's environment.

Walking short distances rather than using the car, or being careful not to overfill the kettle are just two positive steps we can all take.

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BOUSTEAD CONSULTING & ASSOCIATES

"FINAL REPORT"

Life Cycle Assessment for Three Types of Grocery Bags - Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper

Prepared for the Progressive Bag Alliance

Chet Chaffee and Bernard R. Yaros
Boustead Consulting & Associates Ltd.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In the pursuit to eliminate all that is not green, plastic seems to be a natural target. Its widespread use in products and packaging, some say, has contributed to environmental conditions ranging from increased pollution to overloaded landfills to the country's dependence on oil. In response, some cities have adopted legislation that bans plastic grocery bags made from polyethylene in favor of bags made from materials such as cloth, compostable plastics, or paper.

But will switching from grocery bags made from polyethylene to bags made from some other material guarantee the elimination of unfavorable environmental conditions? We know that every product—through its production, use, and disposal—has an environmental impact. This is due to the use of raw materials and energy during the production process and the emission of air pollutants, water effluents, and solid wastes.

More specifically, are grocery bags made other materials such as paper or compostable plastics really better for the environment than traditional plastic grocery bags? Currently, there is no conclusive evidence supporting the argument that banning single use plastic bags in favor of paper bags will reduce litter, decrease the country's dependence on oil, or lower the quantities of solid waste going to landfills. In addition, there is limited information on the environmental attributes of compostable plastics and how they fare against traditional plastic grocery bags or paper bags.

To help inform the debate about the environmental impacts of grocery bags, the Progressive Bag Alliance contracted with Boustead Consulting & Associates (BCAL) to conduct a life cycle assessment (LCA) on three types of grocery bags: a traditional grocery bag made from polyethylene, a grocery bag made from compostable plastics (a blend of 65% EcoFlex, 10% polylactic acid or PLA, and 25% calcium carbonate), and a paper grocery bag made using at least 30% recycled fibers. The life cycle assessment factored in every step of the ~~manufacturing, distribution~~, and disposal stages of these grocery bags. It was recognized that a single traditional plastic grocery bag may not have the same carrying capacity as a paper bag, so to examine the effect of carrying capacity, calculations were performed both on a 1:1 basis as well as an adjusted basis (1:1.5) paper to plastic.

BCAL compiled life cycle data on the manufacture of polyethylene plastic bags and compostable plastic bags from the Progressive Bag Alliance. In addition, BCAL information on the compostable plastic resin EcoFlex from the resin manufacturer BASF. BCAL completed the data sets necessary for conducting life cycle assessments using information extracted from The Boustead Model and Database as well as the technical literature. BCAL used the Boustead Model for LCA to calculate the life cycle of each grocery bag, producing results on energy use, raw material use, water use, air emissions, water effluents, and solid wastes.

The results show that single use plastic bags made from polyethylene have many advantages over both compostable plastic bags made from EcoFlex and paper bags made with a minimum of 30% recycled fiber.

what is a typical bag made of?

	Impact Summary of Various Bag Types (Carrying Capacity Equivalent to 1000 Paper Bags)		
	Paper (30% Recycled Fiber)	Compostable Plastic	Polyethylene
Total Enegy Usage (MJ)	2622	2070	763
Fossil Fuel Use (kg)	23.2	41.5	14.9
Municipal Solid Waste (kg)	33.9	19.2	7.0
Greenhouse Gas Emissions (CO_2 Equiv. Tons)	0.08	0.18	0.04
Fresh Water Usage (Gal)	1004	1017	58

what is assumed recycle rate

When compared to 30% recycled fiber paper bags, polyethylene grocery bags use less energy in terms of fuels for manufacturing, less oil, and less potable water. In addition, polyethylene plastic grocery bags emit fewer global warming gases, less acid rain emissions, and less solid wastes. The same trend exists when comparing the typical polyethylene grocery bag to grocery bags made with compostable plastic resins—traditional plastic grocery bags use less energy in terms of fuels for manufacturing, less oil, and less potable water, and emit fewer global warming gases, less acid rain emissions, and less solid wastes.

The findings of this study were peer reviewed by an independent third party with significant experience in life cycle assessments to ensure that the results are reliable and repeatable. The results support the conclusion that any decision to ban traditional polyethylene plastic grocery bags in favor of bags made from alternative materials (compostable plastic or recycled paper) will result in a significant increase in environmental impacts across a number of categories from global warming effects to the use of precious potable water resources. As a result, consumers and legislators should re-evaluate banning traditional plastic grocery bags, as the unintended consequences can be significant and long-lasting.

Introduction

In the national effort to go green, several states, counties, and cities are turning their attention to plastic grocery bags made from polyethylene because of the perception that plastic bags contribute to local and global litter problems that affect marine life, occupy the much needed landfill space with solid waste, and increase U.S. dependence on oil.

To address these environmental issues, and perhaps in seeking to follow the example of other countries such as Australia and Ireland, legislators in several cities across the United States have proposed or have already passed ordinances banning single use polyethylene plastic grocery bags in favor of bags made from alternative materials such as cloth, paper, or compostable plastic. Legislators state that they believe that these new laws and proposals will reduce litter, reduce the use of fossil fuels, and improve the overall environmental impacts associated with packaging used to transport groceries.

Before we examine whether plastic bags cause more environmental impacts than the alternative materials proposed, we should first consider the most commonly proposed alternatives, which tend to include: cloth bags, compostable plastic bags, and paper bags.

Reusable cloth bags may be the preferred alternative, but in reality, there is no evidence that most, or even a majority of, customers will reliably bring reusable bags each time they go shopping.

Compostable plastic bags, although available, are in short supply as the technology still is new, and therefore cannot currently meet market demand. So it appears that the proposed laws banning plastic grocery bags may simply cause a shift from plastic bags to the only alternative that can immediately supply the demand—paper bags.

Therefore, is legislation that mandates one packaging material over another environmentally responsible given that all materials, products, and packaging have environmental impacts? The issue is whether the chosen alternatives will reduce one or several of the identified environmental impacts, and whether there are any trade-offs resulting in other, potentially worse, environmental impacts.

To help inform the debate on the environmental impacts of grocery bags, and identify the types and magnitudes of environmental impacts associated with each type of bag, the Progressive Bag Alliance contracted Boustead Consulting & Associates (BCAL) to conduct a life cycle assessment (LCA) on single use plastic bags as well as the two most commonly proposed alternatives: the recyclable paper bag made in part from recycled fiber and the compostable plastic bag.

Life cycle assessment is the method being used in this study because it provides a systems approach to examining environmental factors. By using a systems approach to analyzing environmental impacts, one can examine all aspects of the system used to produce, use, and dispose of a product. This is known as examining a product from cradle (the extraction of raw materials necessary for producing a product) to grave (final disposal of the product). LCA has been practiced since the early 1970s, and standardized through several organizations including SETAC (Society of Environmental Toxicology and Chemistry) and ISO (International Standards Organization). LCA studies examine the inputs (resources and energy) and outputs (air emissions, water effluents, and solid wastes) of each system and thus identifies and quantifies the effects of each system, providing insights into potential environmental impacts at local, regional, and global levels.

To compile all the information and make the calculations, BCAL uses the Boustead Model and Database. The Boustead Model and Database is an LCA software model with a database built over the past 25 years, containing a wide variety of data relevant to the proposed study. Dr. Boustead has pioneered the use of life-cycle methods and has conducted hundreds of studies, including those for the plastics industry; which have been reviewed by US and European industry as well as life-cycle practitioners.

Study Goal

According to ISO 14040, the first steps in a life cycle project are defining the goal and scope of the project to ensure that the final results meet the specific needs of the user. The purpose of this study is to inform the debate on the environmental impacts of grocery bags, and identify the types and magnitudes of environmental impacts associated with each type of bag. In addition, the study results aim to inform the reader about the potential for any environmental trade-offs in switching from grocery bags made from one material, plastic, to another, paper.

The life cycle assessment was conducted on three types of grocery bags: a traditional grocery bag made from polyethylene, a grocery bag made from compostable plastics (a blend of 65% EcoFlex, 10% polylactic acid or PLA, and 25% calcium carbonate), and a paper grocery bag made using at least 30% recycled fibers. It is important to note that the study looked at only one type of degradable plastic used in making grocery bags, which is the bag being studied by members of the Progressive Bag Alliance. Since this is only one of a number of potential blends of plastic that are marketed as degradable or compostable, the results of this study cannot be used to imply that all compostable bags have the same environmental profile.

Scope

The scope of the study is a cradle to grave life cycle assessment which begins with the extraction of all raw materials used in each of the bags through to the ultimate disposal of the bags after consumer use, including all the transport associated with the delivery of raw materials and the shipping and disposal of final product.

The function of the product system under study is the consumer use and disposal of a grocery bag. The functional unit is the capacity of the grocery bag to carry consumer purchases. A 1/6 BBL (Barrel) size bag was selected for all three bags in this study because that is the commonly used bag in grocery stores. Although the bags are of equal size, previous studies (Franklin, 1990) pointed out that the use of plastic bags in grocery stores was not equal to the use of paper bags. According to Franklin (1990), bagging behavior showed that plastic to paper use ranged from 1:1 all the way to 3:1, depending on the situation. In contrast, data collected by the Progressive Bag Alliance shows that plastic and paper bags are somewhat equal in use once the baggers have been properly trained. In this study BCAL used both 1:1 and 1.5:1 plastic to paper ratios, allowing for the possibility that it still takes more plastic bags to carry the same amount of groceries as a paper bag. The 1.5:1 ratio equates to 1500 plastic bags for every 1000 paper bags.

BCAL prepared LCA's for the three types of grocery bags. The data requirements for BCAL and for the Progressive Bag Alliance are outlined below.

1. *Recyclable Paper Bag LCA……… The following operations are to be included in the analysis:* To start, BCAL provided data on the extraction of fuels and feedstocks from the earth, including tree growing, harvesting, and transport of all materials. BCAL added process operations in an integrated unbleached kraft pulp & paper mill including recycling facility for old corrugated containers; paper converting into bags; closed-loop recycling of converting bag waste; packaging and transport to distribution and grocery stores; consumer use; and final disposal. Data for most of the above operations in one form or another are in the Boustead Model and Database. Weyerhaeuser reported that its unbleached kraft grocery bag contains about 30% post consumer recycled content and the use of water-based inks[1]. Therefore, in this study BCAL used 30% recycled material. This is also somewhat reflective of current legislation where minimum recycled content in paper bags is required (see Oakland City Council Ordinance requiring 40% recycled material). In the operations leading to final disposal BCAL estimated data for curbside collection and generation and recovery of materials in MSW from government agencies and EPA data, which for 2005 showed paper bag recycling at 21%, paper bag MSW for combustion with energy recovery at 13.6%, resulting in 65.4% to landfill[2]. The following final disposal options will also be considered: composting and two landfill scenarios.

Can we require ↑ recycled paper in bags

2. *Recyclable Plastic Bag LCA……. The following operations are to be included in the analysis:* The extraction of fuels and feedstocks from the earth; transport of materials; all process and materials operations in the production of high and low density polyethylene resin[3]; converting PE resin into bags; packaging and transport of bags to distribution centers and grocery stores; consumer use; and final disposal. In the operations leading to final disposal, BCAL estimated data for curbside collection and generation and recovery of materials in MSW from government agencies and EPA data, which for 2005 showed plastic bag recycling at 5.2 %, plastic bag MSW for combustion with energy recovery at 13.6%, resulting in 81.2% to landfill[2]. The following final disposal options will also consider two landfill scenarios.

   Data for the converting operation was collected specifically from a member of the Progressive Bag Alliance that makes only plastic grocery bags. The data obtained, represents the entire annual production for 2006. All waste is reprocessed on site. so that is how the calculations were conducted. All inks are water-based, and the formulas provided. The production and supply of all PE resin is based on materials produced and transported from a Houston based supplier. The corrugated boxes were included as made from recycled material to reflect the fact that the supplier to the PBA member reported using between 30% and 40% post consumer recycled fiber[1].

3. *Degradable Plastic Bag (EcoFlex and PLA mix) LCA……… The following operations are to be included in the analysis:* The extraction of fuels and feedstocks from the earth; production and transport of materials for all process and materials operations in the production of polylactide resin; EcoFlex from BASF (data provided by BASF)[4]; and calcium carbonate, converting the EcoFlex/PLA resin mixture into bags; packaging and transport of bags to distribution centers and grocery stores; consumer use; and final disposal. Again, most of the above operations are contained in the Boustead Model and Database. The production data for PLA was obtained from NatureWorks[5] and the data for EcoFlex was obtained from BASF[4]. Both NatureWorks and BASF use the Boustead Model for their LCA calculations, so the data BCAL requested and received was compatible with other data used in the study. In addition, BCAL sent its calculated results to BASF for confirmation that the data and the calculations on bags made from the EcoFlex compostable resin was accurate. BASF engineers confirmed that BCAL's use of the data and the calculated results were appropriate. In the operations leading to final disposal, BCAL estimated data for curbside collection and generation and recovery of materials in MSW from government agencies and EPA data[3], which for 2005 showed plastic bag recycling at 5.2 %, plastic bag MSW for combustion with energy recovery at 13.6%, resulting in 81.2% to landfill[2]. The following final disposal options will be also be considered: composting and two landfill scenarios.

   Data for the converting operation of the EcoFlex/PLA resin mixture was collected at the same PBA member facility during a two-week period at the end of May 2007. The production and supply of the PLA polymer is from Blair, NE. The production and supply of Ecoflex polymer is from a BASF plant in Germany. The trial operations at the PBA member's facility indicate that the overall energy required to produce a kilogram of EcoFlex/PLA bags may be lower than the overall energy required to produce a kilogram of PE bags, based on preliminary in-line electrical measurements conducted by plant engineers. However, these results still are preliminary, and need to be confirmed when full scale operations are implemented. As a result, this study will assume that the overall energy required to produce a kilogram of EcoFlex/PLA bags is the same as the overall energy required to produce a kilogram of PE bags. The plastic bag recycling at 5.2 %, will be assumed to go to composting. The inherent energy of the degradable bags has been estimated from NatureWorks and BASF sources.

The following are some detailed specifications for the LCA study:

	Recyclable Plastic	Degradable Plastic	Recyclable Paper
Size/type	1/6 BBL	1/6 BBL	1/6 BBL
Length (inches)	21.625	22.375	17
Width (inches)	12	11.5	12
Gusset (inches)	7.25	7.25	6.75
Gauge (Mil)	0.51	0.75	20 lb /1000 sq ft
Film Color	White	White	Kraft
Material	HDPE (film grade blend)	Degradable Film Compound (EcoFlex/PLA mix)	Unbleached Kraft Paper
Jog Test (strokes)	45	20	n/a
Tensile Strength (lb)	50	35	n/a
Weight per 1000 bags in lbs	13.15 (5.78 kg)	34.71 (15.78 kg)	114 (51.82 kg)

Human energy and capital equipment will not be included in the LCA; detailed arguments for this decision are presented in the proposal appendix.

Methodological Approach

BCAL followed the sound scientific practices as described in ISO 14040, 14041, and 14042 to produce the project results. BCAL is well versed in the requirements of the ISO standards as Dr. Ian Boustead has and continues to be one of the leading experts participating in the formation of the ISO standards. The procedures outlined below are consistent with the ISO standards and reflect BCAL's approach to this project.

Calculations of LCAs

The Boustead database contains over 6000 unit operations on the processes required to extract raw materials from the earth, process those materials into useable form, and manufacture products. These operations provide data on energy requirements, emissions and wastes.

The "Boustead Model" software was used to calculate the consumption of energy, fuels, and raw materials, and generation of solid, liquid, and gaseous wastes starting from the extraction of primary raw materials. The model consists of a calculating engine that was developed 25 years ago and has been updated regularly based on client needs and technical innovations. One important consequence of the modeling is that a mass balance for the entries system is calculated. Therefore, the resource use and the solid waste production are automatically calculated.

Fuel producing industry data are available for all of the OECD countries and some non-OECD countries. The United States and Canada are further analyzed by region; the US is divided into 9 regions and Canada is sub-divided in 5 regions, corresponding to the Electric Reliability Council. For both the US and Canada, there also is a national average. Since the whole of the Model database can be switched from one country to another, any operation with data from outside the US can be adjusted for energy from non-US energy inputs to "USA adjusted" energy inputs. Assuming that the technology is the same, or very similar, this allows BCAL to fill any data gaps with data from similar operations in non-US locations.

Another important aspect of calculating LCAs is the use of allocation procedures when differentiating the use of energy and raw materials associated with individual products within a single system. In many cases, allocation methods that defy or at the very least, ignore sound scientific practice (such as economics) have been used when they benefit clients. These types of errors or biases are important to avoid as they are easily discovered by peer reviewers or technical experts seeking to use the results in subsequent studies (such as building applications), which unfortunately can cause the rest of the work to be discounted due to unreliability. BCAL has considerable experience in this arena having published several technical papers on the appropriate allocation principles in the plastics industry. Utilizing sound scientific principles and objective measures to the greatest extent possible, BCAL has been able to avoid most problems associated with allocation decisions and produce accurate and reliable LCA data for a wide variety of plastics. Proof of this is the widespread use of PlasticsEurope data (produced by Boustead Consulting) in almost every life cycle database available worldwide as well as in life cycle studies in numerous product and building applications.

Calculated data are readily aggregated and used to produce the final LCA data set which includes the impact assessment step of LCA. These resulting data sets address specific environmental problems.

Using LCA data....BCAL scientific viewpoint

Life cycle assessment modeling allows an examination of specific problems as well as comparisons between systems to determine if there are any serious trade-offs between systems. In every system there are multiple environmental parameters to be addressed scaling from global to local issues. No single solution is likely to address all of the issues simultaneously. More importantly, whenever choices are being made to alter a system or to utilize an alternative system, there are potential trade-offs. Understanding those trade-offs is important when trying to identify the best possible environmental solution. Hopefully, decisions to implement a change to an existing system will consider the potential trade-offs and compromises. While LCA can identify the environmental factors and trade-offs, choosing the solution that is optimal is often subjective and political. Science can only help by providing good quality data from which decisions can be made. The strength of the proposed LCA assessment system is that these unwanted side effects can be identified and quantified.

A life cycle assessment can:

1. Quantify those parameters likely to be responsible for environmental effects (the inventory component of life cycle analysis).

2. Identify which parameters are likely to contribute to a specific environmental problem (characterization or interpretation phase of impact assessment). An example would be identifying that carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are greenhouse gases.
3. Aggregate the parameters relating to a specific problem (the valuation or interpretation phase of impact assessment). An example would be producing carbon dioxide equivalents for the components of greenhouse gases.

LCA derived data provide a compilation of information from which the user can address specific problems, while also examining potential trade-offs. For example, if interested in addressing specific conservation issues such as the conservation of fossil fuels, the user would examine the mass and energy data for only coal, oil, and natural gas; and ignore the other information. If the user would like to examine the potential impacts the grocery bag system has on global warming, acid rain, and municipal solid waste one can address these issues both individually and cooperatively by examining the specific parameters which are likely to contribute to each. In so doing, the user can strive to achieve the optimum reduction in each parameter because of a better understanding of how these parameters change in association with the grocery bag system as a whole and each other individually.

Data Sources and Data Quality

As noted above, data sources included published reports on similar materials, technical publications dealing with manufacturing processes, and data incorporated into the Boustead Model and Database, most of which has been generated through 30 years of industrial studies on a wide range of products and processes.

ISO standards 14040, 14041, and 14042 each discuss aspects of data quality as it pertains to life cycle assessments. In general, data quality can be evaluated using expert judgment, statistics, or sensitivity analysis. In LCA studies, much of the data do not lend itself to statistical analyses as the data are not collected randomly or as groups of data for each input variable. Instead, most LCA data are collected as single point estimates (i.e., fuel input, electricity input, product output, waste output, etc). Single point estimates are therefore only able to be evaluated through either expert judgment or sensitivity analysis. Since the reliability of data inevitably depends upon the quality of the information supplied by individual operators, BCAL used its expert judgment to carry out a number of elementary checks on quality. BCAL checked mass and energy balances to ensure that the data did not violate any of the basic physical laws. In addition, BCAL checked data from each source against data from other sources in the Boustead Model and Database to determine if any data fell outside the normal range for similar products or processes.

Data reporting

To enhance the comparability and understanding of the results of this study, the detailed LCA results are presented in the same presentation format that was used for the series of eco-profile reports published by the Association of Plastics Manufacturers in Europe

(APME). A set of eight tables, each describing some aspect of the behavior of the system, shows the results of the study. Five tables in the data set are useful in conservation arguments and three tables are indications of the potential pollution effects of the system.

The performance of the grocery bag systems is described by quantifying the inputs and outputs to the system. The calculation of input energy and raw materials quantifies the demand for primary inputs to the system and these parameters are important in conservation arguments because they are a measure of the resources that must be extracted from the earth in order to support the system.

Calculation of the outputs is an indication of the potential pollution effects of the system. Note that the analysis is concerned with quantifying the emissions; it does not make any judgments about deleterious or beneficial properties.

The inputs and outputs depend on the definition of the system—they are interrelated. Therefore, any changes to the components of the system means that the inputs and outputs will likely change as well. One common misconception is that it is possible to change a single input or output while leaving all other parameters unchanged. In fact, the reverse is true; because a new system has been defined by changing one input or output, all of the inputs and outputs are expected to change. If they happen to remain the same, it is a coincidence. This again illustrates the fact that common perceptions about environmental gains from simple changes may be misleading at best, and detrimental to the environment at worst.

Increasingly there is a demand to have the results of eco-profile analyses broken down into a number of categories, identifying the type of operation that gives rise to them. The five categories that have been identified are:

1. Fuel production
2. Fuel use
3. Transport
4. Biomass
5. Process

Fuel production operations are defined as those processing operations which result in the delivery of fuel, or energy; to a final consumer whether domestic or industrial. For such operations all inputs, with the sole exception of transport, are included as part of the fuel production function.

Fuel use is defined as the use of energy delivered by the fuel producing industries. Thus fuel used to generate steam at a production plant and electricity used in electrolysis would be treated as fuel use operations. Only the fuel used in transport is kept separate.

Transport operations are easily identified and so the direct energy consumption of transport and its associated emissions are always separated.

Biomass refers to the inputs and outputs associated with the use of biological materials such as wood or wood fiber.

LCA RESULTS TABLES

RECYCLABLE PAPER BAG SYSTEM

The results of the LCA for the recyclable paper bag system are presented below, each describing some aspect of the behavior of the systems examined. In all cases, the following tables refer to the gross or cumulative totals when all operations are traced back to the extraction of raw materials from the earth and are based on the consumer use and collection of 1000 bags. The subsequent disposal operations of recycling, composting, incineration with energy recovery and landfill are not included in these results tables and will be discussed separately.

Table 1. Gross energy (in MJ), required for the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Fuel type	Fuel prod'n & delivery	Energy content of fuel	Transport energy	Feedstock energy	Total energy
Electricity	461	185	3	0	649
Oil	17	143	30	1	191
Other	15	777	1	990	1783
Total	493	1105	34	991	2622

Table 2. Gross primary fossil fuels and feedstocks, expressed as energy (in MJ), required for the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Feedstock	Total
Coal	229	94	1	0	324
Oil	23	150	33	1	207
Gas	113	278	0	0	391
Hydro	15	6	0	-	21
Nuclear	90	36	0	-	127
Lignite	0	0	0	-	0
Wood	0	533	0	988	1521
Sulfur	0	0	0	2	2
Hydrogen	0	0	0	0	0
Biomass (solid)	18	7	0	0	24
Recovered energy	0	-1	0	-	-1
Geothermal	0	0	0	-	0
Unspecified	0	0	0	-	0
Solar	0	0	0	-	0
Biomass (liqd/gas)	1	0	0	-	1
Industrial waste	1	0	0	-	1
Municipal Waste	3	1	0	-	4
Wind	0	0	0	-	0
Totals	493	1105	34	991	2622

Table 3. Gross primary fossil fuels and feedstocks, expressed as mass (in milligrams), the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Crude oil.................	4,591,000
Gas/condensate.........	7,432,000
Coal......................	11,210,000
Metallurgical coal......'	25,900
Lignite	79
Peat	444
Wood (50% water).....	274,000,000
Biomass (incl. water)...	2,880,000

Table 4. Gross water resources (in milligrams) required for the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Source	Use in process	Use in cooling	Totals
Public supply	3,895,000,000	-	3,895,000,000
River/canal	5,260	1,920	7,190
Sea	8,490	1,092,000	1,100,000
Unspecified	14,600,000	2,910,000	17,500,000
Well	200	50	250
Totals	3,909,000,000	4,000,000	3,913,000,000

Note: total cooling water reported in recirculating systems = 404.

Table 5. Gross other raw materials (in milligrams required for the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Raw material	Input in mg
Air	4,080,000
Animal matter	0
Barites	211
Bauxite	469
Bentonite	51
Biomass (including water)	0
Calcium sulphate (CaSO4)	0
Chalk (CaCO3)	0
Clay	46,300
Cr	31
Cu	0
Dolomite	792
Fe	64,800
Feldspar	0
Ferromanganese	59
Fluorspar	9
Granite	0
Gravel	239
Hg	0
Limestone (CaCO3)	385,000
Mg	0
N2	6,050
Ni	0
O2	1,180
Olivine	608
Pb	395
Phosphate as P205	147,000
Potassium chloride (KCl)	7
Quartz (SiO2)	0
Rutile	0
S (bonded)	1
S (elemental)	233,000
Sand (SiO2)	101,600
Shale	1
Sodium chloride (NaCl)	712,000
Sodium nitrate (NaNO3)	0
Talc	0
Unspecified	0
Zn	14

Table 6. Gross air emissions (in milligrams) resulting from the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Air emissions/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Fugitive	Total
Dust	32,900	4,440	1,930	89,000	-	-	128,000
CO	59,500	16,300	23,000	21,900	-	-	121,000
CO2	43,100,000	22,600,000	2,330,000	1,066,000	-63,600,000	-	5,507,000
SOX	168,000	166,000	6,030	239,000	-	-	579,000
NOX	151,000	86,400	26,500	600	-	-	264,000
N2O	<1	<1	-	-	-		<1
Hydrocarbons	49,000	16,000	7,300	60	-		72,300
Methane	266,000	16,200	10	3,500	-		286,000
H2S	<1	-	<1	2,750	-	-	2,750
Aromatic HC	6	-	98	1	-	-	105
HCl	6,440	42	4	622	-		7,110
Cl2	<1	-	<1	<1	-		<1
HF	242	2	<1	<1	-		244
Lead	<1	<1	<1	<1	-		<1
Metals	25	105	-	<1	-		131
F2	<1	-	<1	<1	-		<1
Mercaptans	<1	<1	<1	802	-	-	802
H2	124	<1	<1	91	-	-	215
Organo-chlorine	<1	-	<1	<1	-		<1
Other organics	<1	<1	<1	<1	-		1
Aldehydes (CHO)	-	-	-	13	-		13
Hydrogen (H2)	152	-	-	3,130	-		3,280
NMVOC	2	-	<1	<1	-		2

Table 6B. Carbon dioxide equivalents corresponding to the gross air emissions (in milligrams) resulting from the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Type/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Total
20 year equiv	59,850,000	23,690,000	2,400,000	1,330,000	-63,560,000	23,710,000
100 year equiv	49,460,000	23,060,000	2,400,000	1,190,000	-63,560,000	12,550,000
500 year equiv	45,200,000	22,800,000	2,400,000	1,130,000	-63,560,000	7,970,000

Table 7. Gross water emissions (in milligrams), resulting from the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags.. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Process	Total
COD	55	-	35	396,000	396,000
BOD	14	-	<1	75,000	75,000
Acid (H+)	11	-	<1	1	13
Al+compounds as Al	<1	-	<1	<1	<1
Ammonium compounds as NH4	19	-	2	<1	22
AOX	<1	-	<1	<1	<1
As+compounds as As	-	-	<1	<1	<1
BrO3--	<1	-	<1	<1	<1
Ca+compounds as Ca	<1	-	<1	19	20
Cd+compounds as Cd	-	-	<1	-	<1
Cl-	25	-	35	10,400	10,400
ClO3--	<1	-	<1	97	97
CN-	<1	-	<1	<1	<1
CO3--	-	-	3	30	34
Cr+compounds as Cr	<1	-	<1	<1	<1
Cu+compounds as Cu	<1	-	<1	<1	<1
Detergent/oil	<1	-	2	3	6
Dichloroethane (DCE)	<1	-	<1	<1	<1
Dioxin/furan as Teq	-	-	<1	-	<1
Dissolved chlorine	<1	-	<1	<1	<1
Dissolved organics (non-HC)	23	-	<1	<1	23
Dissolved solids not specified	1	-	9	3,700	3,710
F-	<1	-	<1	<1	<1
Fe+compounds as Fe	<1	-	2	<1	3
Hg+compounds as Hg	<1	-	<1	<1	<1
Hydrocarbons not specified	<1	<1	2	<1	3
K+compounds as K	<1	-	<1	<1	<1
Metals not specified elsewhere	3	-	<1	3,060	3,060
Mg+compounds as Mg	<1	-	<1	<1	<1
Mn+compounds as Mn	-	-	<1	<1	<1
Na+compounds as Na	10	-	22	7,510	7,540
Ni+compounds as Ni	<1	-	<1	<1	<1
NO3-	1	-	<1	76	78
Organo-chlorine not specified	<1	-	<1	6	6
Organo-tin as Sn	-	-	<1	-	<1
Other nitrogen as N	3	-	<1	7,950	7,950
Other organics not specified	<1	-	<1	<1	<1
P+compounds as P	<1	-	<1	879	880
Pb+compounds as PB	<1	-	<1	<1	<1
Phenols	<1	-	<1	<1	<1
S+sulphides as S	<1	-	<1	344	344
SO4--	<1	-	8	1536	1,544
Sr+compounds as Sr	-	-	<1	<1	<1
Suspended solids	2,850	-	3,870	219,800	226,500
TOC	<1	-	<1	<1	<1
Vinyl chloride monomer	<1	-	<1	<1	<1
Zn+compounds as Zn	<1	-	<1	<1	<1

Table 8. Generation of solid waste (in milligrams resulting from the recyclable PAPER bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Solid waste (mg)	Fuel prod'n	Fuel use	Transport	Process	Total
Construction waste	<1	-	<1	<1	<1
Inert chemical	<1	-	<1	275	276
Metals	<1	-	<1	1,350	1,350
Mineral waste	2,590	-	38,500	1889,000	230,000
Mixed industrial	-26,300	-	1,550	22,900	-1,860
Municipal solid waste	-383,000	-	-	-	-383,000
Paper	<1	-	<1	<1	<1
Plastic containers	<1	-	<1	-	<1
Plastics	<1	-	<1	389	390
Putrescibles	<1	-	11	<1	11
Regulated chemicals	67,500	-	3	85	67,600
Slags/ash	921,000	5,290	15,000	5,380	947,000
Tailings	81	-	1,290	4	1,380
Unregulated chemicals	51,200	-	51	820	52,040
Unspecified refuse	55,300	-	<1	282,000	337,000
Waste returned to mine	2,202,000	-	1,420	345	2,203,000
Waste to compost	-	-	-	1,290,000	1,290,000
Waste to incinerator	1	-	18	16	35
Waste to recycle	<1	-	<1	2,544,000	2,544,000
Wood waste	<1	-	<1	306,000	306,000
Wood pallets to recycle	<1	-	<1	-	<1

RECYCLABLE PLASTIC BAG SYSTEM

The results of the LCA for the recyclable plastic bag system are presented below, each describing some aspect of the behavior of the systems examined. In all cases, the following tables refer to the gross or cumulative totals when all operations are traced back to the extraction of raw materials from the earth and are based on the consumer use and collection of 1000 bags and 1500 bags. The subsequent disposal operations of recycling, composting, incineration with energy recovery and landfill are not included in these results tables and will be discussed separately.

Table 9A. Gross energy (in MJ), required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Fuel type	Fuel prod'n & delivery	Energy content of fuel	Transport energy	Feedstock energy	Total energy
Electricity	103	42	3	0	148
Oil	2	35	7	156	199
Other	2	37	0	123	162
Total	106	114	11	279	509

Table 9B. Gross energy (in MJ), required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Fuel type	Fuel prod'n & delivery	Energy content of fuel	Transport energy	Feedstock energy	Total energy
Electricity	154	63	5	0	222
Oil	3	53	11	233	299
Other	2	55	1	185	242
Total	159	171	16	418	763

Table 10A. Gross primary fossil fuels and feedstocks, expressed as energy (in MJ), required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Feedstock	Total
Coal	43	21	1	0	65
Oil	5	37	8	155	206
Gas	23	46	1	116	186
Hydro	4	2	0	-	6
Nuclear	26	11	1	-	38
Lignite	0	0	0	-	0
Wood	0	3	0	7	9
Sulfur	0	0	0	0	0
Hydrogen	0	0	0	-	0
Biomass (solid)	3	1	0	0	4
Recovered energy	0	-7	0	-	-7
Geothermal	0	0	0	-	0
Unspecified	0	0	0	-	0
Solar	0	0	0	-	0
Biomass (liqd/gas)	0	0	0	-	0
Industrial waste	0	0	0	0	0
Municipal Waste	1	0	0	-	1
Wind	0	0	0	-	0
Totals	106	114	11	279	509

Table 10B. Gross primary fossil fuels and feedstocks, expressed as energy (in MJ), required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Feedstock	Total
Coal	65	31	2	0	98
Oil	8	56	12	233	309
Gas	35	69	2	175	279
Hydro	6	3	0	-	9
39	16	1	1	-	57
Lignite	0	0	0	-	0
Wood	0	4	0	10	14
Sulfur	0	0	0	0	0
Hydrogen	0	0	0	-	0
Biomass (solid)	4	2	0	0	6
Recovered energy	0	-11	0	-	-11
Geothermal	0	0	0	-	0
Unspecified	0	0	0	-	0
Solar	0	0	0	-	0
Biomass (liqd/gas)	0	0	0	-	0
Industrial waste	0	0	0	0	0
Municipal Waste	1	0	0	-	1
Wind	0	0	0	-	0
Totals	159	171	16	418	763

Table 11A. Gross primary fossil fuels and feedstocks, expressed as mass (in milligrams), required the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Crude oil................	4,571,000
Gas/condensate.........	3,065,000
Coal.....................	2,259,000
Metallurgical coal......	6,060
Lignite	670
Peat	7,920
Wood (50% water).....	809,000
Biomass (incl. water)...	498,000

Table 11B. Gross primary fossil fuels and feedstocks, expressed as mass (in milligrams), required the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Crude oil................	6,857,000
Gas/condensate.........	4,598,000
Coal.....................	3,388,000
Metallurgical coal......	9,100
Lignite	1,010
Peat	11,900
Wood (50% water).....	1,212,000
Biomass (incl. water)...	746,000

Table 12A. Gross water resources (in milligrams) required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Source	Use in process	Use in cooling	Totals
Public supply	31,900,000	1,230,000	33,150,000
River/canal	4,970,000	2,520,000	7,480,000
Sea	819,000	58,600,000	59,400,000
Unspecified	5,120,000	105,400,000	110,600,000
Well	425,000	66,000	138,000
Total	43,250,000	167,800,000	211,100,000

Table 12B. Gross water resources (in milligrams) required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Source	Use in process	Use in cooling	Totals
Public supply	47,900,000	1,850,000	49,700,000
River/canal	7,460,000	3,780,000	11,200,000
Sea	1,230,000	87,900,000	89,100,000
Unspecified	7,680,000	158,000,000	166,000,000
Well	638,000	99,000	207,000
Total	64,900,000	252,000,000	317,000,000

Table 13A. Gross other raw materials (in milligrams required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Raw material	Input in mg
Air	1,436,000
Animal matter	<1
Barites	343
Bauxite	111
Bentonite	231
Calcium sulphate (CaSO4)	22
Clay	235
Cr	7
Cu	<1
Dolomite	184
Fe	15,000
Feldspar	<1
Ferromanganese	14
Fluorspar	3
Granite	<1
Gravel	56
Hg	<1
Limestone (CaCO3)	542,000
Mg	<1
N2	823,000
Ni	<1
O2	110,000
Olivine	141
Pb	87
Phosphate as P205	743
Potassium chloride (KCl)	252
Quartz (SiO2)	0
Rutile	272,000
S (bonded)	13
S (elemental)	1,520
Sand (SiO2)	935
Shale	63
Sodium chloride (NaCl)	51,200
Sodium nitrate (NaNO3)	0
Talc	<1
Unspecified	<1
Zn	266

Table 13B. Gross other raw materials (in milligrams required for the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Raw material	Input in mg
Air	2,154,000
Animal matter	<1
Barites	515
Bauxite	166
Bentonite	347
Calcium sulphate (CaSO4)	33
Clay	353
Cr	10
Cu	<1
Dolomite	276
Fe	22,600
Feldspar	<1
Ferromanganese	21
Fluorspar	4
Granite	<1
Gravel	83
Hg	<1
Limestone (CaCO3)	812,000
Mg	<1
N2	1,235,000
Ni	<1
O2	165,000
Olivine	212
Pb	131
Phosphate as P205	1,120
Potassium chloride (KCl)	379
Quartz (SiO2)	0
Rutile	408,000
S (bonded)	20
S (elemental)	2,270
Sand (SiO2)	1,400
Shale	94
Sodium chloride (NaCl)	76,700
Sodium nitrate (NaNO3)	0
Talc	<1
Unspecified	<1
Zn	399

Table 14A. Gross air emissions (in milligrams) resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Air emissions/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Fugitive	Total
Dust (PM10)	6,340	540	430	7,000	-	-	14,300
CO	10,800	48,900	5,110	2,570	-	-	67,400
CO2	8,570,000	5,390,000	551,000	953,000	-427,000	-	15,030,000
SOX as SO2	35,700	9,130	2,000	3,640	-	-	50,500
H2S	<1	-	<1	14	-	-	14
Mercaptan	<1	<1	-	4	-		4
NOX as NO2	28,500	10,000	6,060	870	-	-	45,400
Aledhyde (-CHO)	<1	-	<1	<1	-	-	<1
Aromatic HC not spec	1	-	22	380	-	-	403
Cd+compounds as Cd	<1	-	<1	-	-		<1
CH4	40,900	1,660	3	20,700	-	-	63,300
Cl2	<1	-	<1	29	-	-	29
Cr+compounds as Cr	<1	-	<1	-	-	-	<1
CS2	<1	-	<1	<1	-		<1
Cu+compounds as Cu	<1	-	<1	-	-	-	<1
Dichlorethane (DCE)	<1	-	<1	<1	-	<1	<1
Ethylene C2H4	-	-	<1	-	-	-	<1
F2	<1	-	<1	<1	-	-	<1
H2	68	2	<1	754	-	-	824
H2SO4	<1	-	<1	<1	-	-	<1
HCl	1,220	95	<1	3	-	-	1,320
HCN	<1	-	<1	<1	-	-	<1
HF	46	1	<1	<1	-	-	47
Hg+compounds as Hg	<1	-	<1	<1	--	-	<1
Hydrocarbons not spec	7,430	920	1,670	13,100	-	-	23,100
Metals not specified	6	5	<1	3	-	-	14
Methylene chloride CH2	<1	-	<1	<1	-	-	<1
N2O	<1	<1	<1	-	-	-	<1
NH3	<1	-	<1	8	-	-	8
Ni compounds as Ni	<1	-	<1	-	-	-	<1
NMVOC	<1	-	<1	993	-	-	994
Organics	<1	<1	<1	367	-	-	367
Organo-chlorine not spec	<1	-	<1	<1	-	-	<1
Pb+compounds as Pb	<1	<1	<1	<1	-	-	<1
Polycyclic hydrocarbon	<1	-	<1	<1	-	-	<1
Sb+compounds as Sb	-	-	<1	-	-	-	<1
Vinyl chloride monomer	<1	-	<1	<1	-	<1	<1
Zn+compounds as Zn	<1	-	<1	<1	-	-	<1

Table 14B. Carbon dioxide equivalents corresponding to the gross air emissions (in milligrams) resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Type/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Total
20 year equiv	11,100,000	5,590,000	566,000	2,280,000	-427,000	19,200,000
100 year equiv	9,550,000	5,530,000	566,000	1,470,000	-427,000	16,700,000
500 year equiv	8,900,000	5,500,000	566,000	1,140,000	-427,000	15,700,000

Table 14C. Gross air emissions (in milligrams) resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Air emissions/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Fugitive	Total
Dust (PM10)	9,500	811	644	10,500	-	-	21,500
CO	16,100	73,400	7,670	3,850	-	-	101,000
CO2	12,900,000	8,082,000	826,000	1,429,000	-640,000	-	22,550,000
SOX as SO2	53,500	13,700	3,000	5,460	-	-	75,700
H2S	<1	-	<1	21	-	-	22
Mercaptan	<1	<1	-	6	-		6
NOX as NO2	42,700	15,100	9,090	1,310	-	-	68,100
Aledhyde (-CHO)	<1	-	<1	<1	-	-	<1
Aromatic HC not spec	2	-	33	570	-	-	604
Cd+compounds as Cd	<1	-	<1	-	-		<1
CH4	61,400	2,490	4	31,090	-	-	95,000
Cl2	<1	-	<1	43	-	-	43
Cr+compounds as Cr	<1	-	<1	-	-	-	<1
CS2	<1	-	<1	<1	-		<1
Cu+compounds as Cu	<1	-	<1	-	-	-	<1
Dichlorethane (DCE)	<1	-	<1	<1	-	<1	<1
Ethylene C2H4	-	-	<1	-	-	-	<1
F2	<1	-	<1	<1	-	-	<1
H2	102	2	<1	1,130	-	-	1,240
H2SO4	<1	-	<1	<1	-	-	<1
HCl	1,830	142	1	5	-	-	1,980
HCN	<1	-	<1	<1	-	-	<1
HF	69	2	<1	<1	-	-	71
Hg+compounds as Hg	<1	-	<1	<1	--	-	<1
Hydrocarbons not spec	11,100	1,380	2,510	19,700	-	-	34,700
Metals not specified	9	7	<1	5	-	-	21
Methylene chloride CH2	<1	-	<1	<1	-	-	<1
N2O	<1	<1	<1	-	-	-	<1
NH3	<1	-	<1	12	-	-	12
Ni compounds as Ni	<1	-	<1	-	-	-	<1
NMVOC	<1	-	<1	1,490	-	-	1,490
Organics	<1	<1	<1	551	-	-	551
Organo-chlorine not spec	<1	-	<1	<1	-	-	<1
Pb+compounds as Pb	<1	<1	<1	<1	-	-	<1
Polycyclic hydrocarbon	<1	-	<1	<1	-	-	<1
Sb+compounds as Sb	-	-	<1	-	-	-	<1
Vinyl chloride monomer	<1	-	<1	<1	-	<1	<1
Zn+compounds as Zn	<1	-	<1	<1	-	-	<1

Table 14D. Carbon dioxide equivalents corresponding to the gross air emissions (in milligrams) resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Type/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Total
20 year equiv	16,700,000	8,390,000	849,000	3,420,000	-641,000	28,800,000
100 year equiv	14,300,000	8,300,000	849,000	2,210,000	-641,000	25,100,000
500 year equiv	13,400,000	8,250,000	849,000	1,710,000	-641,000	23,600,000

Table 15A. Gross water emissions (in milligrams), resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Process	Total
COD	9	-	8	5390	5,410
BOD	2	-	<1	543	545
Acid (H+)	4	-	<1	9	13
Al+compounds as Al	<1	-	<1	4	4
Ammonium compounds as NH4	5	-	<1	11	17
AOX	<1	-	<1	<1	<1
As+compounds as As	-	-	<1	<1	<1
BrO3--	<1	-	<1	<1	<1
Ca+compounds as Ca	<1	-	<1	20	20
Cd+compounds as Cd	-	-	<1	-	<1
Cl-	3	-	8	3,060	3,070
ClO3--	<1	-	<1	15	15
CN-	<1	-	<1	<1	<1
CO3--	-	-	<1	181	182
Cr+compounds as Cr	<1	-	<1	<1	<1
Cu+compounds as Cu	<1	-	<1	1	1
Detergent/oil	<1	-	<1	39	40
Dichloroethane (DCE)	<1	-	<1	<1	<1
Dioxin/furan as Teq	-	-	<1	-	<1
Dissolved chlorine	<1	-	<1	<1	<1
Dissolved organics (non-HC)	3	-	<1	44	47
Dissolved solids not specified	2	-	2	947	952
F-	<1	-	<1	<1	<1
Fe+compounds as Fe	<1	-	<1	<1	<1
Hg+compounds as Hg	<1	-	<1	<1	<1
Hydrocarbons not specified	26	<1	<1	3	30
K+compounds as K	<1	-	<1	11	11
Metals not specified elsewhere	<1	-	<1	54	55
Mg+compounds as Mg	<1	-	<1	<1	<1
Mn+compounds as Mn	-	-	<1	<1	<1
Na+compounds as Na	2	-	5	3,136	3,143
Ni+compounds as Ni	<1	-	<1	<1	<1
NO3-	1	-	<1	13	13
Organo-chlorine not specified	<1	-	<1	<1	<1
Organo-tin as Sn	-	-	<1	-	<1
Other nitrogen as N	<1	-	<1	46	47
Other organics not specified	<1	-	<1	<1	<1
P+compounds as P	<1	-	<1	7	7
Pb+compounds as PB	<1	-	<1	<1	<1
Phenols	<1	-	<1	10	10
S+sulphides as S	<1	-	<1	2	2
SO4--	<1	-	2	4,097	4,098
Sr+compounds as Sr	-	-	<1	<1	<1
Suspended solids	573	-	861	78,300	79,800
TOC	<1	-	<1	60	60
Vinyl chloride monomer	<1	-	<1	<1	<1
Zn+compounds as Zn	<1	-	<1	<1	<1

Table 15B. Gross water emissions (in milligrams), resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Process	Total
COD	14	-	12	8,080	8,110
BOD	3	-	<1	814	817
Acid (H+)	6	-	<1	13	19
Al+compounds as Al	<1	-	<1	5	5
Ammonium compounds as NH4	7	-	<1	17	25
AOX	<1	-	<1	<1	<1
As+compounds as As	-	-	<1	<1	<1
BrO3--	<1	-	<1	<1	<1
Ca+compounds as Ca	<1	-	<1	30	30
Cd+compounds as Cd	-	-	<1	-	<1
Cl-	5	-	11	4,590	4,610
ClO3--	<1	-	<1	22	22
CN-	<1	-	<1	<1	<1
CO3--	-	-	1	272	273
Cr+compounds as Cr	<1	-	<1	<1	<1
Cu+compounds as Cu	<1	-	<1	2	2
Detergent/oil	<1	-	<1	59	60
Dichloroethane (DCE)	<1	-	<1	<1	<1
Dioxin/furan as Teq	-	-	<1	-	<1
Dissolved chlorine	<1	-	<1	1	1
Dissolved organics (non-HC)	4	-	<1	66	70
Dissolved solids not specified	3	-	3	1,420	1,430
F-	<1	-	<1	<1	<1
Fe+compounds as Fe	<1	-	<1	<1	<1
Hg+compounds as Hg	<1	-	<1	<1	<1
Hydrocarbons not specified	39	<1	<1	4	45
K+compounds as K	<1	-	<1	16	16
Metals not specified elsewhere	1	-	<1	81	83
Mg+compounds as Mg	<1	-	<1	<1	<1
Mn+compounds as Mn	-	-	<1	<1	<1
Na+compounds as Na	3	-	8	4,700	4,710
Ni+compounds as Ni	<1	-	<1	<1	<1
NO3-	<1	-	<1	19	19
Organo-chlorine not specified	<1	-	<1	<1	<1
Organo-tin as Sn	-	-	<1	-	<1
Other nitrogen as N	1	-	<1	69	70
Other organics not specified	<1	-	<1	<1	<1
P+compounds as P	<1	-	<1	10	10
Pb+compounds as PB	<1	-	<1	<1	<1
Phenols	<1	-	<1	15	15
S+sulphides as S	<1	-	<1	3	3
SO4--	<1	-	3	6,150	6,150
Sr+compounds as Sr	-	-	<1	<1	<1
Suspended solids	860	-	1,290	117,500	119,600
TOC	<1	-	<1	90	90
Vinyl chloride monomer	<1	-	<1	<1	<1
Zn+compounds as Zn	<1	-	<1	1	1

Table 16A. Generation of solid waste (in milligrams resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Solid waste (mg)	Fuel prod'n	Fuel use	Transport	Process	Total
Construction waste	<1	-	<1	<1	<1
Inert chemical	<1	-	<1	3,446	3,446
Metals	<1	-	<1	301	301
Mineral waste	974	-	8,564	324,200	333,700
Mixed industrial	-11,800	-	345	5,520	-5,950
Municipal solid waste	-79,800	-	-	22,500	-57,300
Paper	<1	-	<1	<1	<1
Plastic containers	<1	-	<1	-	<1
Plastics	<1	-	<1	53,600	53,600
Putrescibles	<1	-	2	7	10
Regulated chemicals	9,040	-	<1	4,720	13,800
Slags/ash	180,000	4,460	3,330	1,660	189,000
Tailings	16	-	287	1,048	1,350
Unregulated chemicals	6,810	-	11	7,190	14,000
Unspecified refuse	7,350	-	<1	62,900	70,200
Waste returned to mine	443,000	-	316	872	444,400
Waste to compost	-	-	-	9,290	9,290
Waste to incinerator	<1	-	4	4,370	4,380
Waste to recycle	<1	-	<1	33,200	33,200
Wood waste	<1	-	<1	2,330	2,330
Wood pallets to recycle	<1	-	<1	298,000	298,000

Table 16B. Generation of solid waste (in milligrams resulting from the recyclable PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Solid waste (mg)	Fuel prod'n	Fuel use	Transport	Process	Total
Construction waste	<1	-	<1	<1	<1
Inert chemical	<1	-	<1	5,170	5,170
Metals	<1	-	<1	452	452
Mineral waste	1,460	-	12,800	486,000	501,000
Mixed industrial	-17,700	-	517	8,280	-8,930
Municipal solid waste	1119,700	-	-	33,800	-85,900
Paper	<1	-	<1	<1	<1
Plastic containers	<1	-	<1	-	<1
Plastics	<1	-	<1	80,400	80,400
Putrescibles	<1	-	4	11	14
Regulated chemicals	13,600	-	<1	7,080	20,600
Slags/ash	270,000	6,680	4,990	2,480	284,000
Tailings	24	-	430	1,570	2,030
Unregulated chemicals	10,200	-	17	10,800	21,000
Unspecified refuse	11,030	-	<1	94,300	105,400
Waste returned to mine	665,000	-	475	1,310	667,000
Waste to compost	-	-	-	13,900	13,900
Waste to incinerator	<1	-	6	6,560	6,560
Waste to recycle	<1	-	<1	49,800	49,800
Wood waste	<1	-	<1	3,500	3,500
Wood pallets to recycle	<1	-	<1	447,000	447,000

THE COMPOSTABLE PLASTIC BAG SYSTEM

The results of the LCA for the compostable plastic bag system are presented below, each describing some aspect of the behavior of the systems examined. In all cases, the following tables refer to the gross or cumulative totals when all operations are traced back to the extraction of raw materials from the earth and are based on the consumer use and collection of 1000 bags and 1500 bags. The subsequent disposal operations of recycling, composting, incineration with energy recovery and landfill are not included in these results tables and will be discussed separately.

Table 17A. Gross energy (in MJ), required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Fuel type	Fuel prod'n & delivery	Energy content of fuel	Transport energy	Feedstock energy	Total energy
Electricity	221	103	1	0	325
Oil	29	279	36	1	345
Other	15	277	1	417	710
Total	265	659	38	418	1380

Table 17B. Gross energy (in MJ), required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Fuel type	Fuel prod'n & delivery	Energy content of fuel	Transport energy	Feedstock energy	Total energy
Electricity	331	154	2	0	487
Oil	44	418	54	1	518
Other	22	416	2	625	1065
Total	398	988	57	627	2070

Table 18A. Gross primary fossil fuels and feedstocks, expressed as energy (in MJ), required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Feedstock	Total
Coal	113	48	1	0	161
Oil	34	281	37	1	353
Gas	44	301	1	360	705
Hydro	7	2	0	-	9
Nuclear	62	11	0	-	74
Lignite	0	0	0	-	0
Wood	0	7	0	18	26
Sulfur	0	0	0	0	0
Hydrogen	0	0	0	0	0
Biomass (solid)	6	2	0	39	47
Recovered energy	-2	-5	0	-	-8
Geothermal	0	0	0	-	0
Unspecified	0	0	0	-	0
Solar	0	0	0	-	0
Biomass (liqd/gas)	0	0	0	-	0
Industrial waste	1	0	0	-	1
Municipal Waste	1	0	0	-	1
Wind	0	11	0	-	11
Totals	265	659	38	418	1,380

Table 18B. Gross primary fossil fuels and feedstocks, expressed as energy (in MJ), required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Feedstock	Total
Coal	169	72	1	0	241
Oil	51	422	55	1	529
Gas	65	451	1	540	1,057
Hydro	11	3	0	-	14
Nuclear	94	17	0	-	111
Lignite	0	0	0	-	0
Wood	0	11	0	27	38
Sulfur	0	0	0	0	0
Hydrogen	0	0	0	0	0
Biomass (solid)	9	4	0	58	71
Recovered energy	-4	-8	0	-	-11
Geothermal	0	0	0	-	0
Unspecified	0	0	0	-	0
Solar	0	0	0	-	0
Biomass (liqd/gas)	0	0	0	-	0
Industrial waste	1	0	0	-	1
Municipal Waste	1	1	0	-	2
Wind	0	16	0	-	16
Totals	398	988	57	627	2,070

Table 19A. Gross primary fossil fuels and feedstocks, expressed as mass (in milligrams), required the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Crude oil................	7,840,000
Gas/condensate.........	14,020,000
Coal.....................	5,760,000
Metallurgical coal......	17,000
Lignite	0
Peat	7
Wood (50% water).....	2,210,000
Biomass (incl. water)...	986,000

Table 19B. Gross primary fossil fuels and feedstocks, expressed as mass (in milligrams), required the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Crude oil................	11,760,000
Gas/condensate.........	21,030,000
Coal.....................	8,630,000
Metallurgical coal......	25,000
Lignite	0
Peat	10
Wood (50% water).....	3,310,000
Biomass (incl. water)...	1,480,000

Table 20A. Gross water resources (in milligrams) required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Source	Use in process	Use in cooling	Totals
Public supply	2,540,000,000	19,200,000	2,560,000,000
River/canal	3,870	1,690,000	1,700,000
Sea	13,100	2,710,000	2,720,000
Unspecified	36,600,000	6,270,000	42,900,000
Well	564,000	49	564,000
Totals	2,580,000,000	29,900,000	2,607,000,000

Table 20B. Gross water resources (in milligrams) required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Source	Use in process	Use in cooling	Totals
Public supply	3,810,000,000	28,800,000	3,840,000,000
River/canal	5,810	2,540,000	2,550,000
Sea	19,650	4,065,000	4,080,000
Unspecified	54,900,000	9,410,000	64,350,000
Well	846,000	74	846,000
Totals	3,870,000,000	44,900,000	3,910,000,000

Table 21A. Gross other raw materials (in milligrams) required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Raw material	Input in mg
Air	1,460,000
Animal matter	0
Barites	1,700
Bauxite	4,000
Bentonite	99
Calcium sulphate (CaSO4)	<1
Clay	34,200
Cr	19
Cu	0
Dolomite	513
Fe	47,300
Feldspar	0
Ferromanganese	38
Fluorspar	3
Granite	0
Gravel	155
Hg	0
Limestone (CaCO3)	4,230,000
Mg	0
N2 for reaction	17,900
Ni	0
O2 for reaction	1,030
Olivine	394
Pb	260
Phosphate as P205	12,300
Potassium chloride (KCl)	23,000
Quartz (SiO2)	0
Rutile	0
S (bonded)	401,000
S (elemental)	23,700
Sand (SiO2)	22,400
Shale	2
Sodium chloride (NaCl)	261,000
Sodium nitrate (NaNO3)	0
Talc	0
Unspecified	0
Zn	9

Table 21B. Gross other raw materials (in milligrams) required for the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Raw material	Input in mg
Air	2,190,000
Animal matter	0
Barites	2,550
Bauxite	6,010
Bentonite	148
Calcium sulphate (CaSO4)	<1
Clay	51,300
Cr	28
Cu	0
Dolomite	769
Fe	71,000
Feldspar	0
Ferromanganese	57
Fluorspar	5
Granite	0
Gravel	232
Hg	0
Limestone (CaCO3)	6,350,000
Mg	0
N2 for reaction	26,800
Ni	0
O2 for reaction	1,550
Olivine	591
Pb	390
Phosphate as P205	18,400
Potassium chloride (KCl)	34,500
Quartz (SiO2)	0
Rutile	0
S (bonded)	602,000
S (elemental)	35,500
Sand (SiO2)	33,600
Shale	3
Sodium chloride (NaCl)	392,000
Sodium nitrate (NaNO3)	0
Talc	0
Unspecified	0
Zn	14

Table 22A. Gross air emissions (in milligrams) resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Air emissions mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Fugitive	Total
Dust (PM10)	9,120	520	1,500	42,200	-	-	53,400
CO	16,000	4,900	16,900	4,100	-	-	41,900
CO2	13,860,000	2,620,000	2,580,000	41,800,000	-4,230,000	-	56,600,000
SOX as SO2	54,900	7,210	21,100	192,000	-	-	275,000
H2S	0	0	1	40	-	-	41
Mercaptan	0	0	0	11	-		11
NOX as NO2	50,000	8,260	24,500	221,500	-	-	304,000
Aledhyde (-CHO)	0	0	0	0	-	-	0
Aromatic HC not spec	2	-	67	4	-	-	74
Cd+compounds as Cd	0	-	0	-	-		0
CFC/HCFC/HFC not sp	0	-	0	0	-		0
CH4	59,600	1,060	98	224,000	-	-	284,000
Cl2	0	-	0	0	-	-	0
Cr+compounds as Cr	0	-	0	-	-	-	0
CS2	0	-	0	0	-		0
Cu+compounds as Cu	0	-	0	-	-	-	0
Dichlorethane (DCE)	0	-	0	0	-	0	0
Ethylene C2H4	-	-	0	-	-	-	0
F2	0	-	0	0	-	-	0
H2	38	0	0	226	-	-	264
H2SO4	0	-	0	0	-	-	0
HCl	2,140	6	3	871	-	-	3,020
HCN	0	-	0	0	-	-	0
HF	81	0	0	0	-	-	81
Hg+compounds as Hg	0	-	0	0	--	-	0
Hydrocarbons not spec	13,800	1,720	6,400	100	-	-	22,000
Metals not specified	8	4	0	0	0	-	12
Molybdenum	-	-	-	1	-	-	1
N2O	0	0	0	53,100	-	-	53,100
NH3	0	-	0	39	-	-	39
Ni compounds as Ni	0	-	0	-	-	-	0
NMVOC	0	72	410	46,400	-	-	46,900
Organics	0	0	0	119	-	-	119
Organo-chlorine not spec	0	-	0	16	-	-	16
Pb+compounds as Pb	0	0	0	0	-	-	0
Polycyclic hydrocarbon	0	-	0	0	-	-	0
Titanium	-	-	-	119	-	-	119
Vinyl chloride monomer	0	-	0	0	-	-	0
Zn+compounds as Zn	0	-	0	0	-	-	0

Table 22B. Carbon dioxide equivalents corresponding to the gross air emissions (in milligrams) from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Type/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Total
20 year equiv	17,630,000	2,700,000	2,640,000	70,200,000	-4,230,000	89,000,000
100 year equiv	15,300,000	2,660,000	2,640,000	62,640,000	-4,230,000	79,000,000
500 year equiv	14,300,000	2,640,000	2,400,000	51,600,000	-4,230,000	67,000,000

Table 22C. Gross air emissions (in milligrams) resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Air emissions/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Fugitive	Total
Dust (PM10)	13,700	780	2,260	63,400	-	-	80,100
CO	24,000	7,360	25,300	6,150	-	-	62,900
CO2	20,800,000	3,930,000	3,880,000	62,700,000	-6,340,000	-	84,900,000
SOX as SO2	82,400	10,800	31,600	288,000	-	-	413,000
H2S	0	0	2	60	-	-	62
Mercaptan	0	0	0	17	-		17
NOX as NO2	74,900	12,400	36,700	332,000	-	-	456,000
Aledhyde (-CHO)	0	0	0	0	-	-	0
Aromatic HC not spec	3	-	101	7	-	-	111
Cd+compounds as Cd	0	-	0	-	-		0
CFC/HCFC/HFC not sp	0	-	0	0	-		0
CH4	89,500	1,590	147	335,000	-	-	426,000
Cl2	0	-	0	0	-	-	0
Cr+compounds as Cr	0	-	0	-	-	-	0
CS2	0	-	0	0	-		0
Cu+compounds as Cu	0	-	0	-	-	-	0
Dichlorethane (DCE)	0	-	0	0	-	-	0
Ethylene C2H4	-	-	0	-	-	-	0
F2	0	-	0	0	-	-	0
H2	57	0	0	339	-	-	397
H2SO4	0	-	0	0	-	-	0
HCl	3,220	8	5	1,310	-	-	4,540
HCN	0	-	0	0	-	-	0
HF	121	0	0	0	-	-	122
Hg+compounds as Hg	0	-	0	0	--	-	0
Hydrocarbons not spec	20,600	2,580	9,590	150	-	-	33,000
Metals not specified	13	5	0	0	0	-	18
Molybdenum	-	-	-	2	-	-	2
N2O	0	0	0	79,600	-	-	79,600
NH3	0	-	0	59	-	-	59
Ni compounds as Ni	0	-	0	-	-	-	0
NMVOC	1	108	615	69,600	-	-	70,300
Organics	0	0	0	178	-	-	178
Organo-chlorine not spec	0	-	0	24	-	-	24
Pb+compounds as Pb	0	0	0	0	-	-	0
Polycyclic hydrocarbon	0	-	0	0	-	-	0
Titanium	-	-	-	178	-	-	178
Vinyl chloride monomer	0	-	0	0	-	-	0
Zn+compounds as Zn	0	-	0	0	-	-	0

Table 22D. Carbon dioxide equivalents corresponding to the gross air emissions (in milligrams) from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Type/mg	Fuel prod'n	Fuel use	Transport	Process	Biomass	Total
20 year equiv	26,400,000	4,050,000	3,960,000	105,300,000	-6,350,000	134,000,000
100 year equiv	23,000,000	3,990,000	3,960,000	94,000,000	-6,350,000	119,000,000
500 year equiv	21,500,000	3,960,000	3,600,000	77,400,000	-6,350,000	101,000,000

Table 23A. Gross water emissions (in milligrams), resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Process	Total
COD	15	2	57	59,700	59,800
BOD	4	-	4	3,190	3,200
Acid (H+)	2	-	0	0	4
Al+compounds as Al	0	-	0	2	2
Ammonium compounds as NH4	5	-	2	0	7
AOX	0	-	0	10	10
As+compounds as As	-	-	0	0	0
BrO3--	0	-	0	0	0
Ca+compounds as Ca	0	-	0	201	201
Cd+compounds as Cd	-	-	0	-	0
Cl-	7	-	670	27,500	28,100
ClO3--	0	-	0	2	2
CN-	0	-	0	0	0
CO3--	-	-	2	5	7
Cr+compounds as Cr	0	-	0	0	0
Cu+compounds as Cu	0	-	0	0	0
Detergent/oil	0	-	2	3	5
Dichloroethane (DCE)	0	-	0	0	0
Dioxin/furan as Teq	-	-	0	-	0
Dissolved chlorine	0	-	0	0	0
Dissolved organics (non-HC)	6	-	0	0	6
Dissolved solids not specified	2	-	6	59	67
F-	0	-	6	0	6
Fe+compounds as Fe	0	-	1	20	22
Hg+compounds as Hg	0	-	0	0	0
Hydrocarbons not specified	0	0	1	334	337
K+compounds as K	0	-	0	2	2
Metals not specified elsewhere	0	-	0	52	52
Mg+compounds as Mg	0	-	0	2	2
Mn+compounds as Mn	-	-	0	0	0
Na+compounds as Na	3	-	15	1,270	1,290
Ni+compounds as Ni	0	-	0	0	0
NO3-	0	-	0	1,910	1,910
Organo-chlorine not specified	0	-	0	0	0
Organo-tin as Sn	-	-	0	-	0
Other nitrogen as N	0	-	0	4,300	4,300
Other organics not specified	0	-	0	0	0
P+compounds as P	0	-	0	41	41
Pb+compounds as PB	0	-	0	0	0
Phenols	0	-	0	0	0
S+sulphides as S	0	-	0	5	5
SO4--	0	-	5	6,287	6,290
Sr+compounds as Sr	-	-	0	0	0
Suspended solids	945	-	2,660	396,000	399,000
TOC	0	-	15	2,460	2,480
Vinyl chloride monomer	0	-	0	0	0
Zn+compounds as Zn	0	-	0	0	0

Table 23B. Gross water emissions (in milligrams), resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

	Fuel prod'n	Fuel use	Transport	Process	Total
COD	22	2	86	89,500	89,600
BOD	6	-	6	4,790	4,800
Acid (H+)	4	-	0	1	5
Al+compounds as Al	0	-	0	3	3
Ammonium compounds as NH4	7	-	2	1	11
AOX	0	-	0	15	15
As+compounds as As	-	-	0	0	0
BrO3--	0	-	0	0	0
Ca+compounds as Ca	0	-	0	302	302
Cd+compounds as Cd	-	-	0	-	0
Cl-	10	-	1,010	41,200	42,200
ClO3--	0	-	0	2	2
CN-	0	-	0	0	0
CO3--	-	-	3	7	10
Cr+compounds as Cr	0	-	0	0	0
Cu+compounds as Cu	0	-	0	0	0
Detergent/oil	0	-	2	4	7
Dichloroethane (DCE)	0	-	0	0	0
Dioxin/furan as Teq	-	-	0	-	0
Dissolved chlorine	0	-	0	0	0
Dissolved organics (non-HC)	9	-	0	1	10
Dissolved solids not specified	2	-	10	89	101
F-	0	-	9	0	9
Fe+compounds as Fe	0	-	2	31	33
Hg+compounds as Hg	0	-	0	0	0
Hydrocarbons not specified	1	1	2	501	505
K+compounds as K	0	-	0	3	3
Metals not specified elsewhere	0	-	0	76	76
Mg+compounds as Mg	0	-	0	3	3
Mn+compounds as Mn	-	-	0	0	0
Na+compounds as Na	4	-	23	1,900	1,930
Ni+compounds as Ni	0	-	0	0	0
NO3-	0	-	0	2,860	2,860
Organo-chlorine not specified	0	-	0	0	0
Organo-tin as Sn	-	-	0	-	0
Other nitrogen as N	0	-	0	6,440	6,440
Other organics not specified	0	-	0	0	0
P+compounds as P	0	-	0	62	62
Pb+compounds as PB	0	-	0	0	0
Phenols	0	-	0	0	0
S+sulphides as S	0	-	0	7	7
SO4--	0	-	8	9,430	9,440
Sr+compounds as Sr	-	-	0	0	0
Suspended solids	1,420	-	3,990	594,000	599,000
TOC	0	-	23	3,690	3,710
Vinyl chloride monomer	0	-	0	0	0
Zn+compounds as Zn	0	-	0	0	0

Table 24A. Generation of solid waste (in milligrams) resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1000 bags. Totals may not agree because of rounding.

Solid waste (mg)	Fuel prod'n	Fuel use	Transport	Process	Total
Construction waste	0	-	0	0	0
Inert chemical	0	-	0	5	5
Metals	0	-	0	822	822
Mineral waste	1,110	-	26,500	405,000	433,000
Mixed industrial	-12,800	-	1,100	2,620	-9,080
Municipal solid waste	-130,000	-	-	205,000	75,000
Paper	0	-	0	0	0
Plastic containers	0	-	0	-	0
Plastics	0	-	0	1,580	1,580
Putrescibles	0	-	7	1	8
Regulated chemicals	18,400	-	4,830	133	23,400
Slags/ash	308,000	660	10,300	2,690,000	3,009,000
Tailings	27	-	15,900	284	16,300
Unregulated chemicals	14,000	-	0	82,400	96,400
Unspecified refuse	15,100	-	0	171,700	186,800
Waste returned to mine	731,000	-	980	108	732,100
Waste to compost	-	-	-	25,400	25,400
Waste to incinerator	0	-	12	67	80
Waste to recycle	0	-	0	32,500	32,500
Wood waste	0	-	0	6,370	6,370
Wood pallets to recycling	0	-	0	812,700	812,700

Table 24B. Generation of solid waste (in milligrams) resulting from the COMPOSTABLE PLASTIC bag LCA. Based on consumer use & collection of 1500 bags. Totals may not agree because of rounding.

Solid waste (mg)	Fuel prod'n	Fuel use	Transport	Process	Total
Construction waste	0	-	0	0	0
Inert chemical	0	-	0	6	6
Metals	0	-	0	1,230	1,230
Mineral waste	1,660	-	39,800	608,000	649,000
Mixed industrial	-19,200	-	1,650	3,940	-13,600
Municipal solid waste	-195,000	-	-	308,000	113,000
Paper	0	-	0	0	0
Plastic containers	0	-	0	-	0
Plastics	0	-	0	2,380	2,380
Putrescibles	0	-	11	<1	11
Regulated chemicals	27,600	-	7,250	199	35,100
Slags/ash	462,000	985	15,500	4,035,000	4,510,000
Tailings	40	-	23,900	427	24,400
Unregulated chemicals	20,900	-	52	124,000	145,000
Unspecified refuse	22,600	-	0	258,000	280,000
Waste returned to mine	1,097,000	-	1,470	162	1,098,000
Waste to compost	-	-	-	38,000	38,000
Waste to incinerator	0	-	18	101	120
Waste to recycle	0	-	0	48,800	48,800
Wood waste	0	-	0	9,550	9,550
Wood pallets to recycling	0	-	0	1,220,000	1,220,000

Final Disposal Solid Waste Options: Recycling, Combustion with Energy Recovery, Landfill and Composting

Recycling

A major goal of recycling is to reduce the generation of solid waste. The bag making process for grocery bags generates paper and plastic waste. The majority of this waste, known as mill waste, is recycled internally. Therefore, in this study BCAL treated mill waste as a closed loop recycling effort that returned the waste to the production process.

All of the grocery bags are recyclable to other paper and plastic products. EPA data from 2005 show that 21% of the kraft paper grocery bags are recycled and 5.2 % of the plastic grocery bags are recycled. The allocation decision for these recycled materials is that the recycled materials are not burdened with any inputs or outputs associated with their previous manufacture, use, disposal prior to recycling.

BCAL used this allocation approach, and treated the recycled materials as diverted waste. Diverted waste, like raw materials, are burdened with their intrinsic feedstock value and are subsequently burdened with the resource use, energy consumption, and environmental releases associated with their collection, cleaning and reprocessing, use, and disposal. Therefore, the inherent feedstock energy value of the recycled material is assigned to the diverted waste.

With respect to the degradable plastic bags, BCAL assumed that initially the same rate that applies to recycling of standard plastic bags (5.2%) would be appropriate for the rate sent to composting. This reflects a conservative approach using only data that currently reflect consumer behavior with regard to plastic bags. It is expected that the percentage of degradable plastic bags sent to composting will actually be higher once they are made available and collection can occur within municipalities, making it easier for the general consumer to send these bags through a different route of disposal. Recycling of plastic bags is currently low. This may be for a number of reasons, not the least of which appears to be the lack of infrastructure and poor consumer awareness about the inherent recycleability of plastic bags.

Solid Waste Combustion With Energy Recovery

In previous years, a controlled burning process called combustion or incineration was used solely to reduce volume of solid waste. However, energy recovery became more prevalent in the 1980s. Therefore, today, most of the municipal solid waste combustion in the US incorporates recovery of energy. EPA data from 2005 show that 13.6% of MSW was combusted with energy recovery.

The gross calorific values for the various grocery bags are estimated as follows:

For kraft paper bags	17.7 MJ/kg
For recyclable plastic bag	40.0 MJ//kg
For degradable plastic bag	19.6 MJ/kg

These materials are used as fuels in the waste to energy plants, however the thermal efficiencies for mass-burn WTE plants varies from 15% to 23% in the newer plants.[6] This study used 23% thermal efficiency for energy recovery.

Assuming complete combustion, the resulting estimated CO2 emissions are:
For kraft paper bags 1,650,000 mg/kg paper bag
For recyclable plastic bags 3,150,000 mg/kg recyclable plastic bag
For degradable plastic bags 1,360,000 mg/kg degradable plastic bag

The recovered energy (23% thermal efficiency) is as follows:
For kraft paper bags 4.07 MJ/kg paper bag
For recyclable plastic bags 9.20 MJ/kg recyclable plastic bag
For degradable plastic bags 4.51 MJ/kg degradable plastic bag

Therefore, using the above information, the following table is prepared on the basis of 1000 grocery bags and shows the recovered energy and resulting carbon dioxide emissions when 13.6% of the 1000 grocery bags are combusted with energy recovery.

Table 25. Recovered energy (MJ) and resulting carbon dioxide emissions (mg) when 13.6% of the 1000 grocery bags are combusted with energy recovery.

	Kraft Paper Bag	Recyclable Plastic Bag	Degradable Plastic Bag
Recovered energy	28.7 MJ	7.2 MJ	9.7 MJ
CO2 emissions	11,640,000 mg	2,150,000 mg	2,920,000 mg

Table 25 shows that the kraft paper bag has the highest recovered energy and the highest CO2 emissions. The recyclable and compostable plastic bags have significantly lower recovered energy and CO2 emissions.

Solid Waste to Landfill

A landfill has various phases of decomposition. Initially, aerobic decomposition will take place where oxygen is consumed to produce carbon dioxide gas and other by-products. During the first phase of anaerobic decomposition, carbon dioxide is the principal gas generated. As anaerobic decomposition proceeds toward the second phase, the quantity of methane generated increases until the methane concentration reaches 50% to 60%. The landfill will continue to generate methane at these concentrations for 10 or 20 years, and possibly longer[7].

Methane emissions from landfills in the United States were estimated at 8.0 million metric tons in 2001. In addition, 2.5 million tons were recovered for energy use and 2.4 million tons were recovered and flared. Therefore, more than 60% of the methane produced in landfills is not recovered.[8]

The precise fate of paper deposited in a landfill site is unknown. Paper may decompose entirely in a short space of time or it may remain intact for long periods.[9] This depends on a variety of factors such as temperature, pH, the presence of bacteria and nutrients, the composition of the waste and the form of the paper-shredded paper is much more likely to decompose than is a whole telephone book. To account for this variability, two scenarios were used to calculate emissions associated with the disposal of paper bags (both adjustment for 40% of the recovered methane noted above). The first scenario is a worst-case scenario that follows the basic decomposition reaction for cellulose and the second scenario is one that estimates carbon sequestration for paper in MSW landfills.

Scenario 1 for Paper Bags

The basic decomposition reaction for cellulose is well known and follows the form of:

$$C_6H_{10}O_5 + H_2O = 3CH_4 + 3CO_2 \quad (1)$$

It is therefore expected that only one half of the carbon present in kraft paper bags will result in methane formation during decomposition. Typically carbon represents 45% of the mass of paper. Thus, the carbon content of 1 kg of paper will be 0.45 kg. That proportion giving rise to methane, assuming 100 % decomposition, would then be 0.225 kg. Based on this, the mass of methane produced would be 0.30 kg and the corresponding mass of the coproduct carbon dioxide would be 0.83 kg.

Scenario 2 for Paper Bags

Although cellulose decomposition in landfill is well documented, there remains significant uncertainty in the maximum extent of cellulose decomposition that can be realized under landfill conditions. Several studies indicate that significant carbon sequestration occurs in landfills because of the limited degradation of wood products. In one study[10] a carbon storage factor (CSF) was calculated that represented the mass of carbon stored (not degraded) per initial carbon mass of the component. For the following MSW paper refuse components-the CSF was calculated: old newsprint = 0.42 kg C sequestered, coated paper = 0.34 kg C sequestered, and old corrugated = 0.26 kg C sequestered.

For this scenario the partial decomposition that the paper bags go through is assumed to be aerobic or the initial anaerobic phase, resulting principally in carbon dioxide emissions. In this scenario, we have assumed that the paper bags are similar to old corrugated, and therefore have assigned the same value of 0.26 kg C sequestered. Given that 0.26 kg of the kraft paper bag is assumed to be sequestered, 0.74 kg of the kraft paper bag results in carbon dioxide emissions of 1.23 kg.

Recyclable plastic bags are not considered to degrade in landfills, suggesting that all the inherent feedstock energy and emissions will be sequestered. Therefore, there are no carbon dioxide or methane emissions associated with the recyclable plastic bags sent to landfills.

Many types of biodegradable polymers are available to degrade in a variety of environments, including soil, air, or compost. The biodegradable products degrade under aerobic conditions to carbon dioxide and water in the presence of oxygen. The biodegradable, compostable plastic bags in this study are made from a blend of Ecoflex and PLA. Ecoflex is made from aliphatic-aromatic copolyester blended with equal amounts of starch. According to information provided by BASF, Ecoflex meets the requirements for biodegradable polymer classification based on European, US, and Japanese standards because Ecoflex can be degraded by micro-organisms.[11] PLA is a biodegradable polymer made from corn and is converted completely to carbon dioxide and water by micro-organisms. In addition, compostable plastic bags have been found to degrade as designed within an allowable timeframe in appropriate composting facilities[13]. In composting facilities, decomposition of biodegradable plastic bags made from a blend of Ecoflex and PLA are expected to release primarily carbon dioxide emissions and water. However, if sent to a landfill, biodegradable plastic will either not degrade at all, or may follow similar pathways as paper bags (a combination of both aerobic and anaerobic degradation). BCAL treated these bags in both ways in this study to examine all possibilities.

Solid Waste Composting

The biodegradable, compostable plastic bags in this study have demonstrated biodegradation in several standardized tests in several countries. Ecoflex and PLA meet US, European, Australian, and Japanese standards by degrading in 12 weeks under aerobic conditions in a compost environment and by breaking down to carbon dioxide and water. The extent of the degradation for Ecoflex was 2 to 6 months in compost depending upon temperature, and for PLA was 1 to 3 months in compost depending upon temperature. [11] Therefore, in the composting environment, decomposition of biodegradable plastic bags made from a blend of Ecoflex and PLA is expected to degrade over time with the release primarily of carbon dioxide emissions and water.

LCA Calculations of Environmental Impacts

As noted under the section on LCA methodology, life cycle assessment modeling allows an examination of specific problems as well as comparisons to determine if there are any serious side effects to any of the systems under study. In every system there are multiple environmental parameters to be addressed scaling from global to local issues, and no single solution is likely to address all of the issues simultaneously. In addition, almost every change to a system creates trade-offs, and it is the identification of these trade-offs that is important when trying to determine the best solution for any given problem.

To reiterate, a life cycle assessment can:

1. Quantify those parameters likely to be responsible for environmental effects (the inventory component of life cycle analysis).
2. Identify which parameters are likely to contribute to a specific environmental problem (characterization or interpretation phase of impact assessment). An

example would be identifying that carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are greenhouse gases.
3. Aggregate the parameters relating to a specific problem (the valuation or interpretation phase of impact assessment). An example would be producing carbon dioxide equivalents for the components of greenhouse gases.

The LCA calculations provide a compilation of information from which the user can address specific problems such as the conservation of fossil fuels, global warming, acid rain, and municipal solid waste. In addition, the user also is able to determine what trade-offs exist between systems and to examine the specific parameters which are likely to contribute to these problems. In so doing, the user can strive to achieve the optimum reduction in each parameter because of a better understanding of how these parameters change in association with each grocery bag system.

GLOBAL WARMING

One important issue that is currently being addressed using LCA studies is an examination of the contribution that industrial systems make to climate change. The work of the Intergovernmental Panel on Climate Change (IPCC)[12] provides a framework for aggregating data on those air emissions that are thought to be significant contributors to global warming. The aggregated effect of any system can be summarized as a parameter known as Global Warming Potential (GWP) or carbon dioxide equivalent. Any gaseous emission that is thought to contribute to global warming is assigned a value equal to the equivalent amount of CO_2 that would be needed to produce the same effect. Multiplying each gaseous emission by its CO_2 equivalent allows the separate effects of different emissions to be summed to give an overall measure of global warming potentials.

The major greenhouse gases of importance in this eco-profile are carbon dioxide, methane and nitrous oxide. The results tables provided previously (see Section on LCA Results) showed the global warming impacts (with carbon dioxide equivalents) up to the collection of the grocery bags.

The following table estimates the global warming impacts just from the collection and disposal of the grocery bags.

As discussed previously, two scenarios will be considered for the kraft paper bags, the first is a worst-case scenario that follows the basic decomposition reaction for cellulose and the second scenario is one that estimates carbon sequestration for paper in MSW landfills.

The recyclable plastic bags will not degrade in the landfill; all the inherent feedstock energy and emissions will be sequestered. Therefore, there are no carbon dioxide emissions from recyclable plastic bags in landfills.

In the landfill, decomposition of biodegradable plastic bags made from a blend of Ecoflex and PLA is expected to degrade over time with the release primarily of carbon dioxide emissions and water.

Table 26A. Greenhouse gas emissions. 20-year carbon dioxide equivalents (in milligrams) resulting from the disposal of 1000 grocery bags.

Disposal process	Paper bag with "worst case scenario" of methane emissions	Paper bag with "sequestered scenario" of carbon dioxide emissions	Recyclable plastic bag	Degradable plastic bag With 100% aerobic decomposition in landfill	Degradable plastic bag with 50% aerobic & 50% anaerobic decomposition in landfill (using the same pathway as described for paper bags)
Recycling	21% recycled & burden is transferred	21% recycled & burden is transferred	5.2% recycled & burden is transferred	5.2% recycled to composting & burden is transferred	5.2% recycled to composting & burden is transferred
Incineration with energy recovery 13.6%	11,640,000	11,640,000	2,150,000	2,920,000	2,920,000
Landfill 65.4% paper, 81.2% plastic	412,000,000	41,300,000	0	17,400,000	129,400,000
Total disposal related emissions	423,640,000	52,940,000	2,150,000	20,320,000	132,320,000

Table 26A shows that after disposal, the recyclable plastic bag has the lowest greenhouse gas emissions. The paper bag with the "sequestered scenario" has more than 15 times the greenhouse gas emissions of the recyclable plastic bag. The paper bag with the "worst-case scenario" has more than 200 times the greenhouse gas emissions of the recyclable plastic bag. The degradable plastic bag has more than 9 times the greenhouse gas emissions of the recyclable plastic bag.

Table 26B. Greenhouse gas emissions. 20-year carbon dioxide equivalents (in milligrams) resulting from the disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

Disposal process	Paper bag with "worst case scenario" of methane emissions	Paper bag with "sequestered scenario" of carbon dioxide emissions	Recyclable plastic bag	Degradable plastic bag With 100% aerobic decomposition in landfill	Degradable plastic bag with 50% aerobic & 50% anaerobic decomposition in landfill
Recycling	21% recycled & burden is transferred	21% recycled & burden is transferred	5.2% recycled & burden is transferred	5.2% recycled to composting & burden is transferred	5.2% recycled to composting & burden is transferred
Incineration with energy recovery 13.6%	11,640,000	11,640,000	3,230,000	4,380,000	4,380,000
Landfill 65.4% paper, 81.2% plastic	412,000,000	41,300,000	0	26,100,000	194,000,000
Total disposal related emissions	423,640,000	52,940,000	3,230,000	30,500,000	198,000,000

Table 26B shows that even using 1.5 plastic bags to 1 paper bag, after disposal, the recyclable plastic bag has the lowest greenhouse gas emissions. The paper bag at a 1 to 1.5 use ratio, with the "sequestered scenario," has more than 10 times the greenhouse gas emissions of the recyclable plastic bag. The paper bag with the "worst-case scenario" has more than 130 times the greenhouse gas emissions of the recyclable plastic bag. The degradable plastic bag has more than 9 times the greenhouse gas emissions of the recyclable plastic bag with the 100% aerobic decomposition and more than 60 times the greenhouse gas emissions of the recyclable plastic bag with the 50% aerobic decomposition/50% anaerobic decomposition.

Table 27A. Carbon dioxide equivalents (in milligrams) resulting from all operations just prior to the disposal of 1000 grocery bags.

	Recyclable and Recycled Paper bag (from Table 6B)	Recyclable plastic bag (from Table 14B)	Degradable plastic bag (from Table 22B)
20 year CO2 eq.	23,710,000 mg	19,200,000 mg	89,000,000 mg

*It should be noted that these emissions include the "credit" when carbon dioxide was absorbed during tree growing.

Table 27A shows that from all operations just prior to disposal, the resulting CO2 equivalents are more than 20% greater for the paper bag compared to the recyclable plastic bag. From all operations just prior to disposal, the resulting CO2 equivalents for the degradable plastic bag are the highest about 4 times greater than the recyclable plastic bag.

Table 27B Carbon dioxide equivalents (in milligrams) resulting from all operations just prior to the disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

	Recyclable and Recycled Paper bag* (from Table 6B)	Recyclable plastic bag (from Table 14B)	Degradable plastic bag (from Table 22B)
20 year CO2 eq.	23,710,000 mg	28,800,000 mg	134,000,000 mg

*It should be noted that these emissions include the "credit" when carbon dioxide was absorbed during tree growing.

Table 27B shows that from all operations just prior to disposal, the resulting CO2 equivalents are more than 20% greater for the recyclable plastic bag compared to the paper bag. From all operations just prior to disposal, the resulting CO2 equivalents for the degradable plastic bag are the highest about 4 times greater than the recyclable plastic bag and 5 times greater than the paper bag.

Now, adding the greenhouse gas emissions from tables 26 and 27 the total LCA cradle-to-grave greenhouse gas emissions for the production, use, and disposal of 1000 grocery bags are given in Table 28.

Table 28A. Total LCA cradle-to-grave CO2 equivalents (in milligrams) for the production, use, and disposal of 1000 grocery bags:

	Paper bag with "worst-case scenario" of methane emissions	Paper bag with "sequestered scenario" of carbon dioxide emissions	Recyclable plastic bag	Degradable plastic bag With 100% aerobic decomposition in landfill	Degradable plastic bag with 50% aerobic & 50% anaerobic decomposition in landfill
20 year CO2 eq	447,350,000	76,650,000	21,350,000	109,300,000	221,300,000
100 year CO2 eq	202,200,000	65,490,000	18,850,000	99,300,000	134,800,000
500 year CO2 eq	90,410,000	60,910,000	17,850,000	87,320,000	92,100,000

Table 28A shows that the recyclable plastic bag has the lowest the total cradle-to-grave CO2 equivalents. The paper bag with the "sequestered scenario" has more than 3.5 times the total cradle-to-grave CO2 equivalents of the recyclable plastic bag. The paper bag with the "worst-case scenario" has more than 20 times the total cradle-to-grave CO2 equivalents of the recyclable plastic bag. The degradable plastic bag has more than 5 times the total cradle-to-grave CO2 equivalents of the recyclable plastic bag.

Table 28B. Total LCA cradle-to-grave CO2 equivalents (in milligrams) for the production, use, and disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

	Paper bag with "worst-case scenario" of methane emissions	Paper bag with "sequestered scenario" of carbon dioxide emissions	Recyclable plastic bag	Degradable plastic bag With 100% aerobic decomposition in landfill	Degradable plastic bag with 50% aerobic & 50% anaerobic decomposition in landfill
20 year CO2 eq	447,350,000	76,650,000	32,030,000	164,000,000	332,000,000
100 year CO2 eq	202,200,000	65,490,000	28,300,000	149,000,000	202,000,000
500 year CO2 eq	90,410,000	60,910,000	26,800,000	131,000,000	138,000,000

Table 28B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag has the lowest the total cradle-to-grave CO2 equivalents. The paper bag, at a 1 to 1.5 use ratio, with the "sequestered scenario," has about 2.3 times more total cradle-to-grave CO2 equivalents of the recyclable plastic bag, depending upon the time horizon. The paper bag with the "worst-case scenario" has more than 20 times the total cradle-to-grave CO2 equivalents of the recyclable plastic bag. The degradable plastic bag has more than 5 times the total cradle-to-grave CO2 equivalents of the recyclable plastic bag.

STRATOSPHERIC OZONE DEPLETION

The stratospheric ozone layer occurs at an altitude of between 10-40 km. The maximum generation of ozone (O3) occurs at the outer layer, where oxygen molecules (O2) react with atomic oxygen. The presence of other compounds, particularly halogenated compounds, promotes the decomposition of this ozone in the presence of strong ultra-violet radiation.

In this study there were no identified ozone depleting chemicals associated with the bag systems studied, and therefore no contributions to stratospheric ozone depletion.

ACID RAIN

The production of acid rain in the northeastern United States is recognized as a regional problem. Acid rain results when sulfur and nitrogen oxides and their transformation products return from the atmosphere to the earth's surface. The major source of acid rain is the emission of these pollutants from coal powered electricity generating plants.

The following data were extracted from the results tables. There are no data available for SOX and NOX emissions after disposal.

Table 29A. Acid rain emissions (in milligrams of SO_2 and NO_2) resulting from all operations just prior to disposal 1000 grocery bags.

Acid rain emissions mg	Paper bag	Recyclable plastic bag	Degradable plastic bag
SOX	579,000 mg	50,500 mg	275,000 mg
NOX	264,000 mg	45,400 mg	304,000 mg

Table 29A shows that the recyclable plastic bag has the least SOX and NOX emissions. The paper bag has more than 10 times the SOX emissions compared with the recyclable plastic bag and more than 5 times the NOX emissions compared with the recyclable plastic bag. The degradable plastic bag has more than 5 times the SOX and NOX emissions compared with the recyclable plastic bag.

Table 29B. Acid rain emissions (in milligrams of SO_2 and NO_2) resulting from all operations just prior to disposal for 1500 recyclable plastic bags and degradable plastic grocery bags.

Acid rain emissions mg	Paper bag	Recyclable plastic bag	Degradable plastic bag
SOX	579,000 mg	75,800 mg	413,000 mg
NOX	264,000 mg	68,100 mg	456,000 mg

Table 29B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag has the least SOX and NOX emissions. The paper bag, at a 1 to 1.5 use ratio, has more than 7 times the SOX emissions compared with the recyclable plastic bag and almost 4 times the NOX emissions compared with the recyclable plastic bag. The degradable plastic bag has more than 5 times the SOX and NOX emissions compared with the recyclable plastic bag.

MUNICIPAL SOLID WASTE

Another widespread environmental issue concerns the generation and disposal of municipal solid waste. The mineral wastes from mining, the slags and ash wastes from oil and gas production and utility coal combustion, and regulated chemical wastes are generally managed by regulation and permits that exclude these wastes from the municipal solid waste stream. The type of wastes in mixed industrial wastes can contribute to the municipal solid waste problem. If, as in this study, there is an interest in focusing on the municipal solid waste problem, the results on mineral wastes, slags & ash, and regulated chemicals can be ignored. Selecting only the solid waste resulting from just the disposal of grocery bags in landfill, one can prepare the following table 30A considering disposal of 1000 grocery bags and table 30B considering disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags. The table reflects the waste that is landfilled as 65.4% paper bags and 81.2% plastic bags.

Table 30A. The municipal solid waste (in mg) resulting from just the disposal of grocery bags in landfill. Based on 1000 grocery bags but only 65.4% of paper bags are landfilled and 81.2% of plastic bags are landfilled.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Municipal solid waste mg	33,900,000	4,690,000	12,800,000

Table 30A shows that the recyclable plastic bag has the least municipal solid waste. The paper bag has more than 7 times the municipal solid waste compared with the recyclable plastic bag. The degradable plastic bag has almost 3 times the municipal solid waste compared with the recyclable plastic bag.

Table 30B. The municipal solid waste (in mg) resulting from just the disposal of grocery bags in landfill. Based on 1000 kraft paper grocery bags but only 65.4% of paper bags are landfilled and 1500 plastic grocery bags of which 81.2% of plastic bags are landfilled.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Municipal solid waste mg	33,900,000	7,035,000	19,200,000

Table 30B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag has the least municipal solid waste. The paper bag, at a 1 to 1.5 use ratio, has almost 5 times the municipal solid waste compared with the recyclable plastic bag. The degradable plastic bag has almost 3 times the municipal solid waste compared with the recyclable plastic bag.

CONSERVATION OF FOSSIL FUELS

Conservation problems are concerned with the depletion and possible exhaustion of raw materials and fuels. With continued use, the finite supply of raw materials, and especially fossil fuels will one day be exhausted. The conservation of fossil fuels: coal, oil ,and natural gas is an important global environmental issue. It is therefore important to ensure that these resources are used with the maximum efficiency and the minimum of waste.

Table 31A. The gross fossil fuels and feedstocks, expressed as energy (MJ) required for the production, use, and disposal of 1000 grocery bags.

Energy in MJ	Paper bag	Recyclable plastic bag	Degradable plastic bag
Coal	324	65	161
Oil	207	206	353
Gas	391	186	705
Totals	922	457	1,219

Table 31A shows that the recyclable plastic bag uses the least fossil fuels and feedstocks. The paper bag uses more than 2 times the fossil fuels and feedstocks compared with the recyclable plastic bag. The degradable plastic bag used more than 2 1/2 times the fossil fuels and feedstocks compared with the recyclable plastic bag.

Table 31B. The gross fossil fuels and feedstocks, expressed as energy (MJ) required for the production, use, and disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

Energy in MJ	Paper bag	Recyclable plastic bag	Degradable plastic bag
Coal	324	98	242
Oil	207	309	530
Gas	391	279	1,058
Totals	922	686	1,830

Table 31B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag uses the least fossil fuels and feedstocks. The paper bag, at a 1 to 1.5 use ratio, uses 34% more fossil fuels and feedstocks compared with the recyclable plastic bag. The degradable plastic bag used more than 2 1/2 times the fossil fuels and feedstocks compared with the recyclable plastic bag.

LOCAL & REGIONAL GRID ELECTRICITY USE

The US recently has experienced severe problems related to its local and regional grid electricity. Because of these recent "blackouts," "brownouts," and electricity interruptions, the need for appropriate conservation measures can be argued.

Table 32A. The electrical energy (MJ) required for the production, use, and disposal of 1000 grocery bags.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Electrical energy MJ	649	148	325

Table 32A shows that the recyclable plastic bag uses the least electrical energy. The paper bag uses more than 4 times the electrical energy compared to the recyclable plastic bag. The degradable plastic bag used more than 2 times the electrical energy compared with the recyclable plastic bag.

Table 32B. The electrical energy (MJ) required for the production, use, and disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Electrical energy MJ	649	222	488

Table 32B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag uses the least electrical energy. The paper bag, at a 1 to 1.5 use ratio, uses almost 3 times the electrical energy compared with the recyclable plastic bag. The degradable plastic bag used more than 2 times the electrical energy compared with the recyclable plastic bag.

WATER USE & PUBLIC SUPPLY

Parts of the US continue to be plagued by periodic drought conditions. During these times, laws and regulations concerning water conservation are enforced. Since public water supply issues have been identified as a problem, the following table has been prepared to compare public water supply used for the production, use, and disposal of 1000 grocery bags.

Table 33A. Public water supply (in mg) used for the production, use, and disposal of 1000 grocery bags.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Public water supply (in mg)	3,895,000,000	31,150,000	2,560,000,000

Table 33A shows that the recyclable plastic bag uses the least public water supply. The paper bag uses more than 125 times the public water supply compared with the recyclable plastic bag. The degradable plastic bag used more than 80 times the public water supply compared with the recyclable plastic bag.

Table 33B. Public water supply (in mg) used for the production, use, and disposal of 1000 kraft paper grocery bags and 1500 recyclable plastic and degradable plastic grocery bags.

	Paper bag	Recyclable plastic bag	Degradable plastic bag
Public water supply	3,895,000,000	46,700,000	3,840,000,000

(in mg)		

Table 33B shows that even using 1.5 plastic bags to 1 paper bag, the recyclable plastic bag uses the least public water supply. The paper bag, at a 1 to 1.5 use ratio, uses more than 80 times the public water supply compared with the recyclable plastic bag. The degradable plastic bag used more than 80 times the public water supply compared with the recyclable plastic bag.

SUMMARY AND CONCLUSIONS

Recent efforts by legislators to ban traditional plastic bags on the basis of environmental impact have reignited the debate surrounding single-use grocery bags, and whether there are any environmental trade-offs in switching from bags made with polyethylene to bags made from alternative materials.

This life cycle assessment was commissioned to examine the overall environmental impacts associated with the typical single-use polyethylene plastic grocery bag, compared with grocery bags made from compostable plastic resin and grocery bags made from 30% recycled paper.

Life cycle assessment is a useful analytical tool because it allows for the examination of an entire production system from cradle to grave, thus examining the full range (global, regional, and local impacts) of environmental issues at once rather than examining individual components of a system or individual products or processes. This broad picture analysis is important because environmental effects range from global (greenhouse gases), to regional (acid rain/solid waste) or local (toxic releases) impacts. And while there often is excellent information on local environmental effects, few complete data sets are available to understand the contributions production systems are making to global and regional environmental problems.

These study results confirm that the standard polyethylene grocery bag has significantly lower environmental impacts than a 30% recycled content paper bag. This supports conclusions drawn from a number of other studies looking at similar systems.[14, 15, 16] In addition, this report also shows that the typical polyethylene grocery bag has fewer environmental impacts than a compostable plastic grocery bag made from a blend of EcoFlex (BASF), polylactic acid, and calcium carbonate, when compared on a 1:1 basis, as well as when the number of bags is adjusted for carrying capacity so that the comparison is 1.5:1. Surprisingly, the trend is the same for most of the individual categories of environmental impacts. No one category showed environmental impacts lower for either the compostable plastic bag or the paper bag.

This study did not examine the impacts associated with reusable cloth bags, so no comparison was made between the cloth bags and single-use polyethylene plastic bags. In other studies, however, cloth bags were shown to reduce environmental impacts if consumers can be convinced to switch. The problem is that there are few examples where entire cities, counties, or countries have been successful in changing consumer behavior from the convenience of using bags provided by retail establishments to bringing their own bags to the store each time they shop. There is no question that a percentage of consumers do, and will use reusable cloth grocery bags, but the vast majority of consumers still appear to use the freely available bags provided by retail establishments. So, if consumer behaviors are not appearing to change, banning one type of single-use bag will simply mean that it is replaced by another type of single-use bag.

Given the above-stated assumption, it is clear that the replacement bags will either be compostable plastic bags or paper bags, as proposed legislation tends to stipulate these as the preferred alternatives. But can these alternative materials meet the legislative objectives, which often include: the reduction of litter, the need to reduce dependence on fossil fuels, and the need to reduce solid wastes? Taking the latter two objectives first, one can use the LCA results in this report to see if the above stated objectives are being met.

In the case of reducing dependence on overall energy, it is clear (see Table 34) that neither the life cycle of compostable bag nor paper bag provides a reduction in overall energy use. The standard polyethylene plastic grocery bag uses between 1.8 and 3.4 times less energy than the compostable and paper bag systems, respectively.

Table 34. Gross Energy by Activity (MJ)

	Fuel prod'n (total)	Fuel use (total)	Transport (total)	Feedstock (total)	Total
Paper Bag (1000 bags)	493	1105	34	991	2622
Compostable Plastic Bag (1000 bags)	265	659	38	418	1380
Compostable Plastic Bag (1500 bags)	398	988	57	627	2070
Polyethylene Plastic Bag (1000 bags)	106	114	11	279	509
Polyethylene Plastic Bag (1500 bags)	159	171	16	418	763

Table 35 demonstrates that in terms of fossil fuel use, including oil, the compostable plastic bag system does not provide any benefit. The compostable plastic bag system appears to use more oil than either of the other two bag systems, varying from 1.7 to 2.57 times more oil than either the plastic bag or paper bag systems, respectively. The paper bag system would appear to be able to provide a slight improvement, but only if the plastic bag system actually uses 1.5 bags for every 1 bag in the paper system. If this assumption cannot be supported, then the paper bag system would not provide even a slight advantage.

Table 35. Gross Fossil Fuel Use (kg)

	Paper Bag (1000 bags)	Compostable Plastic Bag (1000 bags)	Compostable Plastic Bag (1500 bags)	Polyethylene Plastic Bag (1000 bags)	Polyethylene Plastic Bag (1500 bags)
Coal	11.2	5.8	8.7	2.3	3.4
Oil	4.6	7.8	11.8	4.6	6.9
Gas	7.4	14.0	21.0	3.1	4.6

These results may appear to some to be counterintuitive, but both compostable plastic and paper bags require more material per bag in their manufacture. This results in greater use of fuels in the extraction and transport of raw materials for the manufacture of the bags, as well as greater energy in bag manufacturing and greater fuel use in the transport of the finished product from the manufacturer to retail establishments. Although standard polyethylene plastic bags are made from oil, the added requirements of manufacturing energy and transport for the compostable and paper bag systems far exceed the raw material use in the standard plastic bag system.

The results of this study also show that the standard polyethylene single-use plastic grocery bag's contribution to the solid waste stream is far lower than either the paper bag system or the compostable bag system. This is not surprising considering both the compostable bag and paper bag systems require more material per bag. The increase in solid wastes has become an important global issue as populations multiply and developing countries become wealthier, consuming more material goods. Currently, more land is being devoted to the disposing of solid wastes, and the lack of proper containment in solid waste facilities is causing problems in terms of soil contamination and water pollution.

Table 36. Municipal Solid Waste (kg)				
Paper Bag (1000 bags)	Compostable Plastic Bag (1000 bags)	Compostable Plastic Bag (1500 bags)	Polyethylene Plastic Bag (1000 bags)	Polyethylene Plastic Bag (1500 bags)
33.9	12.8	19.2	4.7	7.0

This study was not designed to address the issue of litter, so no specific calculations were conducted on the effect of the various bag systems on litter. However, there are some interesting points that can be made with regard to meeting the objective of reducing litter by switching to alternative materials in the grocery bag system. The summary of results discussed above on energy use and solid waste already illustrate that reducing litter through a change in the grocery bag system will lead to greater use in energy and greater amounts of solid wastes. Those who believe that this is an acceptable trade-off must also understand that there are additional, and perhaps far more serious, environmental impacts that will result if plastic bags are supplanted by either compostable plastic bags or paper.

One of these serious environmental impacts is global warming. The study showed that switching from single-use polyethylene plastic grocery bags to either paper or compostable plastic grocery bags may increase the emission of greenhouse gases and therefore contribute to global warming (See Table 37). Based on these results, it appears that the trade-off for reducing litter is an increase in global warming, which if not curbed, is expected to cause problems for decades and to affect marine, freshwater, and terrestrial habitats, and species globally. If one of the major concerns about litter is its accumulation in marine habitats and its negative effect on sea life, it would hardly seem justified to address the effects of litter with a grocery bag system that can cause significant harm to not only the same habitats, but to all other habitats as well.

Table 37. Global Warming Potential (CO2 Equivalents in tons)				
	Paper bag with "sequestered scenario" of carbon dioxide emissions (1000 bags)	Compostable plastic bag With 100% aerobic decomposition in landfill (1500 bags)	Compostable plastic bag with 50% aerobic & 50% anaerobic decomposition in landfill (1500 bags)	Polyethylene Plastic Bag (1500 bags)
Production	0.03	0.15	0.15	0.03
Disposal	0.05	0.03	0.22	0.00
Total	0.08	0.18	0.37	0.04

Another increasingly important issue is the protection of water sources around the globe. Concerns have been raised over the long-term availability of water to support the expanding population's need for drinking, manufacturing, and agriculture. Table 38 shows the use of freshwater resources for each of the grocery bag systems studied. The standard polyethylene plastic bag uses significantly less water, compared with the paper or compostable grocery bag systems. Paper grocery bags use approximately 1 gallon of water for every bag, compared with the plastic bag system, which uses only .008 gallons per bag or 1 gallon for every 116 bags. Compostable grocery bags do not appear to provide any improvement over paper bags, and use far more water than the standard polyethylene plastic bag. It appears, therefore, that in switching to a paper bag or compostable plastic bag system to combat a litter problem, consumers will have to accept another significant trade-off—the increase in use of valuable water resources.

Table 38. Gross Freshwater Resources (gallons)					
	Paper Bag (1000 bags)	Compostable Plastic Bag (1000 bags)	Compostable Plastic Bag (1500 bags)	Polyethylene Plastic Bag (1000 bags)	Polyethylene Plastic Bag (1500 bags)
Public Supply	1000	660	1000	8	13
Other	4	12	17	32	45

Other environmental factors that show similar trends are the emission of acid rain gases and water pollutants. In both cases, paper bag and compostable bag systems show larger amounts of pollutants emitted into the environment than those emitted by the plastic grocery bag system. Similarly, there are other environmental matters that are important to consider when making a decision on which systems to implement. Paper bag systems use a completely different resource base—wood fiber—than the plastic bag system. If the wood fiber does not come from sustainably managed forest systems or from agricultural wastes, it may cause a trade-off that is unacceptable to consumers. Forests are important ecosystems that support a wide variety of life, and disrupting these ecosystems in the name of reducing litter is an effect that deserves further contemplation.

The study results support the conclusion that any decision to ban traditional polyethylene plastic grocery bags in favor of bags made from alternative materials (compostable plastic or recycled paper) will be counterproductive and result in a significant increase in environmental impacts across a number of categories from global warming effects to the use of precious potable water resources.

Addressing the issue of increasing litter with bans on plastic grocery bags may be counterproductive as this study has not considered many other mitigating circumstances that may lead to even greater differentials between plastic grocery bags and those made from either paper or compostable plastics.

Increased recycling rates for plastic bags, better bagging techniques at retail, and secondary uses of plastic grocery bags such as waste disposal could all further reduce the environmental impacts of plastic grocery bags. In addition, getting consumers to change their behavior so that plastic bags are kept out of the litter stream would appear to be more productive in reducing the overall environmental impact of plastic bags including litter.

This study supports the conclusion that the standard polyethylene grocery bag has significantly lower environmental impacts than a 30% recycled content paper bag and a compostable plastic bag. An LCA report and its findings can be used to demonstrate that an environmental impact analysis needs to take into account the entire picture, and when dealing with a product that is likely to be replaced by another, the trade-offs in the environmental impact of the replaced alternative should also be given a critical analysis.

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APPENDIX 1 – PEER REVIEW

Background

Dr. Overcash conducted the peer review and is a Professor of Chemical Engineering, as well as a Professor of Biological and Agricultural Engineering at North Carolina State University. Dr. Overcash has developed an in-depth national research program in life cycle research, developing the new areas for utilization of the life cycle tools. Dr. Overcash has led the effort in life cycle inventory techniques for manufacturing improvement and product change. Dr. Overcash has contributed to life cycle studies in energy production, electroplating, solvent selection, pharmaceutical processes, life cycle assessment comparisons, paper industry, and textiles. He has been active in European life cycle efforts and reviews of research in this field.

All of the suggestions and recommendations made by Dr. Overcash have been reviewed and incorporated in this report. Below is the Peer Review Report provided by Dr. Overcash.

Review of Draft Report
Life cycle assessment for three types of grocery bags – recyclable plastic; compostable, biodegradable plastic; and recycled, recyclable paper

By Dr. Michael Overcash
September 2, 2007

This report provides both a sound technical descriptions of the grocery bag products and the processes of life cycle use. The functional unit has a range to accommodate differences in customer use found to exist. These differences did not prove to change the resulting low environmental impact choice. The discussion of the limitations of the life cycle impact assessment is very important and the readers should use these observations. The following detailed review is divided into technical and editorial segments.

The conclusions regarding the relative environmental impact when using a life cycle view are consistent with previous studies and need to be reinforced in the policy arena. The policies to discourage plastic bags may have more to do with litter than the overall environment. Whatever the goals of the policy makers, these need to be far more explicit than general environmental improvement, since the life cycle story is consistent in favor of recyclable plastic bags. It is possible that the emphasis of another report might be that the full benefit of plastic bags is even higher when large recycling is in place.

Technical

1) p.3 last paragraph BBL is not defined
2) Table 3 at 5.78 kg functional unit this mass reflects the 50% water in wood. However this wood is lignin and cellulose and so only about 50% of the solid material ends up in paper bag, so this should be 274,000,000 mg

3) Table 5 These occur in all the raw material Tables
    a. Biomass is double counted as it appears also in Table 3 while wood does not appear both places
    b. Limestone is listed twice. here and as chalk
    c. N2 and O2 are listed twice as air and constituents of air
4) Table 7 This is an unusually high COD:BOD ratio. it might need to be checked
5) Table 9B Elec = 103 This did not change from Table 9A, while all the other values did change reflecting the differences in number of bags.
6) p.34 line 4 under Solid Waste This identifies steam or electricity as possible energy recovery mechanisms, but Table 25 is only electricity. Steam would have a much higher recovery value
7) p.41 2nd line From the data in Table 28A this ratio is more like 3.5 and not 2.5
8) p. 42 3rd line From the data in Table 28B it is hard to see any ratio as high as 13

Editorial
1) p1 2nd line world for governments
2) p4 last para, 3rd line represent
3) whole document the conventional style is that data are plural, but throughout this documents that is mostly not followed. A search for the word data and inserting the correct verb will fix this.

REVIEW OF LIFE CYCLE DATA RELATING TO DISPOSABLE, COMPOSTABLE, BIODEGRADABLE, AND REUSABLE GROCERY BAGS

I. BACKGROUND

In March 2007, the Board of Supervisors of the City of San Francisco passed an ordinance effectively banning the use of plastic grocery bags at supermarkets and large pharmacies. The Board's objective was to stop environmental degradation and reduce litter, and its solution was to legislate the replacement of traditional plastic bags with reusable bags or bags made from paper or compostable plastic.

In an effort to gauge the impact of the Board's decision, both in terms of environmental impact and litter reduction, the Editors of *The ULS Report* have examined a number of credible third-party research reports, and used the findings to develop their own conclusions and recommendations.

Please note that this review was originally published in June, 2007 and has been revised as follows:

1. This review includes research performed by Boustead Consulting & Associates that was released after the previous version was published in June 2007.

2. Information from the EPA's web sites cited in the previous summary has been removed from this version, as it is no longer publicly available.

3. All results mentioned below have been made equivalent to reflect the different carrying capacity of paper vs. plastic bags. For reference, it is generally accepted that 1.5 plastic bags equal the capacity of 1 paper bag.

II. METHODOLOGY

An examination was made of four studies that compared the environmental impacts of various grocery bags, or provided data widely used to do so:

1. Carrefour Group, an international retail chain that was founded in France and is second only to Wal-Mart in terms of global retail revenues, commissioned a Life Cycle Assessment (LCA) Study by Price-Waterhouse-Coopers/EcoBalance *(Évaluation des impacts environnementaux des sacs de caisse, February 2004, #300940BE8)* that compared the environmental impact of four types of bags: plastic made from high density polyethylene (HDPE), paper, biodegradable plastic (50% corn starch and 50% polycaprolactone compostable plastic), and reusable plastic (flexible PE). The study evaluated environmental impacts from material production, through bag manufacturing and transport, to end of life management.

   The study was completed according to ISO standards 14040-14043, and peer reviewed by the French environmental institute, ADEME, the Agency for

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Environment and Energy Management. The first review was by Henri Lecouls, an independent lifecycle analysis expert assisted by Laura Degallaix, representative of the Federal Consumers' Union, Que Choisir, and Dominique Royet, World Wildlife Federation (WWF) representative. A second review was made by related parties: APME (European Plastics Manufacturers Association; CEPI (Confederation of European Paper Industries); and Novamont, manufacturer of the biodegradable plastic assessed in the study.

2. *Life Cycle Inventories for Packagings*, Environmental Series No. 250/1, Swiss Agency for the Environment, Forests and Landscape (SAEFL), 1998. The study was critically reviewed by corporate and association members representing the paper, plastics, glass, aluminum and steel packaging industries.

3. *Eco-Profiles of the European Plastics Industry*, performed by I. Boustead for PlasticsEurope, 2005. This series was developed by LCA pioneer Boustead Consulting and conforms wherever possible to ISO standards 14040-14043. The data on polyethylene film are also referenced in the SAEFL study listed above.

4. *Life Cycle Assessment for Three Types of Grocery Bags - Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper*, performed by Boustead Consulting & Associates Ltd. for the Progressive Bag Alliance, 2007. The study compared traditional grocery bags made from polyethylene, bags made from compostable plastics, and paper bags made using at least 30% recycled fibers. The life cycle assessment factored in every step of the manufacturing, distribution, and disposal stages of these bags.

   The study was peer reviewed by Dr. Michael Overcash, Professor of Chemical Engineering, as well as a Professor of Biological and Agricultural Engineering, at North Carolina State University.

III. STUDY LIMITATIONS

1. Findings, conclusions, and recommendations are based on data that have been obtained through publicly available channels or through the broad group of contacts that *The ULS Report* has developed. There may be other data available that refute, confirm, or extend the findings herein developed.

2. Results are based upon an analysis of quantitative data, especially in relation to materials consumption, energy and water usage, pollution, and greenhouse gas (GHG) production. Because of their qualitative and personal nature, issues that transcend a scientific approach, such as the social value of renewable vs. non-renewable resources and composting vs. landfilling, are best considered independently by the reader.

3. While the 2007 Boustead Consulting study was performed in the United States, the other studies originated in Europe. Because production processes are relatively similar globally, the data provide accurate assessments that can be used to draw valid conclusions in the United States. The similarity in results between the American and European studies further bears this out.

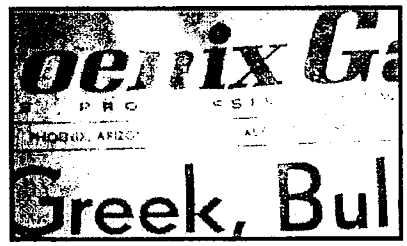
IV. FINDINGS

A. Biodgredation/Compostability

While paper and certain plastics may be biodegradable or compostable in specially designed industrial facilities, evidence indicates that this feature may be of little value in the effort to reduce waste:

1. Current research shows that in modern landfills, paper does not degrade or break down at a substantially faster rate than plastic does. Due to the lack of water, light, oxygen, and other important elements necessary for the degradation process to occur, nothing completely degrades in modern landfills.

   As evidence of this, here is a photo of a newspaper buried in an Arizona landfill and dug up after more than three decades. As can be clearly seen, paper does not degrade rapidly in landfills. *(Photo credit: Dr. William Rathje, Founder of The Garbage Project at The University of Arizona.)*

   Compostable plastics, which are produced from plant-based feedstocks, do not degrade in landfills, either. According to Natureworks®, a producer of a corn-based plastic known as PLA, containers made from its material will last as long in landfills as containers made from traditional plastics.[1]

2. In order to breakdown as intended, compostable plastics must be sent to an industrial or food composting facility, rather than to backyard piles or municipal composting centers. Since there are apparently fewer than 100 of these facilities functioning in the entire United States, the economic and environmental costs of wide-scale plastics composting are prohibitive, significantly reducing the value of such an alternative.[2]

3. By definition, composting and biodegradation release carbon dioxide (CO_2), a greenhouse gas, into the atmosphere, increasing the potential for climate change. For example, composted paper produces approximately twice the CO_2 emissions produced by non-composted paper. (See Paragraph B.1. just below for specific details.)

B. Waste, Energy Consumption, Greenhouse Gas Emissions

The evidence does not support conventional wisdom that paper bags are a more environmentally sustainable alternative than plastic bags. While this is certainly counterintuitive for many people, relevant facts include the following:

1. Plastic bags generate 39% less greenhouse gas emissions than uncomposted paper bags, and 68% less greenhouse gas emissions than composted paper bags. The plastic bags generate 4,645 tons of CO_2 equivalents per 150 million bags; while uncomposted paper bags generate 7,621 tons, and composted paper bags generate 14,558 tons, per 100 million bags produced.[3]

2. Plastic bags consume less than 6% of the water needed to make paper bags. It takes 1004 gallons of water to produce 1000 paper bags and 58 gallons of water to produce 1500 plastic bags.[4]

3. Plastic grocery bags consume 71% less energy during production than paper bags.[5] Significantly, even though traditional disposable plastic bags are produced from fossil fuels, the total non-renewable energy consumed during their lifecycle is up to 36% less than the non-renewable energy consumed during the lifecycle of paper bags and up to 64% less than that consumed by biodegradable plastic bags.[6]

4. Using paper sacks generates almost five times more solid waste than using plastic bags.[7]

5. After four or more uses, reusable plastic bags are superior to all types of disposable bags --paper, polyethylene and compostable plastic -- across all significant environmental indicators.[8]

C. Litter

While the data appear to indicate that paper and compostable plastic bags may account for less litter, data also indicates that this finding is offset by the increased environmental impacts these bags produce versus traditional plastic bags:

1. The manufacture of paper bags consumes twice as much water and emits about 60% more greenhouse gases than the production of plastic bags.[9]

2. Compared to disposable plastic bags, biodegradable plastic bags generate higher levels of greenhouse gas emissions, atmospheric acidification and eutrophification (a process whereby bodies of water receive excess nutrients that stimulate excessive plant growth, such as algae blooms).[10]

V. CONCLUSIONS/INDICATED ACTIONS

The conclusion to be drawn about how to reduce the environmental impacts and litter associated with grocery bags is very much in line with both longstanding EPA guidelines and the *ULS Report* philosophy: the issue is not paper or plastic, but rather finding ways to reduce, reuse, and recycle both of them - *in that order*. By putting more items in fewer bags, avoiding double bagging, switching to durable tote bags, and reusing and recycling disposable bags, significant reductions in material and non-renewable energy consumption, pollution, solid waste, greenhouse gas emissions, and litter, will occur.

And, while recycling can help save resources, its real value lies in the reduction of greenhouse gas emissions, and the minimization of waste going to landfills. Also, recycling helps reduce litter, as bags are contained and stored. Containment reduces the potential for them to be left in open spaces, where they become eyesores.

VI. SUMMARY

Legislation designed to reduce environmental impacts and litter by outlawing grocery bags based on the material from which they are produced will not deliver the intended results. While some litter reduction might take place, it would be outweighed by the disadvantages that would subsequently occur (increased solid waste and greenhouse gas emissions). Ironically, reducing the use of traditional plastic bags would not even reduce the reliance on fossil fuels, as paper and biodegradable plastic bags consume at least as much non-renewable energy during their full lifecycle.

Further, an Internet scan of available government and non-profit information for the United States, United Kingdom, Canada and Australia indicates that chewing gum and cigarette butts account for up to 95% of the litter generated in the English-speaking world.[11] Thus, there would appear to be far better and potentially more effective legislative opportunities available if the objective is to significantly reduce litter.

Again, when it comes to reducing the environmental and litter impacts of grocery and merchandise bags, the solution lies in a.) Minimizing the materials used to produce all types of bags, regardless of their composition, and b.) Building public awareness and motivation to reduce, reuse and recycle these bags - in that order.

Robert Lilienfeld

Robert Lilienfeld, Editor

Footnotes

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[5] *Life Cycle Assessment for Three Types of Grocery Bags - Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper. Op cit.*

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3 Life cycle assessment of paper and plastic checkout carrier bags

3.1 Overview of the life cycle analysis approach and findings

This section has been approached by means of an introduction to life cycle analysis (LCA) followed by a description of a generic life cycle analysis methodology, a discussion of the limitations of LCA's, descriptions of the lifecycles of paper and plastic checkout carrier bags, a description of the research approach, a description of the limitations of the research, the presentation of the research found and a statement of conclusions.

The objective of this section was to present a summary of the findings of a literature review into studies previously undertaken of the life cycles of plastic (polyethylene), paper and cloth checkout carrier bags. The review found no data relating to cloth carrier bags. Two studies dealing with the comparison of, firstly, paper and plastic checkout grocery bags in the United States and, secondly, paper and plastic animal feed distribution sacks in Europe were found.

A comparison of the two studies indicates that the results are contradictory. Literature found suggests that the discipline of life cycle analysis is highly sensitive to internal variables including the project scope, methodology, objectives and environmental and geographic context in which the studies are undertaken. This therefore suggests that the studies are limited in both comparison to one another and interpretation in the South African context. It is therefore concluded that in order to generate an understanding of which product life cycle has the greater environmental impact (in South Africa) a South African LCA comparison must be completed.

3.2 Introduction to life cycle analysis

A life cycle analysis (LCA) provides a framework and methods for identifying and evaluating environmental burdens associated with the complete life cycles of products and services, i.e. from the product cradle to the grave.

3.3 What is Life Cycle Analysis?

The life cycle assessment (LCA) method deals with the complex interaction between the provision of a product or service, through all stages of its life cycle, and the environment. The LCA attempts to predict the overall environmental burdens associated with the provision of the product and identify particularly burdensome or wasteful processes therein.

The United States Environmental Protection Agency defines a Life Cycle assessment as 'an objective process used to evaluate the environmental burdens associated with a product, process or activity by identifying and quantifying energy and materials used and wastes released to the environment, and

...to evaluate and implement opportunities to affect environmental improvements'[3] The purpose of following the product life cycle from the cradle to the grave is to limit or eliminate impact displacement.

Typically a life cycle assessment would determine the energy and raw material utilisation and solid, liquid and gaseous emissions generated at each stage of the life cycle. Generally the second-generation impacts of the system are ignored (e.g. the energy used to fire the bricks that are used to build the kiln would typically not be included).

The basis of an LCA study is an inventory of all the inputs and outputs of industrial processes that occur during the life cycle of a product. The inventory process is simple, in principle. In practice, however, it is subject to a number of practical and methodological problems, as listed below:

- System boundaries
- Processes that generate more than one product
- Avoided impacts
- Geographical variations
- Data quality
- Choice of technology

3.4 Generic methodology

The life cycle of a product or service includes extraction of natural resources, production of raw materials, transport, production of the product, use, and waste management/recycling. In a life cycle assessment, the environmentally relevant input and output flows of the life cycle of the studied products, and the environmental impacts that these cause are calculated and evaluated.

Currently ISO 14040-43 defines a life cycle as comprising of four phases, namely:

Phase 1: Goal and scope assessment

The purpose of the study is described. This description includes the intended application and audience, and clearly states the reasons for carrying out the study. The scope of the study is described, which includes the limitations, the functions of the systems investigated, the functional unit, the systems investigated, the system boundaries, the allocation approaches, the data requirements, the key assumptions, the impact assessment method, the interpretation method and the type of reporting.

[3] Vignon B W. Tolle D A. Cornaby B W. Latham H C. Harrison C L. Boguski T L. Hunt R G and Sellers J D, 1993, 'Life-Cycle Assessment: Inventory Guidelines and Principles'. United States Environmental Protection Agency. Cincinnati. USA.

Phase 2: Inventory analysis

Data is collected and interpreted. calculations are made and the inventory results are calculated and presented. Mass flows and environmental input and output flows are calculated and presented.

Phase 3: Impact assessment

The production system is examined from an environmental perspective using category indicators. such as global warming, acidification and eutrophication.

Phase 4: Interpretation

Herein the results are analysed in relation to the goal of the study. Conclusions are drawn. limitations of the results are presented and recommendations are provided based on the findings of the preceding phases. The conclusions should be compatible with the goals and quality of the study.

Practical constraints of life cycle assessments

A continuing concern of LCA methodology development bodies is the time and cost required to complete LCAs. Some have questioned whether the LCA community has established a methodology that is beyond the reach the majority of potential users. Others have questioned the relevance of the LCA to the actual decisions that potential users must make.

Collection of Life Cycle Inventory (LCI) data can be extremely costly and time consuming and often results in LCA studies being abandoned or proving inadequate because of poor and inconsistent LCI data. Good LCA's demand sound LCI's that subsequently contribute to making good judgments about environmental matters. The build up of a LCI puts together a whole series of smaller process data sets, either for individual processes or collections of individual processes.

In an attempt to facilitate the completion of LCIs numerous industry segments have undertaken and made available 'cradle-to-gate' or 'gate-to-gate' LCI studies. These are prepared by many of the specific industry groupings for the connected processes that are under their control. Such 'block' collections of industry data are known as 'eco-profiles'. A collection of Eco-profiles can then be added together to form a complete LCI. This procedure serves to reduce costs. save time. provide reliable and accurate data and makes LCA studies easier to complete. be more widely applicable. and as a consequence. assists with sound decisions on environmental management by interested parties. The profiles are, however, highly dependent on the context in which they where developed and use in different contexts introduces risk of incompatibility.

There are a number of organizations marketing eco-profiles in the form of LCA databases however these have been found to vary considerably in[4]:

- Level of detail
- Flexibility of data manipulation
- Data quality
- Purchase costs

3.5 Limitations of LCAs

As with any scientific method the LCA methodology suffers from limitations that must be understood. Several basic principles and practicalities remain to be defined:

- Data details differ for each supplier, specific processes used, location, dominant methods of primary production
- Analysis of multi-product manufacturing systems provide complex allocation problems
- The impact assessment stages are not fully developed and cannot provide a full decision support system
- The impact assessment depends on environmental priorities of the industry segment and data provided
- Interpretation is subjective in its ranking of impacts

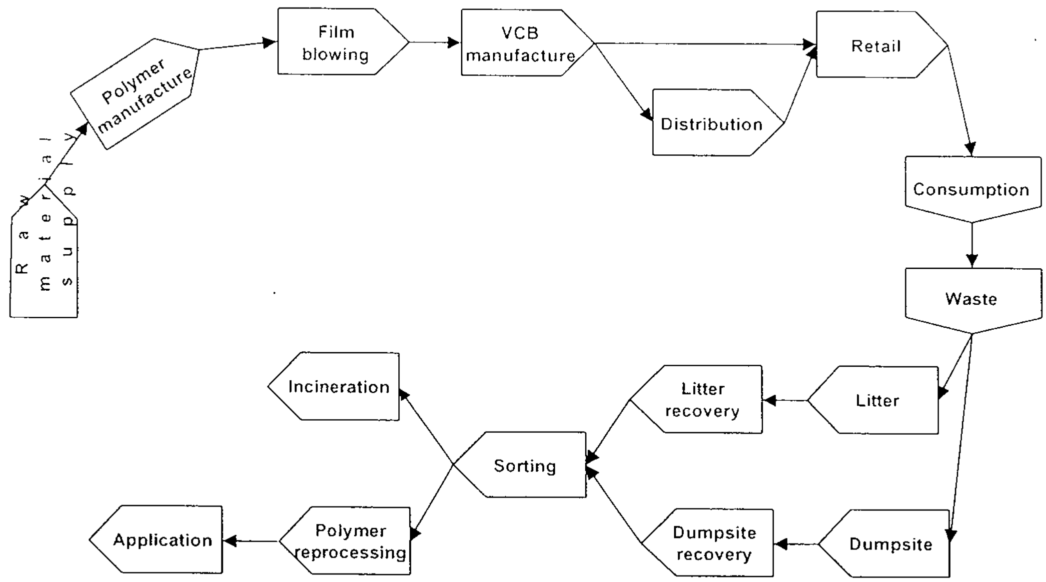
In this light LCAs have been shown to rarely produce clear winners and losers but rather serve to detail environmental implications and illustrate tradeoffs[5].

[4] LCA – Help or Headache?, Estelle Hook, http://www.co-design.co.uk/ehook.htm

[5] Use of Life Cycle Assessment (LCA) as a Policy Tool in the Field of Sustainable Packaging Waste Management, A EUROPEN Discussion Paper – September 1999, http://www.europen.be/issues/lca/lca_revised.html

3.6 Generic Life Cycle of Plastic Carrier Bags

The life cycle of plastic vest type carrier bags is illustrated in the diagram below.



Raw material supply and polymer production

Polymers used in the plastic resin and manmade fiber industries either occur naturally, such as cellulose, or are formed during polymerization when bond-forming reactions cause small repeating molecules to join together. Polymers are typically made from one type of simple chemical unit, or monomer.

Polymers are central to plastic resin manufacture. Many grades of different polymers are produced, each with different physical characteristics such as strength and ease of flow when melted. These different physical characteristics are achieved by changing operating parameters or by using different polymerization processes to change properties, such as polymer density or molecular weight. Polymers, which have been dried and formed into pellets, are called plastic resins. These resins are further processed at plastics processing facilities that create plastic products of different shapes, sizes and physical properties.

There are several steps that are important to polymerization. First, reactants are purified prior to polymerization. During polymerization, catalysts, heat, pressure and reaction time are all optimized to maximize polymer conversion and speed the reaction. Finally, the polymer is extruded and palletized for packaging and shipment. Various supporting steps are important to note because of their potential effect on the environment. These supporting steps include unloading and storage of chemicals and equipment cleaning.

Conversion of plastic film

Polymer resins are delivered to converters either in bulk tankers or in plastic sacks. Molten polymer is extruded as a continuous tube. As it leaves the extrusion die, the tube is inflated with air to form a bubble and when the bubble reaches the appropriate size it is cooled by air that changes it into a solid film. The region where the solidification occurs is known as the 'frost line', is the region where the required film thickness is reached. The tube is then guided by collapsing boards and gradually flattened and gusseted as it approaches the pinch rolls. When the film passes between them, the top of the bubble is effectively sealed.

The flat film is fed to the winding equipment via a pre-treatment and slitting unit. Slitting and trimming is a continuous operation. The flat film is then wound onto rolls.

Machinery for the extrusion of HDPE and LDPE differ significantly due to the different nature of the molten polymer. The differences prevail primarily in cooling, dye units and screws.

VCB manufacture

The gusseted wound film is unwound and passed through a series of rollers. Depending on the printing requirements the film may be passed under ultra violet lights to serve as preparation for printing and print curing. The film may then be printed.

Printed film is passed through rollers, sealed and cut at predetermined lengths. Lengths of film are then stacked and punched to form the handles of the vest type carrier bag. Bags are then bundled and baled for distribution.

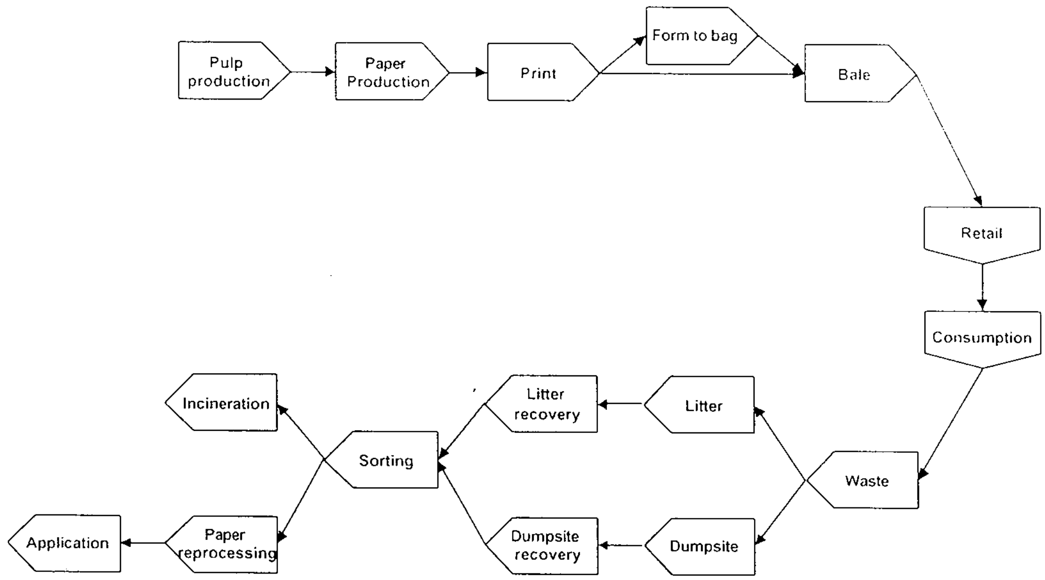
Distribution and consumption

Vest type carrier bags are distributed to formal and informal retailers though numerous mechanisms including hawkers, distributors and direct delivery. Carrier bags are used on checkout to hold purchased goods. On completion of use the carrier bag is thrown away or reused in numerous ways such as bin liners and carriers.

Waste management

The sources of materials for recyclers typically comprise in-house film that is collected and sorted by polymer grade. Collectors obtain materials from those not wishing to recycle their own materials and may also wish to obtain material from dumps by means of teams of pickers. Materials are then sorted and baled. Materials collected generally comprise post consumer waste and in process waste. Sorted and baled materials are passed through a granulator, agglomerator and then pelletised.

3.7 Generic Life Cycle of Paper Carrier Bags



Raw material production

Paper is manufactured by applying a watery suspension of cellulose fibres to a screen which allows the water to drain and leaves the fibrous particles behind in a sheet. Most modern paper products contain non-fibrous additives, but otherwise fall within this general definition. Only a few paper products for specialized uses are created without the use of water, via dry forming techniques. The watery fibrous substrate formed into paper is called pulp. The production of pulp is the major source of environmental impacts in the pulp and paper industry.

Processes in the manufacture of paper and paperboard can, in general terms, be split into three steps: pulp making, pulp processing, and paper/ paper board production. First, a stock pulp mixture is produced by digesting a material into its fibrous constituents via a chemical, mechanical, or a combination of chemical and mechanical means. In the case of wood, the most common pulping material, chemical pulping actions release cellulose fibres by selectively destroying the chemical bonds in the glue-like substance (lignin) that binds the fibres together. After the fibres are separated and impurities have been removed, the pulp may be bleached to improve brightness and processed to a from suitable for paper-making equipment. At the paper-making stage, the pulp can be combined with dyes, strength building resins, or texture adding filler materials, depending on its intended end product. Afterwards, the mixture is dewatered, leaving the fibrous constituents and pulp additives on a wire or wire-mesh conveyor. Additional additives may be applied after the sheet-making step. The fibers bond together as they are carried through a series of presses and heated rollers. The final paper product is then spooled on large rolls to be passed on to subsequent steps.

Conversion

Self opening bags are produced on S.O. bag machines. some of which have their own in line printing presses. These presses are used when the number of colours or type of design do not justify pre-printing. After printing. the plies pass trough slitters which pre-cut the bottom of the bag. and a cross pasting station where the plies are pasted together at regular intervals. A nozzle then applies adhesive to the longitudinal seam. The plies are then folded over one another and the pre-pasted seams allowed to adhere to the form a tube. This tube is immediately flattened, gussets being formed in the process. The tube now passes between a revolving knife and a stationary knife which cut with a scissor action. and separate the tube into individual lengths for converting into bags. The pre-slit bottom section of each length is opened up with the aid of suction cups and forming guides after which adhesive is applied. Bottom pasters ensure that adhesive is transferred to the required position on the bottom. The bottom is then closed by means of formers and rollers. The completed bags are compressed between a series of rollers before being counted, bundled and palletized.

Distribution and consumption

Paper checkout bags are distributed to retailers through numerous channels including distributors and direct supply. Paper checkout bags are primarily used by boutique stores and distributed free of charge to consumers at checkout. Currently paper bags make up approximately 9% of bags distributed by small retailers. However the percentage of grocery checkout carrier bags is significantly smaller than that (currently estimated at less than 1%).

Waste management

After use bags can enter the sorting phase by one of two mechanisms namely from litter or the dumpsite. After collection the waste is then sorted and depending on quality and condition is either disposed of by incineration or dumping or recycled.

3.8 Research approach for the life cycle assessment

Publicly available literature relating to LCAs of plastic, paper and cloth check out bags was sought from the following sources:

- ECOINVENT (Energy-materials-environment Group)
- BUWAL 250 (ETH Swiss Federal Institute of Technology)
- Eco-profile of the European plastics industry (APME)
- IVAM (IVAM Environmental Research)
- FEFCO
- STFI
- VITO (Flemish Institute for Technological Research)
- KCL ECODATA (The Finnish Pulp and Paper Research Institute)
- PEMS (Packaging Industry Research Association)

The review managed to identify numerous point sources of inventory data in the form of 'eco-profiles'. Lack of data continuity prevented the production of a Life Cycle Inventory, it was therefore necessary to resort to studies in which the complete life cycle for products had been analysed. Since the scope and objectives of LCAs greatly affect results, in order to provide comparisons between product types it was necessary to target comparative studies.

Review of the relevant literature revealed two studies that dealt with direct comparisons between paper and plastic sacks.

The first study, undertaken in the United States, is an LCA based comparison of LDPE and Paper "1/6 barrel grocery sacks" and was undertaken by Franklin Associates.

The second study undertaken in Europe dealt with the distribution of agricultural filling goods in different distribution systems, namely paper, plastic, semi-bulk and bulk. The distribution systems are 25 kg (capacity) sacks made of 140 micron Low Density Polyethylene and 70 g/m^2 two ply unbleached paper.

No data was found relating to the life cycle of biodegradable plastics. Industry experts however felt that biodegradable plastics offer no real life cycle benefit since production is on a smaller scale than polyethylene therefore production facilities are not as efficient per kilogram of polymer. In addition due to lack of local production facilities of biodegradable resins therefore require shipping thereby significantly affecting the life cycle profile. None of the alternative biodegradable polymers would have a density lower than polyethylene: therefore equivalent bags would require more resin thereby attracting a life cycle penalty[6].

No life cycle inventory data, or life cycle analyses were found for cloth bags this therefore has been left out of the report.

3.9 Limitations of the research approach

There are a number of issues affecting the comparison of the above studies both to the South African environment and to one another, for example:

- Geographies
  - Temperature
  - Availability of land
  - Annual rainfall
- Product life cycle
  - Raw material source (e.g. coal vs. oil)
  - Sources of energy (nuclear, coal, hydro electric power stations)
  - Production processes (Cracking and extrusion technologies, emission controls)
  - Conversion processes (Modern and antiquated technology)
  - Consumer processes (propensity for reuse, propensity to recycle, waste management, is the product used as a source of energy?)
  - Waste management processes
- Objectives and scope
  - Definition of system parameters
  - Definition of objectives
  - Data collection methodology

The issues listed above are indicative of the factors that may, or may not, cause significant differences in LCAs for similar products in different circumstances. These factors compromise the ability to use the above studies in the South African context. The two studies are, however, presented in the following section and conclusions drawn.

[6] Email communications with Tony Kingsbury, President of the International Biodegradable Products Institute, 27th August 2001.

3.10 Presentation of relevant literature

The functional unit

The functional unit of an LCA is the amount of product or material for which the environmental loadings are quantified. When comparisons are performed it is important that the products to be compared fulfil the same function, therefore the unit of comparison in both the following studies is 10.000 uses.

Study 1: Title: **"Resource and Environmental Profile Analysis of Polyethylene and Unbleached Paper Grocery Sacks,"** Franklin Associates, Ltd., 1990.

Franklin Associates, an independent Life Cycle Analysis and Solid Waste Management consultancy undertook the study.

Background

Packaging materials, in the United States, had come under the scrutiny of a wide range of interest groups as a result of decreasing landfill capacity, an inability to find new landfill sites and the large percentage by volume of packaging materials in landfills.

Objectives

The objective of this study is stated as the determination of energy and environmental discharges of polyethylene and paper grocery sacks.

Scope

Grocery bags examined in the study were the:

- 1/6 barrel polyethylene (HDPE and LLDPE) vest type grocery sacks; and
- 1/6 barrel 70 pound base weight single ply unbleached paper grocery sack.

Details of the sacks considered.

Bag type	Micron/ g/m^2	Dimensions (cm)	Similar to	Indicative pricing
1/6 Barrel Polyethylene	unknown	51 x 30.5 x 20	Maxi VCB	$ 45/ 1000
1/6 Barrel Paper	110	44 x 18 x 31	Shopper paper checkout bag	$ 70/ 1000

These sacks were regarded as being standard issue plastic and paper sacks used in grocery stores in the United States.

The utilisation ratio of polyethylene to paper sacks was identified as critical to the project. It was identified that there was no representative industry ratio indicating the number of uses of polyethylene grocery sacks that fill the same role as paper grocery sacks. The results of the analysis are presented at ratios of 1.5:1 and 2:1. i.e. 1.5 plastic sacks filling the same role as 1 paper sack. It is however recognized that the plastic sack has a greater reuse capability.

Methodology

A cradle to the grave approach was used to determine the energy and environmental discharges of the packages. this quantified energy consumption and environmental emissions at each stage of the product's life cycle beginning at the point of raw material extraction and proceeding through processing. manufacture. use and final disposal. or reuse.

Energy use was presented in the report in British Thermal Units but has been converted to Mega Joules for the purposes of this report.

Government documents as well as federal regulations, technical literature and confidential industry sources form the basis of the data.

Three broad environmental categories were considered. namely solid wastes, atmospheric emissions and waterborne wastes.

Both paper and polyethylene sacks were considered to participate in an "open loop" recycling system, in that recycled materials would replace virgin materials in the manufacture of other goods (e.g. in the case of polyethylene recycled material would go to the manufacture of pipes, etc.).

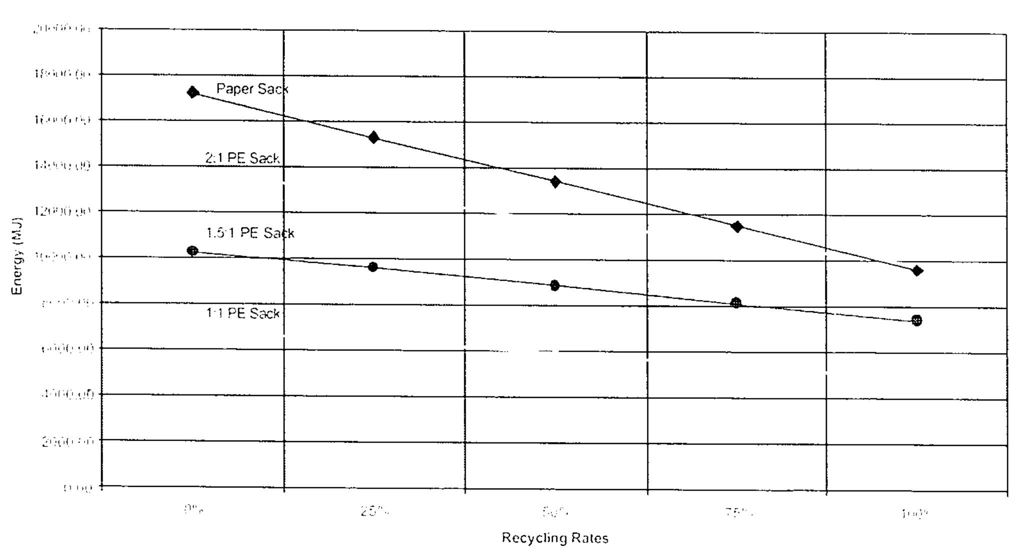
Findings of the study

Energy requirements

Energy requirements for 1/6 Barrel PE and Paper Grocery Sacks at Various Recycling Rates (MJ/10 000 bags)					
Sack type	Recycling rates				
	0%	25%	50%	75%	100%
1.0 PE to 1 Paper Sack Ratio					
Polyethylene	6822.70	6400.67	5908.31	5415.95	4923.59
Paper	17197.41	15298.31	13399.21	11500.11	9601.01
1.5 PE to 1 Paper Sack Ratio					
Polyethylene	10234.04	9601.01	8862.47	8123.93	7385.39
Paper	17197.41	15298.31	13399.21	11500.11	9601.01
2 PE to 1 Paper Sack Ratio					
Polyethylene	13715.73	12766.18	11711.12	10761.57	9812.02
Paper	17197.41	15298.31	13399.21	11500.11	9601.01

The energy requirements for the plastic polyethylene sacks were found to be 20 to 40% less than for paper sacks at zero percent recycling for both sacks. As recycling increases, the energy requirements became equivalent at approximately a 90% recycling rate (for a 2:1 ratio)

Energy requirements for Grocery Sacks



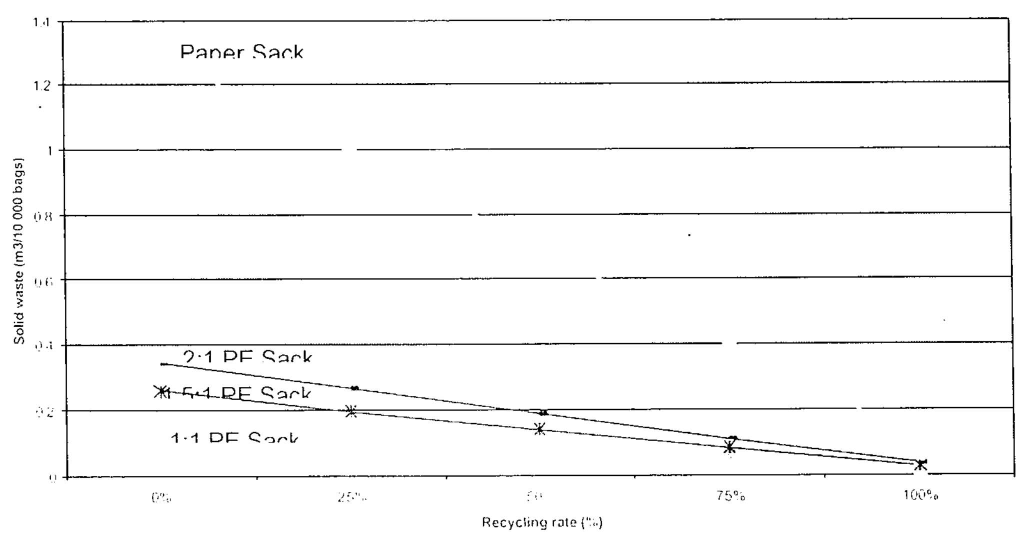
Environmental

Solid waste emissions

Solid waste emissions (m^3/ 10 000 bags)					
Sack Type	Recycling rates				
	0%	25%	50%	75%	100%
1 PE to 1 Paper Sack Ratio					
Polyethylene	0.17	0.13	0.09	0.05	0.02
Paper	1.30	1.00	0.70	0.40	0.10
1.5 PE to 1 Paper					
Polyethylene	0.26	0.19	0.14	0.082	0.025
Paper	1.30	1.00	0.70	0.40	0.10
2.0 PE to 1 Paper					
Polyethylene	0.34	0.27	0.19	0.11	0.03
Paper	1.30	1.00	0.70	0.40	0.10

For the purposes of this study solid wastes comprised ash from energy generation and incineration and post consumer solid wastes. Polyethylene sacks were found to contribute 74 to 80 percent less solid waste than paper sacks at zero percent recycling. Polyethylene sacks continued to contribute less solid waste than paper sacks at all recycling rates.

Total solid wastes for grocery sacks



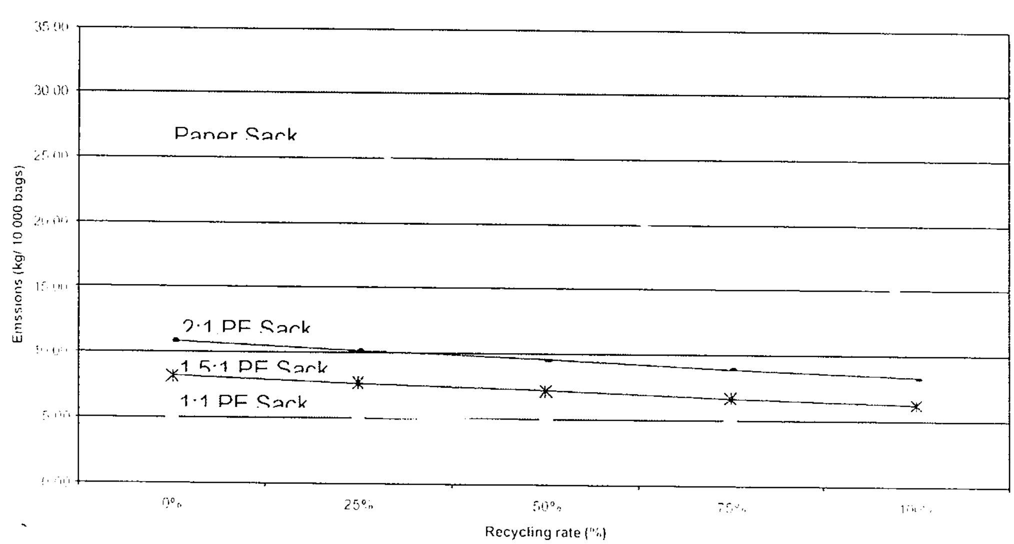
Atmospheric emissions

Atmospheric emissions (kg/ 10 000 bags)					
Sack Type	Recycling rates				
	0%	25%	50%	75%	100%
1 PE to 1 Paper Sack Ratio					
Polyethylene	5.41	5.11	4.78	4.48	4.14
Paper	29.12	25.49	21.86	18.23	14.61
1.5 PE to 1 Paper					
Polyethylene	8.12	7.67	7.17	6.71	6.21
Paper	29.12	25.49	21.86	18.23	14.61
2.0 PE to 1 Paper					
Polyethylene	10.84	10.21	9.57	8.94	8.30
Paper	29.12	25.49	21.86	18.23	14.61

Six components were analysed in combination in this category, namely particulates, nitrogen oxides (NO_x), Hydrocarbons, sulphur oxides (SO_x), carbon monoxide and odorous sulphur.

Atmospheric emissions for the polyethylene sack were found to range from 63 to 73 percent less than for paper sack at zero percent recycling. These lower impacts for polyethylene sack continued throughout all recycling rates.

Atmospheric emissions of grocery sacks



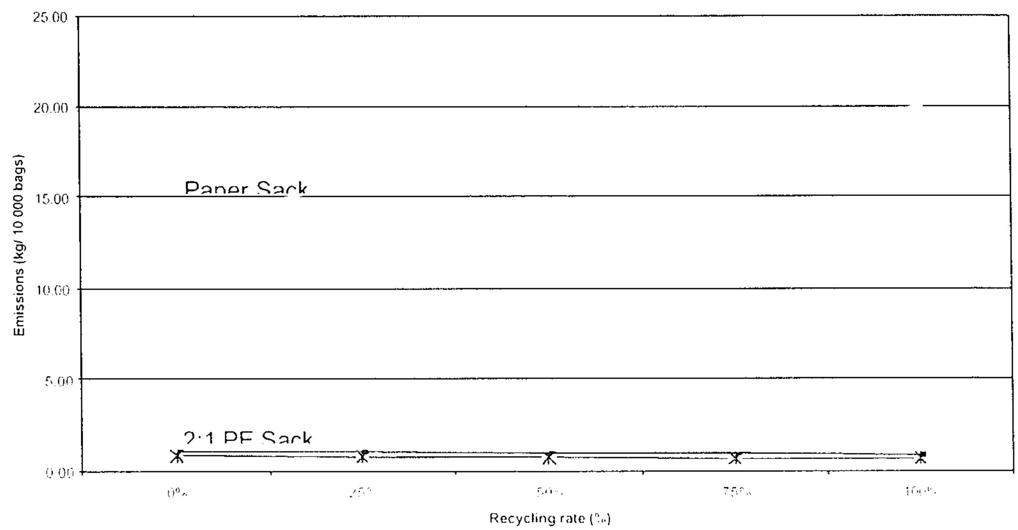
Waterborne wastes

Waterborne emissions (kg/ 10 000 bags)					
Sack Type	Recycling rates				
	0%	25%	50%	75%	100%
1 PE to 1 Paper Sack Ratio					
Polyethylene	0 54	0 51	0 48	0 45	0 45
Paper	14 15	15 56	17 06	18.46	19.91
1.5 PE to 1 Paper					
Polyethylene	0 82	0 77	0 73	0.68	0.68
Paper	14 15	15 56	17 06	18.46	19.91
2.0 PE to 1 Paper					
Polyethylene	1 09	1 04	1.00	0.91	0.86
Paper	14.15	15.56	17.06	18.46	19.91

Four components were analysed in combination in this category, namely dissolved solids, biological oxygen demand (BOD), suspended solids and acids.

At zero percent recycling rate the polyethylene sack contributed over 90 percent less waterborne wastes than the paper sack. As the rates of recycling increased the difference was found to increase as the recycling of paper contributes more to waterborne wastes than paper made from virgin material.

Waterborne wastes for grocery sacks



Recyclability

Both polyethylene and paper sacks were found to be recyclable. Manufacturing and scrap trim from the fabrication of the sacks were typically recycled. Post consumer recycling for both sacks was not found to be significant. In the case of paper sacks, recycling efforts relied on the collection of old newspapers as a support. For Polyethylene sacks, efforts were found to focus on industrial film scrap.

Combustion

Polyethylene releases 2.75 times more energy upon incineration than unbleached paper. However on an unequal basis, paper grocery sacks weigh 4 to 5 times more than plastic grocery sacks. Therefore the paper sack was noted as having the greater potential for energy release from incineration than the polyethylene sack.

Landfill impacts

The landfill volume occupied by the polyethylene sack is 70 to 80 percent less than the volume occupied by paper sacks given equivalent uses. It was noted that little data exists regarding the rate of degradation for both polyethylene and paper. It was therefore argued that the rate of decomposition could not be estimated and so no estimates regarding the potential impact on landfill leachate or methane gas production were included.

Discussion

The products under consideration are clearly are directly relevant to the South African study. In terms of comparison to a South African situation the factors discussed earlier may alter the results significantly. Unfortunately the only access to the study was in the form of the final report. It was not possible to get better access to the study results.

Study 2: Title: **"Distribution in Paper Sacks."** CIT Ekologik, Chalmers Industriteknik, 2000.

The study was undertaken by CIT Ekologik, an independent Swedish environmental consultancy, on behalf of Eurosac and CEPI Eurokraft.

Goal

To compare the environmental performance of distribution in 25kg paper sacks with alternative distribution systems. The alternatives include bulk distribution, 25kg Plastic sacks and 1000kg 'big bags'. It is noted that the products analysed in this study are fundamentally different products to check out carrier bags – they are bigger bags.

Objectives

The primary objective of the study was to compare the environmental impacts of distribution in paper sacks with those of distribution in other systems for filling goods in Europe.

Scope

All of the systems studied include extraction of natural resources, production of raw materials, production of sacks/big bags/silos, after use treatment and all associated transport.

On the comparison of the distribution systems, it became clear that the distribution system transport itself gave the highest impact of the studied systems. This was due to the assumed distribution of 1000kg of filling goods over a distance of 300km. It was also noted that the environmental effects were of the same size regardless of the packaging system and were therefore removed from the presentation of the study results.

The paper and plastics sacks are described as follows:

Bag type	Micron/ g/m^2	Dimensions (cm)
LDPE	140	37 x 72 x 13
Paper	2 x 110	50 x 70 x 13

The lifecycle phases covered in this report are explained in the table below

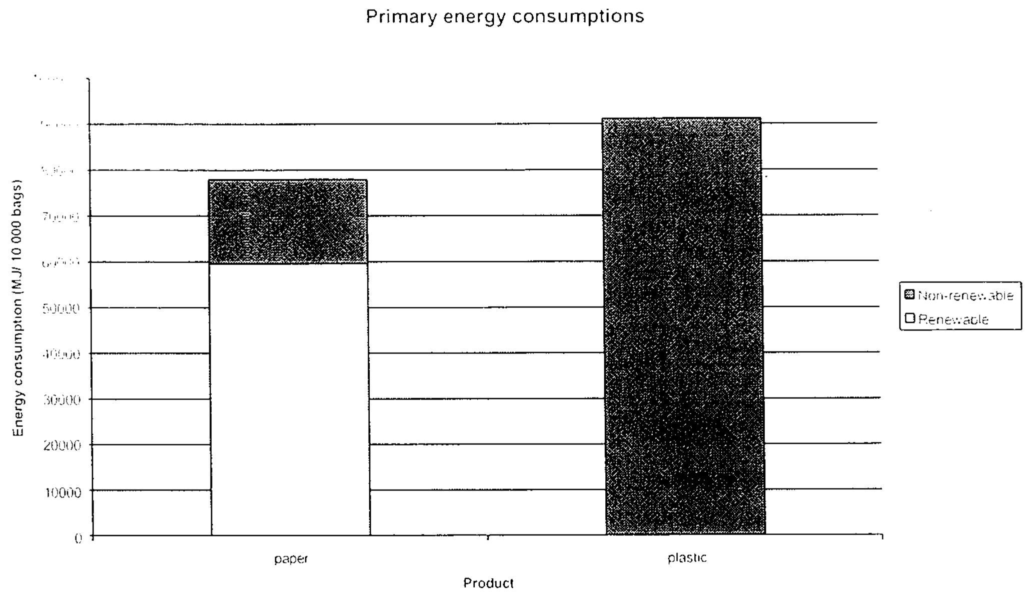
Life cycle stage	Explanation
Raw material production	Production of paper and LDPE from original source
Conversion	The conversion of paper and resin into Sacks
Waste management	Waste management, incineration, land filling or composting were considered as separate scenarios. The recycling scenario has assumed 100% recycling for both paper and plastic. Note for ease of comparison only reflected the recycling waste management scenarios have been reflected, however where relevant reference is made to other scenarios
System expansion	The systems are expanded to include parts of other life cycles that are affected by the compared systems. The purpose of this system expansion is to avoid allocation problems that arise at waste incineration or at open loop recycling of material from one life cycle to another. The systems are expanded to include parts of other systems that are affected by the recycling of major materials after use in the distribution system.

This life cycle analysis considered environmental impacts under the following headings:

Impact category	Unit
Primary energy consumption	MJ/ 10 000 bags
Abiotic resource depletion	Kg/ year/ 10 000 bags
Global warming	Kg CO_2 equivalents/ 10 000 bags
Acidification	Kg SO_2 equivalents/ 10 000 bags
Nutrient enrichment	Kg NO. equivalents / 10 000 bags
Photochemical ozone formation	Kg C_2H_4 equivalents/ 10 000 bags
Aquatic ecotoxicity (water emissions)	M^3 polluted water
Air emissions	Kg contaminated body weight
Water emissions	Kg contaminated bodyweight

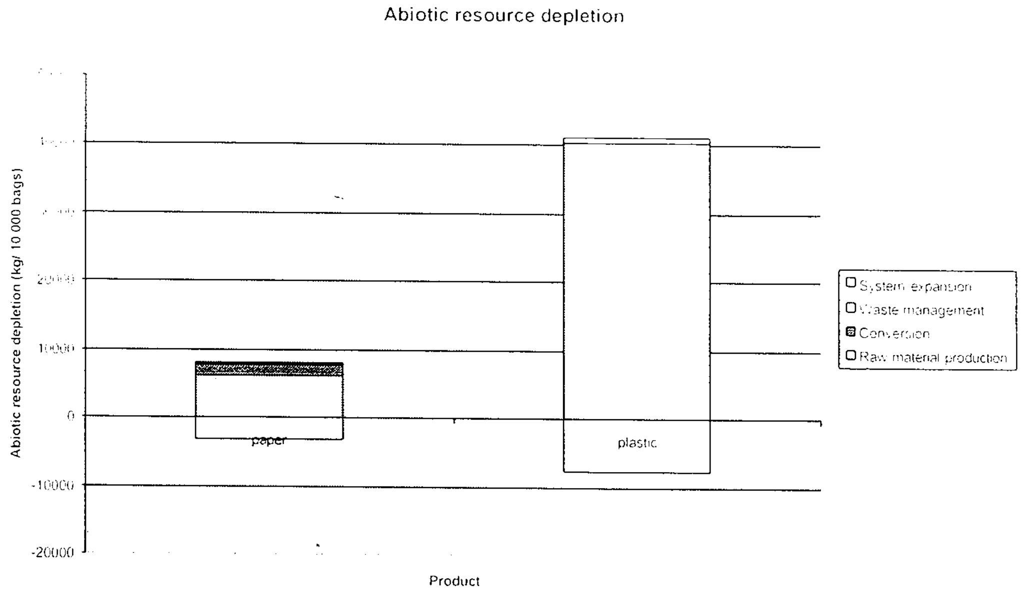
The findings of the analysis are presented in the following sections.

Primary energy consumption



Primary energy consumption was calculated including energy utilization in the production of the raw material (i.e. crude oil and wood). The LDPE sacks were found to give a higher contribution to the depletion of non-renewable resources than paper. This is due to the use of fossil raw material and energy in the production of LDPE.

Abiotic resource depletion

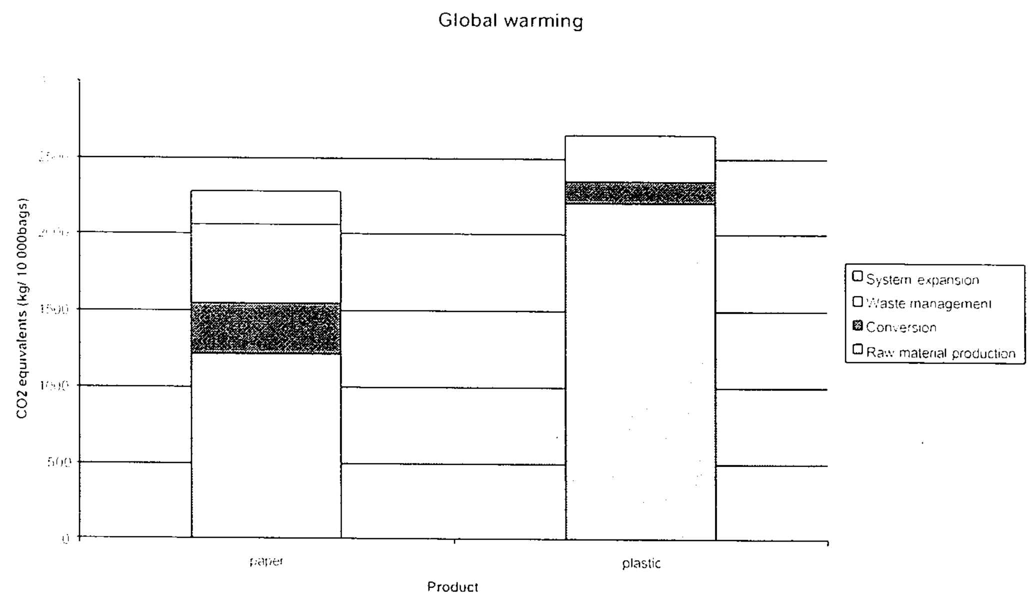


The depletion of abiotic resources such as metal ores and fossil fuels is problematic since it results in a situation where future generations will be required to resort to use other resources. It is important to note in this respect that, in Europe, forests grow faster than they are depleted and this was therefore not included as resource depletion.

The LDPE sack was found to give the highest contribution to abiotic resource depletion. This was dependant on the fact that, in the study geography, LDPE is made from crude oil and natural gas. The characterization factor associated to extraction of natural gas and oil is large due to the assumption that annual extraction is large when compared to reserves.

In addition the recycling scenarios gave higher contributions than the corresponding incineration scenarios since the energy produced on incineration was assumed to replace heat and electricity from other sources. Heat energy has been assumed to be a mix of 60% light fuel oil and 40% natural gas, and electrical energy was based on European averages.

Global warming



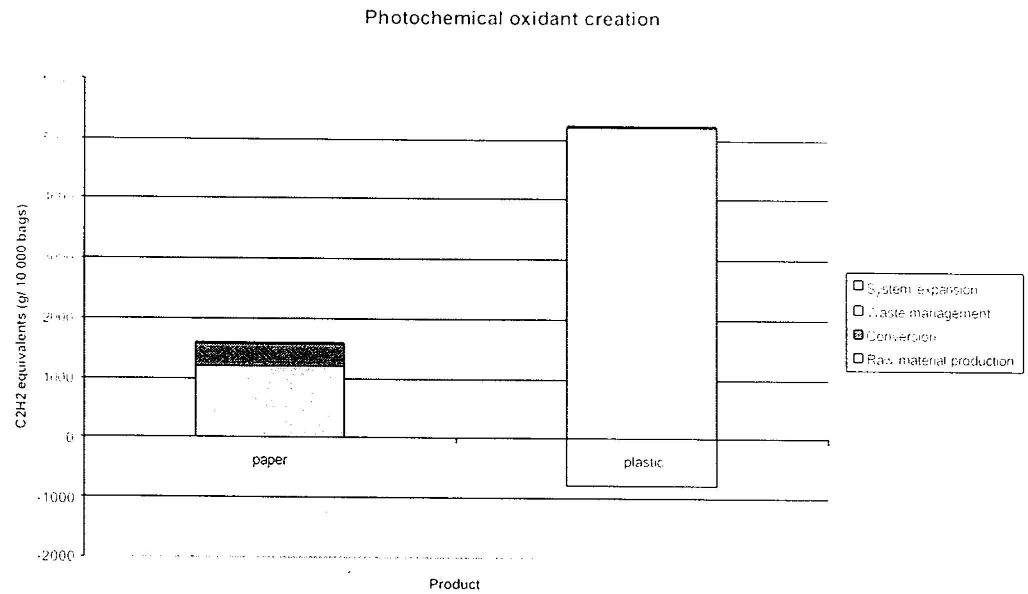
Global warming is caused by increases in the atmospheric concentration of chemical substances that absorb infrared radiation. Global warming is measured in CO_2 equivalents.

It was found that the LDPE sacks gave the highest potential contribution to global warming. It was also found that the contribution to global warming from paper sacks on incineration was low because the carbon dioxide at incineration of paper was deemed to be biological thereby eliminating a net contribution to global warming. In addition the heat generated during incineration has been assumed to replace heat produced from a mix of 60% light fuel oil and 40% natural gas.

The contribution from the LDPE sack. incineration scenario was found to be higher than the incineration scenarios for the paper sacks. This was due to the characterization of carbon dioxide emissions from incineration of LDPE as fossil. as opposed to biological. LDPE was found to have a higher 'heat value' than paper thereby allowing greater recovery of energy.

The contribution to global warming from the paper sacks. recycling scenario was found to be high. This was as a result of system expansion as the recycled sacks were assumed to replace virgin paper from other products that were assumed to end up in landfills thereby causing methane gas emissions.

Photo chemical oxidant creation



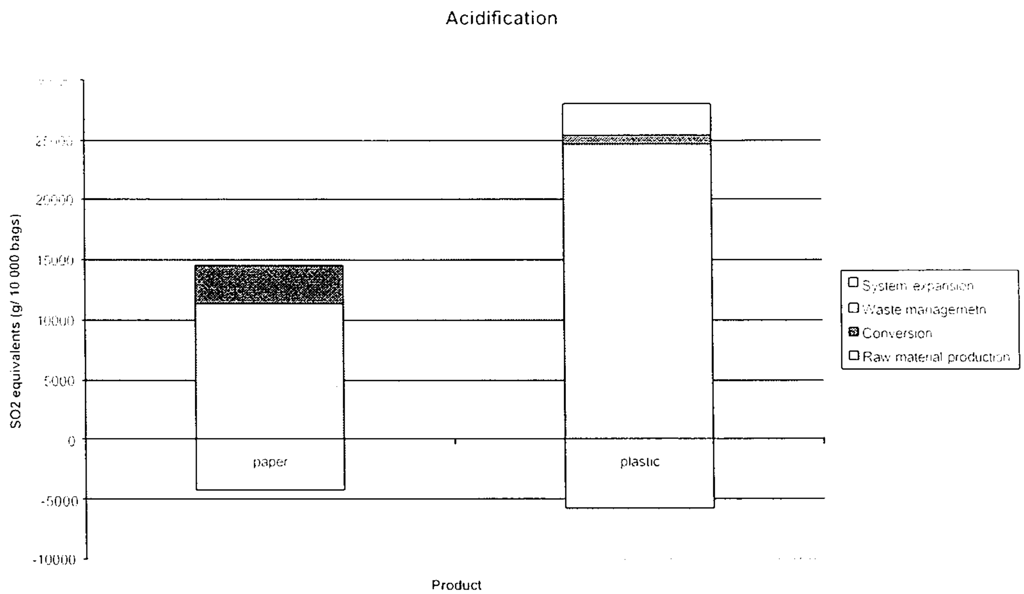
This impact category reflects the creation of oxidizing compounds through photochemical reactions in the air. The most important oxidant, in this context, is ozone.

The LDPE sack gave the highest contribution to photochemical oxidant creation. This was as a result of the emission of hydrocarbons from the production of LDPE.

The landfill scenarios for the paper sacks gave the higher contributions than the other scenarios for the paper sacks due to the formation of methane during decomposition.

An additional difference between photo oxidant creation was found to be a gap in data provided by STFI (i.e. lack of detail).

Acidification



Acidification is the reduction of the pH value in terrestrial and water systems. This is problematic since it causes substances, including nutrients, in the soil to dissolve and be carried away by water systems.

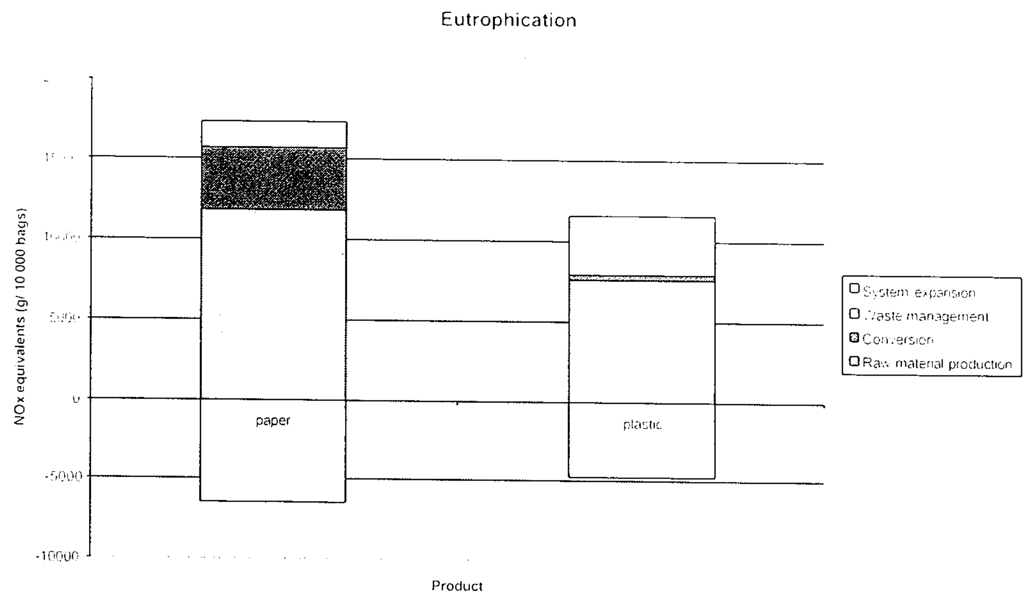
The LDPE sack gave the highest contribution to acidification due to emissions of NO_x and SO_2 associated with the use of fossil fuels.

During the incineration of LDPE, NO_x, is created, contributing to acidification.

The positive contribution to acidification from the recycling of LDPE comes from creation of NO_x and SO_2 at electricity generation. The negative contribution from the system expansion at the recycling of LDPE is mainly from the avoided LDPE production, the avoided LDPE recycling and from the alternative energy production.

The difference between the LDPE sack and the paper sack is however rather high, which primarily depends on the fact that at recycling, the LDPE has been assumed to replace only 17% virgin material while the paper replaces 44% virgin material.

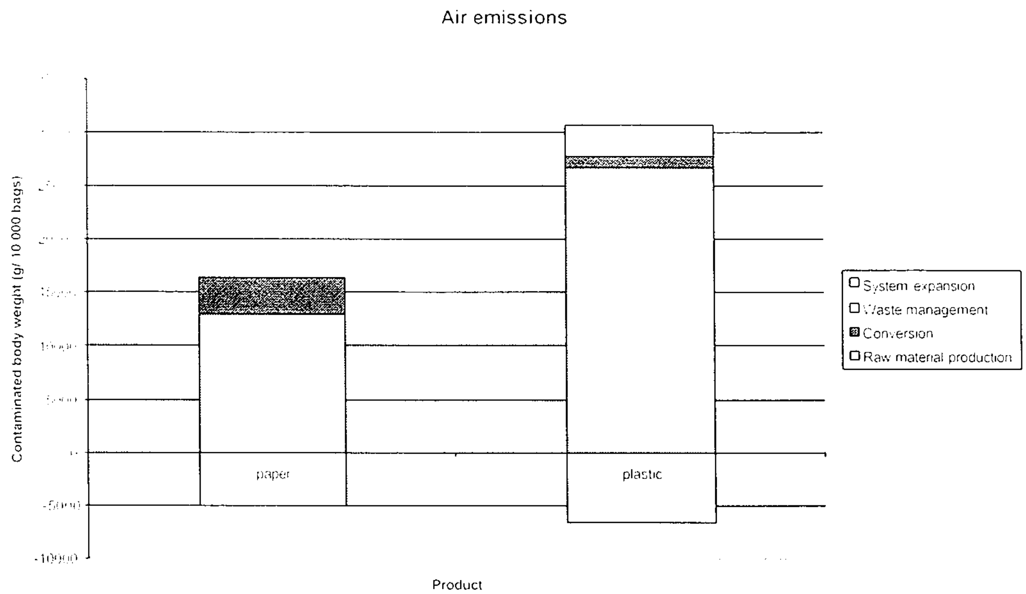
Eutrophication



Eutrophication is the disturbance of the nutritional balance in the soil. In aquatic systems this leads to increased production of biomass, which may lead to oxygen deficiency on decomposition.

The paper sack gave the highest contribution to eutrophication due to the high levels of COD from sack paper production.

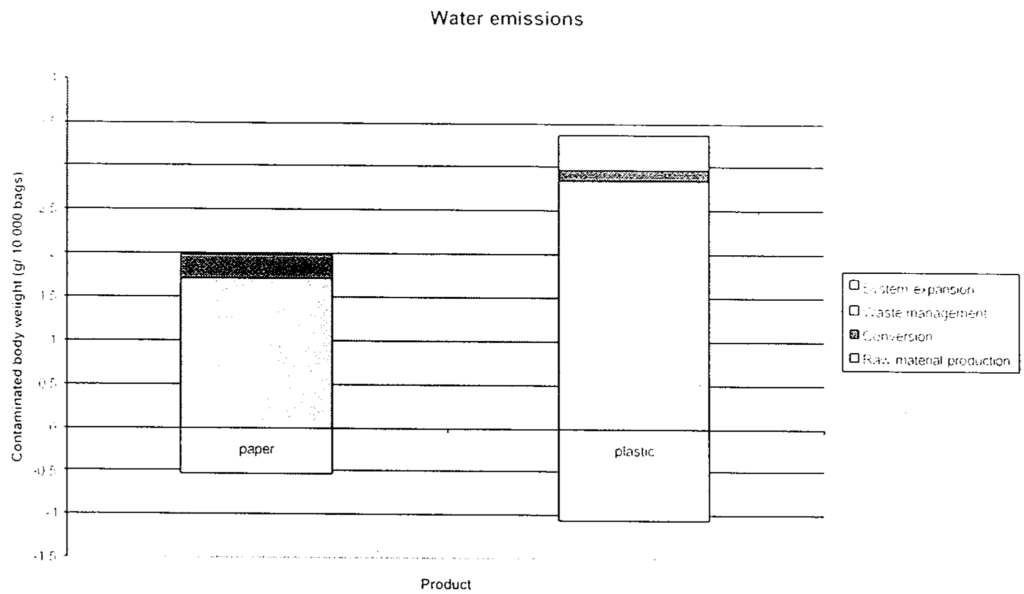
Air emissions



For human toxicity caused by air emission, it is the LDPE sack that gives the highest contribution. The emissions of NO_x and SO_2 associated with the use of fossil fuels at the production of LDPE were found to dominate thereby giving the LDPE sack a greater contribution to air emissions.

The positive contribution from the recycling of LDPE arises due to the creation of NO_x and SO_2 at electricity generation. The negative contribution from the system expansion at the recycling of LDPE is mainly from the avoided LDPE production, the avoided LDPE recycling and from the alternative energy production.

Water emissions

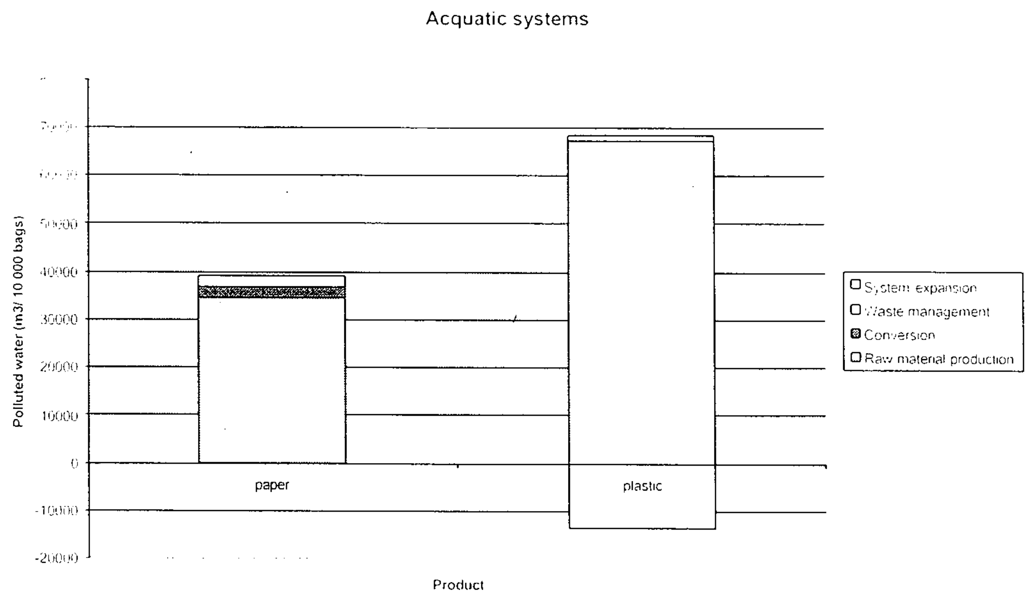


For human toxicity caused by water emissions, it is the bleached paper sack, landfill scenario that gives the highest contribution.

The negative contributions from the system expansions for recycling were found to be higher for the LDPE sacks than for the paper sacks. The recycling of LDPE was assumed to replace 83% recycled material from dher products and 17% virgin material. The recycling of paper was assumed to replace 56% recycled material from other products and 44% virgin material.

The slight negative contribution from the recycling of paper is due to the production of electricity. This is a negative contribution due to the lack of emissions of iron (Fe) to water from European average electricity production.

Pollution of aquatic systems



The contribution to the pollution of aquatic systems from the production of LDPE was found to be higher than the contribution from paper production.

The negative contributions from system expansions for recycling are higher for the LDPE sacks than for the paper sacks.

3.10.1 Conclusion

The objective of this section was to prepare a comparison of the environmental life cycle effects of both plastic and paper checkout carrier bags. It was found however that due to the sensitivity of the results of LCA to factors such as scope. objective. geography. climate. energy sources including others that LCA's are limited in their comparison. firstly. between studies and. secondly. between environments (e.g. Europe and South Africa).

Life cycle studies analysing relevant products were found. the findings of which are listed for each of the impact categories in the table below:

Impact category	Study 1 1/6 barrel grocery sacks	Study 2 25 kg (capacity) distribution sacks
	Paper versus Plastic	**Paper versus Plastic**
Primary energy	Plastic life cycle uses 23.08% less	Paper life cycle uses 80 00% less
Solid waste	Plastic life cycle produces 75.68% less	Category not considered
Abiotic resource depletion	Category not considered	Paper life cycle depletes 85.00% less
Global warming	Category not considered	Paper life cycle contributes 95.69% less
Acidification	Category not considered	Paper lifecycle contributes 53.79% less
Nutrient enrichment	Category not considered	Plastic life cycle 55.36% less
Photochemical ozone formation	Category not considered	Paper life cycle contributes 64.04% less
Aquatic ecotoxicity	Category not considered	Paper life cycle contributes 37.04% less
Air emissions	Plastic life cycle contributes 57.45% less	Paper life cycle contributes 52.23% less
Water emissions	Plastic life cycle has 96.58% fewer	Paper life cycle contributes 28.79% less

Clearly the results presented in the table above are contradictory. This serves as an illustration as to the possible effect of project scope, system limitations, objectives and assumptions and possible geographic factors on the LCA results. Furthermore. close examination of the exact by-products examined as emissions in each LCA may reveal differences which identify why the results are contradictory (the consultants are not privy to these details). Greater access to studies may have shed light on sources of differences unfortunately however access was limited to the final reports of the projects. This however would shed no light on the possible geographic and environmental differences between study locations and South Africa. Furthermore. any LCA can be constructed to carry a specific message by carefully selecting the appropriate impacts to examine.

It is therefore concluded that in order to formulate an accurate assessment of which life cycle is the more environmentally friendly in the South African context a streamlined LCA should be commissioned.