March 20, 2012

Via email

Mr. Dale C. Bowyer
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Comments on "Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s"—Technical Memorandum, and "Trash Load Reduction Tracking Method: Assessing the Progress of San Francisco Bay Area MS4s Towards Stormwater Trash Load Reduction Goals"—Technical Report (Version 1.0)

Dear Mr. Bowyer:

The American Chemistry Council Plastics Division ("ACC") appreciates the opportunity to comment on the Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s ("Baseline Methodology") and Trash Load Reduction Tracking Method ("Tracking Method") submitted by the Bay Area Stormwater Management Agencies Association ("BASMAA") on behalf of the Permittees subject to the San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (Order R2-2009-0074) ("MRP"). The BASMAA documents serve as the foundation of the individual Permittees' Baseline Trash Loads and Short-Term Trash Load Reduction Plans ("Short-Term Plans"). Accordingly, ACC's comments on the BASMAA documents also extend to each of the 71 Short-Term Plans on which the Regional Board is also accepting comments, because each of the Short-Term Plans fundamentally relies on the methodologies and calculations contained in BASMAA's Baseline Methodology and Tracking Method. By submitting these comments to the email address identified, ACC requests that these comments also be deemed submitted to each of these jurisdictions in response to the Short-Term Plans.

ACC strongly supports litter reduction and has taken many steps with partners to reduce litter that are mentioned briefly in our detailed comments. Unfortunately, these well-intentioned but error-riddled plans do nothing to reduce trash in our waterways.

Collectively, the Baseline Methodology, Tracking Method, and Short-Term Plans are intended to demonstrate how the Permittees will reduce the trash loads from their municipal storm sewer systems ("MS4s") by 40% by July 1, 2014, as the MRP requires. For the reasons set forth in the attached comments, these documents do not achieve that requirement. The Regional Board is required to act on these documents, and we urge the Board to reject each of them. Our key concerns can be summarized as follows:

- First, the Baseline Methodology lacks a credible scientific foundation. It relies on two litter surveys (or "trash monitoring and characterization events") that did not follow any established methodology and are rife with demonstrable flaws. As a result, among other things, the surveys

overstate the amount of single-use plastic bag and polystyrene foam trash actually contained in the Permittees' trash streams. Because the Baseline Methodology is the starting point for BASMAA's approach, these fundamental errors at the outset impede the success of the entire initiative at later steps.

- Second, both the Baseline Methodology and the Tracking Method arbitrarily allow Permittees to artificially inflate their baseline trash loads and then claim "reductions" that are not attributable to new or enhanced trash reduction measures, in contravention of both the MRP and the Clean Water Act. As a result, the Permittees' actual trash load reductions by 2014 will be smaller than the amounts claimed in their Short-Term Plans. These artificial adjustments make both approaches arbitrary and detached from actual efficacy.

- Third, the unprecedented trash generation reduction "credit" system established by the Tracking Method accounts for actions aimed at reducing trash generation in an arbitrary manner, divorced from actual data, real-world impacts, and efficacy. There is no demonstrable nexus between the percentages assigned to the credited actions and actual trash load reductions. In fact, the data collected by BASMAA's own litter surveys strongly suggest that the credits assigned to some measures greatly overstate their actual contribution to trash load reductions. As a result, the credit program will lead to reductions that exist on paper but not in reality. Sound rulemaking must be based in empirical data and rational evidence, not arbitrary policy choices that bear no nexus to sound science.

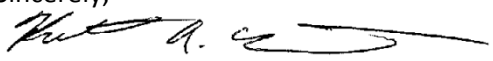
- Fourth, the credit system unfairly and arbitrarily promotes measures targeting two particular types of trash—single-use plastic bags and polystyrene foam food ware—to the exclusion of other measures and forms of trash that contribute more significantly to water quality issues. It creates incentives for Permittees to enact bans and restrictions on plastic bags and polystyrene foam products—thus passing significant compliance costs onto others—in lieu of installing pollution controls with known and quantifiable efficacy, i.e., controls that actually intercept trash before it is discharged into receiving waters.

- Fifth, the implementation of the Baseline Methodology and the Tracking Method via the Permittees' Short-Term Plans, which rely on those documents, requires analysis under the California Environmental Quality Act ("CEQA"). To our knowledge, none of the Permittees have begun the CEQA process, either individually or collaboratively through BASMAA.

If approved, the approaches contained in the Baseline Methodology and Tracking Method would not reduce trash loads and improve water quality as the MRP requires. Instead, they would allow the Permittees to claim a 40% trash load reduction that exists only on paper. We urge the Regional Board to reject the BASMAA documents and the Short-Term Plans which rely on them. The Permittees, through BASMAA, should be required to adopt plans that rely on control methods with proven and quantifiable efficacy, and to eliminate the arbitrary trash generation reduction "credit" system, which will not reduce actual MS4 trash discharges by any demonstrable amount.

ACC appreciates this opportunity to provide comments on BASMAA's Baseline Methodology and Tracking Method. Please contact me at 202-249-6610 if you have questions about these comments.

Sincerely,



Keith Christman
Managing Director, Plastics Markets
American Chemistry Council

cc: Municipal Permittees (by mail only; see appended list)

Attachments:

- Comments of the American Chemistry Council
- Technical Assessment of BASMAA 2012 Documents, conducted for ACC by Environmental Resources Planning, LLC, Steven R. Stein, Project Manager

Alameda County Permittees

Daniel Woldesenbet, Ph.D., P.E.
Director of Public Works
Alameda County
399 Elmhurst Street
Hayward, CA 94544

Matthew T. Naclerio
Public Works Director
City of Alameda
2263 Santa Clara Avenue
Alameda, CA 94501

Nicole Almaguer
Environmental Specialist
City of Albany
1000 San Pablo Avenue
Albany, CA 94706

Andrew Clough
Director of Public Works
City of Berkeley
2180 Milvia Street, 3rd Floor
Berkeley, CA 94704

Roger Bradley
Assistant to the City Manager
City of Dublin
100 Civic Plaza
Dublin, CA 945568

Maurice Kaufman
Public Works Director
City of Emeryville
1333 Park Avenue
Emeryville, CA 94608

Kathy Cote
Environmental Services Manager
City of Fremont
Environmental Services Division
39505 Liberty Street
Fremont, CA 94538

Alex Ameri
Director of Public Works
Public Utilities & Environmental Services
City of Hayward
777 B Street
Hayward, CA 94541

Darren Greenwood
Assistant Public Works Director
City of Livermore
Water Resources Division
101 W. Jack London Boulevard
Livermore, CA 94551

Soren Fajeau, P.E.
Senior Civil Engineer
City of Newark
37101 Newark Boulevard
Newark, CA 94560

Lesley Estes
Watershed & Stormwater Management Supervisor
Department of Engineering and Construction
City of Oakland
Public Works Agency
Watershed & Stormwater Program
250 H. Ogawa Plaza
Oakland, CA 94612

Chester G. Nakahara
Director of Public Works
City of Piedmont
120 Vista Avenue
Piedmont, CA 94611

Daniel Smith
Director of Operations
City of Pleasanton
Operation Services Center
333 Busch Road
P.O. Box 520
Pleasanton, CA 94566-0802

Michael Bakaldin
Public Works Services Director
City of San Leandro
835 E 14th Street
San Leandro, CA 94577

Mintz Cheng
Director of Public Works
City of Union City
34009 Alvarado – Niles Road
Union, CA 94587

Contra Costa County Permittees

Laura Hoffmeister
Assistant to the City Manager
City of Clayton
6000 Heritage Trail
Clayton, CA 94517

Danea Gemmell
City Engineer
City of Concord
1950 Parkside Drive MS/52
Concord, CA 94519

Julia B. Bueren
Director, Contra Costa County Public Works Department
Contra Costa County
255 Glacier Drive
Martinez, CA 94553-4825

Steve Lake
Development Services Director/City Engineer
Town of Danville
510 LaGonda Way
Danville, CA 94526

Jerry Bradshaw
Public Works Director
City of El Cerrito
Public Works Department
10890 San Pablo Avenue
El Cerrito, CA 94530

Steve Duran
City Manager
City of Hercules
111 Civic Drive
Hercules, CA 94547

Ron Lefler
Public Works Services Manager
City of Lafayette
3675 Mt Diablo Boulevard, #210
Lafayette, CA 94549

Tim Tucker
City Engineer
City of Martinez
525 Henrietta Street
Martinez, CA 94553

Jill Keimach
Town Manager
Town of Moraga
329 Rheem Boulevard
Moraga, CA 94556

Charles G. Swanson
Director, Public Works and Engineering Services Department
City of Orinda
22 Orinda Way
Orinda, California 94563

Dean Allison
Public Works Director
City of Pinole
2121 Pear Street
Pinole, CA 94564

Jolan Longway
Civil Engineer II
City of Pittsburg
65 Civic Avenue
Pittsburg, CA 94565

June Catalano
City Manager
City of Pleasant Hill
100 Gregory Land
Pleasant Hill, CA 94523

Lynne Scarpa
Environmental Manager
City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Matt Rodriguez
City Manager
City of San Pablo
13831 San Pablo Avenue
San Pablo, CA 94806

Steven Spedowfski
Stormwater Program Manager
City of San Ramon
2401 Crow Canyon Road
San Ramon, CA 94583

Rinta Perkins
Clean Water Program Manager
Public Services Department
Clean Water Program
City of Walnut Creek
1666 N. Main Street
Walnut Creek, CA 94596

San Mateo County Permittees

Steven Tyler
Public Works Superintendent
Certified Arborist
Town of Atherton
91 Ashfield Road
Atherton, CA 94027

Leticia Alvarez
Assist. Public Works Director/City Engineer
City of Belmont
Department of Public Works
One Twin Pines Lane
Suite 385
Belmont, CA 94002

Randy L. Breault, P.E.
Director of Public Works/City Engineer
City of Brisbane
50 Park Place
Brisbane, CA 94005

Syed Murtuza
Director of Public Works
City of Burlingame
1361 N. Carolan Avenue
Burlingame, CA 94010

Brad Donohue
Acting Public Works Director
Town of Colma
1188 El Camino Real
Colma, CA 94014

Cynthia Rover
Manager of Technical Services
City of Daly City
339 90th Street
Daly City, CA 94015

Kamal Fallaha
City Engineer
City of East Palo Alto
1060 Tate Street
East Palo Alto, CA 94303

Norman Dorais
PW Maintenance Manager
City of Foster City
610 Foster City Bl.
Foster City, CA 94404

Mo Sharma
City Engineer
City of Half Moon Bay
501 Main Street
Half Moon Bay, CA 94019

David Bishop
Assistant City Engineer
Town of Hillsborough
1600 Floribunda Avenue
Hillsborough, CA 94010

Matt Oscamou
Engineering Services Manager
City of Menlo Park
701 Laurel Street
Menlo Park, CA 94025

Khee Lim
City Engineer
City of Millbrae
621 Magnolia Avenue
Millbrae, CA 94030

Raymund D. Donguines, PE
Associate Civil Engineer
City of Pacifica
170 Santa Maria Avenue
Pacifica, CA 94044

Howard Young
Director of Public Works
Town of Portola Valley
765 Portola Road
Portola Valley, CA 94028

Marilyn Harang
Acting Public Works Services
City of Redwood City
1017 Middlefield Road
Redwood City, CA 94063

Klara A. Fabry
City of San Bruno
Public Services Director
567 El Camino Real
San Bruno, CA 04066

Klara A. Fabry
Public Services Director
City of San Bruno
567 El Camino Real
San Bruno, Ca 94066

Jeff Maltbie
City Manager
City of San Carlos
600 Elm Street
San Carlos CA 94070

James C. Porter
Director, Department of Public Works
County of San Mateo
400 County Center
Redwood City, CA 94063

Larry A. Patterson, P.E.
Public Works Director
City of San Mateo
330 W. 20th Avenue
San Mateo, CA 94403

Cassandra Prudhel
Technical Services Supervisor
City of South San Francisco
105 Belle Air Road
South San Francisco, CA 94080

Gratien Etchebehere
Community Preservation Officer
Town of Woodside
2955 Woodside Road
Woodside, CA 94062

Santa Clara County Permittees

Bill Helms
Executive Project Manager
Cit of Campbell
70 N. First Street
Campbell, CA 95008

Clenn Goepfert
Assistant Director of Public Works, Engineering
City of Cupertino
10300 Torre Avenue
Cupertino, CA 95014

Richard Chiu, P.E.
Public Works Director
Town of Los Altos Hills
26379 Fremont Road
Los Altos Hills, CA 94022

Larry Lind
Senior Engineer
City of Los Altos
One North San Antonio Road
Los Altos, CA 94022

Todd Capurso
Director of Parks & Public Works
The Town of Los Gatos
110 East Main Street
Los Gatos, CA 95030

Thomas Williams
City Manager
City of Milpitas
455 E. Calaveras Blvd.
Milpitas, CA 95035

Brian Loventhal
City Manager
City of Monte Sereno
18041 Saratoga-Los Gatos Road
Monte Sereno, CA 95030

Jaymae Wentker
Fire Marshall
City of Mountain View
500 Castro Street
Mountain View, CA 94041-2010

Joe Teresi
Senior Engineer
City of Palo Alto
250 Hamilton Avenue
Palo Alto, CA 94301

Napp Fukuda
Acting Deputy Director
Environmental Services
Watershed Protection
City of San José
200 E. Santa Clara Street
San José, CA 95113

Darrell K.H. Wong, P.E.
Senior Civil Engineer
Land Development Engineering
Development Services Office
County of Santa Clara
Department of Planning and Development
County Government Center, East Wing
70 West Hedding Street, 7th Floor
San Jose, CA 95110

Dave Staub
Acting Assistant Director of Street & Automotive Services
City of Santa Clara
1700 Walsh Avenue
Santa Clara, CA 95050

John Cherbone
Director of Public Works
City of Saratoga
13777 Fruitvale Avenue
Saratoga, CA 95070

Adam W. Olivieri, Dr. P.H., P.E.
Program Manager
SCVURPPP
111 West Evelyn Avenue, Suite 110
Sunnyvale, CA 94086

John Stufflebean
Director of Environmental Services
City of Sunnyvale
Environmental Services Department
P.O. Box 3707
Sunnyvale, CA 94088-3707

Solano County Permittees

George R. Hicks
Director of Public Works
City of Fairfield
1000 Webster Street
Fairfield, CA 94533

Daniel A. Kasperson
Building and Public Works Director
City of Suisun City
701 Civic Center Boulevard
Suisun City, CA 94585

Daniel T. Tafolla
Director of Environmental Services
Vallejo Sanitation and Flood Control District
450 Ryder Street
Vallejo, CA 94534

Comments of the American Chemistry Council

"Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s" Technical Memorandum

and

"Trash Load Reduction Tracking Method: Assessing the Progress of San Francisco Bay Area MS4s Towards Stormwater Trash Load Reduction Goals" Technical Report (Version 1.0)

March 20, 2012

The American Chemistry Council's Plastics Division ("ACC") appreciates the opportunity to comment on the Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s ("Baseline Methodology") and Trash Load Reduction Tracking Method ("Tracking Method") submitted by the Bay Area Stormwater Management Agencies Association ("BASMAA") on behalf of the Permittees subject to the San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (Order R2-2009-0074) ("MRP"). BASMAA's Baseline Methodology and Tracking Method are critical documents, because they serve as the foundation of each Permittee's Baseline Trash Load and Short-Term Trash Loading Reduction Plan ("Short-Term Plan") and, in turn, have a significant impact on how scores of communities will proceed to implement the MRP. ACC and its members are essential stakeholders who will be significantly impacted by these programs. Below, we explain why we believe the proposed approaches fundamentally will not reduce trash and improve water quality, and propose alternative considerations and approaches to realize these goals.

ACC represents the leading companies engaged in the business of chemistry.[1] ACC's Plastics Division represents the leading manufacturers of plastic resins -- the raw material used to make consumer and other products of and with plastics. The Plastics Division's Packaging Team leads a variety of recycling initiatives and educational outreach programs, as does the Division's Plastics Foodservice Packaging Group. Central to the work of these groups is educating the public and others about plastic packaging. Among the many benefits: plastic packaging helps protects the integrity and safety of food; prolongs the shelf life of packaged foods; and reduces greenhouse gas emissions, while delivering fuel savings, since it is more lightweight than alternatives.

ACC's Plastics Division actively works to implement environmental protection and sustainability initiatives for the plastics industry. These have included creating partnerships with

[1] ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $674 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

governments and non-governmental organizations to prevent litter, reduce marine debris and increase recycling. In California, ACC has been a strong supporter of AB 258, which was passed in 2007 to control and prevent the release of preproduction plastic pellets. AB 258 built on an existing program created by ACC and the Society of the Plastics Industry called Operation Clean Sweep in order to prevent spilled pellets from making their way into California's waters and the oceans. ACC also supports AB 2449, which also went into effect in 2007. AB 2449 required large grocery stores to take back and recycle plastic grocery bags. ACC is dedicated to campaigning for an anti-litter ethic, which includes education on reducing and preventing litter. To that end, ACC through partnerships has placed over 700 recycling bins on beaches and in other locations that can help reduce trash in waterways. This is one part of a larger program to prevent marine debris that has been undertaken by global partners through the "Declaration for Solutions on Marine Litter."[2]

Introduction

ACC recognizes the need to address trash loads from municipal separate storm sewer systems ("MS4s") to meet water quality objectives and enhance water quality in the San Francisco Bay. Unfortunately, BASMAA's attempt to realize these goals in the Baseline Methodology and the Tracking Method is fundamentally flawed. ACC has five main concerns:

- First, the Baseline Methodology lacks a credible scientific foundation. It relies on two litter surveys (or "trash monitoring and characterization events") that did not follow any established methodology and are rife with demonstrable flaws. As a result, among other things, the surveys overstate the amount of single-use plastic bag and polystyrene foam trash actually contained in the Permittees' trash streams. Because the Baseline Methodology is the starting point for BASMAA's approach, these fundamental errors at the outset impede the success of the entire initiative at later steps.

- Second, both the Baseline Methodology and the Tracking Method arbitrarily allow Permittees to artificially inflate their baseline trash loads and then claim "reductions" that are not attributable to new or enhanced trash reduction measures, in contravention of both the MRP and the Clean Water Act. As a result, the Permittees' actual trash load reductions by 2014 will be smaller than the amounts claimed in their Short-Term Plans. These artificial adjustments make both approaches arbitrary and detached from actual efficacy.

- Third, the unprecedented trash generation reduction "credit" system established by the Tracking Method accounts for actions aimed at reducing trash generation in an arbitrary manner, divorced from actual data, real-world impacts, and efficacy. There is no demonstrable nexus between the percentages assigned to the credited actions and actual trash load reductions. In fact, the data collected by BASMAA's own litter surveys strongly suggest that the credits assigned to some measures greatly overstate their actual contribution to trash load reductions. As a result, the credit program will lead to reductions that exist on paper but not in reality. Sound rulemaking must be based in

[2] *See* http://www.marinedebrissolutions.com/Global

empirical data and rational evidence, not arbitrary policy choices that bear no nexus to sound science.

- Fourth, the credit system unfairly and arbitrarily promotes measures targeting two particular types of trash—single-use plastic bags and polystyrene foam food ware—to the exclusion of other measures and forms of trash that contribute more significantly to water quality issues. It creates incentives for Permittees to enact bans and restrictions on plastic bags and polystyrene foam products—thus passing significant compliance costs onto others—in lieu of installing pollution controls with known and quantifiable efficacy, *i.e.*, controls that actually intercept trash before it is discharged into receiving waters.

- Fifth, the implementation of the Baseline Methodology and the Tracking Method via the Permittees' Short-Term Plans, which rely on those documents, requires analysis under the California Environmental Quality Act ("CEQA"). To our knowledge, none of the Permittees have begun the CEQA process, either individually or collaboratively through BASMAA.

In sum, both the Baseline Methodology and the Tracking Method are demonstrably lacking in scientific rigor. It is wholly improper to base administrative decisions on such fundamentally flawed documents. Because each Permittee's Short-Term Plan relies on the fatally flawed BASMAA reports, the individual plans similarly fail to ensure that the Permittees will achieve the MRP's trash load reduction requirements. The RWQCB's approval of the Short-Term Plans and the underlying Baseline Methodology and Tracking Method thus would violate the Porter-Cologne Water Quality Control Act and the Clean Water Act and would constitute a prejudicial abuse of discretion.

Background

The MRP is a regional National Pollutant Discharge Elimination System ("NPDES") permit regulating stormwater discharges from MS4s in 76 municipalities and flood control agencies in the San Francisco Bay Region.[3] It implements plans, policies and provisions of the Water Quality Control Plan for the San Francisco Bay Basin ("Basin Plan"), the RWQCB's master water quality control planning document, which designates beneficial uses and water quality objectives for waters of the Region and establishes strategies and timetables to achieve those objectives.[4] Under the federal Clean Water Act, NPDES permits must "effectively prohibit non-stormwater discharges into storm sewers" and shall "require controls to reduce the discharge of pollutants to the maximum extent practicable."[5]

The MRP includes discharge prohibitions and receiving water limitations that prohibit, *inter alia*, the discharge of "rubbish, refuse, bark, sawdust, or other solid wastes" to surface waters,[6] and discharges that cause or contribute to a violation of any water quality standard. In

[3] MRP at 4-5.

[4] *Id.* at 6 & App. I-15.

[5] 33 U.S.C. § 1342(p)(3)(B)(ii), (iii).

[6] MRP at 9.

furtherance of those requirements, Section C.10 of the MRP requires the Permittees to eliminate trash loads from their MS4s by 2022. The MRP establishes a phased implementation schedule for the zero-trash mandate, requiring each Permittee to reduce its trash load by 40% by 2014, 70% by 2017, and 100% by 2022.[7]

To ensure that the municipal Permittees meet the "short-term" mandate to reduce their trash loads by 40% by July 1, 2014, the MRP required them to submit certain documentation and plans to the RWQCB by February 1, 2012. *First*, each Permittee was to determine the "baseline trash load" from its MS4. The baseline trash load serves as the level from which each Permittee's 40% trash load reduction will be measured. *Second*, the Permittees were to submit "documentation of the methodology" used to determine their baseline trash loads. *Third*, the Permittees were to submit a "trash load reduction tracking method," describing how they would account for trash load reduction measures and demonstrate progress toward, and attainment of, the permit's trash reduction requirements. *Fourth*, each Permittee was to provide a "short-term trash loading reduction plan" describing its current trash reduction measures, as well as the "additional control measures and best management practices that will be implemented, and/or an increased level of implementation," in order to achieve a 40% trash reduction by July 1, 2014.[8]

The Permittees chose to work collaboratively through BASMAA to comply with the MRP's requirements.[9] On February 1, 2012, on behalf of all the Permittees, BASMAA submitted the Baseline Methodology and Tracking Method to the RWQCB. The municipal Permittees simultaneously submitted individual Short-Term Plans based on BASMAA's findings and methodologies. Each Permittee's Short-Term Plan reports its preliminary baseline trash load using a uniform calculation formula established by the Baseline Methodology,[10] and a trash loading reduction plan based on the menu of options and quantification formulae established by the Tracking Method.[11] Thus, BASMAA's Baseline Methodology and Tracking Method serve as the foundation for each Permittee's plan to meet the MRP's 40% reduction requirement. Accordingly, given that ACC's fundamental concerns with the BASMAA Baseline Methodology and Tracking Method extend to the individual Permittees' proposals, ACC is simultaneously submitting these comments to the RWQCB and the individual Permittees.

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[7] *Id*. at 92.

[8] *Id*. (provisions C.10.a.i. & ii.)

[9] Baseline Methodology at 1; Tracking Method at 1; *see generally* The Mission of BASMAA, *available at* http://basmaa.org.dnnmax.com/AboutBASMAA.aspx (last visited March 6, 2012).

[10] Each Permittee estimates its preliminary annual trash baseline loads in Table 2-3 of its plan based on estimated land use category effective loading calculations (Table 2-2) and offsets for street sweeping activities, storm drain inlet maintenance and stormwater pump station maintenance developed by BASMAA (incorporated into Table 2-3 of each plan).

[11] Section 4.0 of each plan describes the credit reduction measures and quantification formulae developed by BASMAA that each Permittee will implement. Table 5-1 of each plan calculates the reduction credits and reduced trash load that will purportedly result from implementing these practices in order to claim that each Permittee will meet the MRP's 40% trash load reduction.

The RWQCB Must Review and Act Upon the BASMAA Documents and the Permitees' Short-Term Plans

NPDES permitting authorities may only issue permits which "*ensure* that every discharge of pollutants will comply with all applicable effluent limitations and standards."[12] This includes instances where permittees must provide management plans demonstrating how they will comply with NPDES permit terms.[13] Here, the MRP mandates that the Permittees submit management plans showing how they will meet the trash load reductions required by provision C.10.[14] Thus, the RWQCB is *required* to (1) review the individual Permittees' Short-Term Plans as well as the BASMAA Baseline Methodology and Tracking Method; (2) accept or reject those documents; and (3) once final documents are approved, incorporate them into the MRP as binding and enforceable permit terms.[15] The failure to do so "creates an impermissible self-regulatory system" and will not "ensure that the measures that any given operator of a [MS4] has decided to undertake will *in fact* reduce discharges…".[16] Without the requisite review and approval by the RWQCB, none of the Permittees' plans would be legally effective and each Permittee would be in violation of the MRP.

In accordance with the foregoing legal requirements, the RWQCB should reject the Baseline Methodology, the Tracking Method, and each of the Permittees' Short-Term Plans. The RWQCB's action, or failure to act, may be reviewed by the State Water Resources Control Board ("SWRCB") upon the filing of a petition for review.[17] The SWRCB's decision or order on such a petition, or the RWQCB's decision should the SWRCB deny the petition, is subject to review in Superior Court by a petition for writ of mandate.[18]

The Superior Court "shall exercise its independent judgment on the evidence" considered by the Board,[19] and it will review the Board's decision for a "prejudicial abuse of discretion."[20] Abuse of discretion is established if the agency has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by substantial evidence.[21] The court will not uphold administrative findings that are "so lacking in

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[12] *Waterkeeper Alliance, Inc. v. USEPA*, 399 F.3d 486, 498 (2d Cir. 2005).

[13] *Id.* at 498-502; *Envt'l Def. Ctr., Inc. v. EPA*, 344 F.3d 832, 854-56 (9th Cir. 2003).

[14] MRP at C.10.a.i, ii.

[15] *See Waterkeeper Alliance*, 399 F.3d at 498-502 (requiring permitting agencies to review Concentrated Animal Feeding Operation nutrient management plans required under the permit, accept or reject them and incorporate them into the NPDES permit); *Envt'l Def. Ctr.*, 334 F.3d at 854-56 (permitting agencies must review and approve of individual stormwater pollution control programs under the small MS4 general permit to ensure compliance with general permit terms).

[16] *Envt'l Def. Ctr.*, 334 F.3d at 854, 856.

[17] Cal. Water Code § 13320(a) (providing for petitions for SWQCB review of Regional Board decisions including, *inter alia*, NPDES permit decisions under § 13370 *et seq*.).

[18] *Id*. § 13330(a), (b).

[19] *Id*. § 13330(e).

[20] *Id*. (providing that Code of Civil Procedure § 1094.5 shall govern Superior Court review of NPDES permit orders and decisions by State and Regional Boards): Cal. Code of Civil Proc. § 1094.5(b).

[21] *Id.*; *McCallister v. Cal. Coastal Comm'n*, 169 Cal. App. 4th 912, 921 (2008).

evidentiary support as to render them unreasonable," and it will not uphold findings "based on evidence which is inherently improbable … or … based upon evidence which is irrelevant to the issues."[22]

ACC urges the RWQCB reject the Permittees' plans and the underlying BASMAA documents on which they are based. BASMAA's Baseline Methodology and Tracking Method have no scientific or factual bases, include numerous errors and unfounded assumptions, and fail to ensure that the Permittees will comply with the trash load reduction requirements in the MRP. Approval of the Permittees' plans, and the BASMAA documents, would be a clear and prejudicial abuse of discretion.

I. BASMAA's Baseline Methodology is Fundamentally Flawed

The Baseline Methodology has two fundamental flaws. *First*, the methodology is arbitrary, lacks scientific basis or factual support in the developed record and leads to inaccurate trash loading baselines. *Second*, it allows Permittees to realize *credit* toward reducing their trash loads without *actually* reducing their trash loads but instead by adopting arbitrary methodologies that reflect policy decisions, not sound science or empirical data. The RWQCB should reject the Permittees' plans for relying upon BASMAA's Baseline Methodology because they would not actually achieve the 40% trash load reduction from their true baseline trash loading levels, as required by the MRP.

A. The Baseline Methodology Is Not Based on Sound Science and Not Supported by the Developed Record

1. The Baseline Methodology Lacks a Scientific Basis

BASMAA's Baseline Methodology is entirely novel and bears no indicia of reliability. It has not been used for trash loading calculations elsewhere, has not been subjected to any form of scientific scrutiny, and has not been tested under real-world conditions. Its effectiveness in accurately calculating a baseline for MS4 trash discharges is wholly unknown and should not be accepted by the RWQCB without additional study and independent verification. The absence of any type of confirmatory analysis is especially important given that each component of the trash loading equation is subjective in nature and difficult, if not impossible, to credibly quantify. For example, the two trash "monitoring and characterization events" (or "litter surveys") commissioned by BASMAA, which purport to provide the underlying data supporting the Baseline Methodology, have numerous significant flaws. This makes the Baseline Methodology unreliable; the RWQCB must reject it.

2. BASMAA's Litter Surveys Did Not Follow an Established Methodology

BASMAA's two litter surveys, which serve as the foundation for the Baseline Methodology, are not based on any established methodology. BASMAA fails to explain a

[22] *Jaramillo v. State Bd. for Geologists & Geophysicists*, 136 Cal. App. 4th 880, 888 (2006) (quoting *Hongsathavij v. Queen of Angels/Hollywood Presbyterian Med. Ctr.*, 62 Cal. App. 4th 1123, 1137 (1998)).

number of methodological problems that could have substantially skewed or invalidated the survey results.[23] The survey methodology was invented by BASMAA, yet there is no record evidence that anyone involved in developing the methodology had any prior experience in creating or performing these types of surveys. BASMAA's surveys and analysis of the data have never been subject to any outside scientific scrutiny or validated in any way. There is no way of knowing whether the survey results are accurate or reproducible under prevailing scientific standards.

Trash surveys are not novel. Established methodologies exist and some consultants have extensive experience in performing them. The City of San Francisco performed similar trash audits in 2007 and 2008. Both studies were conducted by experienced outside consultants that performed fourteen previous litter surveys and reviewed more than thirty others.[24] As the City's experienced consultants explained, litter "[m]easurement techniques need to be unbiased, scientifically rigorous, and reproducible to be defensible."[25] Accordingly, the City's consultants employed a widely used methodology developed by the Florida Center for Solid and Hazardous Waste Management.[26] BASMAA did not even acknowledge this proven and widely employed methodology. Instead, it arbitrarily ignored the established methodology used by experienced professionals.

The consultants who authored the San Francisco audits warned against creating new survey methodologies, as BASMAA did. They noted that "some local environmental groups have done litter audits of their own design. These methodologies may not be scientific in their development and they often tended to not be reproducible."[27] The BASMAA surveys meet this description. They were arbitrarily created, lack a scientific basis, and have never been validated. If the RWQCB approves the Permittees' plans, and by incorporation, BASMAA's Baseline Methodology, then RWQCB bears "the burden of demonstrating by a preponderance of the evidence that" the methodology used was "correct."[28] BASMAA has provided no record evidence to show that it used a "correct" methodology or that its own, invented methodology is scientifically sound and defensible. RWQCB must reject it.

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[23] BASMAA's "Sampling and Analysis Plan" is not online and has not been made available for public review. Therefore, whatever explanation BASMAA may have provided for its methodology is not part of the public record and may not be relied upon by the RWQCB in making its decision. *See Architectural Heritage v. Monterey Cnty.*, 19 Cal. Rptr. 3d 469, 481-82 (2004) (agency decision-making is limited to the administrative record and consideration of extra-record evidence is generally prohibited).

[24] HDR, The City of San Francisco Streets Litter Audit 2007, prepared for the City of San Francisco, San Francisco Environment Department (May 18, 2007) ("2007 Audit") at 8.

[25] *Id.* at 9.

[26] *Id.* at 8.

[27] *Id.* at 9

[28] *County of Kern v. State Dep't of Health Care Servs.*, 180 Cal. App. 4th 1504, 1514 (2009).

3. The Use of "Uncompressed Gallons" to Measure Trash Is Not Representative and Skews the Volume of Trash Unfairly

BASMAA's use of uncompressed gallons to measure volume in its litter surveys was flawed because this method is not representative of actual trash discharges. ACC retained a national expert, Steven Stein of Environmental Resources Planning, LLC ("ER Planning"), to study BASMAA's work. ER Planning's report is included with these comments and incorporated herein.[29] ER Planning explains that "litter surveys should always include a count of items" and that the use of uncompressed gallons skewed the survey results in order to overstate the amount of single-use plastic bag and polystyrene foam trash actually recovered.[30] Measurement of uncompressed gallons involves large error rates, especially for items such as plastic bags and polystyrene foam.[31] The failure to compress trash is "not scientifically sound" and "likely overstated" the amount of plastic bag and polystyrene foam trash by as much as *900%*.[32] This overstatement is corroborated by the San Francisco litter audits, which found that plastic bag and polystyrene foam trash comprised a much lower percentage of trash surveyed.[33] Established litter survey methodologies record a count of trash items recovered;[34] however, BASMAA failed to do so here. And, weight is also valuable in calculating trash loading.[35]

BASMAA offered no explanation for its failure to compress trash or conduct a count of items collected in its litter surveys. If, for example, it assumed that non-compressed trash is more likely to float than compressed trash, that assumption is not explained, supported, or documented in the record. In any event, the Basin Plan's water quality objectives proscribe more than just "floating material" in surface waters; they also provide that waters shall not contain settleable or suspended materials.[36]

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[29] *See* Technical Assessment of BASMAA 2012 Documents, conducted for American Chemistry Council by Environmental Resources Planning, LLC (March 2012) (attached) ("Technical Assessment"). ER Planning is a leading firm in field of litter-related studies. Mr. Stein has directed litter surveys across the country that have covered more than 15.5 million square feet of roadways and recreational areas. *See* Technical Assessment, Appx. A (Mr. Stein's CV).

[30] *See* Technical Assessment at 4.

[31] *Id.* at 4-5.

[32] *Id*. As ER Planning reports: "The characterization methodology BASMAA describes involved placing trash in buckets measured by fullness, but it appears that the materials collected were not compacted. This means the volume measured would have included a significant amount of air space that would cause the volumes and percentages of light materials such as polystyrene foam food ware items and retail plastic bags to be overstated considerably." *Id.* at 4.

[33] *See* 2007 Audit at 33-34 (plastic bags approximately 2.5% of trash and polystyrene foam 0.5%); HDR, The City of San Francisco Streets Litter Re-Audit 2008, prepared for the City of San Francisco, San Francisco Environment Department (July 4, 2008) ("2008 Audit") at 35-36 (plastic bags approximately 4% of trash and polystyrene foam 0.5%).

[34] Technical Assessment at 4.

[35] *Id.* at 5.

[36] *See* San Francisco Bay Region (Region 2) Water Quality Control Plan at Ch. 3 (Water Quality Objectives 3.3.6, 3.3.13, & 3.3.14); *see also* Technical Assessment at 12.

In evaluating agency decisions, "the phrases 'arbitrary and irrational' or 'capricious' are often shorthand expressions for a standard of review that asks whether there are sufficient facts in the record to support the agency's action…".[37] Here, BASMAA provided no record evidence demonstrating why it chose to use uncompressed gallons as a volume of measurement, and it seemed entirely unaware of the large error rate involved in doing so. Therefore, BASMAA's deviation from established scientific methodologies, without any record justification whatsoever, was arbitrary and irrational.

4. Survey Site Selection Was Arbitrary and Unsupported

BASMAA's site selection decisions for various land use categories were arbitrary, unsupported by any record evidence and never explained. As a result of its flawed methodology, BASMAA dramatically over-sampled, either intentionally or through error, a disproportionate number of "Retail and Wholesale" land use sites. Of 138 total site surveys, 52 sites were categorized as "Retail and Wholesale" sites, where plastic bag and polystyrene foam trash generation would arguably be more prevalent.[38] Thus, the "Retail and Wholesale" land use category accounted for roughly 38% of all sites surveyed. By comparison, Retail and Wholesale sites comprise only *5%* of the land use in the Permittees' jurisdictions. Under a proper methodology, sites would not be selected to bear such a disproportionate representation of reality—here a 33 percent delta between the assumptions in the methodology (38% of sites surveyed) and the actual concentration of such sites in the survey area (5%). Instead, sites should have been selected randomly[39] or selected to be representative of the Permittees' land use. This is essential to avoid bias and skewed survey results; without representative selection, BASMAA's conclusions regarding the relative prevalence of various types of litter in the Permitttees' trash streams lack foundation. BASMAA, however, provided no rationale for why it selected the sites it did and took no steps to avoid sample selection bias. This lack of scientific integrity and arbitrary failure to explain the reasoning behind its decision-making impels the RWQCB to reject the Baseline Methodology.

5. The Two Survey Events Included Arbitrarily Selected Accumulation Periods and Were Not Shown to Have Been Conducted Under Representative Conditions

The accumulation periods were likewise arbitrarily selected, and not based on a scientific methodology that was ever explained or disclosed. The accumulation periods are the number of days that BASMAA staff allowed trash to collect in its capture devices in order to estimate trash volume. These accumulation periods varied wildly from "between 66 to 257 days" in BASMAA's first survey[40] and from "36 to 355 days" for its second survey.[41] There are two significant flaws here. *First*, BASMAA never explained why it chose to allow trash to accumulate for any particular number of days at any particular site. Trash accumulated for about

[37] *Galland v. City of Clovis*, 24 Cal. 4th 1003, 1033 (2001).

[38] Baseline Methodology at 13.

[39] 2007 Audit at 11.

[40] Baseline Methodology at 8.

[41] *Id.*

one *month* at some sites and one *year* at others. Therefore, BASMAA's survey methods were arbitrary, as there appears to be no rational basis for the different accumulation periods.[42] *Second*, despite attesting that the accumulation periods for each site would be listed in Appendix C to the Baseline Methodology, these data were not actually included.[43] Given the numerous flaws and biases evident in the survey methodology, withholding such data from public scrutiny further undercuts any possible claims of scientific reliability.

In addition, the fact that BASMAA relied on only two monitoring and characterization events to form its conclusions regarding trash volume raises questions as to whether the results are statistically significant or reproducible. BASMAA explains that it timed its two monitoring events (with their attendant widely-divergent site accumulation periods) such that the first event would depict the wet weather season, and the second event would depict the dry weather season.[44] There is no way to know from the report whether the weather conditions during just those two events are in fact representative of "normal" or "average" years, or whether they are outliers. BASMAA even acknowledges that "two unseasonable storms" occurred during its dry weather monitoring events, which "resulted in rainfall at all sites installed prior to June 2011."[45] Without any assurance that the litter surveys resulted in representative, reproducible results, they do not provide a rational basis for rulemaking.

6. An Extreme Outlier Significantly Skewed the Litter Surveys' Results

Out of 216 sites surveyed, a single site, R101 (Richmond), accounted for 10% of all plastic bags and 10.6% of all polystyrene foam trash recovered by the surveys. By comparison, BASMAA found zero plastic bags at 57% of all sites and no polystyrene foam trash at 50% of all sites. By calculating the *mean* value for plastic bags and polystyrene trash, instead of the *median*, the data for site R101 dramatically skewed the surveys' overall results.[46] BASMAA should have removed R101 from the data set, or at the very least, explained why R101 was considered and how the data would be treated to avoid the dramatic skew. Its failure to do so was arbitrary, irrational and inconsistent with prevailing scientific standards.

B. Land Use Category Trash Generation Rates Were Arbitrarily Altered for "Effective" Street Sweeping and Parking Enforcement Without Any Rationale or Credible Scientific Basis

Cumulating the errors in the Baseline Methodology, BASMAA significantly altered land use category trash generation rates based on "effective street sweeping," but failed to provide any credible scientific basis for doing so. BASMAA factored in a street sweeping "effectiveness

[42] Technical Assessment at 6.

[43] Baseline Methodology at 7.

[44] *Id*. at 8.

[45] *Id*.

[46] Technical Assessment at 7-8, 26-29.

curve" that was "adapted" from a 2001 study.[47] The study, however, created this "effectiveness curve" without any underlying data. It was a purely theoretical exercise that "assume[d] that it is relatively easy to pick up" large trash and was based on an observation that street sweeping "two to three times daily in the commercial business district of Cape Town, South Africa *appears* to remove as much as 99% of the total litter load from the streets…."[48] Nowhere does the study's author assert that the "effectiveness curve" was based on any actual quantification or study of street sweeping effectiveness. No monitoring, study or data set is ever referenced by the author. BASMAA adopted the study's "effectiveness curve" without any explanation, analysis or discussion of caveats. It is not enough that BASMAA cited a study without discussion or analysis to the methods and conditions applicable to the Permittees; "the record citations offered by" BASMAA "must back up the claim" it is making.[49] Here, the 2001 study cannot support BASMAA's reliance on the street sweeping "effectiveness curve." Therefore, reliance upon that study is arbitrary, irrational and unsupported by any record evidence.

BASMAA further adjusted this "effectiveness curve" upward for "effective" parking enforcement,[50] based on the assumption that a street sweeping program is more effective if the sweeper is able to reach the curb.[51] Even assuming the 2001 study relied upon by BASMAA could be considered reliable, it never mentioned considerations of parking enforcement. How BASMAA translated its criteria for effective parking enforcement[52] into specific quantifiable decreases in trash loading is never explained. BASMAA never referenced any monitoring results, study or data set attempting to measure the effectiveness with and without the use of its selected parking enforcement measures. Its adjustments for "effective" parking enforcement are arbitrary, irrational and unsupported by any record evidence.

C. The Baseline Methodology Allows Permittees to Artificially Manipulate Actual Baseline Trash Loads and Trash Load Reductions

BASMAA's Baseline Methodology unlawfully adjusts the Permittees' baseline trash loads to allow for control measures *currently* being implemented to be counted as *future* reductions that count towards the MRP's 40% trash load reduction requirements. This is accomplished by allowing Permittees to use "baseline ceilings" when adjusting their trash load generation baselines for street sweeping. These "baseline ceilings" artificially inflate Permittee baselines and then allow Permittees to claim trash reductions without *actually* reducing their trash loads.

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[47] Baseline Methodology at 12 (citing Armitage, N., The Removal of Urban Litter from Stormwater Drainage Systems., Ch 19 in Stormwater Collection Systems Design Handbook. L.W. Mays, Ed., McGraw-Hill Companies, Inc., ISBN 0-07-1354471-9, New York, USA, 2001, 35 pp.).

[48] Armitage, N. (2001) at 8 (emphasis added).

[49] *Endangered Habits League v. County*, 32 Cal. Rptr. 3d 177, 183 (2005).

[50] Baseline Methodology at 12.

[51] *Id*. at 17.

[52] *See id.* at 7 for these criteria.

1. The "Baseline Ceilings" Unlawfully Manipulate Permittee Baselines

BASMAA's use of "baseline ceilings" inflates and misrepresents Permittee baselines. In determining their trash load generation baselines, Permittees must account for control measures currently being implemented, such as street sweeping. However, instead of deducting the amount of trash *actually* being reduced by current street sweeping programs, the Baseline Methodology instructs some Permittees to use a baseline frequency "ceiling" in measuring their baseline reductions. The "baseline street sweeping ceiling" is defined as once per week for retail land uses and twice per month for all other land uses.[53] This rate is purportedly the "average frequency currently implemented by Permittees."[54] Permittees that were already street sweeping more frequently than the "baseline ceiling" prior to the effective date of the MRP, and therefore already generating less trash than the "baseline ceiling" assumes, nonetheless do not account for the a current trash load reductions associated with their "existing enhanced" street sweeping in their baseline calculations.[55] This means that Permittees currently street sweeping more frequently than the "baseline ceiling" will have an artificially high trash load generation baseline.

The MRP requires Permittees to calculate their baseline trash loads. It does not allow for the type of arbitrary manipulation used in the Baseline Methodology. Artificially inflating some Permittees "baselines" correlates to an artificial reduction in the amount of trash loading that those Permittees will be required to achieve by 2014. Therefore, the use of these "baseline ceilings" violates the MRP. It also contravenes the Clean Water Act's requirement that NPDES permit controls reduce the discharge of pollutants to the "maximum extent practicable."[56]

2. The "Baseline Ceilings" Unlawfully Allow for Trash Reduction Credit in the Absence of Actual Trash Load Reductions

The artificially inflated trash load baselines created by the "baseline ceilings" allow Permittees to claim credit for future trash reductions that will not actually occur. Once a Permittee establishes its baseline, it must then reduce its trash load by 40% by 2014, in accordance with the MRP. Where the street sweeping "baseline ceiling" artificially inflates a Permittee's baseline, that Permittee would then be able to claim that it reduced trash loads based on an "enhanced" street sweeping program implemented *before* the baseline was set, not after. This allows the Permittee to claim that it reduced its trash load, when compared to its baseline,

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[53] *Id.* at 17.

[54] *Id.* BASMAA did not produce any data to support this street sweeping baseline ceiling. This absence of verifiable data is especially important given BASMAA's reliance upon data based not on empirical evidence, but on informal, undocumented conversations with unnamed persons. *See* Baseline Methodology at 6 (establishing street sweeping frequency and parking enforcement data, in part, through "municipal staff queries" and "municipality websites"); *id.* at 4 (land use classification errors were corrected, in part, through "Permittee staff knowledge of the sites"); *id.* at 8 (drain inlet cleanout dates provided by "municipal staff, or third party contractors responsible for cleaning the devices."); *id.* at 18 (drain inlet maintenance frequency based, in part, on "queries of Permittee staff").

[55] BASMAA uses the same "baseline ceiling" scheme for Permittees conducting storm drain inlet cleaning more than an "average" frequency. *Id.* at 18. Although we are referring to the street sweeping "baseline ceiling" here for illustrative purposes, all of the same defects apply to the "baseline ceiling" used for storm drain inlet cleaning.

[56] 33 U.S.C. § 1342(p)(3)(B)(ii), (iii).

without undertaking any new control measures or actually reducing its trash load. It would be a reduction on paper only.

The City of Alameda's Short-Term Plan provides an example. Alameda *currently* performs street sweeping significantly more often than BASMAA's "baseline frequency ceiling" of once per week for retail land uses and twice per month for all other land uses. "The City's current street sweeping program actually includes sweeping most streets in residential areas once per week, and sweeping in the two retail districts on a daily (i.e., Monday-Friday) basis…."[57] Yet, in calculating its baseline trash load, Alameda determined that it removes 6,304 gallons/year of trash based on street sweeping, using BASMAA's "baseline street sweeping frequency ceiling."

Table 2-3: City of Alameda annual trash baseline load.[58]

Category	Annual Load (gallons)
Preliminary Generation Trash Load	15,769
Load Removed via Baseline Street Sweeping	6,304
Load Removed via Baseline Storm Drain Inlet Maintenance	473
Load Removed via Baseline Stormwater Pump Station Maintenance	119
Trash Baseline Load	**8,873**

Yet, because Alameda is *currently* street sweeping at a higher rate than the baseline ceiling, it is *currently* reducing *more* than 6,304 gallons per year through street sweeping. Once Alameda's baseline and plan are approved, it will immediately receive an "enhanced" street sweeping trash load reduction credit of 1,051 gallons per year, equating to an 11.8% reduction from its baseline.[59]

Table 5-1. City of Alameda Trash Load Reduction Summary Table.

Trash Control Measure	Summary Description of Control Measure	% Reduction (Credits)	Trash Load Reduced (gallons)	Cumulative % Reduction (Compared to Baseline)
Existing Enhanced Street Sweeping	Street Sweeping activities currently implemented above Baseline Ceiling	**11.8%**	**1,051**	**11.8%**

However, as the City of Alameda states, this is for street sweeping activities "currently implemented."[60] In other words, the City of Alameda will achieve more than a quarter of its required 40% trash load reduction without implementing any new control measures or actually reducing its trash load.

[57] City of Alameda Baseline Trash Load and Short-Term Trash Load Reduction Plan (Feb. 1, 2012) ("Alameda Plan") at 7.

[58] Alameda Plan at 8.

[59] *Id.* at 32.

[60] *Id.*

This approach violates the MRP in at least two ways. First, the MRP requires Permittees to *implement* "*additional* control measures and best management practices … and/or an *increased* level of implementation designed to attain a 40% trash load *reduction* from its MS4 by July 1, 2014."[61] Recognizing reductions on paper that merely acknowledge existing practices and do not involve actual reductions of trash or implementation of new control measures violates the MRP. Second, BASMAA's justification for artificially inflating the baselines of some Permittees is unlawful under the MRP. It claims that the "baseline ceilings" are necessary to avoid "penaliz[ing] implementers of effective street sweeping programs prior to the effective date of the MRP…."[62] Yet, the MRP does not provide any special concessions for those already engaged in such activities. Every Permittee must reduce trash discharges from its baseline by 40%, regardless of what control measures they implemented before the baselines are set. This type of manipulation is arbitrary and unlawful under the MRP.

D. Because the Baseline Methodology Is Not Final, the RWQCB Should Provide a Further Public Comment Period When BASMAA Submits Its Final Technical Report

BASMAA's Baseline Methodology is essentially a draft and still a work in progress. BASMAA states that it will supersede the Baseline Methodology with a technical report that "more fully describes methods and includes all results from all data collected during the project."[63] BASMAA anticipates submitting this final technical report to RWQCB by September 15, 2012,[64] approximately 7½ months after the MRP's deadline for a Baseline Trash Load determination.[65] The failure of the Permittees to provide a complete baseline determination methodology means that they have failed to meet the February 1, 2012 deadline and are in violation of the MRP. Even more importantly, given BASMAA's intention to submit a superseding technical report, absent further public comment, the public would not have had the opportunity to address fully the BASMAA analyses. Accordingly, the technical report also must be subject to public notice and comment, as must be any individual Permittee's Short-Term Plan that is revised based on BASMAA's future technical report. In the interim, BASMAA should not implement a process that is only in draft form, will be superseded, and will have a significant and irreparable burden if implemented.

BASMAA itself recognizes significant uncertainties in the development of its trash generation rates and considers them to be "preliminary" in nature.[66] Thus, even BASMAA admits that its Baseline Methodology lacks the credible scientific foundation necessary to support a finding that Permittees who use this methodology can comply with the MRP's trash load reduction terms.

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[61] MRP at C.10.a.i. (emphases added).

[62] Baseline Methodology at 17.

[63] *Id*. at 2.

[64] *Id.*

[65] MRP at C.10.a.i., page 92.

[66] Baseline Methodology at 4 ("generation rates presented in this Technical Memorandum should be considered preliminary first order estimates that have a moderate level of confidence.").

II. BASMAA's Tracking Method is Fundamentally Flawed and Not Based on Sound Science

BASMAA's Tracking Method similarly lacks a scientific underpinning and cannot be shown to reduce trash discharges by any objectively demonstrable amount, as required by the MRP. In particular, the trash load reduction "credit" system described in Step 2 of the Tracking Method fundamentally does not comply with the MRP's discharge reduction requirements and must be rejected. The credit system has three fatal flaws. *First*, the percentage credits assigned to various trash generation reduction measures are wholly arbitrary and unsupported by factual data in the record. *Second*, the particular reduction credits awarded for ordinances that would ban or restrict single-use plastic bags and polystyrene containers overstate the actual trash reductions that would be achieved by those measures. *Third*, the plastic bag and polystyrene-related credits do not account for the nature and volume of litter from materials that would replace those materials.

In addition to the unreliable credit system, the Tracking Method, like the Baseline Methodology, improperly allows Permittees to consider trash load reductions attributable to control measures implemented before the effective date of the MRP as counting toward their required 40% reductions. In sum, the Tracking Method arbitrarily creates incentives for Permittees to enact bans and restrictions on plastic bags and polystyrene foam products in lieu of installing control technologies and other methods whose contributions to trash reduction are proven and quantifiable. The RWQCB must reject the Tracking Method.

A. The Percentage Credits Assigned to Specific Trash Generation Reduction Measures Are Arbitrary and Lack a Credible Scientific Basis

The trash generation reduction credit system should be rejected outright because it allows Permittees to assume specific percentage reductions in their trash loads, in amounts that are utterly lacking in *any* scientific or factual underpinning. The control methods to which credits are assigned are, according to BASMAA, measures whose efficacy is unknown and/or impossible to quantify.[67] There is no question that the percentage "credits" assigned to BASMAA's favored control measures are *wholly arbitrary*. BASMAA apparently based the assigned percentages "on discussions among BASMAA Trash Committee members."[68] Such undocumented discussions, along with BASMAA's and "discussions with Permittees, Water Board staff and participating NGOs" that are not documented in the record,[69] are inadequate to support the assigned percentage credits.

Further, the credit system violates the Clean Water Act, which requires that "permits *ensure* that every discharge of pollutants will comply with all applicable effluent limitations and standards."[70] BASMAA's unquantifiable, unverifiable credit reduction system is exactly the

[67] *Id*. at 10 (trash reduction credits were developed for control measures "that were deemed as infeasible or impractical to quantify at this time").

[68] *Id.* at 4.

[69] *Id*. at 4, 10.

[70] *Waterkeeper Alliance*, 399 F.3d at 489.

type of "paper tiger" regulatory program that the U.S. Court of Appeals for the Ninth Circuit rejected previously in the *Environmental Defense Center* litigation.[71] There, EPA designed a regulatory program for California small MS4s requiring that operators create and adhere to individualized best management plans to reduce stormwater discharges.[72] However, the program failed to require the permitting authority to review and confirm that these plans "will *in fact* reduce discharges…."[73] BASMAA concedes that its credit system is used *because* "effectiveness data [is] lacking" and "load reductions are difficult to quantify."[74] Thus, in addition to being completely arbitrary and unsupported by any record evidence, the percentage credits established by BASMAA also fail to provide the RWQCB with the information it requires to ensure that the Permittees are in fact complying with the MRP's trash load reduction standard. A Permittee could easily satisfy its entire 40% reduction requirement by relying completely on measures for which it is awarded arbitrary, inflated reduction "credits" that bear no discernable relation to reality.

ACC is unaware of any jurisdiction in the country that has imposed this type of "credit" system to comply with NPDES stormwater permit requirements. Moreover, there are alternatives—including controls and other measures—that have been shown to be effective ways to reduce trash discharges. Hence, allowing Permittees to claim compliance by enacting measures based on arbitrary credits whose actual contribution to discharge reductions are, by definition, incalculable, is the epitome of arbitrary decision making. Approving BASMAA's credit scheme would be arbitrary and an abuse of discretion.

B. The Reduction Credits Assigned to Ordinances Targeting Single-Use Plastic Bags and Polystyrene Foam Service Ware Are Arbitrary and Contradicted by BASMAA's Own Data

The Tracking Method's credit system arbitrarily preferences the enactment of ordinances that would ban or significantly reduce the use of single-use plastic carryout bags and polystyrene foam food service ware, without any empirical data showing that such ordinances would more effectively reduce pollutant discharges than measures directed at other forms of litter. BASMAA does not present reliable or adequate factual and scientific support for singling out these two particular types of trash in its credit system.

First, BASMAA's 2011 "literature review," which it cites as basis for the Tracking Method,[75] provides no basis whatsoever for the credits assigned to plastic bag or polystyrene foam bans. Chapter 5 of that document discusses "Product Bans," but reviews measures directed at only two products: polystyrene foam and single-use plastic bags—apparently because these products are, according to BASMAA, "the two most common products banned worldwide."[76]

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[71] *Envt'l Def. Ctr.*, 344 F.3d at 854.

[72] *Id.* at 842.

[73] *Id.* at 855.

[74] Tracking Method at 4.

[75] *See, e.g.*, *id*. at 3, citing BASMAA, "Trash Load Reduction Tracking Method: Technical Memorandum #1—Literature Review" (May 2, 2011) ("Literature Review").

[76] Literature Review at 34.

But nothing in that document indicates that these materials are a more significant contributor to litter than other forms of trash. Notably, BASMAA recommended in the conclusion of its literature review that product bans should be among the trash control measures for which "quantification formulas" are developed[77]—but it abandoned that idea in the Tracking Method. It also conceded that it is not possible to make even preliminary quantification estimates based on existing data and control measure effectiveness values collected in the literature review.[78]

The only other conceivable basis for the specific reduction credits assigned to material bans would be the litter surveys conducted by BASMAA in the development of the Baseline Methodology. Yet, as outlined above, the surveys themselves are fundamentally flawed, not supported by the record, and not based on an accepted scientific method for conducting litter surveys. If the foundation for the credits are unreliable, so too are the credit reductions themselves. As ER Planning explains in its report, as a result of one "apparent flaw in BASMAA's methodology"—the use of uncompressed gallons—"the basis for awarding load reduction credits for plastic bags … and polystyrene foam food service ware … would also be flawed and should be replaced with credits more likely to correlate with significant reductions in litter. Reductions in overstated levels of plastic bags and polystyrene foam food service products would be unlikely to occur at the levels that BASMAA indicates."[79] As discussed above, that is only one of the several fundamental flaws with the surveys.

Even if BASMAA's surveys were reliable, single-use plastic bags and polystyrene foam food service ware did not constitute a significant amount of trash recovered in those surveys. Instead, single-use plastic bags and polystyrene foam food ware were the *smallest* two categories of trash recovered in the surveys.[80] Indeed, BASMAA's data demonstrate that the trash load reduction credits assigned to ordinances involving bans of these materials bear no discernable connection to the actual trash discharge reductions that might be associated with those measures. BASMAA actually concluded that the contribution percentages of these materials to the total amount of trash recovered in its litter surveys are *lower* than the credits assigned to them in the Tracking Method.[81]

Finally, a detailed examination of the results from the sites surveyed in BASMAA's litter surveys shows that some of the sites where the *highest* amounts of plastic bag and polystyrene foam food ware were collected *already had bans of those materials in place at the time the surveys were conducted*.[82] For both types of materials, three of the six sites with the highest rates of that form of litter had already banned the material.[83] This is compelling evidence that there is *no* relationship between high litter rates of plastic bags and polystyrene foam and

[77] *Id*. at 86.

[78] Tracking Method at 4.

[79] Technical Assessment at 5.

[80] *See* Baseline Methodology at 11, Figure 3.1.

[81] *Compare* Baseline Methodology at 10 (reporting percentages of types of trash collected during each survey) *with* Tracking Method at 11-15 (assigning reduction credits for various types of plastic-bag and polystyrene-foam bans).

[82] Technical Assessment at 29-30.

[83] *Id*.

ordinances banning these materials. BASMAA's pursuit of a system that would credit such ordinances despite evidence that clearly demonstrates their lack of efficacy is the epitome of arbitrary and unreasonable decision-making.

C. The Tracking Method Fails to Account for Switching of Single-Use Bags and Polystyrene Containers to Alternate Forms of Trash

The tiered percentage credits assigned to plastic bag ordinances suffer from a separate flaw in that they fail to account for the fact that single-use paper bags would substantially replace single-use plastic bags when such ordinances are passed. Paper bags become trash, too, even if establishments charge customers a fee for them, as in Tier 4. Therefore, a certain portion of single-use plastic bag trash would simply be replaced by single-use paper bag trash and the Permittee imposing a plastic bag ban would not realize such a substantial trash load reduction. Indeed, courts have already agreed that banning single-use plastic bags leads to increases in paper bag trash.[84]

BASMAA also failed to consider the materials that would replace polystyrene foam food service ware if polystyrene were banned. These materials would likely be paperboard or cardboard, which would simply replace polystyrene foam in the Permittees' trash streams. The City of San Francisco instituted a similar ban which became effective in 2007. Two audits of San Francisco street litter found that, while polystyrene foam clamshells decreased after the ban, there was a dramatic increase in paperboard and cardboard materials.[85] This led to a significant overall *increase* in what San Francisco termed to be "box litter." In assigning trash load reduction credits, BASMAA failed to acknowledge that other materials would simply replace polystyrene foam food service ware, and the ordinance would not lead to a reduction in trash loading—and could result in an increase in the volume of litter generated.

Even without consideration of replacement materials, BASMAA failed to consider data on whether plastic bag or polystyrene foam food ware bans are effective. BASMAA's surveys collected litter at sites with and without bans on plastic bags and polystyrene foam food ware. That analysis showed that the difference between plastic bag and polystyrene foam trash volume in jurisdictions with bans versus jurisdictions without bans is statistically insignificant.[86] Further, the site which had the highest amount of polystyrene foam trash, R101, is in Richmond, which instituted a polystyrene foam food ware ban in August 2010. BASMAA, however, assumes that bans on plastic bags and polystyrene foam food ware will eliminate virtually all bag and foam trash. BASMAA provided no analysis or justification to support its assumption that plastic bag and polystyrene foam bans will reduce trash loading, even though its own survey data appear to refute that assumption.

BASMAA's failure to consider trash created by replacement materials and the efficacy of bans is significant, as reviewing courts "must ensure that an agency has adequately considered

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[84] *See Save the Plastic Bag Coal. v. City of Manhattan Beach*, 52 Cal. 4th 155 (2004*); Coal. to Support Plastic Bag Recycling v. City of Oakland*, Tentative Decision Granting Petition for Writ of Mandate, No. RG07-339097 (Cal. Super. Ct. Apr. 17, 2008).

[85] *Compare* 2007 Audit at 34 *with* 2008 Audit at 36.

[86] Technical Assessment at 28-30.

all relevant factors, and has demonstrated a rational connection between those factors [and] the choice made…."[87] RWQCB cannot approve a measure that assumes reductions in total trash loading while ignoring substantial data contravening those assumptions. Therefore, BASMAA's trash load reduction credits for banning single-use plastic bags and polystyrene foam food ware are arbitrary, irrational and not supported by substantial evidence.

D. The Tracking Method Improperly Manipulates Baseline Trash Loads for "Early Implementers" of Favored Trash Control Measures

As discussed above, the Baseline Methodology inappropriately allows Permittees to claim "credit" for certain trash reduction methods implemented prior to the effective date of the MRP. The same flaw is present in the Tracking Method. Allowing the Permittees to account for trash reduction measures taken before the effective date of the permit within their trash load reduction calculations plainly violates MRP provision C.10.a.i, which requires the Permittees to implement "new" and "enhanced" measures to reduce their trash loads.[88]

First, the Tracking Method reinforces BASMAA's determination that an "average" level of street sweeping should serve as the "baseline ceiling" for all Permittees. Accordingly, Step 1 of the Tracking Method allows Permittees that implemented more frequent street sweeping programs *before* the effective date of the MRP to count those measures toward their 40% trash reduction requirement.[89] The Tracking Method also allows Permittees that have already passed ordinances to restrict or ban single-use plastic bags or polystyrene foam containers to claim credit for those ordinances, even if enacted prior to the MRP's effective date.

BASMAA's sole rationale for awarding the Permittees credit for "reductions" that are not attributable to new and enhanced trash control measures, as the permit requires, is "to avoid penalizing early implementers."[90] There is also no rational basis for BASMAA's selection of some trash reduction methods, but not others, to be subject to special treatment. Noticeably, the only pre-MRP measures credited are ones for which the Permittees themselves bore the expense. BASMAA does not, for example, allow percentage credits to be taken for reductions attributable to measures implemented by retail establishments before the effective date of the MRP, such as trash bag recycling programs. Again, BASMAA's favoring of particular trash control measures over others is arbitrary and unsupported.

E. Imposition of a Fee on Single-use Beverage and Food Containers May Constitute an Impermissible Tax Under the California Constitution

One of the Tracking Method's control methods provides a trash load reduction credit of up to 24% for ordinances that require all "food service establishments … that serve take-out food and/or beverages to charge the consumer a fee for each take-out food or beverage container

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[87] *Shapell Indus., Inc. v. Governing Bd.*, 1 Cal. App. 4th 218, 232 (1991).

[88] MRP at 92.

[89] Tracking Method at 7.

[90] *See, e.g., id*. at 5.

used…."[91] The Tracking Method does not specify who would ultimately retain the revenue collected from such a "fee" and this matter is presumably left to the Permittee that may adopt such an ordinance. If a Permittee were to impose such a "fee" and collect the resulting revenues, this would likely be an unconstitutional tax.

The California Constitution defines a "tax" as "any levy, charge, or exaction of any kind imposed by a local government…."[92] A "general tax" is "any tax imposed for general governmental purposes"[93] where the "revenues are placed into the general fund and are available for expenditure for any and all government purposes."[94] Under the California Constitution, "[n]o local government may impose … any general tax unless and until that tax is submitted to the electorate and approved by a majority vote."[95] Should any Permittee seek to impose the "fee" on single-use beverage and food containers described in the Tracking Method and collect those revenues, it may only do so through a majority vote of the electorate.

ACC reserves its right to address, on a case-by-case basis, the institution of any fees or taxes for single-use food and beverage containers that may be adopted in the future. ACC urges the RWQCB to emphasize real pollution controls over the potentially unconstitutional tax-and-credit scheme proposed by BASMAA.

F. Any Revisions to the Permittees' Tracking Methods Should Be Subject to Public Comment

As with the Baseline Methodology, the RWQCB should provide for further public comment on revised versions of the Tracking Method. BASMAA states that its Tracking Method should be considered "preliminary" and "subject to revision based on additional information and implementation experience."[96] The Permittees also assert the right to propose additional trash load reduction methods not included in the Tracking Method, and to develop processes to calculate trash load reduction associated with those methods, in future Annual Reports.[97] The Permittees' apparent reluctance to commit to a definitive trash load reduction tracking method is inconsistent with MRP provision C.10.a.ii, which does not allow for the Permittees' tracking methods to be indefinitely subject to revision without RWQCB approval, subject to public notice and comment. Thus, in the event that "Version 1.0" of BASMAA's Tracking Method, or any individual Permittee's tracking method, is superseded by revised versions, those revised tracking methods should be subject to public notice and comment. In the interim, BASMAA should not proceed to impose draft plans and standards until they are finalized following required notice and comment procedures.

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[91] Tracking Method at 26.

[92] Cal. Const., art. 13C, §2(e)

[93] *Id.* § 1(a).

[94] *Howard Jarvis Taxpayers Ass'n v. City of Roseville*, (2003) 132 Cal Rptr. 2d 1, 5-6.

[95] Cal. Const., art. 13C § 2(b).

[96] Tracking Method at 3.

[97] *Id*. at 2.

V. The Permittees Must Comply with CEQA

Under the California Environmental Quality Act ("CEQA"), the Permittees must prepare an environmental impact report ("EIR") prior to the implementation of their Short-Term Plans, all of which are based on, and thus incorporate, BASMAA's Baseline Methodology and Tracking Method. Government agencies must prepare an EIR "on any project which they propose to carry out or approve that may have a significant effect on the environment."[98] Here, many of the Permittees' Short-Term Plans incorporate proposals to ban single-use plastic bags and polystyrene foam food ware, for which they award themselves credit toward their MRP trash reduction obligations based on the Tracking Method. These bans would likely cause an increase in the use of replacement materials, such as paper bags and paperboard or cardboard food containers, that are *more* environmentally harmful than plastic or polystyrene foam. Although an agency must comply with CEQA procedures "when the agency proposes to carry out or approve" a project,[99] ACC is not aware of any actions taken by the Permittees, either individually or collectively through BASMAA, to initiate or otherwise comply with the CEQA process.

A. CEQA Legal Background

CEQA informs government "decision makers and the public about the potential, significant environmental effects of proposed activities."[100] Through this process, both government and the public can "[i]dentify ways that environmental damage can be avoided or significantly reduced … by requiring changes in projects through the use of alternatives or mitigation measures."[101] The process begins with an initial study of the proposed project.[102] Where this initial study shows "no substantial environmental effect," the agency may prepare a Negative Declaration.[103] However, if the agency "finds substantial evidence that the project may have a significant environmental effect," [104] even if the "overall effect of the project is … beneficial," the agency must prepare a draft EIR.[105] This includes situations where the "project has the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals"[106] or where environmental effects are "individually limited but cumulatively considerable."[107]

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[98] Cal. Pub. Res. Code § 21100(a); *see also* Cal. Code Regs., tit. 23, § 501 (incorporating CEQA Guidelines into Title 23 governing the Department of Water Resources).

[99] Cal. Code Regs., tit. 14 § 15002(e).

[100] *Id.* § 15002(a)(1).

[101] *Id.* § 15002(a)(2)-(3).

[102] *Id.* § 15060(c); *see also id.* § 15063.

[103] *Id.* § 15002(f)(1); *see also id.* §§ 15063(b)(2), 15070, 15075.

[104] *Id.* § 15002(f)(1); *see also id.* § 15064(f)

[105] *Id.* § 15063(b)(1); *see also id* § 15064(a)(1).

[106] *Id.* § 15065(a)(2).

[107] *Id.* § 15065(a)(3). "Cumulatively considerable" effects are "the incremental effects of an individual project … when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." *Id.*

A draft EIR analyzes "the significant environmental effects of a proposed project, to identify alternatives, and to disclose possible ways to reduce or avoid the possible environmental damage."[108] These significant environmental effects include "reasonably foreseeable indirect physical changes in the environment which may be caused by the project."[109] Feasible alternatives must be adequately examined and an agency "should not approve a project as proposed if there are feasible alternatives or mitigation measures available that would substantially lessen any significant effects that the project would have on the environment."[110] If the agency approves the project, the agency must identify any changes or alterations required to "avoid or substantially lessen the significant effect as identified in the final EIR."[111] All findings in the EIR must be "supported by substantial evidence in the record."[112]

Regardless of whether the lead agency decides to issue notice of intent to adopt a negative declaration or draft an EIR, these initial decisions must be subject to public notice and comment.[113] If an agency does embark on the EIR process, then "[t]he review of a final EIR should focus on the responses to comments on the draft EIR."[114] This makes public participation in CEQA decision-making vital to the review of any project.

B. CEQA Applies to the Proposed Implementation of the Permittees' Short-Term Plans and the BASMAA Documents

CEQA applies to the implementation under the MRP of the Permittees' Short-Term Plans, which incorporate the BASMAA Baseline Methodology and Tracking Method. (It would also separately apply to any individual Permittee's proposed enactment of an ordinance banning the use of single-use plastic bags or polystyrene containers.). The implementation of these Plans constitutes a "project" subject to CEQA. Such a project is defined as an "activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment."[115] The term "project" is construed broadly.[116]

C. Approval of the BASMAA Documents and the Short-Term Plans Is Likely to Have a Significant Effect on the Environment and Would Likely Involve Substantial Changes

Three control measures described in BASMAA's Tracking Method involve banning single-use plastic bags or polystyrene foam food service ware. Where any of these materials are banned, they will be replaced with new disposable materials, at least in substantial part. For

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[108] *Id.* § 15002(f).

[109] *Id.* § 15064(d), (d)(2).

[110] *Id.* § 15021(a)(2).

[111] *Id.* § 15091(a)(2).

[112] *Id.* § 15091(b).

[113] *Id.* §§ 15064(c), 15072, 15073, 15087.

[114] *Id.* § 15089(b).

[115] Cal. Pub. Res. Code § 21065.

[116] Cal. Code Regs., tit. 14, § 15002(d).

example, it is well documented that plastic bag bans result in large increases in the use of single-use paper bags.[117] Paper bags have significantly greater lifecycle environmental impacts than plastic bags. A life cycle comparison by Bousted Environmental Consulting[118] in 2007 found that:

- Plastic bags require 70% less energy than paper;
- Plastic bags generate less than half of the greenhouse gas emissions generated by paper;
- Plastic bags generate 80% less solid waste than paper; and
- Plastic bags use less than 5% of the water required for paper.

Other studies have confirmed that paper bags require more energy, emit more greenhouse gases, generate more solid waste and use more water than plastic bags.[119] These studies provide "substantial evidence" that the Permittees' plans "may have a significant environmental effect."[120] These environmental effects are even more substantial in that, when enacted over 35 jurisdictions, they are "cumulatively considerable."[121] Therefore, CEQA review is required before the Permittees implement Short-Term Plans that include single-use plastic bag bans.

Permittees would also receive credit reductions for enacting ordinances that restrict or prohibit the distribution of polystyrene foam food service ware. BASMAA has not identified the types of materials that would be used to replace polystyrene foam food service ware. It is likely that they would be replaced with heavy paper or polylactic products that require more energy and water to manufacture, which would result in higher greenhouse gas emissions, and would continue to contribute trash loads to MS4 receiving waters.[122] A CEQA review should consider

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[117] *See Save the Plastic Bag Coal. v. City of Manhattan Beach*, 52 Cal. 4th 155, 172 (2011) ("it is undisputed that the manufacture, transportation, recycling, and landfill disposal of paper bags entail more negative environmental consequences than do the same aspects of the plastic bag 'life cycle.'"); *Coal. to Support Plastic Bag Recycling v. City of Oakland*, Tentative Decision Granting Petition for Writ of Mandate, No. RG07-339097 (Cal. Sup. Ct. Alameda Apr. 17, 2008) (slip op.) at 8-9 (discussing studies).

[118] Bousted Consulting, Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper, 2007.

[119] *See* Environmental Group Research Report, Proposed Plastic Bag Levy—Extended Impact Assessment, Volume 1: Main Report (2005) (Scottish government report finding that paper bags require more energy and water consumption while creating greater emissions of greenhouse gases and traditional air pollutants while increasing solid waste production); Boustead Consulting & Assocs., Ltd., Life Cycle Assessment for Three Types of Grocery Bags—Recyclable Plastic; Compostable; Biodegradable Plastic; and Recycled, Recyclable Paper (prepared for the Progressive Bag Alliance) (2007) (finding that polyethylene plastic bags use less total energy, water and fossil fuels than recycled paper while also generating fewer greenhouse gas emissions and municipal solid waste).

[120] Cal. Code Regs., tit. 14 § 15002(f)(1); *see also id.* § 15064(f)

[121] *Id.* § 15065(a)(3).

[122] *See* Final Peer-Reviewed Report: Life Cycle Inventory of Foam Polystyrene, Paper-Based, and PLA Foodservice Products, Franklin Associates, Ltd., prepared for the Plastic Foodservice Packaging Group (Feb. 4, 2011), *available at*, http://plasticfoodservicefacts.com/Life-Cycle-Inventory-Foodservice-Products (last visited March 7, 2012); Life Cycle Inventory of Foam and Coated Paperboard Plates, Peer-Reviewed Final Report, prepared for Pactiv

the types of materials that would replace the polystyrene foam food service ware that would be banned and analyze the environmental lifecycle impacts of those materials. The review should also consider how the replacement materials would be disposed of and whether replacement would result in any actual reductions in trash loading. As discussed above, shuffling the composition of trash from polystyrene foam to another material would not necessarily reduce the amount of trash discharged by MS4s to receiving waters. In fact, there is evidence that bans on retail food packaging have failed to reduce litter.[123] For example, as noted *supra*, San Francisco instituted a ban on polystyrene foam cups and food packaging in 2007. Surveys of litter in San Francisco in 2007 (before the ban) and 2008 (after the ban) showed that, although polystyrene foam litter decreased slightly, other types of food and beverage packaging increased.[124]

Although the California Supreme Court recently held that a plastic bag ban did not require CEQA review, that case is distinguishable from the scenario presented here. In *Save the Plastic Bag Coalition v. City of Manhattan Beach*, the Court determined that the "common sense" exemption from CEQA applied to a plastic bag ban enacted by the City of Manhattan Beach, which has a population of only 33,000 people, because instituting that ban "would have only a minuscule contributive effect on the broader environmental impacts detailed in the paper bag 'life cycle' studies."[125] However, the Court also observed that "the analysis would be different for a ban on plastic bags by a larger governmental body…."[126]

Here, 35 Permittees, with a cumulative population of approximately 5.3 million people, plan to implement full or partial plastic-bag bans in order to claim trash load reduction credits. And, 21 Permittees, with a cumulative population of approximately 3.5 million, plan to institute full or partial polystyrene foam food ware bans for trash load reduction credits. The populations involved are many times higher than in *City of Manhattan Beach*. Collectively, the proposed bans would result in a significant cumulative impact across the participating jurisdictions, which requires an EIR. Under CEQA, an agency *must* conduct an EIR where "possible environmental effects that are individually limited" will be "cumulatively considerable."[127] The term "cumulatively considerable" includes "the incremental effects of an individual project" that are

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Corporation, Franklin Associates, Ltd.(Dec. 2009), *available at* http://www.pactiv.com/About_Pactiv/LCI_Foam_PaperPlates_FinalReport.aspx (last visited March 8, 2012); Schaffer, *et al.*, Paper on Styrofoam, A Review of the Environmental Effects of Disposable Cups, University of California at San Diego (Dec. 2006), *available at*, http://www.polystyrenepackaging.co.za/files/downloads/UCSD%20Paper_or_Foam_report.pdf (last visited March 8, 2012); Final Peer-Reviewed Report: Life Cycle Inventory of Polystyrene Foam, Bleached Paperboard and Corrugated Paper Foodservice Products, Franklin Associates, Ltd., prepared for Polystyrene Packaging Council (Mar. 2006).

[123] *See* Ross, S.S., Swanson, R.L., 1995. The impact of the Suffolk County, New York, plastics ban on beach and roadside litter. Journal of Environmental Systems 23, 337-51; Technical Assessment at 28-30.

[124] *Compare* 2007 Audit at 32 *with* 2008 Audit at 34. Despite the ban on polystyrene cups, overall cup litter showed a slight increase after the ban, from 242.5 pieces to 254. The comparison of "Box Litter," (section 3.2.4) which includes polystyrene clamshells, showed a marked increase, from 46 items in 2007 to 132.5 items in 2008, due to the proliferation of cardboard and paperboard packaging.

[125] *City of Manhattan Beach*, 52 Cal. 4th at 174.

[126] *Id.*

[127] Cal. Code Regs. § 15065(a)(3).

"significant when viewed in connection with the effects of … other current projects…."[128] The simultaneous institution of plastic bag bans and polystyrene foam bans over a large number of jurisdictions creates just such a "cumulatively considerable" environmental effect. Therefore, the Permittees must perform an EIR prior to implementing plans to implement such bans.

1. None of CEQA's Exemptions Apply

Although CEQA includes exemptions to its requirements,[129] none are applicable in this situation. The Permittees may only claim an exemption "[w]here it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment…."[130] An agency claiming an exemption has the burden of providing evidence showing that no "legitimate questions can be raised about whether the project might have a significant impact…."[131] In this instance, substantial evidence indicates that paper bag use would significantly increase as a result of banning single-use plastic bags, and that replacing plastic bags with paper bags creates significant adverse environmental effects.[132] These findings have already been accepted by courts in CEQA litigation.[133] Similarly, studies have shown that the likely replacements for polystyrene foam food service ware also cause significant adverse environmental effects.[134] Thus, if the Permittees sought to exempt the implementation of their Short-Term Plans from CEQA review, they could not meet the stringent "no possibility" standard.

Other exemptions to CEQA, such as those for projects involving the protection of natural resources,[135] for projects involving the protection of the environment,[136] and for projects

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[128] *Id.*

[129] *See generally id.* §§ 15061, 15062.

[130] *Id.* § 15061(b)(3).

[131] *Davidson Homes v. City of San Jose*, 54 Cal. App. 4th 106, 117 (1997).

[132] Bousted Consulting, Life Cycle Assessment for Three Types of Grocery Bags—Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper, 2007; Environmental Group Research Report, Proposed Plastic Bag Levy—Extended Impact Assessment, Volume 1: Main Report (2005) (Scottish government report finding that paper bags require more energy and water consumption while creating greater emissions of greenhouse gases and traditional air pollutants while increasing solid waste production); Boustead Consulting & Associates, Ltd., Life Cycle Assessment for Three Types of Grocery Bags—Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper (prepared for the Progressive Bag Alliance) (2007) (finding that polyethylene plastic bags use less total energy, water and fossil fuels than recycled paper while also generating fewer greenhouse gas emissions and municipal solid waste).

[133] *See City of Manhattan Beach*, 52 Cal. 4th at 172 ("it is undisputed that the manufacture, transportation, recycling, and landfill disposal of paper bags entail more negative environmental consequences than do the same aspects of the plastic bag 'life cycle.'"); *City of Oakland*, Tentative Decision Granting Petition for Writ of Mandate, No. RG07-339097 (Cal. Sup. Ct. Alameda Apr. 17, 2008) (slip op.) at 8-9 (discussing studies).

[134] Franklin Associates, Life Cycle Inventory of Foam Polystyrene, Paper-Based, and PLA Foodservice Products (prepared for the Plastic Foodservice Packaging Group) (Feb. 4, 2011), *available at*, http://plasticfoodservicefacts.com/Life-Cycle-Inventory-Foodservice-Products (last visited March 7, 2012),

[135] Cal. Code Regs. § 15307.

[136] *Id.* § 15308.

involving a certified state regulatory program,[137] are also inapplicable. CEQA prohibits the use of categorical exemptions where there is "a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances."[138] The court in *City of Oakland* found that shifting from single-use plastic bags to environmentally damaging single-use paper bags is just such an unusual circumstance.[139] These same "unusual circumstances" are implicated in banning polystyrene foam food service ware as the likely replacement materials have significant environmental impacts. Thus, the CEQA exemptions for protecting natural resources and protecting the environment are not applicable. Nor is the exemption for certified state regulatory programs applicable, because implementation of the Permittees' Short-Term Plans, and by extension, the Baseline Methodology and Tracking Method, will not be certified by the Secretary of Resources as being exempt from CEQA under the Public Resources Code.[140] Therefore, the Permittees that plan to implement bans on single-use plastic bags or polystyrene foam food ware under their Short-Term Plans must perform an EIR prior to implementation of those plans.

2. Superior Alternatives to Bans Exist and Must Be Considered Under CEQA

A central purpose of an EIR is "to identify alternatives, and to disclose possible ways to reduce or avoid the possible environmental damage." [141] Feasible alternatives to the plastic bag and polystyrene foam bans must be examined. [142] The Permittees cannot implement their Short-Term Plans without identifying alternatives that can "avoid or substantially lessen the significant effect as identified in the final EIR."[143]

Other alternatives exist that can lead to real discharge reductions without the adverse environmental impacts, added costs and disruption of banning popular and widely used materials, such as recycling programs for plastic bags and polystyrene foam. AB 2449, which went into effect on July 1, 2007, instituted a 6-year pilot program requiring large grocery stores to take back and recycle plastic grocery bags. The City of Los Angeles built upon this program through voluntary bag recycling programs with retailers near trash hot spots along the Los Angeles River. These types of recycling initiatives target a much larger array of plastic bags, such as bags used for dry cleaning and newspapers, as well as plastic wraps for foods and consumer products. BASMAA's proposal is much less inclusive. In addition, banning plastic bags from supermarkets or other retailers would significantly discourage bag and film recycling programs. Thus, not only would there be no incentive to recycle non-covered plastic bags and

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[137] *Id.* § 15250.

[138] *Id.* § 15300.2(b).

[139] *City of Oakland*, Tentative Decision Granting Petition for Writ of Mandate, No. RG07-339097 (Cal. Sup. Ct. Alameda Apr. 17, 2008) (slip op.) at 8.

[140] Cal. Code Regs. § 15250. Even if the implementation of the Permittees' Short-Term Plans were covered by an existing certified program, it would be incumbent upon the RWQCB to develop "a plan or other environmental review document that serves as a functional equivalent of an EIR." *Mountain Lion Found. v. Fish & Game Comm'n*, 16 Cal. 4th 105, 113 (1997).

[141] *Id.* § 15002(f).

[142] *Id.* § 15021(a)(2).

[143] *Id.* § 15091(a)(2).

films, implementing jurisdictions would have to contend with the paper bag trash that would accrue in the absence of plastic bags at supermarkets and other retailers. Polystyrene foam may also be recycled in numerous California locations, with successful recycling programs already working in Los Angeles, San Joaquin County, Torrance and many other localities within and outside of California. By contrast, likely substitutes for polystyrene foam, such as coated bleached paperboard, are not typically recycled. The EIR should consider these more environmentally-friendly alternatives to materials bans.

VI. Conclusion

ACC appreciates this opportunity to provide comments on BASMAA's Baseline Methodology and Tracking Method. Please contact Keith Christman at 202-249-6610 if you have questions about these comments.

Technical Assessment of BASMAA 2012 Documents

Conducted for

American Chemistry Council

by

Environmental Resources Planning, LLC

Steven R. Stein, Project Manager

March 19, 2012

Table of Contents

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Background

The Bay Area Stormwater Management Agencies Association (BASMAA) is a consortium of the following eight San Francisco Bay Area municipal storm water programs:

- Alameda Countywide Clean Water Program
- Contra Costa Clean Water Program
- Fairfield-Suisun Urban Runoff Management Program
- Marin County Stormwater Pollution Prevention Program
- San Mateo Countywide Water Pollution Prevention Program
- Santa Clara Valley Urban Runoff Pollution Prevention Program
- Sonoma County Water Agency
- Vallejo Sanitation and Flood Control District

Caltrans and the City/County of San Francisco CSS participate in certain BASMAA activities. BASMAA represents more than 90 agencies, including 79 cities, 6 counties and the bulk of the area immediately surrounding the San Francisco Bay watershed. BASMAA was formed by local governments in response to the NPDES permitting program for storm water to promote regional consistency and efficiency.

On February 1, 2012, BASMAA released the following documents:

1. Trash Load Reduction Tracking Method – Assessing the Progress of San Francisco Bay Area MS4s Towards Stormwater Trash Load Reduction Goals – Technical Report (Version 1.0), EOA, Inc., February 1, 2012

2. Transmittal Letter – Progress Report – Trash Baseline Loads and Load Reduction Tracking – MRP Provision C.10.a(ii), James Scanlin, Tom Dalziel, et al., February 1, 2012

3. Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s - Technical Memorandum, EOA, Inc., February 1, 2012

Environmental Resources Planning, LLC ("ER Planning"), subject matter experts in the field of litter, conducted an evaluation of these documents at the request of the American Chemistry Council. The time period available for this analysis was approximately two weeks, limiting the scope.

However, it is our hope that the information provided will be useful in helping to create programs and credit systems that will more effectively reduce the amount of litter in BASMAA's service area as well as the amount of trash entering its stormwater systems and waterways.

Technical Assessment

Objective 1: Determine if the assumptions and factors used to calculate the trash generation rates and loads are accurate.

The trash characterization methodology BASMAA describes appears to have flaws that would have significantly overstated the amount and percentage of light materials such as plastic bags and polystyrene foam products in litter. This overstatement is corroborated by numerous statistically based litter surveys, which show that these materials comprise a minor portion of litter. Thus, it is very likely that the factors and assumptions subsequently made to award credits for estimated reductions in litter were inaccurate.

Trash Characterization Methodology

BASMAA leads its members to believe that the list of trash control measures it has developed will help them "reach MRP trash load reduction goals," based in part on the "expected benefit of implementation" (BAASMA 2012b, p. 2). BASMAA stated its intention to "provide a scientifically-sound method" (Ibid., p. 3) for determining trash generation rates using a conceptual model presented in the BASMAA Sampling and Analysis Plan (Ibid., p. 3).

BASMAA's "Sampling and Analysis Plan" plays a significant role in the trash characterization methodology upon which BASMAA's trash reduction plan is based. Yet, this critically important document, which contains more detailed information about BASMAA's trash characterization methodology, is not currently available for public review.

The characterization methodology BASMAA describes involved placing trash in buckets measured by fullness, but it appears that the materials collected were not compacted. This means the volume measured would have included a significant amount of air space that would cause the volumes and percentages of light materials such as polystyrene foam food ware items and retail plastic bags to be overstated considerably.

This raises concerns about BASMAA's resulting data and calls into question the "expected benefit of implementation" that BASMAA leads its members to believe will occur.

Litter surveys should always include a count of items, which is more precise than volume or weight and has the lowest variability between replicated measurements (IAR 2007, p. 1). "The standard deviation of repeated measurements of the same litter measured by volume is 21.2 percent compared to 3-6 percent for all other methods of litter measurement". While this variability can decline as sample sizes grow, it always tends to be greater than with item counts (Ibid., p. 2).

BASMAA cites the City of Oxnard's storm drain sampling results in its references. Yet, Oxnard states that its data form included a list of the counts for trash (Oxnard, p. 5).

The Anacostia Watershed Society in Washington, D.C. notes the importance of an actual count of littered items to supplement other data measurements. "The tally count is an important indicator of trash impairment and should be used in conjunction with the total score to assist in site comparisons" (Anacostia 2008, pp. 8-5).

BASMAA weighed littered items during its trash characterization and states that those weights were recorded and transferred into the project database (BASMAA 2012a, p. 9). Yet that meaningful data was excluded from BASMAA's report, precluding the opportunity to review and evaluate the weights of light items such as plastic grocery bags and polystyrene foam items, which BASMAA implies might be low enough to dismiss otherwise (Ibid., p. 10).

Caltrans was aware that measuring materials by volume increased the proportion of light materials, which "may be attributed to the differences in their densities. Another observation is the increased proportion of Styrofoam compared to weight, due to its low density, and the reverse trend for the dense moldable plastics" (Caltrans 2000, p. 6-6). In fact, this applies to all light and dense components of litter and can be misleading when counts and weights are not also provided.

Due to this apparent flaw in BASMAA's methodology, the basis for awarding load reduction credits for plastic bags (CR-1) and polystyrene foam food service ware (CR-2) would also be flawed and should be replaced with credits more likely to correlate with significant reductions in litter. Reductions in overstated levels of plastic bags and polystyrene foam food service products would be unlikely to occur at the levels that BASMAA indicates. Yet, BASMAA members are pursuing these bans solely based upon the credits they expect to receive, not upon any reductions in litter expected (San Mateo 2012).

Based on the methodology BASMAA used, each retail plastic bag and polystyrene foam food ware item may easily have been overstated by as much as 900 percent, based on comparing BASMAA's data with the data from numerous statistically-based litter surveys, which are referenced in this report.

BASMAA states that one of its technical report's goals is to provide concepts of "water quality benefits associated with specific trash control measures" (BASMAA 2012b, p. 3). But the organization's use of a flawed trash characterization methodology only encourages its members to expend a significant "level of effort" (Ibid., p. 11) to enact ordinances that are not likely to provide the reductions BASMAA implies could be realized for light items such as retail plastic bags or polystyrene foam food ware.

BASMAA conceded that certain measures have load reduction credits "where effectiveness data are lacking or load reductions are difficult to quantify" (BASMAA 2012b p. 4), acknowledging that some of the load reduction credits may not achieve the implied results even if the amounts of these lighter items were not overstated.

BASMAA compounds this uncertainty by stating that "In some cases, information is very limited and assumptions have to be made." It admits that "assumptions create uncertainties" (Ibid., p. 5), yet, it encourages its members to pursue implementation of material bans based on this conceded lack of data and uncertainties.

In an effort to account for certain measures that may already have been put into effect, BASMAA evidently adjusted the trash generation rates (BASMAA 2012a, p. 17), based on "estimated effectiveness." This suggests that the data presented for analysis may not represent the actual data counted.

BASMAA cites a Clean Water Action document regarding the impact of trash on water. While that document recommends banning retail plastic bags and polystyrene foam, it lists the 10 most frequently littered materials and neither of these items is on that list (Clean Water 2011). In fact, the study results show that neither of these items is on the 20 most frequently littered items (Clean Water 2011a).

BASMAA states that weights were also measured (BASMAA 2012a, p. 10), but those data points were not provided. The organization notes that this data will be provided in a final report, but that report may not be issued until after this plan has been approved, thus precluding review of this important information before public policies, based on inaccurate data, are put into effect.

BASMAA states that "Accumulation periods for each site and sampling event combination are included in Appendix C" (Ibid., p.7). However that data is missing from Appendix C. Land Use and other data is missing for 12 sites. In addition, it is unclear how the accumulation periods were calculated. BASMAA should explain the process and implication of the different accumulation periods used.

Data Anomalies

The source of data used to calculate quality assurance in Appendix B of the Trash Generation report is inconsistent. While the original sample volumes listed from Event 2 are the same as those used in the monitoring results, the original sample volumes listed from Event 1 are significantly different from those used in the monitoring results. The source of these data points is unclear.

In addition, the relative percentages are averaged to determine the mean of the values for quality assurance. This goes against statistical best practices. Here is a clear example of why that method should never be used:

Table 1 – Averaging Percentages

Site #	Sample #1	Sample #2	Relative Difference
1	4	2	- 50%
2	2	4	+100%
All	**6**	**6**	**+50%**

In the example above, the overall volume is exactly the same, but averaging the percentage differences shows a 50 percent increase, a misleading and inaccurate conclusion.

The resulting problems from averaging the relative differences, while not as vivid in the Event 1 and 2 data tables below, results in the same type of inaccurate result.

Table 2 – BASMAA Quality Assurance: Event 1

Event 1

BASMAA ID	Sample Total Vol. (gallons)	Duplicate Total Vol. (gallons)	Relative % Difference
SJ05	9.36	8.96	-4.3%
SJ20	32.72	29.72	-9.2%
SJ25	19.28	18.94	-1.8%
SJ31	11.34	10.49	-7.5%
SM01	20.79	19.5	-6.2%
OK02	8.87	8.15	-8.1%
SL02	6.5	6.8	4.5%
SL03	9.34	9.58	2.5%
SL04	20.91	19.65	-6.0%
Mean			**-4.0%**

Averaging the percents rather than the data yielded a -4.0 percent rather than the correct difference of -5.3 percent, which is based on the difference in the actual total volumes. Keep in mind that none of the sample totals listed in Event 1 were found in the survey data listed in Appendix C.

Table 3 – BASMAA Quality Assurance: Event 2

Event 2

BASMAA ID	Sample Total Vol. (gallons)	Duplicate Total Vol. (gallons)	Relative % Difference
OK02	18.52	17.99	-2.9%
OK04	9.44	8.87	-6.0%
RI01	72.84	72.77	-0.1%
RI02	21.19	20.04	-5.4%
SJ11	7.73	5.71	-26.2%
SJ12	4.81	5.01	4.2%
SJ29	8.91	7.16	-19.6%
SJ30	11.51	10.66	-7.4%
SJ31	11.04	9.35	-15.2%
SJ51	8.91	8.23	-7.6%
SJ74	6.15	5.96	-3.1%
SL09	12.52	11.39	-9.0%
SL11	11.16	10.61	-4.9%
SL23	15.91	15.59	-2.0%
SL25	25.42	25.35	-0.3%
SM12	23.89	22.37	-6.4%
SP01	42.38	38.37	-9.5%
SU03	23.84	22.51	-5.6%
WC01	28.2	27.73	-1.7%
Mean			**-6.8%**

Similar to Event 1, averaging the percents rather than the data yielded a -6.8 percent rather than the correct difference of -5.1 percent, which is based on the difference in the actual total volumes. Unlike Event 1 data, all of the data points in Event 2 were found in the survey data listed in Appendix C.

In their discussion of recommended QA/QC procedures, GeoSyntec, working with ASCE and US-EPA, advised the use of matrix spikes in stormwater monitoring to determine the precision of the analysis conducted (GeoSyntec, p. 136). In fact, Caltrans used this procedure in their litter management pilot (Caltrans 2000) and recommended its use in its protocol guidance manual to assess data accuracy (Caltrans 2003, p. 11-1). Yet BASMAA does not utilize this best practice, which may have called attention to the presence of the data anomalies that resulted in its trash characterization.

Extreme Outlier

Although many sites had no retail plastic bags or polystyrene foam food ware products in litter, one site in particular constituted an extreme outlier. The data for Site RI01 (Richmond) presented significant problems. Out of the 216 total sites, this one site accounted for 10.0 percent of the retail plastic grocery bags and 10.6 percent of the polystyrene foam food service products from the entire survey, skewing the results significantly.

Sites with No Retail Plastic Bags or Polystyrene Foam Food Ware

In addition, BASMAA found no retail plastic bags at 57 percent of sites and no polystyrene foam food ware products at 50 percent of the sites, a fact that is not clear when the mean value is used to calculate the average value.

The median is the more appropriate measure to use when the data is skewed and when it contains an extreme outlier. Both cases apply here. When calculating the median, the values for both retail plastic bags and polystyrene foam food ware products are both zero.

Using the mean to determine average values from data with an extreme outlier can be misleading. A good example is calculating the average temperature of 11 objects in a kitchen. All of them are between 68°F and 77°F except for an oven, which is at 450°F. The mean temperature would be 107°F, but the median temperature of 73°F is a more accurate indicator of the average temperature of objects in the kitchen.

Table 4 – When Mean Value is Not Appropriate

#	Temp.	#	Temp.
1	68	1	68
2	69	2	69
3	70	3	70
4	71	4	71
5	72	5	72
6	73	6	73
7	74	7	74
8	75	8	75
9	76	9	76
10	77	10	77
11	450	11	450
Median	**73**	**Mean**	**107**

Thus, given the one extreme outlier, BASMAA's use of the mean to calculate averages of each material as a component of litter is not the appropriate statistical measure. This data is shown in Table 5 for all items along with the implications of data from site RI01.

Table 5 – Median and Mean Values for All Items

Value	Debris	Trash	Bev Cont	Pl Bags	PS FW	Oth Pl	Paper	Mtl	Msc	Gr Total
Sites with "0":	1	9	152	124	109	14	46	190	54	0
% Sites with "0":	0%	4%	70%	57%	50%	6%	21%	88%	25%	0%
Median Value:	5.00	1.60	0.00	0.00	0.00	0.75	0.22	0.00	0.11	6.71
Site RI01:	2.0%	8.7%	0.5%	10.0%	10.6%	10.4%	8.9%	0.0%	1.8%	3.7%
Total Values:	1469.04	491.42	27.83	39.94	33.63	240.19	105.51	1.68	42.52	1960.31
Mean Value:	6.80	2.28	0.13	0.18	0.16	1.11	0.49	0.01	0.20	9.08

BASMAA states its trash reduction goals in terms of percent reductions (BASMAA 2012a, p. 1), but US-EPA states that calculating percent removal "is not recommended and can be very misleading" (EPA NPDES). TMDL reductions for the Anacostia River Watershed are in pounds per day (MDE 2010, p. 40).

The implications of this extreme outlier and flaws in the trash characterization methodology clearly show why BASMAA should consider EPA's recommendation to not use percent removal as the basis for trash reduction.

Objective 2: Assess the potential impact of the credits included in the Load Reduction Calculation Process.

Although the considerable credits for material bans are not likely to result in significant litter reductions, BASMAA addresses a number of other options for which credits will likely correlate with significant reductions in litter. Additional information about these options and credits would be helpful.

Step #1: Existing Enhanced Street Sweeping

The impact of existing enhanced street sweeping on trash baseline loads is not completely clear. It would be helpful for BASMAA to explain more clearly the process and formula by which these adjustments are made. Since BASMAA provides formulas and more descriptive language for other steps including QF-2 Enhanced Street Sweeping, it should be possible to provide similar language for this step as well.

Step#2: Trash Generation Reduction (Urban)

While BASMAA inordinately focuses on banning materials that comprise a small portion of litter and proposes to subsequently grant credits that are not likely to correlate with significant reductions in trash, Anacostia Watershed focuses their trash TMDL efforts more broadly.

The Anacostia Watershed Trash Reduction Strategy, which began in the late 1980s with the signing of the Anacostia Watershed Agreement in 1987 by the District of Columbia; Montgomery and Prince George's Counties, Maryland; and the state of Maryland. Strategic efforts to reduce trash in the Anacostia River have a more comprehensive focus than BASMAA, placing more emphasis on strategies that have a proven relationship to significant trash reduction:

"The Anacostia Watershed Trash Reduction Strategy prepared by the MWCOG's Anacostia Watershed Restoration Partnership (2007), outlines the extent of the trash problem in the Anacostia River, as well as the policy statements and strategies for implementing the six high-priority trash-reduction objectives:

The six objectives, and some of the associated strategies, are:

- Significantly increase funding for trash reduction programs
    - Seek congressional funding to implement the Anacostia Watershed Trash Reduction Strategy
    - Use BMPs and best available technologies throughout the watershed to the maximum extent practicable
    - Encourage new and redevelopment projects to incorporate trash-reduction-related measures
- Create and enhance regional partnerships and coordination among businesses, environmental groups, individual citizens, and government at all levels and in all jurisdictions
    - Each jurisdiction and the Anacostia Watershed Restoration Committee will work with stakeholder groups to prioritize needs and provide technical assistance and training
- Improve people's awareness, knowledge, and behavior relating to littering and illegal dumping
    - Enhance and expand environmental education programs in schools and parks
    - Increase public awareness and publicize good behavior
    - Create incentives to change littering and illegal dumping behaviors
- Promote the greater introduction and use of effective trash-reduction technologies and approaches
    - Coordinate the evaluation of technologies and trash-reduction approaches and the dissemination of information through the Anacostia Watershed Restoration Committee, Alice Ferguson Foundation, and others
    - Publicize information, pilot projects, and proven technologies
    - Facilitate share programs where smaller jurisdictions can share the purchase and operating costs of large, efficient street sweepers
- Improve enactment and enforcement of laws to reduce trash
    - Determine feasibility of instituting payments for returned glass and plastic bottles
    - Investigate the costs and benefits of expanding Business Improvement Districts and Central Business Districts litter-reduction efforts into other areas
    - Provide better surveillance of known dumping hot spots through the use of real-

time video monitoring
    - Establish new Friends of groups in the watershed
    - Urge the adoption of trash-related community service as an alternative to environmental crime-related fines

● Increase trash monitoring-related data collection, generation, and dissemination efforts
    - Provide adequate funding for long-term stream and land-based trash surveys
    - Monitor trash catching devices to measure effectiveness
    - Record tonnage of trash collected through various programs and projects"

(MDE 2010, pp. 47-48)

In addition, BASMAA inordinately focuses on the impacts of floatable materials, but does not equally emphasize the impacts of the settleable and suspended components of litter, despite the fact that the San Francisco Bay Basin Plan also requires that setttleable material (Section 3.3.13) and suspended material (Section 3.3.14) also be addressed in water quality objectives (San Francisco 2011, p. 3-5).

CR-1: Single-Use Carryout Plastic Bag Ordinances

BASMAA states that, "it is highly likely that considerable time and resources would be needed to respond to stakeholder comments and concerns" (BASMAA 2012b, p. 25 footnote). Since the percentage of single-use plastic bags in this trash characterization is most likely overstated significantly, the considerable time and financial resources expended to pursue this control measure is unlikely to achieve significant reductions of materials since they are not likely to exist at the levels implied by BASMAA.

"Single-use carryout bags have been found to contribute substantially to the litter stream and to have adverse effects on marine wildlife (United Nations 2009, CIWMB 2007, County of Los Angeles 2007)" (p. 11, par. 1).

In fact, all components of litter, not just retail plastic bags, can have adverse effects on wildlife. Additionally, many of the plastic bags observed in marine debris have been identified as garbage bags, not retail plastic bags.

Retail Plastic Bag Data in Statewide and Citywide Litter Surveys

Statewide litter surveys that characterize litter using statistically based sampling methodologies consistently show that retail plastic bags constitute a small portion of litter.

The KAB National Litter Survey, conducted in 2008, characterized and quantified roadside litter on 288 sites nationwide using 65 separate categories. This survey concluded that all type of plastic bags constituted just 0.6 percent of roadside litter across the U.S. (KAB 2009).

Comprehensive citywide street litter audits were conducted in San Francisco before and after retail plastic bag use had been banned by the City at certain retail merchants. These surveys showed that retail plastic grocery bags constituted only 0.59 percent of litter in 2007 (HDR 2007) and 0.64 percent in 2008 (HDR 2008). The percentage of retail plastic grocery bags actually grew slightly after the ban had been put into effect.

A comprehensive street litter audit conducted using 298 randomly selected survey sites in Toronto showed that retail plastic grocery bags constituted only 0.1 percent of litter (MGM 2006).

A comprehensive statewide roadside litter study, funded by Florida Department of Environmental Protection, was conducted using 670 randomly selected sites in Florida showed that retail plastic grocery bags constituted only 0.5 percent of litter. Similar surveys had been conducted in Florida in 1994, 1995, 1996, 1997 and 2001. In each of those years, retail plastic bags constituted less than 1.0 percent of litter (Florida 2002, p. 22).

California's Integrated Waste Management Board published a statewide solid waste characterization study conducted in 2003 and 2004. That study showed that plastic grocery bags comprised only 0.4 percent of trash in California (CIWMB 2004, p. 6).

The US-EPA collects and reports data on the components of municipal solid waste disposal in the U.S. The most recent report showed that retail plastic bags constitute 0.4 percent of municipal solid waste (US-EPA 2010, pp. 4, 8, 25).

The data from each of these studies, which are similar to US-EPA's published data, show that retail plastic bags are a small portion of roadside litter and support the indication that BASMAA's data likely overstated the amount of retail plastic bags as a component of litter significantly.

CR-2: Polystyrene Foam Food Service Ware Ordinances

BASMAA states that, "it is highly likely that considerable time and resources would be needed to respond to stakeholder comments and concerns" (BASMAA 2012b, p. 25 footnote). Since the percentage of polystyrene foam food service products in this trash characterization is most likely overstated significantly, the considerable time and financial resources expended to pursue this control measure are unlikely to achieve significant reductions of materials since they are not likely to exist at the levels implied by BASMAA.

Polystyrene Foam Food Ware Data in Statewide and Citywide Litter Surveys

Statewide litter surveys that characterize litter using statistically based sampling methodologies consistently show that all polystyrene foam food ware constitute a small portion of litter.

The KAB National Litter Survey, conducted in 2008, characterized and quantified roadside litter on 288 sites nationwide using 65 separate categories. This survey concluded that expanded polystyrene foam food service products constituted just 0.6 percent of roadside litter across the U.S. (KAB 2009).

Street litter audits conducted in San Francisco showed that expanded polystyrene foam cups, clamshells, plates and trays constituted just 1.7 percent of large litter in 2007 (HDR 2007) and just 1.1 percent in 2008 (HDR 2008). Those items were not identified as components of small litter.

A Highway litter study conducted in Alberta showed that expanded polystyrene foam cups, clamshells, plates and trays constituted just 1.1 percent of large litter (MGM 2007). The components of small litter were not included in this study. This particular survey did not use random site selection and noted that, because it had not done so, the survey resulted in "higher average items per site than would be observed if random site selection was used" (Ibid., p. 3).

A comprehensive street litter audit conducted using 298 randomly selected survey sites in Toronto showed that expanded polystyrene foam cups, clamshells, plates and trays constituted just 1.1 percent of large litter (MGM 2006). The components of small litter were not included in this study.

A comprehensive statewide roadside litter study, funded by Florida Department of Environmental Protection, was conducted using 670 randomly selected sites in Florida showed that all polystyrene foam food ware products (including trays) constituted only 2.3 percent of litter in 2002. Similar surveys had been conducted in Florida in 1994, 1995, 1996, 1997 and 2001. In each of those years, all polystyrene foam food ware products (including trays) never constituted more than 3.9 percent of litter (Florida 2002, p. 22). Those items were not identified as components of small litter.

California's Integrated Waste Management Board published a statewide solid waste characterization study conducted in 2003 and 2004. While that study did not specifically characterize polystyrene foam food ware, the "Miscellaneous Plastic Containers" category included all plastic containers other than HDPE and PET (CIWMB 2004, p. 100). This category comprised only 0.5 percent of trash in California. Polystyrene foam food ware would only constitute a portion of that total (Ibid., 2004, p. 6).

The US-EPA collects and reports data on the components of municipal solid waste disposal in the U.S. The most recent report showed that polystyrene foam food service products constitute 0.44 percent of municipal solid waste (US-EPA 2010, pp.4, 8).

The data from each of these studies show that all polystyrene foam food ware items constitute a small portion of roadside litter and support the evidence that BASMAA significantly overstated the amount of polystyrene foam food ware as a component of litter.

Only one of these surveys did not use a statistically-based representative methodology. That survey still showed that polystyrene foam food ware constituted only 1.1 percent of litter and that the amount of litter observed was higher than if random sampling had been used.

CR-3: Public Education and Outreach Programs

Deeply embedding comprehensive education and ongoing outreach within a community is the most effective method of sustainably reducing litter. However, the effectiveness of such programs depends on a long-term commitment to funding, since it takes time and consistent messaging to engrain litter reduction messages into the public's minds.

These programs require community involvement and are significantly more effective when integrated with enforcement and the efforts of volunteers and highway cleanup crews to remove roadside litter. This, in turn, can help improve political will to continue supporting such programs.

Since motorists and pedestrians are still considered significant sources of littering, education campaigns targeting individual behavior should continue to prevail as a strategy for reducing litter.

Reductions in overall per-capita litter rates suggest that litter reduction education and cleanup efforts can successfully reduce deliberate litter.

Education and outreach should focus efforts on reducing unintentional litter – spillage from insufficiently secured vehicles, an important element in further efforts to reduce litter.

In 1975, KAB completed the Action Research Model (ARM), a three-year project that identified the norms required to reduce littering behavior. The study found that continuous education is required for litter reductions and that positive reinforcement will help maintain program interest (ARM 1975).

Paid advertising programs targeting the age groups primarily responsible for littering are the most cost-effective, according to a New Jersey study of litter program efficacy (New Jersey 2004). The study showed that targeted advertising prevented littering from occurring at a cost of $0.02 per item and could achieve litter reductions of up to 70% within six years if annually funded at a minimum level of $0.30 per capita.

Another important factor of successful programs is the choice of a slogan reflecting the level of commitment a community or state has adopted. Tough slogans have been shown to be more successful at the state level compared with slogans that have less aggressive tones.

Two slogans that were strong in tone included Washington State's "Litter and It Will Hurt", which reduced litter by 24 percent between 2000 and 2004, and Georgia's slogan "Litter. It Costs You.", which was adopted in 2006. Both slogans were accompanied by significant support from enforcement officers and the court system along with supportive PSAs (KAB 2007). Budget cuts have restricted the ability of these states to continue these programs at previous levels.

Maintaining continuous and long-term funded public education and outreach will be vital to reducing litter in a community particularly given current mobility trends and population growth in a community.

CR-4: Reduction of Trash from Uncovered Loads

Insufficient Securing of Trash and Recycling Collection Vehicle Loads

Insufficiently secured trash and recycling collection vehicles are a significant source of litter (ER Planning 2010, p. 25). Such vehicles along with untarped pickup trucks were estimated to be the source of 16.4 percent of the 51.2 billion pieces of roadside litter identified nationwide (KAB 2009, pp. 3-8).

That study also found a significantly higher rate of litter on roadways within two to five miles of solid waste and recycling facilities than on other roadways (KAB 2009, pp. 3-21).

This problem was also documented clearly in a study conducted by Florida Center for Solid and Hazardous Waste Management. That study observed spills at 28.8 percent of trash pickup sites and spills on the road after 20.8 percent of trash pickups (Florida 2003, p. 4).

San Francisco's departments of Public Works and Environmental Health reported in 2012 that, while collection vehicles are inspected, collection routes are not monitored for this type of spillage.

Inadequate Landfill Practices

BASMAA cites a CIWMB observation that, "Furthermore, blowing litter, principally plastic bags, is a commonly cited landfill violation" (CIWMB 2007). Altamont Landfill Community Monitor Committee ("CMC") reports that "The physical setting of the ALRRF site also presents certain constraints and opportunities. Hilly terrain and high winds require constant attention to windblown litter, especially film plastic bags and foam plastic packaging" (CMC 2009).

A May 2008 CMC memorandum includes observations from landfill inspections conducted in January and February 2008. These inspections indicated that a "substantial amount of windblown litter, primarily plastic bags and film" had been documented in both months (CMC 2008, p. 2).

CMC inspections observed windblown litter as a known problem, specifically in November and December 2009 (CMC January 2010, pp. 8, 28, 30, 36, 37).

CMC Records of 2010 inspections at Altamont Landfill note that only 12 inspections were conducted the entire year. Despite the fact that most of these inspections were announced in advance, problems with refuse handling and windblown litter, "primarily plastic bags," were identified in four different months (CMC December 2010, p. 37, 39, 53).

CMC acknowledged that windblown litter would continue to be an issue due to the height of Fill Area 1 (Ibid., 2010, p. 55). They further noted that problems with windblown plastic bags persisted in December 2011 (CMC 2012, p. 24).

CMC clearly cites two problems that continue to cause windblown litter problems, specifically light materials such as plastic bags and polystyrene foam products at Altamont Landfill:

1. Poor design regarding terrain and high winds, which require constant attention to windblown litter.

2. Inadequate landfill practices continue to cause litter problems. Windblown littering of plastic bags was observed in two of the 12 annual inspections, constituting 16.7 percent of inspections. If this is representative of Altamont Landfill operations, then windblown littering of plastic bags could occur approximately 61 days each year.

CR-5: Anti-Littering and Illegal Dumping Enforcement

Enforcement of anti-littering and illegal dumping is a significant key to reducing litter. States and communities can impose fines for vehicles traveling with untarped loads. Solid waste management facilities can add surcharges for untarped loads. Both of these strategies can help achieve significant reductions in litter. It is uncertain whether any such facilities in the region currently surcharge untarped loads.

In an effort to reduce littering due to rear-load collection vehicles traveling with the blades not closed, waste management facilities such as those in Onondaga County, New York, have instituted surcharges for untarped vehicles. In addition, customers are subject to fines of up to $1,000 by the New York State Department of Environmental Conservation. These best management practices have helped reduce this type of litter significantly. Further reductions can occur if a list of violators is released to the media.

George L. Kelling, Professor in the School of Criminal Justice at Rutgers University and a Research Fellow in the Kennedy School of Government at Harvard University, called attention to importance of enforcement with his landmark "Broken Windows" theory (Kelling 1996).

He was able to prove the correlation between enforcement and reductions in crime under the auspices of the Manhattan Institute (Kelling 2002). Kelling later applied that theory to the importance of enforcing anti-littering ordinances (Kelling 2006).

An ongoing challenge of litter reduction strategies is the perceived reluctance of enforcement officials and courts to consider litter offenses a priority. Enforcement officers are tasked with significant responsibilities and littering is not commonly observed. However, when officers do observe littering, having programs and training in place can benefit enforcement officials.

In his talk at the 2006 Governor's Litter Summit in Georgia, Kelling noted that people who commit offenses such as jumping subway turnstiles and littering have a higher than average rate of outstanding warrants. Thus, enforcement of anti-littering ordinances can provide useful tools to enforcement officers.

In a 1971 survey of 1,035 police departments across the U.S., 86 percent felt that enforcement could be effective if enforcement agencies and courts were trained on the implications of litter in their communities. This sentiment was echoed in 2006 at Georgia's litter summit. When implemented with public education and cleanup efforts, enforcement can serve as an effective tool. Sentencing offenders to clean up litter was recommended. Effective enforcement cannot be dependent on signs alone. Anti-litter signage without enforcement can result in higher litter rates (KAB 2007, p. 60).

One factor in successful enforcement is the use of courts specifically designed to handle environmental offenses. This type of court is more supportive of environmental crimes and has higher conviction rates. More than 70 similar courts have been put in place (USCM 1999).

CR-6: Improved Trash Bin/Container Management

The effectiveness of improved trash receptacles was proven by William C. Finnie, Ph.D. in studies he conducted. One study, testing the effect of decorated litter receptacles placed on each block of an urban area in Richmond, VA, reduced litter by a statistically significant 16.7 percent (Finnie 1972). A similar study of attractive receptacles in St. Louis reduced litter by 14.7 percent.

Finnie also found that conspicuously decorated trash receptacles on highways reduced litter by 28.6 percent and that these reductions were apparent six miles from the receptacles. Other researchers such as Dr. Scott Geller and Cone and Hayes have replicated similar results in subsequent studies.

Appropriately placed litter receptacles in commercial and public areas can also reduce littering rates. The City of Long Beach, CA used strategically placed receptacles to reduce litter in storm-water runoff. Receptacles were placed in business areas, bus stop and recreational areas (Long Beach 2001).

According to the City's Storm Water Management Program Manual, approximately 1,000 litter receptacles were placed along public street frontage and serviced at least once per week. The city also placed approximately 2,100 litter receptacles in recreational areas and ensured that they were serviced regularly (Long Beach 2001).

For litter receptacles to effectively reduce litter they must be maintained in a timely manner and ordinances must be put in place and enforced regarding proper maintenance. Overfilled receptacles create litter. As properly maintaining and emptying trash and litter receptacles can be time-consuming and expensive, public/private partnerships can alleviate the costs of upkeep.

CR-7: Single-Use Food and Beverage Ware Ordinances

BASMAA proposes offering the most credits for a measure that taxes the use of single-use or alternatively credits the use of "Bring Your Own" food and/or beverage ware. Unlike street sweeping, the extent to which this measure would reduce litter is uncertain, but is likely minimal since it does not remove materials from the waste stream, it merely taxes their use.

Step #3: On-land Interception

QF-1: On-land Trash Cleanups (Volunteer and/or Municipal) (Area-wide)

BASMAA states that "On-land trash cleanups will be applied as an area-wide reduction and all effective loading rates will be adjusted equally" (BASMAA 2012b, p. 7).

It is highly unlikely that cleanups will be conducted equally within any municipality's area. Loading rates will only be affected in the specific areas that clean-ups occur, similar to street-sweeping, which is area-specific.

"The result of adjustments to effective loading rates due to the implementation of these enhanced control measures will be a set of conveyance system loading rates. The conveyance load is the volume of trash estimated to enter the stormwater conveyance system (e.g., storm drain inlets)" (Ibid. p. 8).

Litter cleanups, whether conducted by volunteer, cities or counties, reduce littering. Research (Cialdini, 1990), was a repeat of similar research done in 1973 (Finnie), 1977 (Geller, Witmer and Tuso) and 1978 (Krause, Freedmen and Whitcup) have shown that litter begets more litter (KAB 2007).

The Adopt-A-Highway program, by itself, which began in 1985, now has about 1,000,000 volunteers nationwide that clean up litter on close to 500,000 miles of roadways" (KAB 2009).

Because the trash characterization and control measures underlying BASMAA's tracking method are imprecise, they are unlikely to produce reasonable estimates of the volume of trash entering the stormwater system. Since storm drain inlets were used to determine the baseline trash rate, these inlets are the only accurate way to measure future reductions in the trash rate.

A revised sampling methodology addressing the flaws in the characterization methodology should be used to determine an accurate BASMAA's baseline trash rate. This would correct errors made in the previous trash characterization and would yield data considerably more accurate and would help BASMAA members choose control measures that are more likely to achieve meaningful reductions in litter.

QF-2: Enhanced Street Sweeping (Area-specific)

A New York City study of street cleaning practices found that augmenting baseline street cleaning (mechanical sweeps twice per week) with manual sweeping of each blockface once per day, six days a week reduced floatable litter 42 percent by count, 51 percent by volume and 64 percent by weight (Newman, 1996).

Enhanced street cleaning should be implemented regardless of other reduction measures used. "Frequent street cleaning can dramatically reduce the quantity of street litter reaching the drainage system – even where there is a generally adequate refuse removal service (Armitage 2001, p. 6)".

The method by which street cleaning is done is a critical factor in its efficacy. "It is important that the street sweeping is carried out in an acceptable manner. A survey carried out by the Board of Works, Melbourne in 1990 revealed that, at that time, 67% of 54 councils in the metropolitan area used street flushing to some extent. Of these about half regularly and extensively used flushing equipment or street hydrants to clean shopping centres and similar litter accumulation areas (Senior, 1992). Under these circumstances, street sweeping could increase the quantities of litter reaching the drainage system" (Ibid., p. 9).

Since enhanced street cleaning can impact floatable litter so significantly, additional credits should be awarded for implementing this measure and to help justify the expense involved.

Step #4: Trash Interception in the Stormwater Conveyance System Partial-Capture and Full-Capture Maintenance and Devices

This section addresses the following types of devices:

1. QF-3a: Partial-capture Treatment Device: Curb Inlet Screens (Area-specific)
2. QF-3b: Partial-capture Treatment Device: Stormwater Pump Station Trash Racks Enhancements (Area-specific)

3. QF-4: Enhanced Storm Drain Inlet Maintenance (Area-specific)
4. QF-5: Full-Capture Treatment Devices (Area-specific)

The use of different partial-capture and full-capture devices has been proposed. These devices provide significant opportunities for effective trash removal. However, regular maintenance and cleaning is essential to their effectiveness. Industry representatives have noted that these devices are routinely put in place and insufficiently monitored, causing trash to bypass these devices, which inaccurately portrays the trash problem.

Otherwise materials will bypass these devices and the blame will be put on these materials rather than the lack of appropriate upkeep and cleaning. This dynamic has been observed in Ballona Creek where materials bypass treatment devices despite a nominal water flow. Similar problems have been documented as noted below.

"The main disadvantage of trash racks is their inability to self cleanse (Nielsen & Carleton, 1989; Beecham & Sablatnig, 1994; and DLWC, 1996). Even though trash racks are designed to cope with discharges while partially blocked (SPCC, 1989) overtopping of a trash rack is common (Carleton, 1990; McKay & Marshall, 1993; and Melbourne Water, 1995a). As more material is retained behind the bars less water can penetrate the bars and the water level behind the trash rack rises until the bars are overtopped. When water flows over the top of the rack it carries not only incoming gross pollutants but also material (especially floating material) that has accumulated behind the screen. The backwaters behind a blocked trash rack can cause upstream flooding, reduce flow velocities near the rack and allow sediments to settle which further contribute to blocking" (Allison 1998, p. 12-13).

Step #5: Trash Interception in Waterways

QF-3c: Partial-capture Treatment Device: Litter Booms/Curtains (Area-wide)

Devices such as litter booms have the potential for significant trash removal. While they can trap large amounts of materials, their limitations have been noted as well.

"Despite early claims of high trapping efficiency (Molinari & Carleton 1987) it was later recognised that during high flows the gross pollutant retaining performance of floating booms is greatly reduced because material is forced over and under the boom (Nielsen & Carleton, 1989; Gamtron, 1992; and Horton et al., 1995), or the boom breaking from the banks (MMBW et al., 1989). The litter retention properties of booms can be enhanced by angling booms across to the current, and by using mesh skirts (Horton et al., 1995); however, high flow problems still persist" (Allison 1998, p. 19).

QF-7: Creek/Channel/Shoreline Cleanups (Volunteer and/or Municipal) (Area-wide)

Cleanups in creeks and along shorelines are critically important and should be awarded credits based on the amount of trash removed and should be applied to the specific areas in which they are conducted. Refer to QF-1 for additional comments.

Step #6: Comparison to Baseline Trash Load

Serious flaws in BASMAA's trash characterization process have been clearly articulated. The formula used in Step #6 compounds these flaws and produces data that is misleading and unlikely to reach the goals it could have achieved. Others have also raised concerns about the type of methodology used by BASMAA:

"There is an enormous variation in the published data on measured litter loadings. Not only are there large differences between the littering profiles of different catchments, but often the data merely reflects the state of the catchment at the time of measurement. What complicates the matter further is that there is no uniformity in the reporting of catchment litter data. The mass of a sample will vary with its moisture content, and frequently samples taken from drains are not dried before they are weighed. The density of the sample can increase by as much as five times from being loose in the drain to being compacted in the back of the refuse removal vehicle" (Armitage 2001, p. 4).

"In particular the degree of fullness recorded was found in many cases to be almost completely arbitrary… Litter counts do however give a better indication of the aesthetic impact of lighter materials such as plastic bags and packaging which can appear to be negligible in terms of mass" (Marais 2003, p. 7).

"It proved to be quite difficult to obtain "accurate" results because so many factors influence litter loading" (Ibid., p. 13).

Refer to comments in Objective 1 for discussions on the importance of counting littered items and providing the weights recorded.

Credits Summary for Control Measure Categories

Table 6 below summarizes the credits that BASMAA currently proposes, focusing an inordinate percentage of points on material bans, based on flawed data regarding the percentage of these items as components of litter.

The table below shows an alternate allocation of credits based on BASMAA's method. More than 20 percent credits are possible for full implementation of CR-1 and CR-2, although the items represented in these categories comprise less than 10 percent of litter in statistically-based litter surveys.

Table 6 – BASMAA Credit Allocations

#	Sequence	Control Measure Categories	Description	Plastic	All
CR-1	2a	Single-Use Carryout Plastic Bag Ordinances	Large Supermarkets	6%	8%
			Retail Est. Selling Packaged Foods	8%	10%
			All Retail (except restaurants)	10%	12%
			Bans/Fee: All bags in all retail	?	?
CR-2	2b	Polystyrene Foam Food Service Ware Ordinances	Permitee Events & Properties	2%	
			Ban Use by Food Service Vendors	8%	8%
CR-3	2c	Public Education and Outreach Programs	Ad Campaigns	3%	
			Outreach - School-Age or Youth	2%	
			Use of Free Media	1%	
			Community Outreach Events	2%	8%
CR-4	2d	Reduction of Trash from Uncovered Loads	Language in Hauler Contracts	1%	
			Enhanced Enforcement	4%	5%
CR-5	2e	Anti-Littering and Illegal Dumping Enforcement	Program in Place	2%	
			Cameras, etc. at 20-50% of hot spots	1%	
			Cameras, etc. at >50% of hot spots	2%	
			Barriers/Improvements at 20-50%	1%	
			Barriers/Improvements at >50%	2%	6%
CR-6	2f	Improved Trash Bin/Container Management		1-6+%	
			Ordinance - Private Property Bins	1%	
			+ Enforce Inadequate Trash/Rec Bins	3%	
			Plan for Public Area Contaienrs	3%	
			Est. BID w/ Trash Reduction Measures	*	7%
CR-7	2g	Single-Use Food and Beverage Ware Ordinances	Ord - Vendor BYO mandatory discount - bev.	8%	
			Ord - Vendor BYO disc. & single-use fee - bev.	12%	
			Ord - Vendor BYO mandatory discount - food/bev.	20%	
			Ord - Vendor BYO disc. & single-use fee - food/bev.	24%	24%
					88%

Alternate Credits Allocation

The table below shows an alternate allocation of credits based on more realistic, proven strategies for reducing litter using the same number of credits that BASMAA had originally allocated. Certain measures, which are unlikely to impact litter significantly, have been omitted.

Table 7 – Alternate Credit Allocations

#	Sequence	Control Measure Categories	Description	Credits	All
CR-3	2c	Public Education and Outreach Programs	Ad Campaigns	2%	
			Outreach - School-Age or Youth	3%	
			Use of Free Media	1%	
			Community Outreach Events	7%	13%
CR-4	2d	Reduction of Trash from Uncovered Loads	Language in Hauler Contracts	2%	
			Enhanced Enforcement - based on effectiveness	8%	10%
CR-5	2e	Anti-Littering and Illegal Dumping Enforcement	Program in Place	1%	
			Cameras, etc. at 20-50% of hot spots	2%	
			Enforcement - based on effectiveness	5%	
			Cameras, etc. at >50% of hot spots	2%	
			Enforcement - based on effectiveness	5%	
			Barriers/Improvements at 20-50%	2%	
			Barriers/Improvements at >50%	4%	21%
CR-6	2f	Improved Trash Bin/Container Management	Ordinance - Private Property Bins	1%	
			+ Enforce Inadequate Trash/Rec Bins	5%	
			Plan for Public Area Contaienrs	2%	
			Est. BID w/ Trash Reduction Measures	5%	13%
QF-1	3a	On-Land Trash Cleanups	Based on trash removed by staff and volunteers	2%	
QF-2	3b	Enhanced Future Street Sweeping	Based on frequency and parking enforcement	4%	
			Augment with area-specific manual sweeping	8%	
QF-3a	4a-1	Partial-Capture Treatment Devices	Based on effectiveness	2%	
QF-3b	4b	Partial-Capture Treatment Devices	Based on effectiveness	2%	
QF-4	4a-2	Enhanced Storm Drain Inlet Maintenance	Based on effectiveness	2%	
QF-5	4a-3	Full-Capture Treatment Devices	Based on effectiveness	7%	
QF-3c	5a	Partial-Capture Treatment Devices - Litter Booms/Curtains	Based on effectiveness	2%	
QF-6	5b	Creek/Channel/Shoreline Cleanups		2%	31%
					88%

Data Analysis Tables

Table 8 shows a set of correlation coefficients. The relationship of each of three demographic variables to each of two trash variables was analyzed. Note that correlation coefficients go from -1 to +1. A positive value suggests a direct relation between two variables: that is, as one increases, the other tends to increase as well. Negative values suggest an inverse relationship, so that as one variable "goes up," the other "goes down." A value of 0, or a value close to that, indicates that no relationship was found.

Note that population density had a slight positive correlation with plastic bag litter and a slight negative correlation with PS foam food ware litter. However, both of these values are close to zero, and neither is statistically significant. The same could be said of the results when the variable "days between street sweeping" was analyzed.

However, the correlations for "median household income" (MHI) are noticeably different: both are negative (and similar) and both of these values are statistically significant at the .05 level. These results are indicative of some relationship between MHI and litter rates. More specifically, as MHI increases, the volume of litter decreases.

Table 8 – Demographic Correlations

Variable	Plastic Bags	PS Foam FW
Population Density	0.03	-0.02
Median Household Income	-0.20	-0.21
Days Between Street Sweeping	0.01	-0.01

Table 9 presents the results of the same analyses, but with the outlier (site RI01) removed. Now both coefficients under "population density" are positive. Furthermore, the correlation between population density and plastic bag litter shows that retail plastic bags found in litter increases with higher population density. This correlation is statistically significant.

The correlations listed for median household income have changed slightly from Table 8, but they are both still significant. The values relating to street sweeping are both negative, but neither is statistically significant.

Correlations were calculated at the .05 significance level. We reject the null hypothesis that there is no correlation between population density and plastic bag litter, and accept the alternate hypothesis that these variables are related.

Table 9 – Demographic Correlations: Outlier Site RI01 Removed

Variable	Plastic Bags	PS Foam FW
Population Density	0.13	0.06
Median Household Income	-0.18	-0.19
Days Between Street Sweeping	-0.07	-0.10

Table 10 compares the mean and median volumes of retail plastic bags and polystyrene foam food ware in litter by county. The mean values for Contra Costa County are more than twice the values for any other county. The city and county data for Site SC01 was not identified. Thus, that site was not included in the comparison in Table 10.

Table 10 – Litter by County

Value	Alameda	Contra Costa	San Mateo	Santa Clara
Number of Samples	67	15	25	108
Mean Volume of Plastic Bags	0.13	0.513	0.253	0.16
Mean Volume of PS Foam FW	0.09	0.509	0.246	0.12
Median Volume of Plastic Bags	.00	0.22	.00	.00
Median Volume of PS Foam FW	.00	0.05	.17	.00

Table 11 shows the mean and median volumes of the same materials with the outlier site RI01 removed from the analysis. Since that site is in Contra Costa County, only the values for that county have been affected. Note that the mean volumes of plastic bag and PS foam FW litter have dropped substantially, while one median value remains unchanged and the other shows a decrease of only .01.

Table 11 – Litter by County: Outlier RI01 Removed

Value	Alameda	Contra Costa	San Mateo	Santa Clara
Number of Samples	67	14	25	108
Mean Volume of Plastic Bags	.13	.26	.253	.16
Mean Volume of PS Foam FW	.09	.29	.246	.12
Median Volume of Plastic Bags	.00	.22	.00	.00
Median Volume of PS Foam FW	.00	.04	.17	.00

Table 12 shows the summary results for the sample of 216 sites, and for four variables: total debris, total trash, retail plastic bags, and polystyrene foam food ware.

Table 12 – Standard Error and Confidence Intervals

Value	Debris	Trash	Plastic Bags	PS Foam FW
Mean	6.8	2.3	.185	.16
Median	5.0	1.6	0.0	0.0
Range	30.0	42.8	4.0	3.6
Standard Error of the Mean	.415	.245	.026	.024
95% Confidence Interval				
Upper Limit	7.619	2.759	0.236	0.203
Lower Limit	5.983	1.791	0.134	0.109

Table 13 presents the same statistics, but with the single outlier (site RI01) removed from the analysis: thus, these values are based on a sample of 215 sites. From Table 12 to Table 13, all mean values drop, while all median values remain unchanged. Note that the means were more sensitive to the inclusion or exclusion of the outlier values.

Both the mean and the median measure averages in a distribution of values. When the distribution is symmetric, the mean and median should be close in value. However, asymmetric distributions yield divergent results.

An outlier can disproportionately affect the mean, but not the median. Therefore, the median is more useful in communicating the typical value for BASMAA's data. Both means and medians are reported in the tables below.

The standard errors and 95% confidence intervals are also reported in Tables 12 and 13. Both express the reliability of the sample mean. Using a 95 percent confidence interval lets us know how likely a value is to be within the limits of the upper and lower limits specified. A smaller standard error and narrower confidence interval suggest that a more precise estimate has been obtained.

The standard errors in Table 13 are considerably lower than those in Table 12, suggesting that the sample means reported in Table 13 have greater precision. We would expect this to be true since data for the one outlier was removed. Similarly, the confidence intervals are tighter in Table 13, also suggesting greater precision.

The mean values are 0.15 and 0.35 ("ban" and "no ban," respectively) and reflect a statistically significant difference.

With regard to polystyrene foam food ware, a similar (but less pronounced) pattern was found. Sites with bans in effect had lower mean volumes of such litter, but the differences are not statistically significant.

Table 13 – Standard Error and Confidence Intervals: Outlier Site RI01 Removed

Value	Debris	Trash	Plastic	PS
Mean	6.7	2.1	.170	.140
Median	5.0	1.6	0.0	0.0
Range	29.6	18.27	1.3	1.7
Standard error of the mean	.403	.158	.019	.018
95% confidence interval				
upper limit	7.487	2.397	.204	.175
lower limit	5.9	1.776	.130	.105

Analysis of Litter Rates and Bans in Place

BASMAA's trash characterization did not document allocating any of the sampling sites to unincorporated areas. Since countywide bans may apply only to unincorporated areas, comparing litter rates based on whether or not countywide bans had been put in place could be misinterpreted and thus is not included in this report.

The following analysis takes into account whether or not citywide bans were in effect at the time BASMAA's trash characterization was conducted. BASMAA provided specific data regarding the cities in which sampling was conducted.

Table 14 presents the results of analyzing city bans on retail plastic bags and polystyrene foam food ware. The difference in the mean values of polystyrene foam food ware was statistically insignificant. The median value for polystyrene foam food ware was 0.0 where a city ban had been put in place and 0.03 where no city ban existed, an insignificant difference mathematically and statistically.

The mean volume of retail plastic bags was lower where a city ban existed (0.14) than where one did not exist (0.23). While this difference was statistically significant when the outlier site was included, it was not statistically significant once the outlier site was removed, as shown in Table 15. The median value for retail plastic bags was 0.0, regardless of whether or not a city ban had been put in place.

Table 14 – Standard Error and Confidence Intervals: City Bans vs. No Bans

	Plastic Bags		PS	
Value	**Yes**	**No**	**Yes**	**No**
Sample Size	110	106	36	180
Mean	0.14	0.23	0.2	0.15
Median	0.0	0.0	0.0	0.03
Range	1.11	4.0	3.56	1.67
Standard error of the mean	0.023	0.046	0.106	0.019
95% confidence interval				
Upper limit	0.189	0.321	0.414	0.185
Lower limit	0.096	0.138	0.00	0.109

The same analysis was conducted after removing the outlier (site RI01). The results are presented in Table 15. Note that the confidence intervals for the mean values were noticeably tighter than in Table 14.

Although the mean values were lower where bans had been put in place, the differences were not statistically significant for retail plastic bags or polystyrene foam food ware products.

Table 15 – Standard Error and Confidence Intervals: City Bans vs. No Bans - Outlier Removed

	Plastic Bags		PS	
Value	**Yes**	**No**	**Yes**	**No**
Sample Size	110	105	35	180
Mean	0.14	0.19	0.1	0.15
Median	0.0	0.0	0.0	0.03
Range	1.11	1.33	1.33	1.67
Standard error of the mean	0.023	0.029	0.047	0.019
95% confidence interval				
Upper limit	0.189	0.251	0.197	0.185
Lower limit	0.096	0.135	0.007	0.109

High Litter Rates in Cities with Bans in Place

Some of the sites with the highest amounts of retail plastic bags and polystyrene foam food ware were in cities that had bans of these items in place at the time that BASMAA's trash characterizations were conducted.

Half of the six sites with the highest amounts of polystyrene foam food ware in litter had citywide bans in place at the time these characterizations were conducted as shown in Table 16.

Table 16 – High Litter Rates in Sites with City Bans – PS Foam Food Ware

#	BASMAA Site ID	PS Foam	City	County	PS Ban
1	RI01	3.56	Richmond	Contra Costa	y
2	SM07	1.67	San Mateo	San Mateo	
3	RI03	1.33	Richmond	Contra Costa	y
4	SL25	1.22	San Leandro	Alameda	
5	BR04	1.00	Brentwood	Contra Costa	
6	OK02	1.00	Oakland	Alameda	y

Similarly, half of the six sites with the highest amounts of retail plastic bags in litter also had citywide bans in place at the time these characterizations were conducted as shown in Table 17.

These sites showed no relationship between the litter rates of retail plastic bags or polystyrene foam food ware and citywide bans that had been put into effect.

Table 17 – High Litter Rates in Sites with City Bans – Retail Plastic Bags

#	BASMAA Site ID	Pl Grocery Bags	City	County	Pl Bag Ban
1	RI01	4.00	Richmond	Contra Costa	
2	SM12	1.33	San Mateo	San Mateo	
3	SP01	1.11	San Pablo	Contra Costa	
4	SJ08	1.11	San Jose	Santa Clara	y
5	SJ22	1.11	San Jose	Santa Clara	y
6	SJ38	1.11	San Jose	Santa Clara	y

Cigarette Butts

Ironically, cigarette butts, one of the most toxic components of litter were only mentioned once in BASMAA's documents and then, only in passing (BASMAA 2011b, p. 23). Yet Caltrans had determined that the impacts of discarded cigarette butts were significant enough to be included when it studied litter in its stormwater conveyance systems (Caltrans 2000).

Caltrans' study of litter composition showed a "very high proportion of the number of cigarette butts, which is consistent with net bag monitoring results from the drainage system" (Ibid., p. 4-31). Although individual cigarette butts were not collected in the ROW portion of Caltrans' study (Ibid., p. 4-33), they comprised 10 to 34 percent of drainage system litter (Ibid., p. 4-35). By count, Caltrans found that cigarette butts were the largest component of all litter (Ibid. 6-6).

The KAB National Litter Survey determined that cigarette butts constituted 36.3 percent of all roadside litter nationwide (KAB 2009). Cigarette butts comprised more than eight times the amount of all other litter counted on roadway edges in Georgia (Georgia 2006, p. 3-6).

Kathleen Register, co-author of US-EPA's "Estuary Monitoring: A Methods Manual", notes that cigarette filters are made of cellulose acetate fibers, a material designed to absorb chemicals from tobacco and which degrades slowly. "Since tobacco is not classified as a food or drug, there are no legal maximums on agricultural chemicals or chemical additives cigarettes may contain" (Register 2000).

Register's study showed that cigarette butts were toxic to water fleas, which are an accepted species for determining acute toxicity as they are sensitive to changes in water chemistry (Ibid.).

BASMAA should follow Caltrans' lead in considering the impacts of cigarette butts on its stormwater systems and waterways.

Recommendations

- Significant issues were identified regarding the trash characterization methodology used by BASMAA. This methodology should be replicated to determine the extent to which the inherent flaws cause data on lighter items such as retail plastic bags and polystyrene foam food ware to be overstated as components of litter.

- Further analysis such be conducted evaluating the impact of underlying problems such as inadequate landfill practices and design on litter rates.

- Trash collection vehicle practices should be monitored to determine the extent to which they are a source of litter in cities and counties that are BASMAA members. These cities and counties should explore the use of enforcement and education to reduce this source of litter.

- Landfill monitors should conduct unannounced inspections in order to obtain more accurate information about the actual levels of litter originating from local landfills.

- The impact of discarded cigarette butts should be addressed in studies analyzing the effects of trash on stormwater systems and waterways.

- A more rigorous QA/QC process should be used to ensure that the trash characterization methodology produces accurate data.

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Appendix A - CV Brief

624 Main Street, Suite B ● Gaithersburg, MD 20878 ● Phone: (240) 631-6532 ● sstein@erplanning.com

Steven R. Stein is Principal of Environmental Resources Planning, LLC ("ER Planning"), the nation's most experienced firm in the field of litter-related studies and litter's effects on our communities. Mr. Stein's background in recycling dates back to the 1970s. His work with litter has been featured on ABC's *Good Morning America* and *NPR* as well as in the *New York Times* and *National Geographic Magazine*. Field crews under his direction have physically surveyed litter along more than 15.5 million square feet of roadways and recreational areas.

Mr. Stein has worked with issues regarding the components of litter, recycling and solid waste as well as their impact on stormwater systems and the marine environment for more than 25 years. He implemented one of the nation's first consumer/commercial plastic bottle recycling programs in 1986 and has taught *Environmental Science* and *Ethics in Management* at the university level. He was recently invited to participate in a study prepared for the President as a subject matter expert on environmental issues and community dynamics.

Education

- **Ph.D. Level Coursework –** *Environmental Science*, SUNY College of Environmental Science and Forestry (SUNY-ESF)/Syracuse University (SU). Focus of studies: The influence of cultural archetypes on littering behavior. Authored a literature review of behavioral and litter quantification/characterization studies conducted between 1968 and 2006.
- **M.Sci.** – *Natural Resource Policy and Management*, SUNY-ESF/SU. Focus of studies: Macroeconomic relationship of Asian/U.S. recycling industries and evaluation of sustainable policy initiatives. Master's thesis examined the implications of public policy intervention on the establishment of sustainable domestic recycling markets. Studied under two forest economists. Recipient of New York SWANA Annual Scholarship Award.
- **B.Sci. Cum Laude** – *Environmental Studies*, SUNY-ESF/SU. Focus of studies: *Waste Management* and *Environmental Law*. Teaching assistant for Dr. Allen Lewis's *Introduction to Environmental Studies* course. Internship with New York State DEC.

Selected Litter-Related Projects

- 2012 Paper and Plastic Bag Litter Survey (2012)
- Sustainable Consumption Expert Roundtable, Johnson Foundation (2012)
- Ocean Conservancy – Beach Litter Survey Methodology (2011)
- Los Angeles County Trash Biography, FoLAR – Peer Review (2011)
- National Litter Forum: Restoring Our Communities - Organizer and Sponsor (2011)

- Northeast Litter Survey (Maine, New Hampshire, Vermont) - Project Manager (2010)
- National Litter in America Research Project - Project Manager (2008-2010)
- Community Appearance Index (Keep America Beautiful) - Project Manager (2007-2009)
- Keep America Beautiful Litter Research Forum (2007)
- Litter: Literature Review - Author (2007)
- Ocean Conservancy's National Marine Debris Monitoring Program - Survey Director for Chincoteague Island, VA Site (Pro Bono, 2006-2007)
- Potomac Watershed Initiative - Trash Monitoring Protocol Subcommittee (Pro Bono, 2006-2007)
- Georgia Visible Litter Survey - Project Manager (2006)
- Tennessee Visible Litter Survey - Project Manager (2006)
- California Beach Litter Study - Project Manager (2005-2006)
- New Jersey Litter Study - Project Manager (2004)
- North Carolina Litter Survey - Co-author (2001)