WASTE IN OUR WATER: THE ANNUAL COST TO CALIFORNIA COMMUNITIES OF REDUCING LITTER THAT POLLUTES OUR WATERWAYS

A REPORT PREPARED FOR
Natural Resources Defense Council

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Contents

EXECUTIVE SUMMARY

Under contract to the Natural Resources Defense Council, Kier Associates solicited data from a random sample of California communities concerning the cost of dealing with litter and preventing it from entering waterways. The project team combined the data received through this effort with data collected in the same manner from 43 additional California communities for two separate studies of the subject sponsored by the U.S Environmental Protection Agency in 2011 and 2012.[1] Thus this study is based on data from 95 communities located throughout California, representing more than one-third of the state's entire population.

On the basis of the data received from these communities, which ranged in size from just over 700 residents (the town of Etna, in Siskiyou County) to more than 4 million (the city of Los Angeles), the project team determined that California communities spend about *half a billion* dollars each year to combat and clean up litter and to prevent it from ending up in the state's rivers, lakes, canals, and ocean. Further, the team determined that the 10 communities spending the most per resident to manage litter were these:

Ranking	City	County	2010 Census	Total Spending	Per Capita
1	Del Mar	San Diego	4,151	$295,621	$71.217
2	Commerce	Los Angeles	12,823	$890,000	$69.407
3	Redondo Beach	Los Angeles	66,748	$2,278,877	$34.142
4	Merced	Merced	78,958	$2,300,000	$29.129
5	Signal Hill	Los Angeles	10,834	$303,900	$28.051
6	Long Beach	Los Angeles	462,604	$12,972,007	$28.041
7	Malibu	Los Angeles	12,645	$339,500	$26.849
8	Dana Point	Orange	33,351	$834,500	$25.022
9	El Segundo	Los Angeles	16,654	$390,000	$23.418
10	Fountain Valley	Orange	55,313	$1,225,687	$22.159

For a full list with more detail, see Table 14 in Appendix B: Data Tables.

Cost information was sought for six activities related to litter management:

- Waterway and beach cleanup
- Street sweeping
- Installation of stormwater capture devices

1 Barbara H. Stickel, Andy Jahn, and William Kier, "The Cost to West Coast Communities of Dealing with Trash, Reducing Marine Debris," prepared by Kier Associates for the U.S. Environmental Protection Agency, Region 9, Order for Services EPG12900098, September 2012; and United States Environmental Protection Agency, "Draft: Economic Analysis of Marine Debris," prepared by Timothy Degan Kelly, edited by Saskia van Gendt, 5 August 2011.

- Storm drain cleaning and maintenance
- Manual cleanup of litter
- Public education

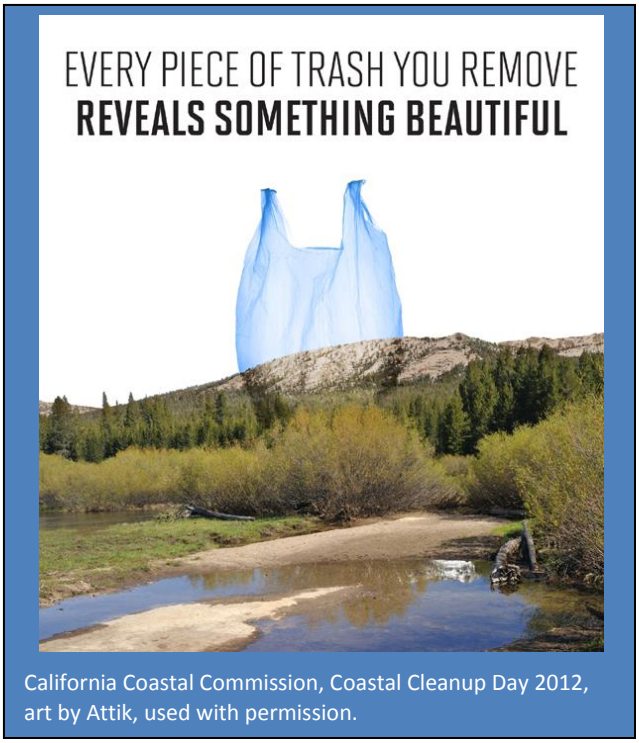
While the reported data reveal that California communities annually spend more than $428,000,000 to combat litter and prevent it from entering the state's waterways*, the actual total cost per Californian is certainly higher, as this study did not assess similar costs incurred at the county and state levels, nor did it include costs associated with recycling, land fills, or waste management before items become litter.*

Such costs, in the view of the project team, make a compelling argument for accelerating the implementation of measures to reduce litter flows that contribute to aquatic debris.

INTRODUCTION

Purpose

This analysis aims to quantify the overall costs incurred by a robust number of randomly selected California communities for all levels of managing aquatic debris, and litter that could become aquatic debris, in order to provide local governments and concerned citizens with the information needed to strengthen efforts to reduce waste that becomes litter. Cost data were gathered and analyzed from communities with populations ranging from just over 700 residents (the town of Etna) to nearly 4 million (the city of Los Angeles). Estimates of the average cost for managing potential aquatic debris are organized by community size, as follows:



California Coastal Commission, Coastal Cleanup Day 2012, art by Attik, used with permission.

Community Size	Population Range	Range of Annual Reported Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$2,877,400–$36,360,669	$13,929,284	$11.239
Large	75,000–249,999	$350,158–$2,379,746	$1,131,156	$8.938
Midsize	15,000–74,999	$44,100–$2,278,877	$457,001	$10.486
Small	Under 15,000	$300–$890,000	$144,469	$18.326

For detail see Appendix B: Data Tables.

Aquatic debris: Out of sight, out of mind

In 1975 the National Academy of Sciences determined that each year, approximately 1.4 billion pounds of litter and other persistent solid materials were being tossed into the world's oceans to become aquatic debris, much of which ends up on beaches.[2] No more current estimate can be found, but in the years since the Academy's determination the production of plastic has increased significantly.[3] Further, the disturbing rate at which debris such as plastics, metal, glass, and rubber is accumulating in the aquatic environment is increasingly well documented.[4] Moreover, recent studies suggest that the amount of debris found on California's beaches increases in direct relationship to their proximity to river mouths, regardless of public accessibility and/or local population density.[5] And debris is not accumulating only in the oceans or along the coast: Although not as well documented, California's inland lakes and streams also bear evidence of microplastic contamination, as do its arid desert regions.[6]

Pico Kenter storm drain in Santa Monica. Image: Haan-Fawn Chau.

2 National Oceanic and Atmospheric Administration (NOAA), "Marine Debris: Frequently Asked Questions," 10 August 2012, marinedebris.noaa.gov/info/faqs.html, #1.

3 " Global plastics production increased by 10 million tonnes (3.7%) to around 280 million tonnes in 2011, continuing the growth pattern that the industry has enjoyed since 1950 approximately by 9% per annum.." Plastics Europe, *Plastics – the Facts. An Analysis of European Plastic Production, Demand and Waste Data for 2011,* (2012): 5 *available at* http://www.plasticseurope.org/Document/plastics-the-facts-2012.aspx?Page=DOCUMENT&FolID=2.

4 Aimee A. Keller et al., "Distribution and Abundance of Anthropogenic Marine Debris Along the Shelf and Slope of the U.S. West Coast," *Marine Pollution Bulletin* 60 (2010): 692-700. Evan A. Howell et al., "On North Pacific Circulation and Associated Marine Debris Concentration," *Marine Pollution Bulletin* 65 (2012): 19-20. Shelly L. Moore and M. James Allen, "Distribution of Anthropogenic and Natural Debris on the Mainland Shelf of the Southern California Bight," *Marine Pollution Bulletin* 40, no. 1 (2000): 83-88. Margy Gassel et al., "Detection of Nonylphenol and Persistent Organic Pollutants in Fish from the North Pacific Central Gyre," *Marine Pollution Bulletin*, 2013 (in press). Charles James Moore, "Synthetic Polymers in the Marine Environment: A Rapidly Increasing, Long-Term Threat," *Environmental Research* 108 (2008): 134. In 2010, researchers in the Northwestern Hawaiian Islands recovered two buoys lost during the 2007–08 coastal Oregon Dungeness crab fishery. The buoys were found on different days in different locations and help demonstrate the oceanic drift path of debris originating along the U.S. Pacific Coast. Further, the fact that the fishery takes place in nearshore waters demonstrates how land-based pollution from the U.S. West Coast can impact distant places. Curtis C. Ebbesmeyer et al., "Marine Debris from the Oregon Dungeness Crab Fishery Recovered in the Northwestern Hawaiian Islands: Identification and Oceanic Drift Paths," *Marine Pollution Bulletin* 65 (2012): 69-70, 74.

5 C. Rosevelt et al., "Marine Debris in Central California: Quantifying Type and Abundance of Beach Litter in Monterey Bay, CA," *Marine Pollution Bulletin*, 2013 (in press).

6 "Microplastic Pollution Prevalent in Lakes, Too," *Science Daily* (2013), www.sciencedaily.com/releases/2013/05/130529092902.htm. Frank Robertson, "Seizing Plastic from Trees County Eyes Restricting Single Use Bags." *Sonoma West Times & News*, 6 February 2013, www.sonomawest.com/living/ seizing-plastic-from-trees-county-eyes-restricting-single-use-bags/article_a0b4b56e-70b4-11e2-aa85-001a4bcf887a.html. Sierra Nevada Conservancy, "The Great Sierra River Cleanup," 2011. www.sierranevada.ca.gov/our-work/rivercleanup. E.R. Zylstra, "Accumulation of Wind-Dispersed Trash in Desert Environments," *Journal of Arid Environments* 89 (2013): 13-15.

Debris is known to threaten sensitive ecosystems, harm hundreds of wildlife species, interfere with navigation, degrade natural habitats, cost millions of dollars in property damage and lost revenue from tourism and commercial fishing activities, and threaten human health and safety.[7] Further, it has been noted that there is a "constant influx of debris [and] if we can't stop that from happening, 'clean up' will never have the necessary impact to protect marine organisms and ecosystems."[8] Scientists are not yet certain how long it takes for plastics to biodegrade in the aquatic environment, but educated guesses are typically on the order of centuries.[9]

Awaiting cleanup: an illegal dump site in San Bernardino. From "America's Brokest Cities," *Forbes* magazine, April 2013.

Studies show that improved inland waste management practices do have a direct, positive impact on the amount of litter and debris entering waterways and accumulating on beaches and elsewhere. Recycling policies coupled with modifications in the ways we use and manufacture plastic items can significantly reduce the percentage of plastic that becomes debris. Moreover, research shows that improved waste management and recycling policies directly and indirectly help create permanent jobs and strengthen economies.[10] Public education programs that increase awareness and stimulate a sense of public responsibility can also help reduce litter.[11]

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7 Natural Resources Defense Council, *Testing the Waters 2013: A Guide to Water Quality at Vacation Beaches: The Impacts of Beach Pollution*, www.nrdc.org/water/oceans/ttw/health-economic.asp. Perla Atiyah et al., "Measuring the Effects of Stormwater Mitigation on Beach Attendance," Marine Pollution Bulletin, 3024 (in press). NOAA, "Interagency Report on Marine Debris Sources, Impacts, Strategies & Recommendations," congressional report developed by Interagency Marine Debris Coordinating Committee, 2008. U.S. Government, 30 July 2012, p. 12, water.epa.gov/type/oceb/marinedebris/upload/2008_imdcc_marine_debris_rpt.pdf. Moore, "Synthetic Polymers in the Marine Environment," 133. Further, "ingested debris" has been recovered during necropsies of marine mammals, birds, fish, turtles, and squid. In 1987, researcher David Laist documented more than 100 different species of seabirds that had either ingested plastic fragments or become entangled in debris. National Research Council, Committee on the Effectiveness of International and National Measures to Prevent and Reduce Marine Debris and Its Impacts, *Tackling Marine Debris in the 21st Century* (Washington, D.C.: National Academies Press, 2008), 1. D.W. Laist, "Impacts of Marine Debris: Entanglement of Marine Life in Marine Debris Including a Comprehensive List of Species with Entanglement and Ingestion Records," in *Marine Debris: Sources, Impacts and Solutions*, ed. M. Coe and D.B. Rogers (New York: Springer-Verlag, 1997), 99-139. Carcasses of northern fulmars recently recovered on coastal beaches reveal the seabirds lacking in muscle and fat reserves; more than 90 percent had ingested plastic particles at some time prior to death from drowning. Further, the results provided "strong evidence" of increasing ingestion of plastic by fulmars, most likely paralleling an increase in the amount of plastic available for them to ingest. Stephanie Avery-Gomm et al., "Northern Fulmars as Biological Monitors of Trends of Plastic Pollution in the Eastern North Pacific," *Marine Pollution Bulletin* 64 (2012): 1776-81. The ingestion of plastic debris by animals can provide an avenue for other organic pollutants, including DDT and PCBs, to enter the food chain. Almira Van et al., "Persistent Organic Pollutants in Plastic Marine Debris Found on Beaches in San Diego, California," *Chemosphere* 86 (2012): 258, 260. In addition, researchers have expressed concern about estrogenic compounds found in plastics possibly causing endocrine disruptions in marine animals. Moore, "Synthetic Polymers in the Marine Environment," 132-135.

8 Email exchange with Zack Bradford, Ocean Policy Research Analyst, Monterey Bay Aquarium, July 30, 2012.

9 Moore, "Synthetic Polymers in the Marine Environment," 132.

10 James Goldstein, Christi Electris, and Jeff Morris for Tellus Institute, *More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.*, November 2011:1, docs.nrdc.org/globalwarming/files/glo_11111401a.pdf.

Although it is impossible to estimate a precise percentage, most aquatic debris comes from land-based sources such as littering, legal and illegal dumping, a lack of good waste management practices and recycling capacities, stormwater discharges, and extreme natural events.[12] Debris cleanup and prevention is expensive and complex, costing public agencies millions of dollars every year.[13] Because most of the responsibility for managing waste falls on local governments, most communities incur direct, significant expenses associated with preventing or reducing aquatic debris, regardless of their proximity to streams or the ocean. Costs can be particularly high for coastal communities.

It is essential that immediate action be taken to reduce the amount of debris entering the aquatic environment each year.[14]

Current approaches

Local governments have the ability to lessen the flow of litter into our waterways by promoting land-based cleanup and source reduction; enacting ordinances to reduce single-use plastic bags and polystyrene (Styrofoam™) takeout packaging; and creating incentives for waste reduction and reuse.[15] Plastic bag ordinances have been implemented in dozens of cities and counties

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11 Ta-Kang Liu, Meng-Wei Want, and Ping Chen, "Influence of Waste Management Policy on the Characteristics of Beach Litter in Kaohsiung, Taiwan," *Marine Pollution Bulletin* 72 (2013), 99, 105.

12 GESAMP: IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution, *State of the Marine Environment*, Reports and Studies No. 39 (United Nations Environment Programme, 1990), 88. A.T. Williams., M. Gregory, and D.T. Tudor, "Marine Debris: Onshore, Offshore, Seafloor Litter," in *Encyclopedia of Coastal Science*, ed. M. Schwartz (Dordrecht, The Netherlands: Springer, 2005), 623. Miriam Gordon, *Eliminating Land-Based Discharges of Marine Debris in California: A Plan of Action from the Plastic Debris Project*," 2006, California Coastal Commission: The Plastic Debris Project, www.plasticdebris.org/ CA_Action_Plan_2006.pdf: 3, 14. C.J. Moore, G.L. Lattin, and A.F. Zellers, "Quantity and Type of Plastic Debris Flowing from Two Urban Rivers to Coastal Waters and Beaches of Southern California," *Journal of Integrated Coastal Zone Management* 11, no. 1 (2011): 65. Further, a 2012 survey of U.S. West Coast data from the National Marine Debris Monitoring Program for the years 1998 through 2007 reveals a consistent overall decline in marine-sourced debris (from ships, fishing, etc.) but does not find the same to be true of land-based debris. Christine A. Ribic et al., "Trends in Marine Debris Along the U.S. Pacific Coast and Hawai'i 1998-2007," *Marine Pollution Bulletin* 64 (2012): 994, 1001.

13 California Ocean Protection Council in Consultation with California Marine Debris Steering Committee and Gordon Environmental Consulting, *An Implementation Strategy for the California Ocean Protection Council: Resolution to Reduce and Prevent Ocean Litter*, 20 November 2008, State of California, Ocean Protection Council, www.opc.ca.gov/webmaster/ftp/pdf/opc_ocean_litter_final_strategy.pdf, accessed 30 July 2012, 4.

14 "'We've been cleaning up inland areas for almost as long as we've been organizing Coastal Cleanup Day,' said Eben Schwartz, statewide outreach coordinator for the California Coastal Commission. 'The data we've collected during the event over the years has shown that most of the trash we pick up starts in our inland and urban areas. So why not go straight to the source and stop that trash where it starts?'" California Coastal Commission, *California Coastal Commission Announces the "58 for 58" Campaign*, press release, 4 February 2004. Beach cleanups, generally conducted by volunteers, do help heighten civic awareness; however, as the annual necessity and increasing size of these volunteer cleanup efforts demonstrate, beach cleanups are not the solution as they do not address sources of the debris. Williams, Gregory, and Tudor, "Marine Debris--Onshore, Offshore, Seafloor Litter," 626. Moore, "Synthetic Polymers in the Marine Environment," 133.

15 The California Ocean Protection Council's 2008 Implementation Strategy for the reduction of marine debris focuses on three main objectives: "1) bans on specific products more likely to become marine debris for which there are available substitute materials; 2) fees on products likely to become marine debris for which there are no available substitute materials; and 3) extended producer responsibility policies, aimed at making producers of plastic products responsible for the entire lifecycle of their products." California Ocean Protection Council in Consultation with California Marine Debris Steering Committee and Gordon Environmental Consulting, "An Implementation Strategy for the California Ocean Protection Council: Resolution to

throughout California.[16] In June 2013, for example, the Los Angeles City Council approved an ordinance that bans single-use plastic bags beginning in 2014.[17] A number of cities and counties have also banned polystyrene food packaging and expanded polystyrene (EPS) items.[18]

Local governments spend significant funds on land-based cleanup to reduce the amount of debris reaching waterways. By 2009, the city of San Francisco was spending more than $6 million a year cleaning up just discarded cigarettes.[19] Los Angeles County spends more than $18 million a year sweeping streets, clearing catch basins, cleaning up litter, and educating the public in an attempt to reduce debris.[20]

Throughout California, communities also address the problem through the implementation of Total Maximum Daily Load (TMDL) plans and implementation of Municipal Separate Storm Sewer System (MS4) permit requirements, working with the state to limit litter discharges into California's waterways. The Los Angeles County TMDL, for example, requires "Southern California cities discharging into the river to reduce their trash contribution to these water bodies by 10% each year for a period of 10 years with the goal of zero trash...by 2015."[21]

Reduce and Prevent Ocean Litter,". 6. *The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris*, developed in conjunction with the United Nations Environmental Programme (UNEP) and NOAA, expands broadly on these goals in Table ES-1. NOAA, *The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris*, n.d., 31 July 2012, marinedebris.noaa.gov/projects/pdfs/HonoluluStrategy.pdf. Jennie R. Romer and Shanna Foley, "A Wolf in Sheep's Clothing: The Plastic Industry's 'Public Interest' Role in Legislation and Litigation of Plastic Bag Laws in California," *Golden Gate University Environmental Law Journal* 58, no. 2 (12 April 2012): 377-78. Jessica R. Coulter, "Note: A Sea Change to Change the Sea: Stopping the Spread of the Pacific Garbage Patch with Small-Scale Environmental Legislation," *William & Mary Law Review* 51 (April 2010): 1961.

16 Californians Against Waste, Plastic Litter and Waste Reduction Campaign: Plastic Bag Litter Pollution: Plastic Bags: Local Ordinances,2012, www.cawrecycles.org/issues/plastic_campaign/plastic_bags/local.

17 "L.A. Approves Ban on Plastic Grocery Bags," *Los Angeles Times*, 18 June 2013, articles.latimes. com/2013/jun/18/local/la-me-plastic-bags-20130619.

18 California Ocean Protection Council*, Resolution to Reduce and Prevent Ocean Litter*, 13. City News Service, "LAUSD to Ban Styrofoam Food Trays at All School Campuses," *Los Angeles Daily New,* 23 August 2012, www.dailynews.com/education/ci_21387420/lausd-ban-styrofoam-food-trays-at-all-school.

19 J.E. Schneider et al., *Estimates of the Costs of Tobacco Litter in San Francisco and Calculations of Maximum Permissible Per-Pack Fees*," Health Economics Consulting Group LLC, 2009, 19.

20 County of Los Angeles, *An Overview of Carryout Bags in Los Angeles County*, a staff report to the Los Angeles County Board of Supervisors (Los Angeles County Department of Public Works, Environmental Programs Division, August 2007), 4.

21 "Total Maximum Daily Loads (TMDLs) for Los Angeles." *City of Los Angeles Stormwater Program*. City of Los Angeles Stormwater Program. 25 July 2011. www.lastormwater.org/Siteorg/program/TMDLs/tmdl_ lariver_trash.htm. "Devices to capture plastic debris before it reaches rivers and oceans are being installed at urban catch basins, storm drains and pumping stations, and debris booms are being placed across rivers draining urban areas. Containment structures cover only a small percentage of debris conduits, and during heavy storms, these devices break or overflow, and release debris. Nevertheless, these devices are being relied upon by municipalities required to reduce trash input to urban waterways by regulations called total maximum daily loads (TMDLs), used by Water Resource Control Boards to regulate pollutants entering urban waterways. Structural controls typically capture macro-debris (45mm) only, as the legal definition of trash under the TMDL is anthropogenic debris that can be trapped by a 5mm mesh screen (California Regional Water Quality Control Board, Los Angeles Region). Based on a study of the Los Angeles watershed, 90% of plastic debris by count, and 13% by weight are micro-debris <5mm." Moore, "Synthetic Polymers in the Marine Environment," 136.

While such cleanup efforts do reduce the amount of litter entering our waterways and affecting aquatic environments, their cost has not been well studied. This report strives to address that unknown cost issue.

METHODOLOGY

This study expands on data collected from 14 California cities by the U.S Environmental Protection Agency in 2011 and from 29 additional California cities collected by Kier Associates in 2012.[22] For this study, information was solicited from 221 communities randomly selected from a list of all California communities.[23] (See Appendix D: Communities Randomly Selected and Contacted for This Study.) Cost data came from a variety of sources including MS4 permits; annual budgets and reports; and phone interviews and e-mail correspondence with city hall staff, public works field managers, and knowledgeable nongovernmental organizations. The data came from an array of program areas: city budget offices, clean water programs, watershed management programs, parks and recreation departments, and more. There was no single source of reliable information common to all the communities; study team members simply persisted until they found the appropriate information source, community by community. (See Appendix B: Data Tables.)

Including the 43 communities previously contacted, more than 250 cities, towns, and municipal agencies (collectively referred to as "communities") were contacted. Of those, 95 (representing about 20 percent of all California communities and one-third of the state's total population) responded with data relating to some, if not all, of the six cost categories. Responses were received from communities located throughout California, including the counties of Alameda, Calaveras, Contra Costa, Fresno, Glenn, Humboldt, Imperial, Kern, Los Angeles, Madera, Marin, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Solano, Stanislaus, and Yolo.

This study derived new data primarily from an initial request for information from communities located throughout California. (See Appendix A: Request for Information.) Significant effort was made to collect consistent, representative information to assess the costs to each community of the following six categories of litter management:

- Waterway and beach cleanup
- Street sweeping

22 Stickel, Jahn, and Kier, "The Cost to West Coast Communities of Dealing with Trash, Reducing Marine Debris."

23 *Community* is used to refer to incorporated cities and towns throughout California, all of which are governed by the same rules and regulations.

- Installation of stormwater capture devices
- Storm drain cleaning and maintenance
- Manual cleanup of litter
- Public education

The resulting figures provide the average annual cost reported by various communities to manage litter capable of becoming aquatic debris.

The following California communities, grouped according to size, provided data used in this study:

Community	Population
Largest	**250,000 or more**
Los Angeles	3,831,868
San Diego	1,301,617
San Jose	964,695
Sacramento	466,488
Long Beach	462,604
Oakland	409,184
Large	**75,000–249,999**
Chula Vista	243,916
Glendale	196,847
Fontana	196,069
Santa Clarita	176,320
Santa Rosa	167,815
Rancho Cucamonga	165,269
Hayward	144,186
Sunnyvale	133,963
Santa Clara	116,468
Vallejo	115,942
Inglewood	112,241
Temecula	100,097
Jurupa Valley	95,004
South Gate	94,300
Mission Viejo	93,305
Redding	89,861
Santa Barbara	88,410
Hawthorne	83,945

Community	Population
San Marcos	83,781
Livermore	80,968
Merced	78,958
Midsize	**15,000–74,999**
Mountain View	74,066
Upland	73,732
Folsom	72,203
Redondo Beach	66,748
Wasco	64,173
South San Francisco	63,632
Laguna Niguel	62,979
Madera	61,416
La Habra	60,239
Santa Cruz	59,946
Gardena	58,829
National City	58,582
Huntington Park	58,100
Petaluma	57,941
Diamond Bar	55,544
Fountain Valley	55,313
Paramount	55,018
Rosemead	53,764
Highland	53,104
Lake Elsinore	51,821
Glendora	49,737
Cerritos	49,041

Community	Population
Rancho Santa Margarita	47,853
Covina	47,796
Azusa	46,361
Bell Gardens	42,072
San Gabriel	39,718
Calexico	38,572
Montclair	36,664
West Hollywood	34,399
Dana Point	33,351
Seaside	33,025
Laguna Hills	30,344
Walnut	29,172
San Pablo	29,139
Burlingame	28,806
Atascadero	28,310
Suisun City	28,111
Benicia	26,997
Desert Hot Springs	25,938
Sanger	24,270
Reedley	24,194
Arvin	19,304
Rancho Mirage	17,218
El Segundo	16,654
Laguna Woods	16,192

Community	Population
Moraga	16,016
La Palma	15,568
Small	**Under 15,000**
Palos Verdes Estates	13,438
Auburn	13,330
Commerce	12,823
Malibu	12,645
San Anselmo	12,336
Signal Hill	10,834
Morro Bay	10,234
Capitola	9,918
Waterford	8,456
Ione	7,918
Calimesa	7,879
Orland	7,291
Hughson	6,640
Winters	6,624
Portola Valley	4,353
Del Mar	4,151
Angels Camp	3,836
Weed	2,967
Blue Lake	1,253
Etna	737

The available cost data were compiled and analyzed by category. Average and per capita costs were then computed and tallied for each category of small, midsize, large, and largest communities.[24] In calculating averages and per capita data, total expenditures were divided by total populations to yield weighted averages such that smaller communities (within each population size category) with anomalous spending patterns did not unduly influence the average. Further, responses of "N/A" and/or "0" were assumed to indicate that a community spent nothing in that category. The project team is aware that this is a conservative approach. It

24 For comparison purposes, a table of only those communities that provided costs for all categories (excluding waterway and beach cleanup) was also prepared and can be found in Appendix B as Table 13: Cost Data for Communities Responding in All Categories.

was clear in many cases that communities were spending in these categories but could not break out the costs.

Because of the large number of variables—local weather conditions, distance of the community from waterways and from the coast, population, equipment expenditures, and so on, —no data extrapolations were made. *Thus, actual averages and per capita expenses are, for the most part, likely to be higher than those reported in this study.* In addition, this study does not take into account what are no doubt significant waste management and recycling expenses routinely incurred at county and state levels.

COST ESTIMATES

Direct costs

These costs can be clearly traced to a specific service for managing potential aquatic debris.

"Reports of groups finding nothing to pick up do not exist" (Charles James Moore, "Synthetic Polymers in the Marine Environment," p. 133). Image: California Coastal Commission.

Waterway and beach cleanup includes costs to clean up litter from waterways and beaches within the community. Not all communities conduct waterway and beach cleanups, and in general coastal communities incur larger expenses for beach cleanups than do inland communities. In addition, communities without waterways often do not participate in cleanups; indeed, some inland cities with streams or rivers sometimes do not recognize the connection between inland waterways and potential aquatic debris.[25]

The cost for these cleanups generally does not reflect the entire cost of the effort including disposal, materials, and labor. Often, waterway and beach cleanups are conducted by a county or regional group (such as Los Angeles County, the Sierra Nevada Conservancy, or the California Coastal Commission), making the data difficult to retrieve and attribute to a particular community.[26] Nonetheless, responses to our request for information suggest that, often in

25 Upon receipt of a copy of the request for information, a few desert communities even called to ask if we realized where they were located.

26 During the 2012 Great Sierra River Cleanup, more than 63,000 pounds of litter and recyclables were removed from 228 miles of California rivers. Sierra Nevada Conservancy, *2012 Great Sierra River Cleanup Results*, 2012, www.sierranevada.ca.gov/our-work/rivercleanup/2012-gsrc/2012-GSRC-Results. On the most recent International Coastal Cleanup Day, 598,076 volunteers collected some 9,184,428 pounds of litter from 20,776 miles of beaches. Eighty percent of the debris collected was made up of the top 10 items found (in descending order: cigarettes; caps/lids; plastic beverage bottles; plastic bags; food wrappers/containers; cups, plates, forks, knives, spoons; glass beverage bottles; straws, stirrers; beverage cans; and paper bags). Ocean Conservancy, *International Coastal Cleanup: 2012 Data Release*, 2012, www.oceanconservancy.org/our-

conjunction with either a county or a regional group, California communities spend, on average, $133,958 annually, or $1.031 per resident, on waterway and beach cleanups. (See Appendix B: Data Tables.)

Table 1: **Annual Cost of Waterway and Beach Cleanup**

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$14,000–$7,801,278	$1,863,126	$1.503
Large	75,000-249,999	$0–$353,900	$36,016	$0.285
Midsize	15,000-74,999	$0–$113,000	$13,730	$0.315
Small	Under 15,000	$0–$114,005	$6,595	$0.837

For detail, see Appendix B: Data Tables.

Street sweeping includes the cost of cleaning community streets using truck-powered street sweepers. Unless otherwise noted, it also includes the cost of equipment, labor, and litter disposal.[27] Not only does sweeping help keep streets and communities free of litter, but it also removes sediment and associated contaminants that would otherwise enter waterways via stormwater collection systems.

About once a month, the Caltrans "sweeper train" cleans California's highways and freeways. Image: Caltrans.

Street sweeping was a readily available cost figure for most communities, because most street sweeping is contracted out and the cost is a single fee to the contractor. However, some communities reported decreased spending for street sweeping due to budget constraints, while in other communities the cost of street sweeping is billed directly to residents as part of their household waste collection service. (See Notes to Appendix B: Data Tables.) Nevertheless, responses to our request for information suggest that California communities spend, on

work/marine-debris/2012-data-release.html. Further, plastics, including pre-production pellets, discarded fishing gear, scrubbers, and fragments of once larger plastic items, are reported to make up between 50 percent and 80 percent of the debris found along shorelines. Volunteer efforts result in most of the bulkier debris being removed; however, not all debris is even visible to the naked eye—fragments and microscopic debris are routinely left behind in large quantities. Van et al., "Persistent Organic Pollutants," 258. Patricia L. Corcoran, Mark C. Biesinger, and Meriem Grifi, "Plastics and Beaches: A Degrading Relationship," *Marine Pollution Bulletin* 58 (2009): 80.

27 While most communities were able to provide a cost figure for street sweeping, in some areas sweeping either is the responsibility of the California Department of Transportation ("Caltrans") or is billed directly to residents as part of their household waste collection service and thus is not a budgeted item.

average, $524,388 ($4.036 per resident) annually to sweep their streets.[28] (See Appendix B: Data Tables.)

Table 2: Annual Cost of Street Sweeping

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$245,000–$8,104,857	$4,389,912	$3.542
Large	75,000–249,999	$0–$1,300,000	$577,181	$4.561
Midsize	15,000–74,999	$5,000–$850,000	$215,351	$4.941
Small	Under 15,000	$0–$160,301	$50,985	$6.468

For detail, see Appendix B: Data Tables.

Stormwater capture devices include the costs of purchasing and installing catchments to trap litter in the storm drain system. The cost of these devices varies, depending on how much progress communities have made in their litter reduction programs and the types of devices installed (see photo below). Some communities have yet to install any devices, and others have already installed several. These catchment devices can range from a simple insert placed into the storm drain for as little as $400 to complex vortex separators costing upwards of $40,000.[29] The choice of device depends in part on the amount of litter normally entering the storm drain; more litter requires a more complex device. Costs for stormwater capture devices also depend on each community's proximity to bodies of water. In addition to installing devices on storm drains, a community may also install devices directly in streams to capture litter from storm events, and street activity. This equipment may include netting systems that catch combined sewer system overflows, which can range in cost from $75,000 to $300,000 or even more (see photo below).[30] Overall, responses to our request for information suggest that California communities spend, on

Trash traps installed in a creek will capture bulky debris as long as they are serviced regularly. Image: riverlink.org.

28 This figure does not include the cost of sweeping California's highways and freeways, which Caltrans does about once a month, nor does it include any costs incurred by counties or federal agencies. Caltrans District 7, "Ask Caltrans: Why does Caltrans sweep the freeways during the day?" 29 August 2012, caltransd7info. blogspot.com/2012/08/ask-caltrans-why-does-caltrans-sweep.html.

29 Miriam Gordon and Ruth Zamist, *Municipal Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff*, n.d., California Coastal Commission; Algalita Marine Research Foundation, 31 July 2012, plasticdebris.org/Trash_BMPs_for_Munis.pdf.

30 Ibid., 30-31.

average, $212,595 annually ($1.636 per resident) on stormwater capture devices. (See Appendix B: Data Tables.)

Table 3: Annual Cost of Stormwater Capture Devices

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$0–$7,887,125	$2,093,667	$1.689
Large	75,000–249,999	$0–$760,433	$153,135	$1.210
Midsize	15,000–74,999	$0–$1,100,000	$72,078	$1.654
Small	Under 15,000	$0–$560,000	$47,948	$6.082

For detail, see Appendix B: Data Tables.


Kristar FloGard Plus Catch Basin Insert


REM Geo-Trap Filter Catch Basin Insert


REM Triton Curb Inlet Filter Insert


Clearwater Curb Inlet Insert


United Stormwater Drainpac Curb Inlet Filter


United Stormwater Drainpac Drop Inlet Filter

Examples of stormwater catchment systems (Gordon and Zamist, "Municipal Best Management Practices," p. 14).

Storm drain cleaning and maintenance includes the cost of cleaning and maintaining storm drains and stormwater catchment devices so they will operate effectively. The cost of storm drain cleaning and maintenance is a very elastic figure; communities yet to install any stormwater devices have minimal costs, while communities with stormwater devices in place naturally have higher costs. In addition, maintenance costs vary widely depending on local weather conditions. Communities that experience more rainfall need to clean storm drains more often, resulting in greater costs. Communities with less rainfall generally clean storm drains only before and after storm events.[31] Overall, responses to our request for information suggest that California communities spend, on average, $249,238 annually ($1.918 per resident) on storm drain cleaning and maintenance. (See Appendix B: Data Tables.)

City employee works to clear clogged storm drain. Image: City of Palo Alto.

Table 4: Annual Cost of Storm Drain Cleaning and Maintenance

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$700,000–$6,400,000	$2,439,232	$1.968
Large	75,000–249,999	$0–$1,098,000	$217,268	$1.717
Midsize	15,000–74,999	$0–$553,053	$86,741	$1.990
Small	Under 15,000	$0–$85,000	$15,803	$2.005

For detail, see Appendix B: Data Tables.

Manual cleanup refers to the cost of manually picking up litter from streets, parks, and roadsides. Manual cleanup programs include complaint response and parks maintenance. Some communities do not have a formal litter collection program. In some communities, volunteers do the work. In other cases, communities with manual litter cleanup programs spread the responsibility among multiple departments, making costs difficult to track. Costs may be spread, for example, between parks and recreation and public works agencies. In most

City employees use dip nets to remove plastic and other debris from Lake Merritt. Image: City of Oakland Clean Lake Initiative.

31 Desert communities may not even have or need storm drain systems, yet desert ecosystems and wildlife are being affected by wind-blown plastics and debris, threatening rare and isolated desert water sources. Further, debris originating in arid desert regions could ultimately be deposited in more distant waterways, especially following natural events such as seasonal flash floods. Zylstra, "Accumulation of Wind-Dispersed Trash," 14.

cases the percentage of employee time devoted to picking up litter is simply an estimate made by the respondent. Overall, responses to our request for information suggest that California communities spend, on average, $197,003 annually ($1.516 per resident) on manual litter cleanup. (See Appendix B: Data Tables.)

Table 5: Annual Cost of Manual Cleanup

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$71,799–$7,000,000	$2,331,686	$1.881
Large	75,000–249,999	$0–$300,000	$79,364	$0.627
Midsize	15,000–74,999	$0–275,000	$55,948	$1.284
Small	Under 15,000	$0–$81,000	$18,653	$2.366

For detail, see Appendix B: Data Tables.

Public education includes the cost to communities of informing the public about how littering and improper disposal of other waste affects stormwater management. This is done through the Internet, billboards, public transit posters, school programs, and television. Many communities invest in broad public education and outreach efforts in which prevention of aquatic debris and littering are but parts of a larger program. Others, such as the city of Benicia, have programs that specifically focus on pollution and/or plastics in the ocean.[32] Overall, responses to our request for information suggest that California communities spend, on average, $73,928 annually ($0.569 per resident) on public education relating to litter and waste disposal. (See Appendix B: Data Tables.)

Table 6: Annual Cost of Public Education

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$521,500–$1,945,531	$811,661	$0.655
Large	75,000–249,999	$2,492–$385,554	$68,193	$0.539
Midsize	15,000–74,999	$0–$107,100	$13,154	$0.302
Small	Under 15,000	$0 –$25,000	$4,485	$0.569

For detail see Appendix B: Data Tables.

Indirect costs

These are more difficult to quantify—and their quantification was not attempted in this study—because they often require attributing a cost to an action or an impact that has no clearly-

32 Melissa Morton, Land Use and Engineering Manager, City of Benicia, e-mail message to Barbara Stickel, 10 July 2013.

defined dollar value. In the case of aquatic debris, communities appear poorly prepared to quantify indirect costs, including losses to tourism and industry.

Loss to tourism consists of tourism dollars that were not spent in the community because of the impacts of debris on the environment. Tourism is affected by littered rivers and beaches, beach closures, and stormwater overflows. During large rain events, many storm drain systems are designed to overflow and discharge stormwater directly into nearby water bodies without treatment. This water can include litter that has been accumulating in storm drains and along streets. Once discharged into a water body, debris can wash ashore, causing both physical and health risks to beachgoers and closing beaches entirely. The actual dollar value of tourism losses directly attributable to debris is difficult to establish; however, economists estimate that "a typical swimming day is worth approximately $35 to each individual, so depending on the number of potential visitors to a beach, the 'consumer surplus' loss on a day that a beach is closed or under advisory for water quality problems can be quite significant."[33]

Further, a 2007 National Oceanic and Atmospheric Administration study found that if water quality in Long Beach, California, were improved to meet the healthier standards of nearby Huntington City Beach, $8.8 million in economic benefits could be created over a 10-year period.[34] Moreover, a recent study of 26 Southern California beaches found that beach attendance increased following installation of storm drain diversions, indicating that improved waste management practices brought a corresponding improvement in the quality of the beachgoing experience.[35]

Beach closure sign along the California coast. Image: Serge Medina, Wildcoast.

Debris can also cause losses to tourism by killing wildlife and degrading habitats. Many California communities depend on wildlife and bird-watching as a means of bringing in revenue. Although an exact estimate is not possible, a 2006 study found that "the non-market value of coastal wildlife viewing in the state could easily be in the tens or hundreds of millions of dollars annually."[36] The impact of debris on the health of ecosystems can and does significantly reduce tourism.

33 Natural Resources Defense Council, *Testing the Waters 2013*.

34 Moore, "Synthetic Polymers in the Marine Environment," 134. V.R. Leeworthy and P.C. Wiley, *Southern California Beach Valuation Project: Economic Value and Impact of Water Quality Change for Long Beach in Southern California*, NOAA, February 2007. National Research Council, *Tackling Marine Debris*, 1. Tourism losses were estimated at $5.4 billion after medical debris washed up on New Jersey shores in 1987 and again on Long Island, New York, in 1988. Tony Barboza, "Beach Pollution at Third-Highest Level in 22 Years: California Registered a Slight Increase in Beach Closures and Advisories in 2011 While the Rest of the United States Saw a 3% Drop, the Natural Resources Defense Council Finds," *Los Angeles Times*, 27 June 2012, articles.latimes.com/2012/jun/27/local/la-me-beach-report-20120627.

35 Atiyah et al., "Measuring the Effects of Stormwater Mitigation," 6.

36 Linwood H. Pendleton, *Understanding the Potential Economic Impact of Marine Wildlife Viewing and Whale Watching in California: Executive Summary*, 1 March 2006, www.dfg.ca.gov/mlpa/pdfs/binder3dii.pdf, 12.

Loss to industry consists of revenue lost because of damage to fishing vessels or equipment and losses of fish and other aquatic animals. Aquatic debris can not only damage fishing gear but also entangle propellers, clog intake valves, and sink vessels. Lost fishing gear can endanger other fishing operations and has the potential to entangle and injure aquatic animals. Further, the gear can "ghost-fish," which is the term used for lost or abandoned fishing gear that continues to catch fish, thereby reducing catches for other fishing vessels.[37] A 2009 study of medical records from wildlife rehabilitation facilities in California found that "derelict fishing gear—lost, abandoned or discarded sport and commercial line, nets, traps, etc.—in the marine environment is a significant cause of injury in California coastal marine wildlife."[38]

The cost of debris to tourism and industry sectors can be a large hidden cost to waterfront and beach communities. Data need to be gathered in these areas to accurately quantify the *total* cost of debris to communities.

"Fishing line kills more than fish. May 2012: this goose at Folsom Lake died a slow death when fishing line tangled around both its feet. One foot has completely fallen off, and the other is nearly severed as a result of the line." Image: KCRA Sacramento .

Overall costs

These include the cost to communities for waterway and beach cleanups, street sweeping, stormwater capture devices, storm drain cleaning and maintenance, manual cleanup, and public education. The full cost picture cannot be presented, however, because of the difficulty of quantifying the indirect costs of litter and other forms of debris.

[37] *See*, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Department, "Ghost Fishing," http://www.fao.org/fishery/topic/14798/en.

38 Brynie Kaplan Dau et al., "Fishing Gear-Related Injury in California Marine Wildlife," *Journal of Wildlife Diseases* 45(2) (2009): 355. Emma Moore et al., "Entanglements of Marine Mammals and Seabirds in Central California and the North-West Coast of the United States 2001–2005," *Marine Pollution Bulletin* 58 (2009): 1045-51.

The study team determined that California communities spend on average between $8.94 and $18.37 per resident to manage litter.

Table 7: Total Annual Direct Cost of Debris Management

Community Size	Population Range	Range of Reported Annual Costs	Average Reported Annual Cost	Average Reported Per Capita Cost
Largest	250,000 or more	$2,877,400–$36,360,669	$13,929,284	$11.239
Large	75,000–249,999	$350,158–$2,379,746	$1,131,156	$8.938
Midsize	15,000–74,999	$44,100–$2,278,877	$457,100	$10.486
Small	Under 15,000	$300–$890,000	$144,469	$18.326

For detail, see Appendix B: Data Tables.

The study team determined the 10 California communities spending the most per resident to manage litter.

Table 8: Communities with the Highest Per Capita Costs for Debris Management

Ranking	City	County	2010 Census	Total Spending	Per Capita
1	Del Mar	San Diego	4,151	$295,621	$71.217
2	Commerce	Los Angeles	12,823	$890,000	$69.407
3	Redondo Beach	Los Angeles	66,748	$2,278,877	$34.142
4	Merced	Merced	78,958	$2,300,000	$29.129
5	Signal Hill	Los Angeles	10,834	$303,900	$28.051
6	Long Beach	Los Angeles	462,604	$12,972,007	$28.041
7	Malibu	Los Angeles	12,645	$339,500	$26.849
8	Dana Point	Orange	33,351	$834,500	$25.022
9	El Segundo	Los Angeles	16,654	$390,000	$23.418
10	Fountain Valley	Orange	55,313	$1,225,687	$22.159

For a full list with more detail, see Table 14 in Appendix B: Data Tables.

CONCLUSION

This study presents the costs of managing litter and reducing aquatic debris reported by a random sample of California communities. The objective of the study was to add to the information available to decision makers and others who are considering further steps to reduce the waste flows that contribute to aquatic debris.

Randomly selected communities from throughout California provided the project team with costs related to waterway and beach cleanup, street sweeping, stormwater capture devices, storm drain cleaning and maintenance, manual litter cleanup, and public anti-littering campaigns. The reported data reveal that California communities annually spend more than

$428,000,000—nearly a half billion dollars—to combat litter and prevent it from entering the state's waterways.[39]

The project team found that, on average, small and medium-size California communities spend at least $11.35 per year per resident in litter management and debris reduction efforts. The largest cities do not enjoy much in the way of economies of scale; large communities are spending, conservatively, $10.63 annually per resident for the same litter management and debris reduction efforts. Overall, regardless of size, California communities spend an average of $10.71 per resident for litter management and debris reduction.

In the view of the project team, the costs to California communities of preventing litter from becoming aquatic debris make a compelling argument for accelerating the implementation of measures to reduce litter flows.

Waste becomes litter in many different ways. In some communities, wildlife contributes to debris problems. From "News: Around Town," *Monrovia (California) Patch*, August 10, 2011. Image: Robert Machulla.

39 The 2010 U.S. Census recorded a total of 37,253,956 California residents in 2010 and estimated this number would grow to 38,041,430 by 2012. Rounding up and multiplying 40 million by the average spending of $10.71 per resident results in approximately $428,400,000 being spent annually to combat litter in California.

WORKS CITED

Atiyah, Perla, Linwood Pendleton, Ryan Vaughn, and Neil Lessem, "Measuring the Effects of Stormwater Mitigation on Beach Attendance." *Marine Pollution Bulletin*, 2013 (in press).

Avery-Gomm, Stephanie, Patrick D. O'Hara, Lydia Kleine, Victoria Bowes, and Laurie K. Wilson, "Northern Fulmars as Biological Monitors of Trends of Plastic Pollution in the Eastern North Pacific," *Marine Pollution Bulletin* 64 (2012): 1776-81.

California Coastal Commission, "California Coastal Commission Announces the '58 for 58' Campaign," press release, 4 February 2004.

California Department of Transportation, Caltrans District 7, "Ask Caltrans: Why does Caltrans sweep the freeways during the day?" 29 August 2012, caltransd7info. blogspot.com/2012/08/ask-caltrans-why-does-caltrans-sweep.html (accessed 23 June 2013).

California Ocean Protection Council in Consultation with California Marine Debris Steering Committee and Gordon Environmental Consulting, *An Implementation Strategy for the California Ocean Protection Council: Resolution to Reduce and Prevent Ocean Litter,* 20 November 2008. State of California, Ocean Protection Councilwww.opc. ca.gov/webmaster/ftp/pdf/opc_ocean_litter_final_strategy.pdf (accessed 30 July 2012).

Californians Against Waste, Plastic Litter and Waste Reduction Campaign: Plastic Bag Litter Pollution: Plastic Bags: Local Ordinances, 2012, www.cawrecycles.org/issues/ plastic_campaign/plastic_bags/local (accessed 28 August 2012).

Corcoran, Patricia L., Mark C. Biesinger, and Meriem Grifi, "Plastics and Beaches: A Degrading Relationship," *Marine Pollution Bulletin* 58 (2009): 80-84.

Coulter, Jessica R., "Note: A Sea Change to Change the Sea: Stopping the Spread of the Pacific Garbage Patch with Small-Scale Environmental Legislation," *William & Mary Law Review* 51 (April 2010): 1959-95.

Dau, Brynie Kaplan, Kirsten V.K. Gilard, Frances M. Gulland, Ali Higgins, Jay B. Holcomb, Judy St. Leger, and Michael H. Ziccardi, "Fishing Gear-Related Injury in California Marine Wildlife," *Journal of Wildlife Diseases* 45(2) (2009): 355-62.

Ebbesmeyer, Curtis C., W.J. Ingraham, Jason A. Jones, and Mary J. Donohue, "Marine Debris from the Oregon Dungeness Crab Fishery Recovered in the Northwestern Hawaiian Islands: Identification and Oceanic Drift Paths," *Marine Pollution Bulletin* 65 (2012): 69-75.

Gassel, Margy, Suhash Harwani, June-Soo Park, and Andrew Jahn, "Detection of Nonylphenol and Persistent Organic Pollutants in Fish from the North Pacific Central Gyre," *Marine Pollution Bulletin*, 2013 (in press).

GESAMP, *State of the Marine Environment*, IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution, Reports and Studies, No. 39. United Nations Environment Programme, 1990.

Goldstein, James, Christi Electris, and Jeff Morris for Tellus Institute, "More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.," November 2011, docs.nrdc.org/globalwarming/files/glo_11111401a.pdf (accessed 6 August 2013).

Gordon, Miriam, *Eliminating Land-Based Discharges of Marine Debris in California: A Plan of Action from the Plastic Debris Project,* California Coastal Commission, 2006. The Plastic Debris Project. 31 July 2012, www.plasticdebris.org/CA_Action_Plan_2006.pdf.

Gordon, Miriam, and Ruth Zamist. "Municipal Best Management Practices for Controlling Trash and Debris in Stormwater and Urban Runoff," California Coastal Commission, Algalita Marine Research Foundation, 31 July 2012, plasticdebris.org/Trash_BMPs_for_Munis.pdf.

Howell, Evan A., Steven J. Bograd, Carey Morishige, Michael P. Seki, and Jeffrey J. Polovina, "On North Pacific Circulation and Associated Marine Debris Concentration," *Marine Pollution Bulletin* 65 (2012): 16-22.

Keller, Aimee A., Erica L. Fruh, Melanie M. Johnson, Victor Simon, and Catherine McGourty, "Distribution and Abundance of Anthropogenic Marine Debris Along the Shelf and Slope of the U.S. West Coast," *Marine Pollution Bulletin* 60 (2010): 692-700.

Laist, D.W., "Impacts of Marine Debris: Entanglement of Marine Life in Marine Debris Including a Comprehensive List of Species with Entanglement and Ingestion Records," In *Marine Debris: Sources, Impacts and Solutions*, ed. M. Coe and D.B. Rogers (New York: Springer-Verlag, 1997), 99-139.

Leeworthy, V.R., and P.C. Wiley, *Southern California Beach Valuation Project: Economic Value and Impact of Water Quality Change for Long Beach in Southern California*, National Oceanic and Atmospheric Administration (NOAA), February 2007.

Liu, Ta-Kang, Meng-Wei Want, and Ping Chen, "Influence of Waste Management Policy on the Characteristics of Beach Litter in Kaohsiung, Taiwan," *Marine Pollution Bulletin* 72 (2013): 99-106.

Los Angeles, County of, "An Overview of Carryout Bags in Los Angeles County," a staff report to the Los Angeles County Board of Supervisors, Los Angeles County Department of Public Works, Environmental Programs Division, August 2007.

"Microplastic Pollution Prevalent in Lakes, Too," *Science Daily*, 29 May 2013, www.sciencedaily.com/releases/2013/05/130529092902.htm (accessed 21 June 2013).

Moore, C.J., A.F. Zellers and G.L. Lattin, "Quantity and Type of Plastic Debris Flowing from Two Urban Rivers to Coastal Waters and Beaches of Southern California," *Journal of Integrated Coastal Zone Management* 11, no. 1 (2011): 65-73.

Moore, Charles James, "Synthetic Polymers in the Marine Environment: A Rapidly Increasing, Long-Term Threat," *Environmental Research* 108 (2008): 131-39.

Moore, Emma, Shanon Lyday, Jay Roletto, Kate Litle, Julia K. Parrish, Hannah Nevins, Jim Harvey, Joe Mortenson, Denise Greig, Melanie Piazza, Alison Hermance, Derek Lee, Dawn Adams, Sarah Allen, and Shelagh Kell, "Entanglements of Marine Mammals and Seabirds in Central California and the North-West Coast of the United States 2001–2005," *Marine Pollution Bulletin* 58 (2009): 1045-51.

Moore, Shelly L., and M. James Allen, "Distribution of Anthropogenic and Natural Debris on the Mainland Shelf of the Southern California Bight," *Marine Pollution Bulletin* 40, no. 1 (2000): 83-88.

National Oceanic and Atmospheric Administration, *The Honolulu Strategy: A Global Framework for Prevention and Management of Marine Debris*, n.d., marinedebris.noaa.gov/projects/pdfs/HonoluluStrategy.pdf (accessed 31 July 2012).

———, *Interagency Report on Marine Debris Sources, Impacts, Strategies & Recommendations*, congressional report developed by Interagency Marine Debris Coordinating Committee, 2008. U.S. Government, 30 July 2012, water.epa.gov/type/oceb/marinedebris/upload/2008_imdcc_marine_debris_rpt.pdf.

———, "Marine Debris: Frequently Asked Questions," marinedebris.noaa.gov/info/faqs.html (accessed 10 August 2012).

National Research Council, Committee on the Effectiveness of International and National Measures to Prevent and Reduce Marine Debris and Its Impacts, *Tackling Marine Debris in the 21st Century* (Washington, D.C.: National Academies Press, 2008).

Natural Resources Defense Council, *Testing the Waters 2013: A Guide to Water Quality at Vacation Beaches*, 2013, www.nrdc.org/water/oceans/ttw/ (accessed 7 August 2013).

Ocean Conservancy, *International Coastal Cleanup: 2012 Data Release*, 2012. www.oceanconservancy.org/our-work/marine-debris/2012-data-release.html (accessed 8 August 2012).

Pendleton, Linwood H., *Understanding the Potential Economic Impact of Marine Wildlife Viewing and Whale Watching in California*, *Executive Summary*, 1 March 2006, p. 12, www.dfg.ca.gov/mlpa/pdfs/binder3dii.pdf.

Ribic, Christine A., Seba B. Sheavly, David J. Rugg, and Eric S. Erdmann, "Trends in Marine Debris Along the U.S. Pacific Coast and Hawai'i 1998–2007," *Marine Pollution Bulletin* 64 (2012): 994-1004.

Robertson, Frank, "Seizing Plastic from Trees: County Eyes Restricting Single Use Bags," *Sonoma West Times & News*, 6 February 2013, www.sonomawest.com/living/seizing-plastic-from-trees-county-eyes-restricting-single-use-bags/article_a0b4b56e-70b4-11e2-aa85-001a4bcf887a.html (accessed 21 June 2013).

Romer, Jennie R., and Shanna Foley., "A Wolf in Sheep's Clothing: The Plastic Industry's Public Interest Role in Legislation and Litigation of Plastic Bag Laws in California," *Golden Gate University Environmental Law Journal* 58, no. 2 (12 Apr. 2012): 377-438.

Rosevelt, C., M. Los Huertos, C. Garza, and H.M. Nevins, "Marine Debris in Central California: Quantifying Type and Abundance of Beach Litter in Monterey Bay, CA," *Marine Pollution Bulletin*, 2013 (in press).

Schneider, J.E., C.S. Decker, A. Doyle, K. Meinders, and N. Kiss, *Estimates of the Costs of Tobacco Litter in San Francisco and Calculations of Maximum Permissible Per-Pack Fees*, Health Economics Consulting Group LLC, 2009.

Sierra Nevada Conservancy, *2012 Great Sierra River Cleanup Results*, 2012, www.sierranevada.ca.gov/our-work/rivercleanup/2012-gsrc/2012-GSRC-Results (accessed 20 June 2013).

Stickel, Barbara H., Andy Jahn, and William Kier, "The Cost to West Coast Communities of Dealing with Trash, Reducing Marine Debris," prepared by Kier Associates for U.S. Environmental Protection Agency, Region 9, Order for Services EPG12900098, September 2012, www.epa.gov/region9/marine-debris/cost-w-coast-debris.html (accessed 5 July 2013).

United Nations Environment Programme (UNEP), *Marine Litter: An Analytical Overview*, prepared by the Regional Seas Coordinating Office, the Secretariat of the Mediterranean Action Plan (MAP), the Secretariat of the Basel Convention, and the Coordination Office of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) of the United Nations Environment Programme (UNEP), in cooperation with the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC of UNESCO), 2005, www.unep.org/regionalseas/marinelitter/publications/docs/anl_oview.pdf (accessed 7 August 2012).

United States Census Bureau, "Urban and Rural Population by State," in *The 2012 Statistical Abstract: Population: Estimates and Projections—States, Metropolitan Areas, Cities*, U.S. Department of Commerce, 2010, www.census.gov/compendia/statab/cats/population/estimates_and_projections--states_metropolitan_areas_cities.html (accessed 31 August 2012).

United States Environmental Protection Agency, *Draft: Economic Analysis of Marine Debris*, prepared by Timothy Degan Kelly, edited by Saskia van Gendt, 5 August, 2011.

Van, Almira, Elisa M. Flores, Chelsea M. Rochman, and Kish L. Hill, “Persistent Organic Pollutants in Plastic Marine Debris Found on Beaches in San Diego, California,” *Chemosphere* 86 (2012): 258-63.

Williams, A.T., M. Gregory, and D.T. Tudor. “Marine Debris: Onshore, Offshore, Seafloor Litter,” in *Encyclopedia of Coastal Science*, ed. M. Schwartz, (Dordrecht, The Netherlands: Springer, 2005), 623-28.

Zylstra, E.R. “Accumulation of Wind-Dispersed Trash in Desert Environments,” *Journal of Arid Environments* 89 (2013): 13-15.

Appendix A: Request for Information

Dear Municipal Manager:

In 2012, on behalf of the U.S. Environmental Protection Agency, Kier Associates completed a preliminary study to document the costs to local governments of preventing and cleaning up litter that could otherwise reach rivers running to the ocean and the ocean itself. As part of an all-out effort to reduce aquatic debris, we have now been asked to expand the California data contained in that report.

We would appreciate it enormously if you could furnish us the information below within the next five days. It's our hope that these numbers can be lifted directly from your line-item budget, inserted in the appropriate spaces below and returned to us.

Activity	Cost in annual $$
1.Beach and waterway cleanup – your costs to clean litter from beaches and waterways, including your cost of participating in local or regional volunteer cleanups.	
2.Street sweeping – your cost of running power street sweepers - and, if you have it, the cost of disposing of the litter swept up	
3.Storm drain grate cleaning and maintenance	
4.Stormwater capture devices – the cost of 1- buying and installing stormwater trash capture devices, and 2- the annual cost of cleaning these devices – two dollar figures if you have them, thanks	
5.Manual litter cleanup – your costs of picking up litter from streets, parks and roadsides to the extent you didn't already report it in the lines above	
6.Public education - your costs of public campaigning against littering and improper disposal of other wastes impacting stormwater management through internet, billboard, public transit, and television (if part of a larger public education campaign, can you break out that portion related to litter?)	

To respond, simply hit "reply all," insert your data into the blanks and send. Your response will automatically be forwarded to the correct parties for processing.

If you have questions or would prefer to complete this survey by telephone, please contact Barbara Stickel at 805-801-2663, or tbstickel@ gmail.com.

Thank you for your good help!

KIER ASSOCIATES
FISHERIES AND WATERSHED PROFESSIONALS

15 JUNIPERO SERRA AVENUE, SAN RAFAEL, CA 94901

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Appendix B: Data Tables

Table 9: Cost Data for Largest Communities (Population ≥250,000)

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Los Angeles	3,831,868	$7,801,278	$2.036	$8,104,857	$2.115	$3,621,878[1]	$0.945	$7,887,125	$2.058	$7,000,000[2]	$1.827	$1,945,531[3]	$0.508	$36,360,669	$9.489
San Diego[4]	1,301,617	$342,165[5]	$0.263	$4,800,000[6]	$3.688	$6,400,000	$4.917	$555,922[7]	$0.427	$809,505[8]	$0.622	$1,200,969[9]	$0.923	$14,108,561	$10.839
San Jose	964,695	$126,619[10]	$0.131	$3,534,731[11]	$3.664	$1,784,924[12]	$1.850	$116,273	$0.121	$3,066,882[13]	$3.179	$247,124[14]	$0.256	$8,876,553	$9.201
Sacramento[15]	466,488	$1,057,300	$2.267	$245,000	$0.525	$1,005,600	$2.156	$0[16]	$0.000	$48,000	$0.103	$521,500	$1.118	$2,877,400	$6.168
Long Beach	462,604	$1,837,398[17]	$3.972	$5,054,886[18]	$10.927	$700,000[19]	$1.513	$1,494,679[20]	$3.231	$3,002,002[21]	$6.489	$883,042	$1.909	$12,972,007	$28.041
Oakland	409,184	$14,000[22]	$0.034	$4,600,000[23]	$11.242	$1,122,989	$2.744	$2,508,000[24]	$6.129	$63,725	$0.156	$71,799[25]	$0.175	$8,380,513	$20.481
TOTALS	**7,436,456**	**$11,178,760**	**$1.503**	**$26,339,474**	**$3.542**	**$14,635,391**	**$1.968**	**$12,561,999**	**$1.689**	**$13,990,114**	**$1.881**	**$4,869,965**	**$0.655**	**$83,575,703**	**$11.239**
AVERAGES	**1,239,409**	**$1,863,127**		**$4,389,912**		**$2,439,232**		**$2,093,667**		**$2,331,686**		**$811,661**		**$13,929,284**	

Table 10: Cost Data for Large Communities (Population 75,000–249,999)

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Chula Vista	243,916	$1,000[26]	$0.004	$257,000[27]	$1.054	$1,098,000[28]	$4.502	$200,000[29]	$0.820	$77,000[30]	$0.316	$72,000[31]	$0.295	$1,705,000	$6.990
Glendale	196,847	$0	$0.000	$1,224,210	$6.215	$156,676	$0.796	$40,000[32]	$0.203	$10,000[33]	$0.051	$5,000	$0.026	$1,435,886	$7.294
Fontana	196,069	$0	$0.000	$750,000[34]	$3.825	$100,000	$0.510	$0[35]	$0.000	$0	$0.000	$5,000	$0.026	$855,000	$4.361
Santa Clarita	176,320	$27,877	$0.158	$562,278	$3.189	$328,096	$1.861	$10,629	$0.060	$0[36]	$0.000	$25,692	$0.146	$954,572	$5.414
Santa Rosa	167,815	$89,600[37]	$0.534	$500,000[38]	$2.979	$360,120	$2.146	$3,700[39]	$0.022	$15,000[40]	$0.089	$385,554[41]	$2.297	$1,353,974	$8.068
Rancho Cucamonga	165,269	$0	$0.000	$428,217[42]	$2.591	$214,851	$1.300	$0	$0.000	$5,300	$0.032	$19,400	$0.117	$667,768	$4.040
Hayward	144,186	$0	$0.000	$1,078,367	$7.479	$468,921	$3.252	$520,000[43]	$3.606	$282,458	$1.959	$30,000[44]	$0.208	$2,379,746	$16.505
Sunnyvale	133,963	$11,457[45]	$0.086	$495,745[46]	$3.700	$112,579[47]	$0.840	$121,703[48]	$0.908	$4,170[49]	$0.031	$10,000	$0.075	$755,654	$5.641
Santa Clara	116,468	$5,000[50]	$0.043	$713,631	$6.127	$463,419[51]	$3.979	$105,000[52]	$0.902	$0	$0.000	$2,492[53]	$0.021	$1,289,542	$11.072
Vallejo	115,942	$0	$0.000	$563,000	$4.856	$54,000	$0.466	$0[54]	$0.000	$107,000	$0.923	$186,000	$1.604	$910,000	$7.849
Inglewood	112,241	$0	$0.000	$702,631[55]	$6.260	$462,720[56]	$4.125	$500,000[57]	$4.455	$0	$0.000	$30,000[58]	$0.267	$1,695,351	$15.105

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Temecula	100,097	$35,000[59]	$0.350	$0[60]	$0.000	$130,000	$1.299	$4,000[61]	$0.040	$65,000	$0.649	$332,525	$3.322	$566,525	$5.660
Jurupa Valley	95,004	$0	$0.000	$200,000[62]	$2.105	$13,680	$0.144	$0	$0.000	$155,268	$1.634	$0	$0.000	$368,948	$3.883
South Gate	94,300	$0	$0.000	$1,100,000	$11.665	$40,000	$0.424	$640,000[63]	$6.787	$0	$0.000	$6,800	$0.072	$1,786,800	$18.948
Mission Viejo	93,305	$10,000[64]	$0.107	$335,584	$3.597	$56,000	$0.600	$0[65]	$0.000	$175,000[66]	$1.876	$80,000	$0.857	$656,584	$7.037
Redding	89,861	$3,000	$0.033	$483,830	$5.384	$55,000	$0.612	$1,500[67]	$0.017	$117,500	$1.308	$20,000[68]	$0.223	$680,830	$7.576
Santa Barbara	88,410	$353,900[69]	$4.003	$425,300[70]	$4.811	$65,600[71]	$0.742	$0[72]	$0.000	$209,600[73]	$2.371	$101,600[74]	$1.149	$1,156,000	$13.075
Hawthorne	83,945	$0	$0.000	$300,000	$3.574	$8,000	$0.095	$760,433	$9.059	$100,000	$1.191	$60,000	$0.715	$1,228,438	$14.634
San Marcos	83,781	$2,000[75]	$0.024	$282,000[76]	$3.366	$0[77]	$0.000	$17,818[78]	$0.213	$43,340[79]	$0.517	$5,000[80]	$0.060	$350,158	$4.179
Livermore	80,968	$17,500	$0.216	$419,000	$5.175	$74,969	$0.926	$111,042[81]	$1.371	$0	$0.000	$35,000[82]	$0.432	$657,511	$8.121
Merced	78,958	$200,000	$2.533	$1,300,000	$16.464	$300,000	$3.799	$180,000[83]	$2.280	$300,000	$3.799	$20,000	$0.253	$2,300,000	$29.129
TOTALS	**2,657,665**	**$756,334**	**$0.285**	**$12,120,793**	**$4.561**	**$4,562,631**	**$1.717**	**$3,215,825**	**$1.210**	**$1,666,636**	**$0.627**	**$1,432,063**	**$0.539**	**$23,754,282**	**8.938**
AVERAGES	**126,555**	**$36,016**		**$577,181**		**$217,268**		**$153,135**		**$79,364**		**$68,193**		**$1,131,156**	

Table 11: Cost Data for Midsize Communities (Population 15,000–75,000)

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Mountain View	74,066	$0	$0.000	$348,000	$4.699	$20,000	$0.270	$276,000[84]	$3.726	$68,000	$0.918	$18,000	$0.243	$730,000	$9.856
Upland	73,732	$0[85]	$0.000	$278,000	$3.770	$0[86]	$0.000	$0	$0.000	$275,000[87]	$3.730	$22,975[88]	$0.312	$575,975	$7.812
Folsom[89]	72,203	$0[90]	$0.000	$204,624[91]	$2.834	$270,203[92]	$3.742	$0[93]	$0.000	$0[94]	$0.000	$23,457[95]	$0.325	$498,284	$6.901
Redondo Beach	66,748	$112,459	$1.685	$850,000	$12.734	$71,000[96]	$1.064	$1,100,000[97]	$16.480	$130,418	$1.954	$15,000	$0.225	$2,278,877	$34.142
Wasco	64,173	$0	$0.000	$120,000	$1.870	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$120,000	$1.870
South San Francisco	63,632	$41,000	$0.644	$335,400	$5.271	$542,000	$8.518	$215,800[98]	$3.391	$129,000	$2.027	$7,500	$0.118	$1,270,700	$19.970
Laguna Niguel	62,979	$51,624	$0.820	$189,000	$3.001	$88,655	$1.408	$43,514	$0.691	$0[99]	$0.000	$15,753	$0.250	$388,546	$6.169
Madera	61,416	$14,920	$0.243	$416,319	$6.779	$553,053	$9.005	$20,200[100]	$0.329	$115,200	$1.876	$10,500	$0.171	$1,130,192	$18.402
La Habra	60,239	$19,235	$0.319	$304,122	$5.049	$12,858	$0.213	$7,500[101]	$0.125	$60,174	$0.999	$12,643	$0.210	$416,532	$6.915

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Santa Cruz	59,946	$113,000	$1.885	$604,109[102]	$10.078	$15,000	$0.250	$3,500	$0.058	$20,000	$0.334	$6,500	$0.108	$762,109	$12.713
Gardena	58,829	$0	$0.000	$235,400[103]	$4.001	$10,000[104]	$0.170	$400,000[105]	$6.799	$200,000	$3.400	$4,748	$0.081	$850,148	$14.451
National City	58,582	$1,000[106]	$0.017	$175,000	$2.987	$20,000	$0.341	$0[107]	$0.000	$9,500[108]	$0.162	$0[109]	$0.000	$205,500	$3.508
Huntington Park	58,100	$0	$0.000	$700,000	$12.048	$25,000	$0.430	$250,000[110]	$4.303	$50,000	$0.861	$8,000	$0.138	$1,033,000	$17.780
Petaluma	57,941	$500[111]	$0.009	$432,386[112]	$7.463	$190,578	$3.289	$0[113]	$0.000	$0[114]	$0.000	$0[115]	$0.000	$623,465	$10.760
Diamond Bar	55,544	$0	$0.000	$205,000	$3.691	$15,000	$0.270	$0	$0.000	$50,000	$0.900	$42,100	$0.758	$312,100	$5.619
Fountain Valley	55,313	$68,127	$1.232	$368,050	$6.654	$538,778	$9.741	$103,613[116]	$1.873	$104,956	$1.897	$42,163	$0.762	$1,225,687	$22.159
Paramount	55,018	$0	$0.000	$204,000	$3.708	$26,366	$0.479	$131,400	$2.388	$105,000	$1.908	$3,500	$0.064	$470,266	$8.547
Rosemead	53,764	$0	$0.000	$175,000	$3.255	$30,000	$0.558	$115,000[117]	$2.139	$100,000[118]	$1.860	$4,000	$0.074	$424,000	$7.886
Highland	53,104	$0[119]	$0.000	$0[120]	$0.000	$40,875[121]	$0.770	$0[122]	$0.000	$128,710	$2.424	$0[123]	$0.00	$169,585	$3.193
Lake Elsinore	51,821	$0	$0.000	$351,000	$6.773	$12,000	$0.232	$0	$0.000	$50,000	$0.965	$107,100	$2.067	$520,100	$10.036
Glendora	49,737	$0	$0.000	$310,000	$6.233	$20,000	$0.402	$0	$0.000	$28,000	$0.563	$80,000	$1.608	$438,000	$8.806
Cerritos	49,041	$0	$0.000	$519,374	$10.591	$25,104	$0.512	$0	$0.000	$11,500	$0.234	$11,087	$0.226	$567,065	$11.563
Rancho Santa Margarita	47,853	$0	$0.000	$88,500	$1.849	$36,000	$0.752	$0[124]	$0.000	$18,200	$0.380	$10,000	$0.209	$152,700	$3.191
Covina	47,796	$0	$0.000	$177,730	$3.719	$184,200[125]	$3.854	$0	$0.000	$91,196	$1.908	$10,500	$0.220	$463,626	$9.700
Azusa	46,361	$0	$0.000	$60,000	$1.294	$9,500	$0.205	$0	$0.000	$0	$0.000	$0	0.000	$69,500	$1.499
Bell Gardens	42,072	$0	$0.000	$160,000	$3.803	$0	$0.000	$34,000[126]	$0.808	$0	$0.000	$2,000	$0.048	$196,000	$4.659
San Gabriel	39,718	$0	$0.000	$200,000	$5.036	$0[127]	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$200,000	$5.036
Calexico	38,572	$0	$0.000	$235,870	$6.115	$275,000	$7.130	$0[128]	$0.000	$43,440	$1.126	$1,000	$0.026	$555,310	$14.397
Montclair	36,664	$0	$0.000	$162,378	$4.429	$10,000	$0.273	$500[129]	$0.014	$0[130]	$0.000	$5,000[131]	$0.136	$177,878	$4.852
West Hollywood	34,399	$0	$0.000	$275,000	$7.994	$25,000	$0.727	$45,000[132]	$1.308	$101,000	$2.936	$10,000	$0.291	$456,000	$13.256
Dana Point[133]	33,351	$500[134]	$0.015	$267,000[135]	$8.006	$75,000	$2.249	$322,000[136]	$9.655	$159,000	$4.767	$11,000[137]	$0.330	$834,500	$25.022
Seaside	33,025	$5,000	$0.151	$170,000	$5.148	$295,580	$8.950	$0	$0.000	$70,000	$2.120	$34,000	$1.030	$574,580	$17.398
Laguna Hills	30,344	$20,000	$0.659	$128,000	$4.218	$50,000	$1.648	$65,000[138]	$2.142	$10,000[139]	$0.330	$0[140]	$0.000	$273,000	$8.997
Walnut	29,172	$800[141]	$0.027	$104,000[142]	$3.565	$100,000[143]	$3.428	$4,000[144]	$0.137	$10,000[145]	$0.343	$10,000	$0.343	$228,800	$7.843
San Pablo	29,139	$63,617	$2.183	$67,011	$2.300	$10,288	$0.353	$30,000[146]	$1.030	$136,396	$4.681	$15,650	$0.537	$322,962	$11.083
Burlingame	28,806	$2,500[147]	$0.087	$220,673[148]	$7.661	$10,000[149]	$0.347	$10,000[150]	$0.347	$12,000	$0.417	$0[151]	$0.000	$255,173	$8.858

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Atascadero[152]	28,310	$25,000	$0.883	$5,000	$0.177	$200,000	$7.065	$5,000	$0.177	$100,000	$3.532	$5,000	$0.177	$340,000	$12.010
Suisun City[153]	28,111	$1,200[154]	$0.043	$16,000[155]	$0.569	$50,000[156]	$1.779	$11,000[157]	$0.391	$20,000[158]	$0.711	$17,000[159]	$0.605	$115,200	$4.098
Benicia	26,997	$26,200[160]	$0.970	$116,155[161]	$4.303	$30,000	$1.111	$0[162]	$0.000	$82,000	$3.037	$7,200[163]	$0.267	$261,555	$9.688
Desert Hot Springs	25,938	$0	$0.000	$60,000	$2.313	$0[164]	$0.000	$20,000[165]	$0.771	$10,000	$0.386	$0[166]	$0.000	$90,000	$3.470
Sanger	24,270	$0	$0.000	$72,000	$2.967	$1,200	$0.049	$1,000	$0.041	$5,000	$0.206	$250	$0.010	$79,450	$3.274
Reedley	24,194	$89,000	$3.679	$86,000	$3.555	$18,000	$0.744	$39,100[167]	$1.616	$36,000	$1.488	$16,000	$0.661	$284,100	$11.743
Arvin	19,304	$0	$0.000	$31,600[168]	$1.637	$0[169]	$0.000	$0[170]	$0.000	$10,000[171]	$0.518	$2,500[172]	$0.130	$44,100	$2.285
Rancho Mirage	17,218	$0	$0.000	$85,000	$4.937	$28,000	$1.626	$3,700[173]	$0.215	$72,800	$4.228	$2,500	$0.145	$192,000	$11.151
El Segundo	16,654	$0	$0.000	$168,000	$10.088	$197,000[174]	$11.829	$0[175]	$0.000	$25,000[176]	$1.501	$0[177]	$0.000	$390,000	$23.418
Laguna Woods	16,192	$1,100	$0.068	$27,685	$1.710	$3,661	$0.226	$7,472[178]	$0.461	$0	$0.000	$6,750	$0.417	$46,668	$2.882
Moraga	16,016	$0	$0.000	$8,000	$0.500	$10,000	$0.624	$16,500[179]	$1.030	$0[180]	$0.000	$28,525[181]	$1.781	$63,025	$3.935
La Palma	15,568	$2,235	$0.144	$20,470	$1.315	$18,650	$1.198	$178,949[182]	$11.495	$38,000	$2.441	$1,500	$0.096	$259,804	$16.688
TOTALS	**2,091,972**	**$659,017**	**$0.315**	**$10,336,856**	**$4.941**	**$4,163,549**	**$1.990**	**$3,459,748**	**$1.654**	**$2,685,490**	**$1.284**	**$631,401**	**$0.302**	**$21,936,062**	**10.486**
AVERAGES	**43,583**	**$13,730**		**$215,351**		**$86,741**		**$72,078**		**$55,948**		**$13,154**		**$457,001**	

Table 12: Cost Data for Small Communities (Population <15,000)

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Palos Verdes Estates	13,438	$0	$0.000	$0	$0.000	$8,000	$0.595	$10,000[183]	$0.744	$0	$0.000	$2,000	$0.149	$20,000	$1.488
Auburn	13,330	$0	$0.000	$88,000	$6.602	$40,000	$3.001	$61,500[184]	$4.614	$8,500	$0.638	$5,000	$0.375	$203,000	$15.229
Commerce	12,823	$0	$0.000	$150,000	$11.698	$85,000	$6.629	$560,000[185]	$43.672	$70,000	$5.459	$25,000	$1.950	$890,000	$69.407
Malibu	12,645	$0	$0.000	$84,000	$6.643	$50,000	$3.954	$173,000[186]	$13.681	$25,000	$1.977	$7,500	$0.593	$339,500	$26.849
San Anselmo	12,336	$0	$0.000	$78,000	$6.323	$20,000	$1.621	$60,000[187]	$4.864	$2,500	$0.203	$500	$0.041	$161,000	$13.051
Signal Hill	10,834	$0	$0.000	$150,400	$13.882	$1,000	$0.092	$64,000[188]	$5.907	$81,000	$7.476	$7,500	$0.692	$303,900	$28.051
Morro Bay	10,234	$400	$0.039	$57,000[189]	$5.570	$1,625	$0.159	$1,040[190]	$0.102	$30,000[191]	$2.931	$5,900	$0.577	$95,965	$9.377
Capitola	9,918	$15,000[192]	$1.512	$100,00[193]	$10.083	$25,000[194]	$2.521	$22,000[195]	$2.218	$30,000[196]	$3.025	$25,000[197]	$2.521	$217,000	$21.879

Community	Population (2010 Census)	Beach/ Waterway Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Waterford	8,456	$2,500	$0.296	$30,000	$3.548	$5,000	$0.591	$1,500[198]	$0.177	$25,000	$2.956	$0	$0.000	$64,000	$7.569
Ione	7,918	$0	$0.000	$30,000[199]	$3.789	$10,000[200]	$1.263	$0	$0.000	$25,000[201]	$3.157	$5,000[202]	$0.631	$70,000	$8.841
Calimesa	7,879	$0	$0.000	$9,660[203]	$1.226	$5,840	$0.741	$4,400[204]	$0.558	$7,840	$0.995	$5,000	$0.635	$32,740	$4.155
Orland	7,291	$0	$0.000	$0[205]	$0.000	$1,680[206]	$0.230	$0[207]	$0.000	$0[208]	$0.000	$500[209]	$0.069	$2,180	$0.299
Hughson	6,640	$0	$0.000	$15,000	$2.259	$5,000	$0.753	$0	$0.000	$9,000	$1.355	$0	$0.000	$29,000	$4.367
Winters	6,624	$0	$0.000	$0[210]	$0.000	$0	$0.000	$0[211]	$0.000	$15,000	$2.264	$0	$0.000	$15,000	$2.264
Portola Valley	4,353	$0	$0.000	$20,000	$4.595	$20,000	$4.595	$0	$0.000	$20,000	$4.595	$0[212]	$0.000	$60,000	$13.784
Del Mar	4,151	$114,005	$27.464	$160,301	$38.617	$20,195	$4.865	$1,120[213]	$0.270	$0	$0.000	$0	$0.000	$295,621	$71.217
Angels Camp	3,836	$0	$0.000	$0	$0.000	$10,920[214]	$2.847	$0	$0.000	$10,920[215]	$2.847	$0	$0.000	$21,840	$5.693
Weed	2,967	$0	$0.000	$44,330	$14.941	$2,000	$0.674	$0	$0.000	$12,000	$4.044	$0	$0.000	$58,330	$19.660
Blue Lake	1,253	$0	$0.000	$3,000	$2.394	$4,800	$3.831	$400	$0.319	$1,300	$1.038	$500	$0.399	$10,000	$7.981
Etna	737	$0[216]	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$300[217]	$0.407	$300	$0.407
TOTALS	**157,663**	**$131,905**	**$0.837**	**$1,019,691**	**$6.468**	**$316,060**	**$2.005**	**$958,960**	**$6.082**	**$373,060**	**$2.366**	**$89,700**	**$0.569**	**$2,889,376**	**$18.326**
AVERAGES	**7,883**	**$6,595**		**$50,985**		**$15,803**		**$47,948**		**$18,653**		**$4,485**		**$144,469**	

Notes to Accompany Tables 9–12

1 Annual report.

2 Approximately $8–$11 million annually on litter collection and disposal, as follows: Department of Sanitation charges Recreation and Parks $3.7–$4 million annually for refuse collection, and Recreation and Parks spends an estimated $4–$7 million for manual trash collection.

3 Annual report.

4 The approach was to gather data on the cost of beach and waterway cleanups (county-led and volunteer-led), street sweeping, installation of stormwater capture devices, storm drain cleaning and maintenance, manual cleanup of litter, and public education. To do so, the following agencies were contacted: San Diego Park and Recreation Department; Stormwater Division, City of San Diego; CalTrans, District 11; San Diego Coastkeeper; and San Diego River Park Foundation.

5 Volunteer cleanups: San Diego Coastkeeper, $248,160; San Diego River Park Foundation, $94,005. This value was calculated using a volunteer wage rate of $21.36/hour. This value is a significant underestimate for two reasons: First, all San Diego Coastkeeper cleanups were calculated as two hours per volunteer, but Coastal Cleanup Day is a three-hour event; and second, it does not account for other organizations and private businesses that participate in cleanup efforts around the city.

6 Stormwater Division, City of San Diego, Street Sweeping: The entire budget line was used in this value because the Cal/EPA draft report *Economic Analysis of Marine Debris* measured this as a direct cost and did not subdivide the amount in any way. Also, the amount was consistent with that of a large city, according to the draft report.

7 CalTrans District 11. This value was calculated as 12.92% of a total cost of $4,302,802. The county of San Diego is 4,199.89 square miles in area, and the city of San Diego is 325.188 square miles in area; therefore, the city is 12.92 of the county by area.

8 San Diego Park and Recreation Department: This value is an overestimate because it includes the cost associated with the removal of waste from permanent receptacles by members of the San Diego Park and Recreation Department maintenance staff.

9 CalTrans District 11, Public Awareness Campaign, $969; Stormwater Division, City of San Diego, Education and Outreach, $1,200,000. The entire budget line was used in this value because the Cal/EPA draft report *Economic Analysis of Marine Debris* measured this as a direct cost and did not subdivide the amount in any way. Also, the amount was consistent with that of a large city, according to the draft report.

10 City/district trash MOA.

11 Residential street sweeping, $1,956,600; RSS contract costs; ACB Street sweeping $1,578,131.

12 Inlet Cleaning Program, $1,022,955; pump station cleaning and maintenance, $645,696 total; assume 15% of sludge removed is attributable to litter/trash. Pilot Inlet Trash Capture Program, $116,273.

13 Alternate Work Program, $122,000; street landscape complaint response, street/median cleaning, $696,318; supplemental landscape and events support, $350,845; parks maintenance, $1,897,719.

14 Anti-Litter Program (includes Illegal Dumping Program).

15 The city of Sacramento's cost data includes information from the city's Department of General Services, Solid Waste Division; and the Department of Utilities, Drainage Collections and Stormwater Management Program.

16 Not available.

17 Beach raking requires seven equipment operators and equipment: $892,223 in labor annually and $845,175 in equipment. This total includes beach renourishment at an annual cost of roughly $100,000 and a minimum of 75,000 cubic yards of sand moved.

18 Swept 142 miles and picked up 10,760 tons of material.

19 Maintenance for these devices was covered under the Los Angeles County Public Works Maintenance for FY 12. Maintenance cost for these devices were to begin in FY 13 with a cost estimated to range from $177,144 to $772,992.

20 Installation of two trash net systems at two storm drain pump stations, $955,045; installation of a vortex separator system device at one storm drain pump station, $539,634. The installation of 2,684 connector pipe screens (CPS) and 670 automatic retractable screens (ARS) was not included.

21 Health Department, $19,008; Harbor Department,$2,835,394; Community Development, $147,600.

22 About 3,500 volunteer hours were logged on Creek to Bay Day in Oakland. Staff cost for the event is approximately $14,000/year.

23 $4.2–$4.6 million/year, including operations and maintenance cost of $10,000 per street sweeper per month. Oakland maintains 20 street sweepers. Residential areas are swept twice a month; industrial areas once a week; commercial areas three times a week.

24 Design and installation of CDS (continuous deflection separation) units: Lake Merritt, $968,000; 73rd Ave., $740,000; Alameda & High Streets, $800,000.

25 Estimate.

26 Sponsoring I Love a Clean San Diego's Creek to Bay Cleanup events.

27 Contract cost.

28 Includes maintenance crew staff time, equipment, materials, and miscellaneous items.

29 In FY 2009–2010, about $200,000 was spent on installing treatment control BMPs as part of the city of Chula Vista's street improvement projects.

30 Figure is for FY 2009–2010, manual cleanup of litter from Chula Vista streets.

31 Includes jurisdictional costs and the city of Chula Vista's share of costs for regional public education and outreach activities.

32 5mm screens inside catch basins.

33 Estimate; "no formal program."

34 For removal of 247 tons of waste per month.

35 Part of landscape maintenance contract.

36 These costs are shared among multiple divisions and departments throughout the city of Santa Clarita and are not available in this format.

37 Estimate; includes staff time from multiple departments and supplies.

38 In 2010 street sweeping was built into the city of Santa Rosa's waste hauler contract. This was the estimated annual cost prior to 2010.

39 Estimated annual cost of maintenance, inspection, and cleaning for one Vortex Unit. Current replacement costs not available at time of survey.

40 Part of several separate budgets; figure is based on an estimate of staff time.

41 Budgeted amount for stormwater and creeks public education as a whole. The majority of this education includes outreach for litter, debris, dumping, and water quality impact education.

42 Disposal of street sweeping debris provided by franchised waste hauler at no additional cost to the city of Rancho Cucamonga.

43 $500,000 for construction of one large and eight small trash capture devices; $20,000 per year for cleanup.

44 Includes installing stencils or markers at the city of Hayward's storm drain inlets.

45 Volunteer river cleanups.

46 Twice a month.

47 Anticipated $98,000 but spent more; generally inspected once a year.

48 $113,503 from grants to buy/install screens w/hinged gates; $8,200 in city funds to identify locations to install.

49 Labor for five hot spots; does not include equipment, materials, and/or disposal costs, which were absorbed into Public Works.

50 Estimate, not explicitly tracked.

51 Includes all storm drain maintenance including catch basin cleaning, jetting lines, flooding response, etc.

52 About $100,000 to purchase two full trash capture netting systems. Cost to maintain nets is included in Storm Drain Cleaning & Maintenance. Cost to purchase replacement nets is estimated at $5,000 year.

53 City of Vallejo's contribution to annual $40,000 countywide campaign (0.623% of total).

54 Not available.

55 2010 fiscal year.

56 Ibid.

57 City has received a grant for approximately $200,000 to install debris excluders in the next fiscal year.

58 2010 fiscal year.

59 To remove trash, debris, litter, and sediment from the city of Temecula's basins, culverts, and certain permitted areas within local creeks that drain into the Santa Maria River.

60 Not available.

61 Purchase and installation, $3,500 per CB filter unit; maintenance, $500 per unit annually. Total number of units not available.

62 The City of Jurupa Valley contracts with two street sweeping companies; one is for $180,000 and the other is for $20,000.

63 Equipment installation was part of an ARRA grant; the cost varied per style (CPS or ARS) and size of catch basin; very approximate costs were $640,000; maintenance costs not available at time of survey.

64 Oso Creek.

65 Not available.

66 Estimated 5% of annual landscape maintenance cost of $3,500,000.

67 Maintenance costs only.

68 Estimate.

69 Creeks Restoration, $115,000; Parks/Beach Maintenance, $150,000; Waterfront & Marina, $84,000; Airport/Goleta Estuary, $4,900.

70 Creeks Restoration, $200,000; Streets, $183,500; Waterfront & Marina $22,500; Airport/Goleta Estuary, $19,300. (Creeks' $200K is transferred to Streets, which adds an additional $133,500 for multiple street sweepers operated by contractor on city streets. In addition, Streets spends $50,000 to own and operate its own sweeper.) 1,850 tons/year of debris and litter disposal is not included because it is built into city's solid waste disposal franchise.

71 Creeks Restoration, $15,000; Streets, $45,500; Airport/Goleta Estuary, $5,100.

72 Santa Barbara received a grant for $2M to install storm drain grates throughout the city. Stormwater capture devices were discontinued due to unfavorable cost/benefit analysis. Storm drain cleaning cost in FY2012, (12" rainfall that year) = 1,041 hours labor for street crews' time and equipment cost for storm drain cleaning during rainy season.

73 Parks/Beach Maintenance, $170,000; Streets, $7,000; Environmental Services (Looking Good Santa Barbara), $32,600.

74 Creeks Restoration - $60,000; Streets - N/A; Environmental Services (Looking Good Santa Barbara) - $41,600.

75 Creek to Bay, FY 2012/13,.

76 FY 2012/13.

77 The city of San Marcos does not track these costs.

78 Purchase and installation cost for curb inlet filter baskets, $1,200 each; curb inlet filter basket cleaning annual cost for FY12/13,: $16,618.

79 Annual litter abatement cost, FY 2012/13.

80 Regional and local program, FY 2012/13.

81 Equipment, $77,072 (180 devices); annual maintenance, $33,969.

82 Estimate; includes personnel costs.

83 Equipment, $80,000; maintenance, $100,000.

84 Equipment, $275,000; maintenance, $1,000.

85 The city of Upland storm drainage is into large recharge/flood basins; debris does not get to waters of the U.S. However, these basins need to be periodically cleaned.

86 Included in Manual Cleanup.

87 Estimate; includes storm drain cleaning.

88 The city of Upland is a co-permittee with 16 other agencies and San Bernardino County (principal permittee), which includes a cost sharing arrangement.

89 Amounts budgeted vary from year to year depending on the resources available. Kier Associates chose to use the largest numbers reported, as we believe they more closely represent the costs that would be incurred for these items should funding be available.

90 The city of Folsom does not specifically track its time or costs associated with this activity.

91 The city of Folsom does report costs associated with street sweeping in its annual report; however, it varies quite a bit each year depending on available resources. FY11/12, $21,000; FY10/11, $21,000; FY9/10, $46,481; FY8/9, $204,624.

92 The city of Folsom does have annual costs associated with storm drain maintenance activities (which includes drain inlets and pipes). However, those costs vary quite a bit each year depending on available resources. The city does not specifically track the costs of cleaning grates. FY11/12, $74,000; FY10/11, $74,000; FY9/10, $224,937; FY8/9, $270,203.

93 The city of Folsom does not purchase and install (or therefore maintain) trash capture devices and does not track costs associated with managing stormwater quality treatment facilities.

94 The city of Folsom does not specifically track time or costs associated with this activity.

95 The city of Folsom contributes 5.2% to the total cost of the Sacramento Stormwater Quality Partnership's public outreach campaign. It does not track other public education costs specifically associated with litter. FY11/12, $6,341; FY10/11, $23,457; FY9/10, $4,716; FY8/9, $9,822.

96 Maintenance of structural trash BMPs, catch basin cleaning.

97 Total cost for the four CDS unit projects was $1.6 million; however only $1.1 million was directly related to trash removal.

98 Buying and installing 82 trash capture devices, $35,100; maintenance, $180,700.

99 The city of Laguna Niguel does not track this cost.

100 Installation, $10,000; maintenance, $10,200.

101 Purchase and installation only; maintenance included in Manual Cleanup.

102 The city of Santa Cruz does not track the disposal of debris collected from street sweeping; however, the total budget for that activity is proposed (FY14) at $604,109.

103 The city of Gardena has three sweepers and one backup.

104 Before and after storms.

105 Installing screens.

106 For the I Love a Clean SD initiative.

107 National City does not use trash capture devices.

108 For California's Adopt-a-Highway program.

109 No use on Internet, billboard, public transit, or television.

110 From ARRA grant funds. Figure is a very approximate estimate of the cost to purchase and install equipment; the annual maintenance cost is not yet available.

111 For staff participation at RCD Creek Cleanup Event.

112 $354,240 plus $78,146 for debris disposal.

113 Information not readily available.

114 Ibid.

115 Ibid.

116 Purchase and installation of equipment, $99,780; annual maintenance, $3,833

117 Equipment, $100,000; maintenance, $15,000 (current budget year only).

118 For staff and contract maintenance costs.

119 The city of Highland does not currently clean litter from any waterways. There are no beaches located in its jurisdiction.

120 The city of Highland sweeps every street weekly, but the cost is included in the solid waste collection program and is paid for by the ratepayers.

121 Approximate cost; includes inlet, box, and pipe cleaning.

122 The city of Highland has only two trash screens installed and the cost is included in Storm Drain Cleaning & Maintenance.

123 Most public education is provided through the city of Highland's participation in the San Bernardino County Stormwater Program.

124 Glendora has a negligible number of devices; cleaning costs are included in overall maintenance budget.

125 Includes $182,300 in annual costs for scientific studies, reporting, monitoring of TMDLs, and NPDES compliance.

126 Debris gates, $4,000; maintenance, $30,000.

127 Unable to break out from overall maintenance costs.

128 Not available.

129 Maintenance only.

130 Not itemized in budget.

131 Estimate.

132 Equipment purchase and installation, $25,000; maintenance, $20,000.

133 Responses based on FY 2011–12; figures expected to be fairly consistent for FY 2012–13.

134 Supplies, when needed, are most often donated by the California Coastal Commission, though the city of Dana Point strives to encourage people to use buckets instead of bags, etc. Dana Point does not have beaches to maintain.

135 70 curb miles are swept on a weekly basis.

136 Maintenance of 798 inlet filters ($137,000) and 7 trash separation units ($185,000).

137 New "Zero Waste" campaign, $10,000 (budgeted for FY13-14), plus $1,000 (assumed 10% of existing Water Quality Public Education). Contributions are also made to Orange County's comprehensive education program but not included herein.

138 Purchase and installation of screens, $62,000; maintenance, $3,000.

139 Estimate.

140 Included in annual fees paid to County of Orange.

141 Volunteers do park and creek cleanups; the city coordinates efforts.

142 CNG sweepers (natural gas).

143 Contracted to Los Angeles County.

144 Six devices were installed voluntarily a number of years ago at an estimated cost of $15,000 each; $4,000 is an estimate of the annual maintenance.

145 Contract landscapers.

146 Includes purchase cost but not maintenance, since it will be installed this year.

147 Coastal cleanup and spring cleanups also provided by San Mateo Countywide Water Pollution Prevention Program; estimate not available.

148 Does not include disposal costs, which are unavailable.

149 Cleaning provided with street sweeping.

150 For maintenance only; cost of purchase is grant funded.

151 Public education is provided through San Mateo Countywide Water Pollution Prevention Program; estimate not available.

152 Figures reflect the approximate maximum funding allocated to these efforts. Street sweeping has been eliminated for the most part due to budget cuts. Other maintenance figures reflect a percentage of Road and Park Operations personnel costs for routine work.

153 All figures are estimates of annual costs.

154 $900 to $1,200.

155 $14,000 to $16,000.

156 $42,000 to $50,000. Suisun City employees clean entire storm drain, not just grates.

157 Device cost (2012), $4,000; maintenance, $6,000 to $7,000. Suisun City has no annual program; devices are installed as part of new development at the developer's expense. In summer of 2011, the city received $23,478 in grant funds for installation of a unit. The city purchased two additional units, which were installed in 2012 for about $2,000 total.

158 $18,000 to $20,000. This is handled in some areas of Suisun City through a landscape contract within Maintenance Assessment Districts. As with all numbers provided, it is an estimate and does not include the costs within the Maintenance Assessment Districts as this cost is not broken out.

159 $14,000 to $17,000; includes $10,000 back to the local garbage company, which employs a recycling coordinator who handles a good amount of the litter outreach for Suisun City.

160 Staff cleanup, $22,500; volunteer cleanup, $3,700.

161 Annual contract.

162 Benicia does not have any stormwater capture devices.

163 $4,000 for third-grade program: Pollution Prevention; $3,200 for sixth-grade program: Plastics in the Ocean.

164 No storm drains, the city of Desert Hot Springs does not drain into waterways.

165 Cleaning and maintenance of catch basins.

166 Included in services provided by Desert Valley Disposal.

167 Purchase and installation, $38,000; maintenance, $1,100.

168 Estimates: equipment, $18,600; labor, $13,000.

169 Expense is not itemized in budget.

170 Have sumps that, on rare occasions, must be pumped.

171 Estimate.

172 For partial sponsorship of valley litter cleanup day, which gets kids involved.

173 Purchase and installation, $1,500 each; maintenance, $2,200.

174 Done with in-house forces.

175 Purchase and installation, $0; maintenance is included in Storm Drain Cleaning & Maintenance.

176 Figure is the cost of picking up litter from parks and planters. Other street/roadside efforts are included in waste hauling contract or done by in-house resources. Estimates for individual incidents are not tracked.

177 Handled by waste hauler, who sends information to residents as part of its annual trash contract. The amount is not separated out.

178 Purchase and installation, $2,000; maintenance, $5,472.

179 Purchase and installation, $12,500 (grant); maintenance, $4,000.

180 Work Alternative Program; averages 2.5 to 3 full-time equivalents each year.

181 $23,725 from Moraga's portion of Contra Costa Clean Water Program; $4,800 in OT for Public Outreach.

182 Purchase and installation, $122,613; maintenance, $56,336.

183 Cost of purchase and installation only.

184 Purchase and installation, $1,500; annual cleaning, $60,000.

185 CPS/ARS.

186 Devices, $3,000 each; Civic Center Stormwater Treatment Facility (CCSTF) maintenance and monitoring, $90,000 annually; Paradise Cove Stormwater Treatment Facility maintenance and monitoring, $80,000 annually. Additionally, CCSTF design and construction cost $5.8 million; Paradise Cove design and construction, $1.2 million.

187 Purchase and installation, $50,000; maintenance, $10,000.

188 Maintenance only; no equipment purchases made this year.

189 Sweeping, $53,400; disposal, $3,600.

190 Maintenance only.

191 Estimate.

192 Ibid.

193 Ibid.

194 Ibid.

195 Equipment purchases, $20,000; maintenance, $2,000; both figures are estimates.

196 Estimate.

197 Ibid.

198 Maintenance only.

199 Allocation of percentage of time, three city workers (two maintenance/one mechanic).

200 Ibid.

201 Ibid.

202 Estimate.

203 Includes disposal costs.

204 Cost of two storm drains, $1,800 each, maintenance, $400 each.

205 The City of Orland bills Caltrans for sweeping of state highway, which runs through town.

206 Two workers, eight hours each at $35/hour, two to three times per year.

207 Natural gravel beds.

208 Volunteers, schools.

209 Orland provides dump truck for cleanup day.

210 Street sweeping is handled by an outside contractor; waste management is part of the city of Winter's refuse/recycling services. Services are not billed separately.

211 No stormwater budget.

212 Done at the county level.

213 Cleaning only.

214 Estimated 10 hours per week for storm drain cleaning and maintenance. Calaveras County road maintenance employees earn $21/hour.

215 Estimated 10 hours per week for trash pickup. Calaveras County road maintenance employees earn $21/hour.

216 There are no beaches near the town of Etna.

217 During Cleanup Week every April, dumpsters and a “burn pile” are provided.

Table 13: Cost Data for Communities Responding in All Categories[218]

Community	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Atascadero	28,310	$25,000	$0.883	$5,000	$0.177	$200,000	$7.065	$5,000	$0.177	$100,000	$3.532	$5,000	$0.177	$340,000	$12.010
Auburn	13,330	$0	$0.000	$88,000	$6.602	$40,000	$3.001	$61,500	$4.614	$8,500	$0.638	$5,000	$0.375	$203,000	$15.229
Blue Lake	1,253	$0	$0.000	$3,000	$2.394	$4,800	$3.831	$400	$0.319	$1,300	$1.038	$500	$0.399	$10,000	$7.981
Calimesa	7,879	$0	$0.000	$9,660	$1.226	$5,840	$0.741	$4,400	$0.558	$7,840	$0.995	$5,000	$0.635	$32,740	$4.155
Capitola	9,918	$15,000	$1.512	$100,000	$10.083	$25,000	$2.521	$22,000	$2.218	$30,000	$3.025	$25,000	$2.521	$217,000	$21.879
Chula Vista	243,916	$1,000	$0.004	$257,000	$1.054	$1,098,000	$4.502	$200,000	$0.820	$77,000	$0.316	$72,000	$0.295	$1,705,000	$6.990
Commerce	12,823	$0	$0.000	$150,000	$11.698	$85,000	$6.629	$560,000	$43.672	$70,000	$5.459	$25,000	$1.950	$890,000	$69.407
Dana Point	33,351	500	$0.015	267000	$8.006	$75,000	$2.249	$322,000	$9.655	$159,000	$4.767	$11,000	$0.330	$834,500	$25.022
Fountain Valley	55,313	$68,127	$1.232	$368,050	$6.654	$538,778	$9.741	$103,613	$1.873	$104,956	$1.897	$42,163	$0.762	$1,225,687	$22.159
Gardena	58,829	$0	$0.000	$235,400	$4.001	$10,000	$0.170	$400,000	$6.799	$200,000	$3.400	$4,748	$0.081	$850,148	$14.451
Glendale	196,847	$0	$0.000	$1,224,210	$6.219	$156,676	$0.796	$40,000	$0.203	$10,000	$0.051	$5,000	$0.025	$1,435,886	$7.294
Hawthorne	83,945	$0	$0.000	$300,000	$3.574	$8,000	$0.095	$760,433	$9.059	$100,000	$1.191	$60,000	$0.715	$1,228,433	$14.634
Hayward	144,186	$0	$0.000	$1,078,367	$7.479	$468,921	$3.252	$520,000	$3.606	$282,458	$1.959	$30,000	$0.208	$2,379,746	$16.505
Huntington Park	58,100	$0	$0.000	$700,000	$12.048	$25,000	$0.430	$250,000	$4.303	$50,000	$0.861	$8,000	$0.138	$1,033,000	$17.780
La Habra	60,239	$19,235	$0.319	$304,122	$5.049	$12,858	$0.213	$7,500	$0.125	$60,174	$0.999	$12,643	$0.210	$416,532	$6.915
La Palma	15,568	$2,235	$0.144	$20,470	$1.315	$18,650	$1.198	$178,949	$11.495	$38,000	$2.441	$1,500	$0.096	$259,804	$16.688
Long Beach	462,604	$1,837,398	$3.972	$5,054,886	$10.927	$700,000	$1.513	$1,494,679	$3.231	$3,002,002	$6.489	$883,042	$1.909	$12,972,007	$28.041
Los Angeles	3,831,868	$7,801,278	$2.036	$8,104,857	$2.115	$3,621,878	$0.945	$7,887,125	$2.058	$7,000,000	$1.827	$1,945,531	$0.508	$36,360,669	$9.489
Madera	61,416	$14,920	$0.243	$416,319	$6.779	$553,053	$9.005	$20,200	$0.329	$115,200	$1.876	$10,500	$0.171	$1,130,192	$18.402
Malibu	12,645	$0	$0.000	$84,000	$6.643	$50,000	$3.954	$173,000	$13.681	$25,000	$1.977	$7,500	$0.593	$339,500	$26.849
Merced	78,958	$200,000	$2.533	$1,300,000	$16.464	$300,000	$3.799	$180,000	$2.280	$300,000	$3.799	$20,000	$0.253	$2,300,000	$29.129
Morro Bay	10,234	$400	$0.039	$57,000	$5.570	$1,625	$0.159	$1,040	$0.102	$30,000	$2.931	$5,900	$0.577	$95,965	$9.377
Mountain View	74,066	$0	$0.000	$348,000	$4.699	$20,000	$0.270	$276,000	$3.726	$68,000	$0.918	$18,000	$0.243	$730,000	$9.856
Oakland	409,184	$14,000	$0.034	$4,600,000	$11.242	$1,122,989	$2.744	$2,508,000	$6.129	$63,725	$0.156	$71,799	$0.175	$8,380,513	$20.481
Paramount	55,018	$0	$0.000	$204,000	$3.708	$26,366	$0.479	$131,400	$2.388	$105,000	$1.908	$3,500	$0.064	$470,266	$8.547

Community	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maintenance	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
Rancho Mirage	17,218	$0	$0.000	$85,000	$4.937	$28,000	$1.626	$3,700	$0.215	$72,800	$4.228	$2,500	$0.145	$192,000	$11.151
Redding	89,861	$3,000	$0.033	$483,830	$5.384	$55,000	$0.612	$1,500	$0.017	$117,500	$1.308	$20,000	$0.223	$680,830	$7.576
Redondo Beach	66,748	$112,459	$1.685	$850,000	$12.734	$71,000	$1.064	$1,100,000	$16.480	$130,418	$1.954	$15,000	$0.225	$2,278,877	$34.142
Reedley	24,194	$89,000	$3.679	$86,000	$3.555	$18,000	$0.744	$39,100	$1.616	$36,000	$1.488	$16,000	$0.661	$284,100	$11.743
Rosemead	53,764	$0	$0.000	$175,000	$3.255	$30,000	$0.558	$115,000	$2.139	$100,000	$1.860	$4,000	$0.074	$424,000	$7.886
San Anselmo	12,336	$0	$0.000	$78,000	$6.323	$20,000	$1.621	$60,000	$4.864	$2,500	$0.203	$500	$0.041	$161,000	$13.051
San Diego	1,301,617	$342,165	$0.263	$4,800,000	$3.688	$6,400,000	$4.917	$555,922	$0.427	$809,505	$0.622	$1,200,969	$0.923	$14,108,561	$10.839
San Jose	964,695	$126,619	$0.131	$3,534,731	$3.664	$1,784,924	$1.850	$116,273	$0.121	$3,066,882	$3.179	$247,124	$0.256	$8,876,553	$9.201
San Pablo	29,139	$63,617	$2.183	$67,011	$2.300	$10,288	$0.353	$30,000	$1.030	$136,396	$4.681	$15,650	$0.537	$322,962	$11.083
Sanger	24,270	$0	$0.000	$72,000	$2.967	$1,200	$0.049	$1,000	$0.041	$5,000	$0.206	$250	$0.010	$79,450	$3.274
Santa Cruz	59,946	$113,000	$1.885	$604,109	$10.078	$15,000	$0.250	$3,500	$0.058	$20,000	$0.334	$6,500	$0.108	$762,109	$12.713
Santa Rosa	167,815	$89,600	$0.534	$500,000	$2.979	$360,120	$2.146	$3,700	$0.022	$15,000	$0.089	$385,554	$2.297	$1,353,974	$8.068
Signal Hill	10,834	$0	$0.000	$150,400	$13.882	$1,000	$0.092	$64,000	$5.907	$81,000	$7.476	$7,500	$0.692	$303,900	$28.051
South San Francisco	63,632	$41,000	$0.644	$335,400	$5.271	$542,000	$8.518	$215,800	$3.391	$129,000	$2.027	$7,500	$0.118	$1,270,700	$19.970
Suisun City	28,111	$1,200	$0.043	$16,000	$0.569	$50,000	$1.779	$11,000	$0.391	$20,000	$0.711	$17,000	$0.605	$115,200	$4.098
Sunnyvale	133,963	$11,457	$0.086	$495,745	$3.701	$112,579	$0.840	$121,703	$0.908	$4,170	$0.031	$10,000	$0.075	$755,654	$5.641
Walnut	29,172	$800	$0.027	$104,000	$3.565	$100,000	$3.428	$4,000	$0.137	$10,000	$0.343	$10,000	$0.343	$228,800	$7.843
West Hollywood	34,399	$0	$0.000	$275,000	$7.994	$25,000	$0.727	$45,000	$1.308	$101,000	$2.936	$10,000	$0.291	$456,000	$13.256
TOTALS	9,131,514	$10,993,010	$1.204	37,991,567	$4.160	$18,792,545	$2.058	$18,598,437	$2.037	$16,865,326	$1.847	$5,254,373	$0.575	$108,495,258	$11.881
AVERAGES	212,361	$255,651		883,525		$437,036		$432,522		$392,217		$122,195		$2,523,146	

218 Excluding Waterway/Beach Cleanup, which is to a large extent location-dependent. Please see Tables 9–12 for notes accompanying these figures.

Table 14: Responding Communities Ranked by Per Capita Spending[227]

	Community	County	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maint.	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
1	**Del Mar**	San Diego	4,151	$114,005	$27.464	$160,301	$38.617	$20,195	$4.865	$1,120	$0.270	$0	$0.000	$0	$0.000	$295,621	$71.217
2	**Commerce**	Los Angeles	12,823	$0	$0.00	$150,000	$11.698	$85,000	$6.629	$560,000	$43.672	$70,000	$5.459	$25,000	$1.950	$890,000	$69.407
3	**Redondo Beach**	Los Angeles	66,748	$112,459	$1.685	$850,000	$12.734	$71,000	$1.064	$1,100,000	$16.480	$130,418	$1.954	$15,000	$0.225	$2,278,877	$34.142
4	**Merced**	Merced	78,958	$200,000	$2.533	$1,300,000	$16.464	$300,000	$3.799	$180,000	$2.280	$300,000	$3.799	$20,000	$0.253	$2,300,000	$29.129
5	**Signal Hill**	Los Angeles	10,834	$0	$0.000	$150,400	$13.882	$1,000	$0.092	$64,000	$5.907	$81,000	$7.476	$7,500	$0.692	$303,900	$28.051
6	**Long Beach**	Los Angeles	462,604	$1,837,398	$3.972	$5,054,886	$10.927	$700,000	$1.513	$1,494,679	$3.231	$3,002,002	$6.489	$883,042	$1.909	$12,972,007	$28.041
7	**Malibu**	Los Angeles	12,645	$0	$0.000	$84,000	$6.643	$50,000	$3.954	$173,000	$13.681	$25,000	$1.977	$7,500	$0.593	$339,500	$26.849
8	**Dana Point**	Orange	33,351	500	$0.015	267000	$8.006	$75,000	$2.249	$322,000	$9.655	$159,000	$4.767	$11,000	$0.330	$834,500	$25.022
9	**El Segundo**	Los Angeles	16,654	$0	$0.000	$168,000	$10.088	$197,000	$11.829	$0	$0.000	$25,000	$1.501	$0	$0.000	$390,000	$23.418
10	**Fountain Valley**	Orange	55,313	$68,127	$1.232	$368,050	$6.654	$538,778	$9.741	$103,613	$1.873	$104,956	$1.897	$42,163	$0.762	$1,225,687	$22.159
11	**Capitola**	Santa Cruz	9,918	$15,000	$1.512	$100,000	$10.083	$25,000	$2.521	$22,000	$2.218	$30,000	$3.025	$25,000	$2.521	$217,000	$21.879
12	**Oakland**	Alameda	409,184	$14,000	$0.034	$4,600,000	$11.242	$1,122,989	$2.744	$2,508,000	$6.129	$63,725	$0.156	$71,799	$0.175	$8,380,513	$20.481
13	**South San Francisco**	San Mateo	63,632	$41,000	$0.644	$335,400	$5.271	$542,000	$8.518	$215,800	$3.391	$129,000	$2.027	$7,500	$0.118	$1,270,700	$19.970
14	**Weed**	Siskiyou	2,967	$0	$0.000	$44,330	$14.941	$2,000	$0.674	$0	$0.000	$12,000	$4.044	$0	$0.000	$58,330	$19.660
15	**South Gate**	Los Angeles	94,300	$0	$0.000	$1,100,000	$11.665	$40,000	$0.424	$640,000	$6.787	$0	$0.000	$6,800	$0.072	$1,786,800	$18.948
16	**Madera**	Madera	61,416	$14,920	$0.243	$416,319	$6.779	$553,053	$9.005	$20,200	$0.329	$115,200	$1.876	$10,500	$0.171	$1,130,192	$18.402
17	**Huntington Park**	Los Angeles	58,100	$0	$0.000	$700,000	$12.048	$25,000	$0.430	$250,000	$4.303	$50,000	$0.861	$8,000	$0.138	$1,033,000	$17.780
18	**Seaside**	Monterey	33,025	$5,000	$0.151	$170,000	$5.148	$295,580	$8.950	$0	$0.000	$70,000	$2.120	$34,000	$1.030	$574,580	$17.398
19	**La Palma**	Orange	15,568	$2,235	$0.144	$20,470	$1.315	$18,650	$1.198	$178,949	$11.495	$38,000	$2.441	$1,500	$0.096	$259,804	$16.688
20	**Hayward**	Alameda	144,186	$0	$0.000	$1,078,367	$7.479	$468,921	$3.252	$520,000	$3.606	$282,458	$1.959	$30,000	$0.208	$2,379,746	$16.505
21	**Auburn**	Placer	13,330	$0	$0.000	$88,000	$6.602	$40,000	$3.001	$61,500	$4.614	$8,500	$0.638	$5,000	$0.375	$203,000	$15.229
22	**Inglewood**	Los Angeles	112,241	$0	$0.000	$702,631	$6.260	$462,720	$4.123	$500,000	$4.455	$0	$0.000	$30,000	$0.267	$1,695,351	$15.105
23	**Hawthorne**	Los Angeles	83,945	$0	$0.000	$300,000	$3.574	$8,000	$0.095	$760,433	$9.059	$100,000	$1.191	$60,000	$0.715	$1,228,433	$14.634
24	**Gardena**	Los Angeles	58,829	$0	$0.000	$235,400	$4.001	$10,000	$0.170	$400,000	$6.799	$200,000	$3.400	$4,748	$0.081	$850,148	$14.451
25	**Calexico**	Imperial	38,572	$0	$0.000	$235,870	$6.115	$275,000	$7.130	$0	$0.000	$43,440	$1.126	$1,000	$0.026	$555,310	$14.397
26	**Portola Valley**	San Mateo	4,353	$0	$0.000	$20,000	$4.595	$20,000	$4.595	$0	$0.000	$20,000	$4.595	$0	$0.000	$60,000	$13.784

227 Please see Tables 9–12 for notes accompanying these figures.

	Community	County	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maint.	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
27	**West Hollywood**	Los Angeles	34,399	$0	$0.000	$275,000	$7.994	$25,000	$0.727	$45,000	$1.308	$101,000	$2.936	$10,000	$0.291	$456,000	$13.256
28	**Santa Barbara**	Santa Barbara	88,410	$353,900	$4.003	$425,300	$4.811	$65,600	$0.742	$0	$0.000	$209,600	$2.371	$101,600	$1.149	$1,156,000	$13.075
29	**San Anselmo**	Marin	12,336	$0	$0.000	$78,000	$6.323	$20,000	$1.621	$60,000	$4.864	$2,500	$0.203	$500	$0.041	$161,000	$13.051
30	**Santa Cruz**	Santa Cruz	59,946	$113,000	$1.885	$604,109	$10.078	$15,000	$0.250	$3,500	$0.058	$20,000	$0.334	$6,500	$0.108	$762,109	$12.713
31	**Atascadero**	San Luis Obispo	28,310	$25,000	$0.883	$5,000	$0.177	$200,000	$7.065	$5,000	$0.177	$100,000	$3.532	$5,000	$0.177	$340,000	$12.010
32	**Reedley**	Fresno	24,194	$89,000	$3.679	$86,000	$3.555	$18,000	$0.744	$39,100	$1.616	$36,000	$1.488	$16,000	$0.661	$284,100	$11.743
33	**Cerritos**	Los Angeles	49,041	$0	$0.000	$519,374	$10.591	$25,104	$0.512	$0	$0.000	$11,500	$0.234	$11,087	$0.226	$567,065	$11.563
34	**Rancho Mirage**	Riverside	17,218	$0	$0.000	$85,000	$4.937	$28,000	$1.626	$3,700	$0.215	$72,800	$4.228	$2,500	$0.145	$192,000	$11.151
35	**San Pablo**	Contra Costa	29,139	$63,617	$2.183	$67,011	$2.300	$10,288	$0.353	$30,000	$1.030	$136,396	$4.681	$15,650	$0.537	$322,962	$11.083
36	**Santa Clara**	Santa Clara	116,468	$5,000	$0.043	$713,631	$6.127	$463,419	$3.979	$105,000	$0.902	$0	$0.000	$2,492	$0.021	$1,289,542	$11.072
37	**San Diego**	San Diego	1,301,617	$342,165	$0.263	$4,800,000	$3.688	$6,400,000	$4.917	$555,922	$0.427	$809,505	$0.622	$1,200,969	$0.923	$14,108,561	$10.839
38	**Petaluma**	Sonoma	57,941	$500	$0.009	$432,386	$7.463	$190,578	$3.289	$0	$0.000	$0	N/A	$0	$0.000	$623,465	$10.760
39	**Lake Elsinore**	Riverside	51,821	$0	$0.000	$351,000	$6.773	$12,000	$0.232	$0	$0.000	$50,000	$0.965	$107,100	$2.067	$520,100	$10.036
40	**Mountain View**	Santa Clara	74,066	$0	$0.000	$348,000	$4.699	$20,000	$0.270	$276,000	$3.726	$68,000	$0.918	$18,000	$0.243	$730,000	$9.856
41	**Covina**	Los Angeles	47,796	$0	$0.000	$177,730	$3.719	$184,200	$3.854	$0	$0.000	$91,196	$1.908	$10,500	$0.220	$463,626	$9.700
42	**Benicia**	Solano	26,997	$26,200	$0.970	$116,155	$4.303	$30,000	$1.111	$0	$0.000	$82,000	$3.037	$7,200	$0.267	$261,555	$9.688
43	**Los Angeles**	Los Angeles	3,831,868	$7,801,278	$2.036	$8,104,857	$2.115	$3,621,878	$0.945	$7,887,125	$2.058	$7,000,000	$1.827	$1,945,531	$0.508	$36,360,669	$9.489
44	**Morro Bay**	San Luis Obispo	10,234	$400	$0.039	$57,000	$5.570	$1,625	$0.159	$1,040	$0.102	$30,000	$2.931	$5,900	$0.577	$95,965	$9.377
45	**San Jose**	Santa Clara	964,695	$126,619	$0.131	$3,534,731	$3.664	$1,784,924	$1.850	$116,273	$0.121	$3,066,882	$3.179	$247,124	$0.256	$8,876,553	$9.201
46	**Laguna Hills**	Orange	30,344	$20,000	$0.659	$128,000	$4.218	$50,000	$1.648	$65,000	$2.142	$10,000	$0.330	$0	$0.000	$273,000	$8.997
47	**Burlingame**	San Mateo	28,806	$2,500	$0.087	$220,673	$7.661	$10,000	$0.347	$10,000	$0.347	$12,000	$0.417	$0	$0.000	$255,173	$8.858
48	**Ione**	Amador	7,918	$0	$0.000	$30,000	$3.789	$10,000	$1.263	$0	$0.000	$25,000	$3.157	$5,000	$0.631	$70,000	$8.841
49	**Glendora**	Los Angeles	49,737	$0	$0.000	$310,000	$6.233	$20,000	$0.402	$0	$0.000	$28,000	$0.563	$80,000	$1.608	$438,000	$8.806
50	**Paramount**	Los Angeles	55,018	$0	$0.000	$204,000	$3.708	$26,366	$0.479	$131,400	$2.388	$105,000	$1.908	$3,500	$0.064	$470,266	$8.547
51	**Livermore**	Alameda	80,968	$17,500	$0.216	$419,000	$5.175	$74,969	$0.926	$111,042	$1.371	$0	$0.000	$35,000	$0.432	$657,511	$8.121
52	**Santa Rosa**	Sonoma	167,815	$89,600	$0.534	$500,000	$2.979	$360,120	$2.146	$3,700	$0.022	$15,000	$0.089	$385,554	$2.297	$1,353,974	$8.068
53	**Blue Lake**	Humboldt	1,253	$0	$0.000	$3,000	$2.394	$4,800	$3.831	$400	$0.319	$1,300	$1.038	$500	$0.399	$10,000	$7.981
54	**Rosemead**	Los Angeles	53,764	$0	$0.000	$175,000	$3.255	$30,000	$0.558	$115,000	$2.139	$100,000	$1.860	$4,000	$0.074	$424,000	$7.886
55	**Vallejo**	Solano	115,942	$0	$0.000	$563,000	$4.856	$54,000	$0.466	$0	$0.000	$107,000	$0.923	$186,000	$1.604	$910,000	$7.849
56	**Walnut**	Los Angeles	29,172	$800	$0.027	$104,000	$3.565	$100,000	$3.428	$4,000	$0.137	$10,000	$0.343	$10,000	$0.343	$228,800	$7.843

	Community	County	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maint.	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
57	**Upland**	San Bernardino	73,732	$0	$0.000	$278,000	$3.770	$0	$0.000	$0	$0.000	$275,000	$3.730	$22,975	$0.312	$575,975	$7.812
58	**Redding**	Shasta	89,861	$3,000	$0.033	$483,830	$5.384	$55,000	$0.612	$1,500	$0.017	$117,500	$1.308	$20,000	$0.223	$680,830	$7.576
59	**Waterford**	Stanislaus	8,456	$2,500	$0.296	$30,000	$3.548	$5,000	$0.591	$1,500	$0.177	$25,000	$2.956	$0	$0.000	$64,000	$7.569
60	**Glendale**	Los Angeles	196,847	$0	$0.000	$1,224,210	$6.219	$156,676	$0.796	$40,000	$0.203	$10,000	$0.051	$5,000	$0.025	$1,435,886	$7.294
61	**Mission Viejo**	Orange	93,305	$10,000	$0.107	$335,584	$3.597	$56,000	$0.600	$0	$0.000	$175,000	$1.876	$80,000	$0.857	$656,584	$7.037
62	**Chula Vista**	San Diego	243,916	$1,000	$0.004	$257,000	$1.054	$1,098,000	$4.502	$200,000	$0.820	$77,000	$0.316	$72,000	$0.295	$1,705,000	$6.990
63	**La Habra**	Orange	60,239	$19,235	$0.319	$304,122	$5.049	$12,858	$0.213	$7,500	$0.125	$60,174	$0.999	$12,643	$0.210	$416,532	$6.915
64	**Folsom**	Sacramento	72,203	$0	$0.000	204624	$2.834	270203	$3.742	$0	$0.000	$0	$0.000	23457	$0.325	$498,284	$6.901
65	**Laguna Niguel**	Orange	62,979	$51,624	$0.820	$189,000	$3.001	$88,655	$1.408	$43,514	$0.691	$0	$0.000	$15,753	$0.250	$388,546	$6.169
66	**Sacramento**	Sacramento	466,488	$1,057,300	$2.267	$245,000	$0.525	$1,005,600	$2.156	$0	$0.000	$48,000	$0.103	$521,500	$1.118	$2,877,400	$6.168
67	**Angels Camp**	Calaveras	3,836	$0	$0.000	$0	$0.000	$10,920	$2.847	$0	$0.000	$10,920	$2.847	$0	$0.000	$21,840	$5.693
68	**Temecula**	Riverside	100,097	$35,000	$0.350	$0	$0.000	$130,000	$1.299	$4,000	$0.040	$65,000	$0.649	$332,525	$3.322	$566,525	$5.660
69	**Sunnyvale**	Santa Clara	133,963	$11,457	$0.086	$495,745	$3.701	$112,579	$0.840	$121,703	$0.908	$4,170	$0.031	$10,000	$0.075	$755,654	$5.641
70	**Diamond Bar**	Los Angeles	55,544	$0	$0.000	$205,000	$3.691	$15,000	$0.270	$0	$0.000	$50,000	$0.900	$42,100	$0.758	$312,100	$5.619
71	**Santa Clarita**	Los Angeles	176,320	$27,877	$0.158	$562,278	$3.189	$328,096	$1.861	$10,629	$0.060	$0	$0.000	$25,692	$0.146	$954,572	$5.414
72	**San Gabriel**	Los Angeles	39,718	$0	$0.000	$200,000	$5.036	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$200,000	$5.036
73	**Montclair**	San Bernardino	36,664	$0	$0.000	$162,378	$4.429	$10,000	$0.273	$500	$0.014	$0	$0.000	$5,000	$0.136	$177,878	$4.852
74	**Bell Gardens**	Los Angeles	42,072	$0	$0.000	$160,000	$3.803	$0	$0.000	$34,000	$0.808	$0	$0.000	$2,000	$0.048	$196,000	$4.659
75	**Hughson**	Stanislaus	6,640	$0	$0.000	$15,000	$2.259	$5,000	$0.753	$0	$0.000	$9,000	$1.355	$0	$0.000	$29,000	$4.367
76	**Fontana**	San Bernardino	196,069	$0	$0.000	$750,000	$3.825	$100,000	$0.510	$0	$0.000	$0	$0.000	$5,000	$0.026	$855,000	$4.361
77	**San Marcos**	San Diego	83,781	$2,000	$0.024	$282,000	$3.366	$0	$0.000	$17,818	$0.213	$43,340	$0.517	$5,000	$0.060	$350,158	$4.179
78	**Calimesa**	Riverside	7,879	$0	$0.000	$9,660	$1.226	$5,840	$0.741	$4,400	$0.558	$7,840	$0.995	$5,000	$0.635	$32,740	$4.155
79	**Suisun City**	Solano	28,111	$1,200	$0.043	$16,000	$0.569	$50,000	$1.779	$11,000	$0.391	$20,000	$0.711	$17,000	$0.605	$115,200	$4.098
80	**Rancho Cucamonga**	San Bernardino	165,269	$0	$0.000	$428,217	$2.591	$214,851	$1.300	$0	$0.000	$5,300	$0.032	$19,400	$0.117	$667,768	$4.040
81	**Moraga**	Contra Costa	16,016	$0	$0.000	$8,000	$0.500	$10,000	$0.624	$16,500	$1.030	$0	$0.000	$28,525	$1.781	$63,025	$3.935
82	**Jurupa Valley**	Riverside	95,004	$0	$0.000	$200,000	$2.105	$13,680	$0.144	$0	$0.000	$155,268	$1.634	$0	$0.000	$368,948	$3.883
83	**National City**	San Diego	58,582	$1,000	$0.017	$175,000	$2.987	$20,000	$0.341	$0	$0.000	$9,500	$0.162	$0	$0.000	$205,500	$3.508
84	**Desert Hot Springs**	Riverside	25,938	$0	$0.000	$60,000	$2.313	$0	$0.000	$20,000	$0.771	$10,000	$0.386	$0	$0.000	$90,000	$3.470
85	**Sanger**	Fresno	24,270	$0	$0.000	$72,000	$2.967	$1,200	$0.049	$1,000	$0.041	$5,000	$0.206	$250	$0.010	$79,450	$3.274
86	**Highland**	San Bernardino	53,104	$0	$0.000	$0	$0.000	$40,875	$0.770	$0	$0.000	$128,710	$2.424	$0	$0.000	$169,585	$3.193

	Community	County	2010 Census	Waterway/ Beach Cleanup	Per Capita	Street Sweeping	Per Capita	Storm Drain Cleaning & Maint.	Per Capita	Stormwater Capture Devices	Per Capita	Manual Cleanup	Per Capita	Public Education	Per Capita	Total	Per Capita
87	**Rancho Santa Margarita**	Orange	47,853	$0	$0.000	$88,500	$1.849	$36,000	$0.752	$0	$0.000	$18,200	$0.380	$10,000	$0.209	$152,700	$3.191
88	**Laguna Woods**	Orange	16,192	$1,100	$0.068	$27,685	$1.710	$3,661	$0.226	$7,472	$0.461	$0	$0.000	$6,750	$0.417	$46,668	$2.882
89	**Arvin**	Kern	19,304	$0	$0.000	$31,600	$1.637	$0	$0.000	$0	$0.000	$10,000	$0.518	$2,500	$0.130	$44,100	$2.285
90	**Winters**	Yolo	6,624	$0	$0.000		$0.000	$0	$0.000	$0	$0.000	$15,000	$2.264	$0	$0.000	$15,000	$2.264
91	**Wasco**	Kern	64,173	$0	$0.000	$120,000	$1.870	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$120,000	$1.870
92	**Azusa**	Los Angeles	46,361	$0	$0.000	$60,000	$1.294	$9,500	$0.205	$0	$0.000	$0	$0.000	$0	$0.000	$69,500	$1.499
93	**Palos Verdes Estates**	Los Angeles	13,438	$0	$0.000	$0	$0.000	$8,000	$0.595	$10,000	$0.744	$0	$0.000	$2,000	$0.149	$20,000	$1.488
94	**Etna**	Siskiyou	737	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$0	$0.000	$300	$0.407	$300	$0.407
95	**Orland**	Glenn	7,291	$0	$0.000	$0	$0.000	$1,680	$0.230	$0	$0.000	$0	$0.000	$500	$0.069	$2,180	$0.299
	TOTALS		**12,343,756**	**$12,726,016**	**$1.031**	**$49,816,814**	**$4.036**	**$23,677,631**	**$1.918**	**$20,196,532**	**$1.636**	**$18,715,300**	**$1.516**	**$7,023,129**	**$0.569**	**$132,155,423**	**$10.706**
	AVERAGES		**129,934**	**$133,958**		**$524,388**		**$249,238**		**$212,595**		**$197,003**		**$73,928**		**$1,391,110**	

Appendix C: Respondents, Participating Communities

Kier Associates would like to thank the following individuals for responding to our request for information and providing the data upon which this paper is based.

Community	County	2010 Census	Year Surveyed	Informant	Position/Department
Angels Camp	Calaveras	3,836	2012	Mary Kelly	Administrative Services Director
Arvin	Kern	19,304	2012	David Powell	Finance Director
Arvin	Kern	19,304	2013	Cecilia Vela	City Clerk
Atascadero	San Luis Obispo	28,310	2013	Russ Thompson	Public Works Director
Auburn	Placer	13,330	2012	Bernie Schroeder	Public Works Director
Azusa	Los Angeles	46,361	2012	Christina Curiel	Engineering Assistant
Bell Gardens	Los Angeles	42,072	2013	Chau Vu	Public Works Director
Benicia	Solano	26,997	2013	Melissa Morton	Land Use and Engineering Manager
Blue Lake	Humboldt	1,253	2012	John Berchtold	City Administrator
Burlingame	San Mateo	28,806	2013	Rob Mallick	Public Works Superintendent
Calexico	Imperial	38,572	2013	Nick Fenley	General Services Director
Calimesa	Riverside	7,879	2013	Bob French	Public Works Director
Capitola	Santa Cruz	9,918	2012	Steven Jesberg	Public Works Director
Cerritos	Los Angeles	49,041	2013	Mike O'Grady	Environmental Services Manager
Chula Vista	San Diego	243,916	2011	Khosro Aminpour, PE	Stormwater Management
Commerce	Los Angeles	12,823	2012	Gina Nila	Environmental Services Manager
Covina	Los Angeles	47,796	2013	Vivian Castro	Environmental Services Manager
Dana Point	Orange	33,351	2013	Lisa Zawaski	Senior Water Quality Engineer
Del Mar	San Diego	4,151	2012	Scott Huth	City Manager
Desert Hot Springs	Riverside	25,938	2013	Hal Goldenberg	Public Works Director
Diamond Bar	Los Angeles	55,544	2011	David Liu	Public Works Director
El Segundo	Los Angeles	16,654	2013	Stephanie Katsouleas, PE	Public Works Director
Etna	Siskiyou	737	2012	Pamela Russell	City Manager
Folsom	Sacramento	72,203	2013	Elaine Anderson	Assistant to the City Manager
Fontana	San Bernardino	196,069	2013	Chuck Hays	Public Works Director
Fountain Valley	Orange	55,313	2012	Steve Hauerwass	Public Works Director/City Engineer
Gardena	Los Angeles	58,829	2011	John Felix	Engineering Division
Glendale	Los Angeles	196,847	2011	Maurice Oillataguerre	Operations and Public Education Coordinator
Glendora	Los Angeles	49,737	2011	Jerry L. Burke, PE	Assistant Public Works Director

Community	County	2010 Census	Year Surveyed	Informant	Position/Department
Hawthorne	Los Angeles	83,945	2011	Doug Krauss, PE	Administrative Analyst
Hayward	Alameda	144,186	2013	Denise Blohm	Administrative Analyst II
Highland	San Bernardino	53,104	2013	Melissa Morgan	Public Services Manager
Hughson	Stanislaus	6,640	2012	Thomas Clark	Community Development Director
Huntington Park	Los Angeles	58,100	2012	John Hunter	Consultant, John L. Hunter Inc.
Inglewood	Los Angeles	112,241	2011	Lauren Amimoto	Senior Administrative Analyst
Ione	Amador	7,918	2012	Jeff Butzlaff	Interim City Manager
Jurupa Valley	Riverside	95,004	2013	Richard Bagley	Public Works Director
La Habra	Orange	60,239	2013	Maria Torres	City Employee
La Palma	Orange	15,568	2013	Carlo Nafarrete	Maintenance Supervisor
Laguna Hills	Orange	30,344	2012	Ken Rosenfield	Public Works Director
Laguna Niguel	Orange	62,979	2013	J.C. Herrera	Public Works Intern
Laguna Woods	Orange	16,192	2012	Douglas C. Reilly	Assistant City Manager
Lake Elsinore	Riverside	51,821	2013	Nicole McCalmont	Engineering Technician II
Livermore	Alameda	80,968	2012	Steve Aguiar	Environmental Compliance Supervisor
Long Beach	Los Angeles	462,604	2011	Diana Tang	Government Affairs Analyst
Los Angeles	Los Angeles	3,831,868	2011	Maged Soliman	Associate Civil Engineer
Madera	Madera	61,416	2013	Dave Randall	Planning Director
Malibu	Los Angeles	12,645	2013	Arthur Aladjadjian	Public Works Superintendent
Merced	Merced	78,958	2013	Michael Wegley	Director of Water Resources and Reclamation
Mission Viejo	Orange	93,305	2013	Keith Rattay	Public Services Director
Montclair	San Bernardino	36,664	2013	Michael C. Hudson	Public Works Director
Moraga	Contra Costa	16,016	2013	Jill Keimach	City Manager
Morro Bay	San Luis Obispo	10,234	2013	Andrea K. Lueker	City Manager
Mountain View	Santa Clara	74,066	2012	Ligia Sarmento	Executive Assistant to the City Manager
National City	San Diego	58,582	2013	Lavonne Watts	Executive Assistant
Oakland	Alameda	409,184	2011	Rebecca Tuden	Watershed Specialist
Orland	Glenn	7,291	2012	Angela Crook	Assistant City Manager
Palos Verdes Estates	Los Angeles	13,438	2013	Alan Rigg	City Engineer
Paramount	Los Angeles	55,018	2011	"Len"	City Employee
Petaluma	Sonoma	57,941	2013	Lena Cox	Environmental Services Supervisor
Portola Valley	San Mateo	4,353	2013	Howard Young	Public Works Director
Rancho Cucamonga	San Bernardino	165,269	2013	Linda Ceballos	Environmental Programs Manager
Rancho Mirage	Riverside	17,218	2013	Bruce B. Harry	Public Works Director

Community	County	2010 Census	Year Surveyed	Informant	Position/Department
Rancho Santa Margarita	Orange	47,853	2013	E. (Max) Maximous	Public Works Director
Redding	Shasta	89,861	2013	Greg Clark	Deputy City Manager
Redondo Beach	Los Angeles	66,748	2011	Michael Shay	Principal Civil Engineer
Reedley	Fresno	24,194	2013	Russ Robertson	Public Works Director
Rosemead	Los Angeles	53,764	2013	Chris Marcarello	Public Works Director
Sacramento	Sacramento	466,488	2012	Sherrill Huun	City Manager
San Anselmo	Marin	12,336	2013	Debra Stutsman	Town Manager
San Diego	San Diego	1,301,617	2012	Alicia Glassco	San Diego Coastkeeper
San Gabriel	Los Angeles	39,718	2012	Thomas Marston	Finance Director
San Jose	Santa Clara	964,695	2011	Paul Ledesma	Environmental Services Department
San Marcos	San Diego	83,781	2013	Lydia Romero	Deputy City Manager
San Pablo	Contra Costa	29,139	2012	Karineh Samkian	Environmental Program Analyst
Sanger	Fresno	24,270	2012	John Mulligan	Interim Public Works Director
Santa Barbara	Santa Barbara	88,410	2013	Kate Whan	Administrative Analyst
Santa Clara	Santa Clara	116,468	2013	David Staub	Acting Assistant Director of Streets
Santa Clarita	Los Angeles	176,320	2013	Travis Lange	Environmental Services Manager
Santa Cruz	Santa Cruz	59,946	2013	Robert Solick	Principal Management Analyst
Santa Rosa	Sonoma	167,815	2013	Jill Scott	Research and Program Coordinator, Utilities Dept.
Seaside	Monterey	33,025	2013	Leslie Llantero	Assistant Engineer
Signal Hill	Los Angeles	10,834	2012	John Hunter	Consultant, John L. Hunter Inc.
South Gate	Los Angeles	94,300	2012	John Hunter	Consultant, John L. Hunter Inc.
South San Francisco	San Mateo	63,632	2013	Terry White	Public Works Director
Suisun City	Solano	28,111	2013	Amanda Dum	Recycling Coordinator
Sunnyvale	Santa Clara	133,963	2011	Kristy McCumby Hyland	Administrative Analyst
Temecula	Riverside	100,097	2013	Aldo Licitra	Associate Engineer
Upland	San Bernardino	73,732	2013	Rosemary Hoerning, PE	Public Works Director
Vallejo	Solano	115,942	2013	David A. Kleinschmidt, PE	Public Works Director
Walnut	Los Angeles	29,172	2012	Alicia Jensen	City Manager
Wasco	Kern	64,173	2012	Bruce Foltz	Finance Director
Waterford	Stanislaus	8,456	2013	Tim Ogden	City Manager
Weed	Siskiyou	2,967	2013	Craig Sharp	Public Works Director
West Hollywood	Los Angeles	34,399	2012	Sharon Pearlstein	City Engineer
Winters	Yolo	6,624	2012	Carol Scianna	Environmental Services Manager

Appendix D: Communities Randomly Selected and Contacted for This Study

City	County	Population (2010 Census)
Albany	Alameda	18,539
Alhambra	Los Angeles	83,089
Aliso Viejo	Orange	47,823
Amador City	Amador	185
Anaheim	Orange	336,265
Anderson	Shasta	9,932
Antioch	Contra Costa	102,372
Apple Valley	San Bernardino	69,135
Arcata	Humboldt	56,364
Artesia	Los Angeles	16,522
Arvin	Kern	19,304
Atascadero	San Luis Obispo	28,310
Atwater	Merced	28,168
Baldwin Park	Los Angeles	75,390
Barstow	San Bernardino	29,603
Bell	Los Angeles	35,477
Bell Gardens	Los Angeles	42,072
Bellflower	Los Angeles	76,616
Belvedere[219]	Marin	2,068
Benicia	Solano	26,997
Berkeley	Alameda	112,580
Biggs	Butte	1,707
Brawley	Imperial	24,953
Buellton	Santa Barbara	4,828
Burbank	Los Angeles	103,340
Burlingame	San Mateo	28,806
Calabasas	Los Angeles	23,058
Calexico	Imperial	38,572
California City	Kern	14,120
Calimesa	Riverside	7,879
Calistoga	Napa	5,155
Carlsbad	San Diego	105,328
Carmel-by-the-Sea	Monterey	3,722
Cerritos	Los Angeles	49,041
City of Industry	Los Angeles	219
Claremont	Los Angeles	34,926
Clearlake[220]	Lake	15,250
Colton	San Bernardino	52,154
Compton	Los Angeles	96,455
Corcoran	Kings	24,813
Corning	Tehama	7,663
Corona	Riverside	152,374
Corte Madera	Marin	9,253
Costa Mesa	Orange	109,960
Cotati	Sonoma	7,265
Covina	Los Angeles	47,796
Cudahy	Los Angeles	23,805
Dana Point	Orange	33,351
Del Rey Oaks	Monterey	1,624

City	County	Population (2010 Census)
Delano	Kern	53,041
Desert Hot Springs	Riverside	25,938
Dixon	Solano	18,351
Dorris	Siskiyou	939
Dos Palos	Merced	4,950
Downey	Los Angeles	111,772
Duarte	Los Angeles	21,321
Eastvale	Riverside	53,670
El Centro	Imperial	42,598
El Monte	Los Angeles	113,475
El Segundo	Los Angeles	16,654
Escalon	San Joaquin	7,132
Escondido	San Diego	143,911
Eureka	Humboldt	27,191
Fairfax	Marin	7,441
Fairfield	Solano	105,321
Farmersville	Tulare	10,588
Firebaugh	Fresno	7,549
Folsom	Sacramento	72,203
Fontana	San Bernardino	196,069
Fort Bragg	Mendocino	7,273
Fort Jones	Siskiyou	839
Fremont	Alameda	214,089
Gilroy	Santa Clara	48,821
Goleta	Santa Barbara	29,888
Half Moon Bay	San Mateo	11,324
Hanford	Kings	53,967
Hayward	Alameda	144,186
Hemet	Riverside	78,657
Hercules	Contra Costa	24,060
Hermosa Beach	Los Angeles	19,506
Highland	San Bernardino	53,104
Huntington Beach	Orange	189,992
Huron	Fresno	6,754
Imperial	Imperial	14,758
Irvine	Orange	212,375
Jurupa Valley	Riverside	95,004
Kerman	Fresno	13,544
King City	Monterey	12,874
La Habra	Orange	60,239
La Habra Heights	Los Angeles	5,325
La Mirada	Los Angeles	48,527
La Palma	Orange	15,568
La Verne	Los Angeles	31,063
Laguna Niguel	Orange	62,979
Lake Elsinore	Riverside	51,821
Lakewood	Los Angeles	80,048
Lancaster	Los Angeles	156,633
Lemon Grove	San Diego	25,320

City	County	Population (2010 Census)
Loma Linda	San Bernardino	23,261
Lomita	Los Angeles	20,256
Lompoc	Santa Barbara	42,434
Los Alamitos	Orange	11,449
Los Altos Hills	Santa Clara	7,922
Los Banos	Merced	35,972
Los Gatos	Santa Clara	29,413
Madera	Madera	61,416
Malibu	Los Angeles	12,645
Mammoth Lakes	Mono	8,234
Maricopa	Kern	1,154
Marina	Monterey	19,718
Martinez	Contra Costa	35,824
Marysville	Yuba	12,072
Maywood	Los Angeles	27,395
Menifee	Riverside	77,519
Menlo Park	San Mateo	32,026
Merced	Merced	78,958
Millbrae	San Mateo	21,532
Milpitas	Santa Clara	66,790
Mission Viejo	Orange	93,305
Monrovia	Los Angeles	36,590
Montclair	San Bernardino	36,664
Monterey Park	Los Angeles	60,269
Moraga	Contra Costa	16,016
Morro Bay	San Luis Obispo	10,234
Napa	Napa	76,915
National City	San Diego	58,582
Nevada City	Nevada	3,068
Norwalk	Los Angeles	105,549
Ojai	Ventura	7,461
Orange	Orange	134,616
Oxnard	Ventura	197,899
Pacifica	San Mateo	37,234
Palm Desert	Riverside	48,445
Palmdale	Los Angeles	152,750
Palos Verdes Estates	Los Angeles	13,438
Petaluma	Sonoma	57,941
Pismo Beach	San Luis Obispo	7,655
Pittsburg	Contra Costa	63,264
Placentia	Orange	50,533
Placerville	El Dorado	10,389
Port Hueneme	Ventura	21,723
Portola	Plumas	2,104
Portola Valley	San Mateo	4,353
Poway	San Diego	47,811
Rancho Cucamonga	San Bernardino	165,269
Rancho Mirage	Riverside	17,218
Rancho Palos Verdes	Los Angeles	41,643
Rancho Santa Margarita	Orange	47,853
Redding	Shasta	89,861
Redwood City	San Mateo	76,815
Reedley	Fresno	24,194

City	County	Population (2010 Census)
Rialto	San Bernardino	99,171
Richmond	Contra Costa	103,701
Rio Dell	Humboldt	3,368
Riverbank	Stanislaus	22,678
Riverside	Riverside	303,871
Rocklin	Placer	56,974
Rohnert Park	Sonoma	40,971
Rolling Hills	Los Angeles	1,860
Rosemead	Los Angeles	53,764
Roseville	Placer	118,788
Ross	Marin	2,415
San Anselmo	Marin	12,336
San Bruno	San Mateo	41,114
San Carlos	San Mateo	28,406
San Fernando	Los Angeles	23,645
San Francisco	San Francisco	805,235
San Jacinto	Riverside	44,199
San Joaquin	Fresno	4,001
San Juan Bautista	San Benito	1,862
San Luis Obispo	San Luis Obispo	45,119
San Marcos	San Diego	83,781
San Marino	Los Angeles	13,147
San Rafael	Marin	57,713
Santa Ana	Orange	324,528
Santa Barbara	Santa Barbara	88,410
Santa Clara	Santa Clara	116,468
Santa Clarita	Los Angeles	176,320
Santa Cruz	Santa Cruz	59,946
Santa Rosa	Sonoma	167,815
Santee	San Diego	53,413
Sausalito	Marin	7,061
Scotts Valley	Santa Cruz	11,580
Seaside	Monterey	33,025
Sebastopol	Sonoma	7,379
Selma	Fresno	23,219
Shasta Lake	Shasta	10,164
Sierra Madre	Los Angeles	10,917
Soledad	Monterey	25,738
Solvang	Santa Barbara	5,245
Sonoma	Sonoma	10,648
South Lake Tahoe	El Dorado	21,403
South Pasadena	Los Angeles	25,619
South San Francisco	San Mateo	63,632
St. Helena	Napa	5,814
Stanton	Orange	38,186
Suisun City	Solano	28,111
Taft	Kern	9,327
Tehama	Tehama	418
Temecula	Riverside	100,097
Tiburon	Marin	8,962
Torrance	Los Angeles	145,538
Trinidad	Humboldt	367
Truckee	Nevada	16,180

City	County	Population (2010 Census)
Ukiah	Mendocino	16,075
Upland	San Bernardino	73,732
Vacaville	Solano	92,428
Vallejo	Solano	115,942
Vernon	Los Angeles	112
Villa Park	Orange	5,812
Waterford	Stanislaus	8,456
Watsonville	Santa Cruz	51,199
Weed	Siskiyou	2,967
West Sacramento	Yolo	48,744
Westminster	Orange	89,701
Westmorland	Imperial	2,225
Willits	Mendocino	4,888
Woodland	Yolo	55,468
Woodside	San Mateo	5,287
Yountville	Napa	2,933
Yuba City[221]	Sutter	64,925

219 Belvedere's public works manager was on vacation during the response period.

220 Clearlake did respond; however, responses were all either $0 or information not available, so they were not included.

221 Yuba City responded that their costs are not broken out in a manner that allowed easy access to the requested data.

Appendix E: Technical Appendix—Characteristics of the Per Capita Spending Data Set

The data set on which this study is based consists of interview data from 15 communities given to our team initially, plus the respondents (43 from a previous report plus 52 new respondents), for a total of 95 communities from a randomly chosen list of more than 200 California communities. The purpose of the analysis presented in this Appendix is to explore the potential accuracy and precision of the estimated per capita spending presented in the body of this report.

Total per capita spending can be most simply calculated as the sum of the dollars spent by the communities sampled ($132,155,423) divided by the total of the population sizes in the sample (12,343,756), giving $10.71 per individual.[222] Though simple, this value has no unbiased variance estimate and thus gives no idea as to the variability of spending on a community basis.

Another way to calculate the average per capita spending is to compute the ratio ($/individual) for each community and treat the result as a random variable. This gives the possibility of calculating an unweighted mean (all communities count equally) but also has the problem that the ratio combines the variances of both spending and population size in a variable of uncertain statistical properties. Per capita spending varied from less than $1 to more than $70 per individual in the communities sampled and was right-skew with a mode in the $7–$8 category (Table 1) and median of $8.84. The mean of per capita spending among the communities in the sample was $11.68, with nominal 95 percent confidence limits of $9.40–$13.95.

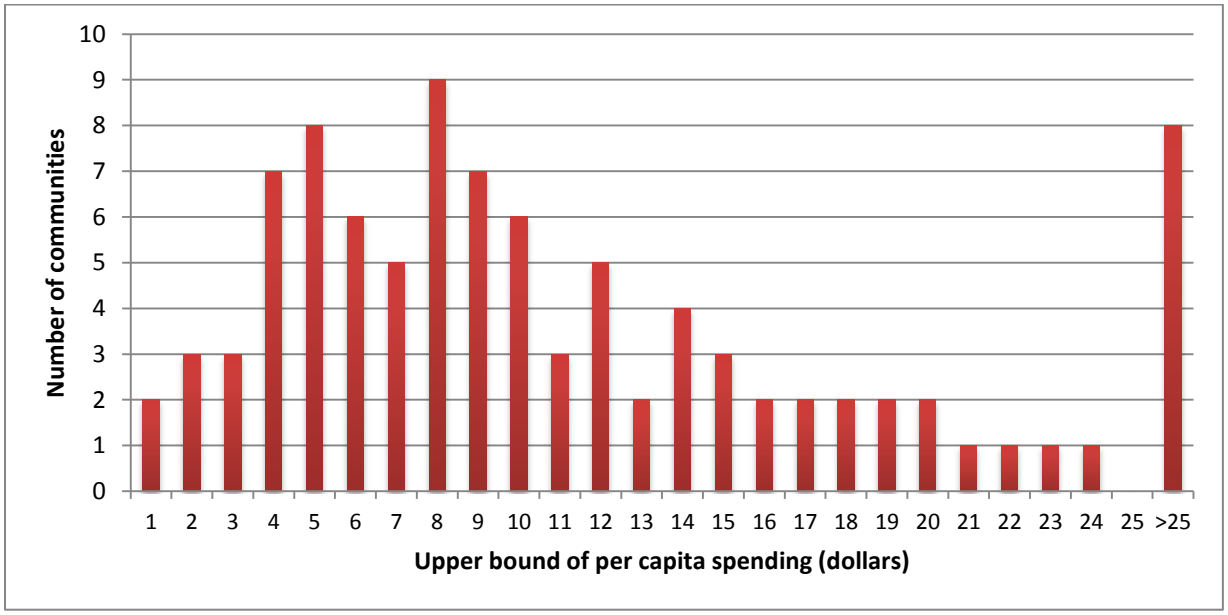

Table 1: Histogram of per capita spending.

Only five communities in the sample had total spending in the range $11–$12 that contains the unweighted mean (Table 1), and three of these were the largest in the sample (Table 2). This would suggest a biased estimate (i.e., one driven by the results from the largest communities) if the unweighted mean differed greatly from the weighted mean reported above. However, this is not the case; the difference is only about $1.

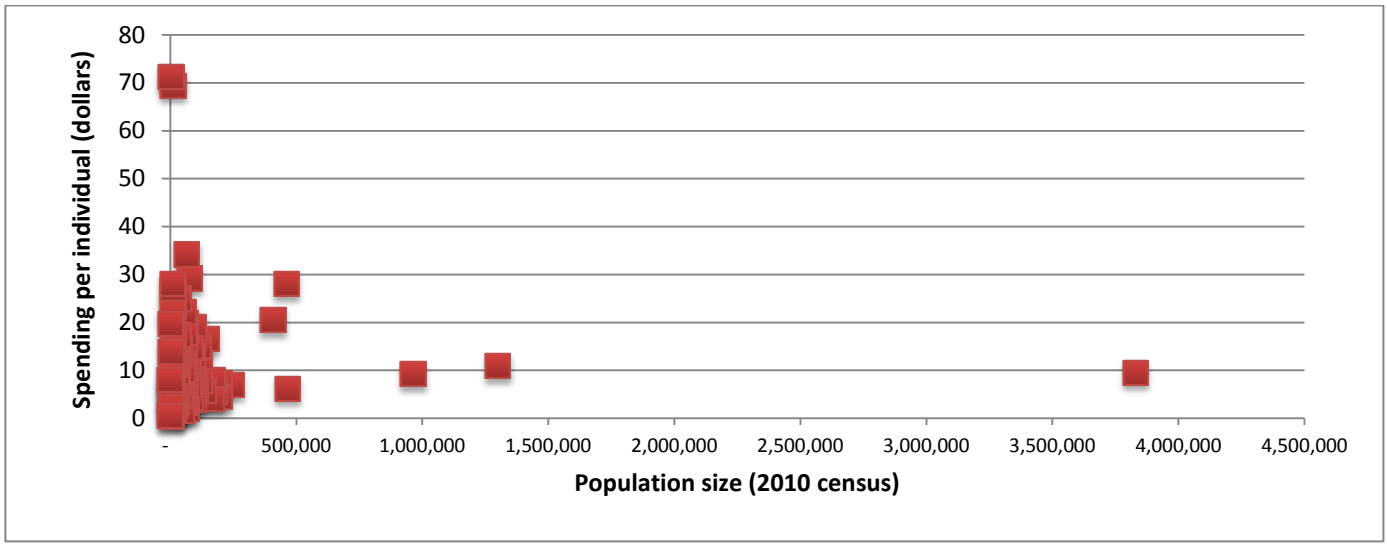

Table 2: Per capita spending vs. population size.

A corollary result illustrated in Table 2 is that the variance in per capita spending appears to lessen with greater population size. This suggests that the weighted mean (sum of spending /sum of population size) is the more precise estimate.

A third common method by which to estimate per capita spending is to calculate the slope of the regression of total spending on population size, making the reasonable assumption that the regression line passes through the origin (i.e., a community with no population spends $0). The resulting regression accounts for 94 percent of the variance in spending and gives per capita spending with mean $9.85 and 95 percent confidence limits of $9.35 to $10.36. A caution with this approach is that the community of Los Angeles has very high influence on the estimate, and two of the larger communities (Long Beach and Oakland) depart significantly from the model (have high residuals).

The sample represents roughly 39 percent of Californians living in incorporated communities as well as more than 30 percent of the population of the entire state and is thus expected to provide a rather robust estimate for the state. However, the sample of “largest” communities may be too small to be representative. One test of the robustness of the mean per capita spending estimate would be if one or more communities with a population size of 500,000 to 1,000,000 that have yet to respond were to

have per capita spending in the ranges calculated above, roughly $9 to $14, or even $6 to $15, as informally predicted by Table 2.

Without a complete census of communities, it is not possible to say that the sample is unbiased, for two reasons: (1) Fifteen of the communities were chosen by a nonrandom process, and (2) only 80 of more than 200 communities contacted responded to our data request. It is possible, for example, that communities that spend very little on cleanup are less likely to respond to the questionnaire. It is clear that small communities will not affect the weighted average very much, and that any further effort to refine the estimate of per capita spending on litter control should therefore focus on the remaining large communities not in the sample.

222 That this is a weighted mean can be verified by weighting each community's per capita spending by the ratio of its population size to the total population in the sample, and summing.