Preliminary Baseline Trash Generation Rates for San Francisco Bay Area MS4s

Technical Memorandum

Submitted in Compliance with Provision C.10.a(ii) of Order R2-2009-0074

Prepared for:

Bay Area Stormwater Management Agencies Association (BASMAA)

Prepared by:

EOA, Inc.
1410 Jackson Street
Oakland, CA 94612

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LIST OF ABBREVIATIONS

ABAG	Association of Bay Area Governments
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
CRV	California Redemption Value
DU	Dwelling Unit
gal	Gallon
GIS	Geographic Information System
HDR	High Density Residential
LDR	Low Density Residential
mm	millimeter
MRP	Municipal Regional Stormwater NPDES Permit
MS4s	Municipal Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
PG&E	Pacific Gas and Electric
RPD	Relative Percent Difference
SCVURPPP	Santa Clara Valley Urban Runoff Pollutant Prevention Program
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
yr	Year

1.0 INTRODUCTION

1.1. Regulatory Background

The Municipal Regional Stormwater NPDES Permit for Phase I communities in the San Francisco Bay (Order R2-2009-0074), also known as the Municipal Regional Permit (MRP), became effective on December 1, 2009. The MRP applies to 76 large, medium and small municipalities (cities, towns and counties) and flood control agencies in the San Francisco Bay Region, collectively referred to as Permittees. Provision C.10 of the MRP (Trash Load Reduction) requires Permittees to reduce trash from their Municipal Separate Storm Sewer Systems (MS4s) by 40 percent before July 1, 2014.

Required submittals to the San Francisco Bay Regional Water Quality Control Board (Water Board) by February 1, 2012 under MRP provision C.10.a (Short Term Plan) include:

1. (a) A baseline trash[1] load estimate and **(b) description of the methodology used to determine the load level**; and
2. A description of the Trash Load Reduction Tracking Method that will be used to account for trash load reduction actions and to demonstrate progress and attainment of trash load reduction levels.
3. A Short-Term Trash Loading Reduction Plan that describes control measures and best management practices that will be implemented to attain a 40 percent trash load reduction from its MS4 by July 1, 2014;

Short Term Trash Loading Reduction Plans (Short-Term Plans) submitted by Permittees are intended to comply with submittals #1(a) and #3 listed above. The BASMAA *Trash Load Reduction Tracking Method Technical Report* was developed and submitted in compliance with submittal #2. This technical memorandum describes the methodology used to develop trash baseline loads and the results of the BASMAA *Baseline Trash Generation Rates* Project, which provided information needed to calculate baseline loads. This Technical Memorandum is intended to comply with submittal #1(b) above required by Provision C.10.a(ii) of the MRP.

1.2. Summary of Trash Baseline Generation Rates Project

To assess progress towards trash load reduction goals in the MRP, each Permittee is required to determine the baseline trash load from its MS4. A baseline trash load must be submitted to the San Francisco Bay Regional Water Quality Control Board (Water Board) by February 1, 2012. Through the approval of a regional project by the Bay Area Stormwater Management Agencies Association (BASMAA), Permittees agreed to work collaboratively to develop a regionally consistent method to establish baseline trash generation rates.

The purpose of the regional project described in this Technical Memorandum is to assist Permittees in establishing a baseline for which to demonstrate progress towards MRP trash load reduction goals (i.e., 40%, 70% and 100%). The *Baseline Trash Generation Rates Project* incorporates a technically-sound method for developing (default) baseline trash generation rates that can be adjusted based on Permittee/site specific conditions and baseline control measure implementation to develop a baseline trash load estimate.

[1] Litter is all human-made materials (as defined by California Code Section 68055.1g), excluding sediments, sand, vegetation, oil and grease, and exotic species, that cannot pass through a 5 mm mesh screen.

The approach was intended to be cost-effective and consistent, but still provide an adequate level of confidence in estimating trash loads from MS4s, while acknowledging that uncertainty in trash loads still exists. The collaborative project was managed through the BASMAA Trash Committee and included the following steps:

1. Conduct literature review;
2. Develop conceptual model;
3. Develop and implement sampling and analysis plan;
4. Test conceptual model;
5. Develop default trash generation rates that may be adjusted by Permittees based on baseline levels of control measure implementation to calculate trash baseline loading rates; and,
6. Report trash baseline loads to the Water Board in Permittee Short-Term Trash Load Reduction Plans.

This Technical Memorandum documents the initial results of the collaborative project that is currently underway and presents the most current understanding of stormwater trash generation in the San Francisco Bay Area. Based on the results of additional trash characterization work planned in 2011-12 as part of the generation rates project, this Technical Memorandum will be superseded by a Technical Report that more fully describes methods and includes all results from all data collected during the project. The anticipated submittal date of the final Technical Report to the Water Board is September 15, 2012. Therefore, generation rates presented in this technical memorandum should be considered preliminary and are subject to revision.

1.3. Trash Baseline Loads Conceptual Model

To assist Permittees in developing a baseline trash load estimation method, BASMAA (2011b) developed a conceptual model of trash loading to MS4s. The conceptual model was built off of information derived from a comprehensive review of available literature regarding baseline trash loads entering stormwater conveyance systems from urban areas. Based on the conceptual model (and literature review), it is apparent that baseline trash loads from MS4s in urbanized areas are dependent upon:

- **Trash Generation** - the volume of trash that is generated by (i.e., deposited onto the urban landscape) in a specific geographical area; and,
- **Trash Interception** – the volume of trash that is intercepted through control measures (e.g., street sweeping) prior to being discharged via MS4s.

The conceptual model shown in Figure 1.1 identifies eight factors, both anthropogenic and natural, that are believed to be the most influential and governing of trash discharged from MS4s. This conceptual model serves as the foundation for developing trash baseline load estimates from Bay Area MS4s.

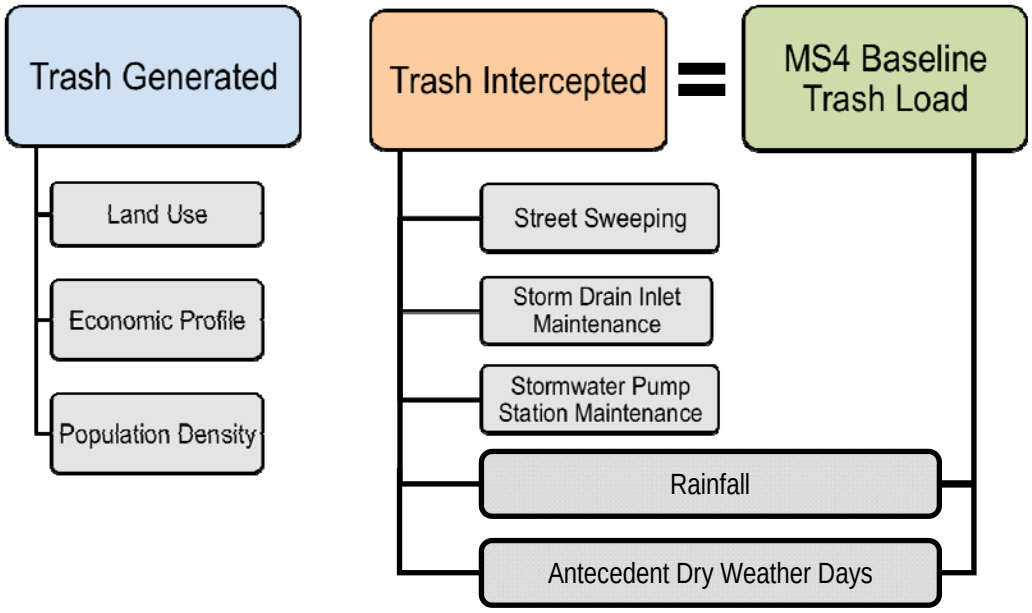

Figure 1.1. Conceptual model of trash baseline loads from Municipal Separate Storm Sewer Systems (MS4s)

It is important to note that two important and distinct terms will be used throughout this report:

- **Baseline Generation Rate** - the rate at which trash is generated onto the urban watershed under a "no interception" scenario (e.g., no street sweeping).
- **Baseline Loading Rate** - the rate at which trash is discharged from an MS4 under a "baseline" control measure implementation scenario (e.g., baseline street sweeping).

The difference between generation rates and baseline loading rates is the amount of trash intercepted by street sweeping, storm drain inlet maintenance, and stormwater pump station at baseline implementation levels. This Technical Memorandum reports on **Baseline Generation Rates** developed through the BASMAA Regional Project. These generation rates were used by Permittees to develop baseline loading estimates required by the MRP and described in Permittee-specific Short-Term Trash Load Reduction Plans.

2.0 METHODS

2.1 Monitoring Design

Sampling and analysis methods employed by BASMAA to develop trash generation rates are fully described in BASMAA (2011b). Methods were followed to provide reasonable estimates of trash generation rates from San Francisco Bay Area MS4s. Baseline generation rates are the rate at which trash deposits onto the environment and provide the starting point for establishing baseline loads from MS4s. Baseline trash generation rates should ideally be based on those factors that most influence and govern trash generation. That said, not all factors that influence the amount of trash discharged from an

MS4 can be assessed, and therefore generation rates presented in this Technical Memorandum should be considered preliminary first order estimates that have a moderate level of confidence.

2.1.1. Monitoring Strata

To test and adapt the conceptual model presented in Figure 1.1, 27 monitoring categories were developed *apriori* based on combination of land use and economic profile (i.e., Household Median Income) categories (Table 2.1). To the extent possible, land use categories were selected to closely resemble those chosen by the County of Los Angeles for its Trash Baseline Monitoring Study conducted in the Los Angeles River and Ballona Creek watersheds, and subsequently used for Total Maximum Daily Load (TMDL) development. That said, the BASMAA regional project provided a higher resolution for some land use categories (e.g., retail/wholesale and industrial) compared to studies conducted in Los Angeles County (Table 2.1). Furthermore, economic profiles and population densities were included in the BASMAA project, but were not in County of Los Angeles studies.

Table 2.1. Reclassified ABAG land use categories that were utilized during the project.

Monitoring Category	Category Description
Land Use	
High Density Residential	> 8 dwelling per acre
Low Density Residential	1 to 8 DUs per acre
Rural Residential	>1 to 5 acre lots
Retail and Wholesale	Retail and Wholesale (may include post offices and hotels)
Commercial and Services	Combines 30 ABAG land use categories that include local government, education, research centers, offices, churches, hospitals, and military.
Light and Other Industrial	Combines 4 ABAG land use categories, including light and unspecified industrial, warehousing and food processing
Heavy Industrial	Activities are devoted to heavy fabrication, making and assembling parts which are, in themselves, large and heavy, or to the processing of basic raw materials. Most industries in this category involve mechanical, chemical or heat processing.
Urban Parks	All leisure, ornamental, zoological and botanical parks. Cemeteries, golf courses, and regional parks are not included.
K-12 Schools	Elementary and secondary schools
Other	All land use categories not included above
Economic Profile (Household Median Income)	
High Income	Annual household median income of greater than $100,000
Moderate Income	Annual household median income between $50,000 and $100,000
Low Income	Annual household median income less than $50,000

*DU = dwelling unit

Land use data were acquired from the 2005 Association of Bay Area Governments (ABAG) Geographic Information System (GIS) land use layer for the Bay Area. Land uses depicted in the ABAG land use datalayer were field verified for all monitoring sites. Major errors in land use classifications in ABAG 2005 were corrected from information gained through field visits and Permittee staff knowledge of the sites.

Economic profile categories selected to test the importance of household incomes are presented in Table 2.1. U.S. Census data were used to identify economic profiles and population densities within 2-acre buffer of each site monitored in this project. The most current Census was conducted in 2010, but was unavailable for this analysis. Therefore, this project utilized the Census data from 2000.

2.1.2. Monitoring Sites

A total of 149 sites located in four Bay Area counties (Alameda, Contra Costa, San Mateo, and Santa Clara) were monitored during the project (Figure 2.1). Each site was a storm drain inlet that was equipped with Water Board recognized trash full capture device.[2] Attempts were made to spatially balance sites throughout the Bay Area while maintaining a homogenous land use for each site and a range economic profiles. The total number of sites included in the project and their associated land use and economic profile category are presented in Table 2.2.

Table 2.2. Baseline Trash Generation Rate Project monitoring site categories.

Land Use	Median Household Income		
	Low (<$50K)	Medium ($50-100K)	High (>$100K)
High Density Residential	9	14	7
Low Density Residential	4	7	7
Rural Residential	0	0	1
Commercial and Services	5	5	2
Retail and Wholesale	25	22	12
Light Industrial	10		
Heavy Industrial	5		
Urban Parks	5		
K-12 Schools	9		
Total # of Sites	**149**		

Requirements for inclusion of a monitoring site in the project included the following:

- A correctly installed, Permittee-owned full-capture device (as defined by the MRP);
- Known installation and past maintenance dates;
- Willingness of the Permittee to cleanout and transport material from the site to a central characterization site when indicated by the Project Manager;
- Homogenous land use within and directly outside of the site drainage area; and,
- Limited to no contribution of trash to the site that originates from areas outside of a Permittee's jurisdiction (e.g., no trash from State or Federally owned freeways or highways).

[2] A device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design capacity of not less than the peak flow rate resulting from a one-year, one-hour, storm in the sub-drainage area.

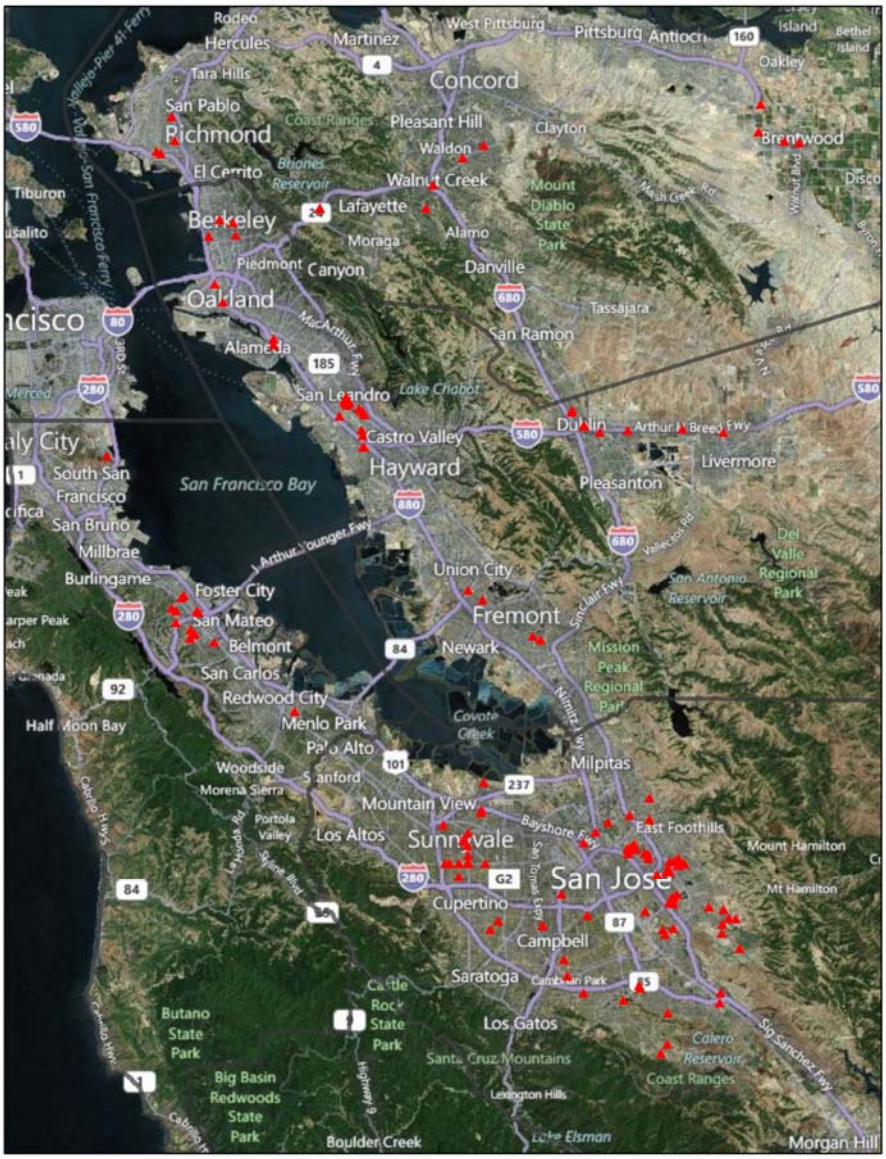

Figure 2.1. Monitoring sites included in the Baseline Trash Generation Rates Project.

2.1.3. Trash Full Capture Devices

To effectively capture trash at each monitoring site, storm drains were equipped with storm drain inserts recognized by the Water Board as full capture devices. All full capture devices installed at monitoring sites were 5mm screen-type devices installed in storm drain inlets. Specific types of storm drain inlet screens installed included:

- Stormtek™ Catchbasin Connector Pipe Screens (Advanced Solutions, Inc.)
- Connector Pipe Screens (West Coast Storm, Inc.)
- Triton Bioflex Drop Inlet Trash Guard (Revel Environmental Manufacturing, Inc.)

2.1.4. Monitoring Site Loading Areas

For each monitoring site, the geographical area that contributes trash to each storm drain inlet was delineated using a standardized method. First, experienced field survey staff reviewed available site drainage maps and conducted field visits to each monitoring site. Hydrological drainage areas were delineated based on topography and the storm drainage system flow directions using the best available information. Once developed, hydrologic drainage areas were adjusted to conform with effective trash loading area definitions described in Section 5.2. Adjustments were made to provide consistency between trash baseline loading estimates and the maximum geographical extent of control measure implementation.

2.1.5. Tracking of Important Factors

Accumulation Periods

Trash accumulation periods for each sampling event were defined for each monitoring site. Accumulation periods were defined as the number of days between the previous cleanout (or installation) date and the monitoring (cleanout) date. Installation and cleanout dates were provided by Permittees or third party contractors responsible for installation and/or cleanout of devices. Accumulation periods for each site and sampling event combination are included in Appendix C.

Rainfall and Antecedent Dry Weather Days

Data from rainfall gages located in as close proximity to each monitoring site as possible were identified. As a result, there were a variety of sources that provided precipitation data for this project. Flood control districts in Alameda, Contra Costa and Santa Clara Counties and the National Weather Service (NWS) provided precipitation data, in addition to rainfall data collected at regional airports. Rainfall totals for 24-hour periods and rainfall intensity[3], as well as antecedent dry weather days[4] were determined from these records for each site during each accumulation period.

Street Sweeping Frequency and Parking Enforcement Data

For each monitoring site, street sweeping frequency and parking enforcement data were obtained through a combination of municipal staff queries, observations of signs posted at sites, and municipality websites. Parking enforcement, or the equivalent, was defined as the ability of a street sweeper to sweep to the curb. Measures that constituted parking enforcement or equivalent included the following:

- Posted signs restricting parking during sweeping times;
- Parking enforcement and citations by local law enforcement;
- Sweeping prior to the arrival of cars on the street;
- Absence of parking on the street; and
- Available, but unused street parking due to alternate and/or preferred parking areas (e.g., driveways and garages in residential areas).

[3] Greatest rainfall intensity in a 24 hour period

[4] Days with less than 0.2 inches per day

2.2. Monitoring and Characterization Events

2.2.1. Trash Monitoring

Three monitoring (cleanout) events were scheduled as part of this BASMAA Regional Project. The first two are pertinent to this Technical Memorandum.

To ensure monitoring occurred during similar timeframes, the project manager scheduled cleanout events for all sites during the same week. Exact cleanout dates were provided by municipal staff, or third party contractors responsible for cleaning of the devices. Permittees were responsible for cleaning of sites and transporting all material to the centralized characterization location during the project. For all sites, trash and debris (e.g., dirt, leaves, rocks, bugs, etc.) were removed and placed in large, plastic garbage bags and transported to the central characterization site located at the City of San Jose's Mabury Corporation Yard.

The first monitoring event was timed to encompass the 2010-2011 wet weather season (November through April). A total of 71 monitoring sites were cleaned between May 16-18, 2011 for this event. The trash accumulation period for the first event ranged between 66 to 257 days for each site. During these site accumulation periods, between 3 and 14 inches of rainfall was observed at gages. The number of wet weather days[5] during these accumulation periods was between 5 and 22 days, depending on the site.

The second monitoring event was conducted between September 8 and 15, 2011 and designed to depict trash generation during the dry weather season (May through October). In addition to sites monitored during the first event, several additional sites were included in the second event, bringing the total number of sites to 149. Again, the trash and debris captured by the devices was transported to the central characterization location by Permittees or contractors. For the second event, the accumulation periods at sites ranged from 36 to 355 days. Though this monitoring event occurred during the dry season, two unseasonable storms in early and late June resulted in rainfall at all sites installed prior to June 2011. In addition, sites installed prior to the start of the second event, but not identified before the first event included rainfall from the previous wet season. As a result rainfall totals at gages near the 149 monitoring sites ranged from 0 to 15 inches over 0 to 24 wet weather days during the accumulation periods. Rainfall was not observed during accumulation periods for those sites where devices were installed after June 2011.

2.2.2. Trash Characterization

Once material cleaned from storm drain inlets was received at the centralized characterization site, trash was separated from other debris using standard operating procedures outline by BASMAA (2011b). A third party contractor, Cascadia Consulting Group, Inc., was employed to conduct all trash characterization activities (Figure 2-2). Cascadia staff characterized all trash into the following categories:

- Recyclable beverage containers labeled with a California Redemption Value (CRV);
- Single-use, plastic grocery bags;
- Polystyrene foam;
- Other plastic material;
- Paper;

[5] A wet day is defined as a 24-hour period with greater than 0.2 inches of rain

- Metal; and,
- Miscellaneous trash.

Material from individual trash categories and other debris were weighed and the volume was measured for each site during each event. Material was placed in containers between 32 ounces and 5 gallons (depending on the volume). Weights and volumes were recorded on standardized field data sheets. Following the completion of measurements, all trash and debris were disposed of properly.

All data recorded on field data sheets were transferred into a project database. To ensure that all data were transferred correctly, quality assurance and control checks were performed throughout and following data entry.

2.3. Quality Assurance and Control Procedures

Quality assurance procedures were implemented throughout the project to ensure that high quality data were obtained. Field forms and monitoring procedures developed by BASMAA (2011b) were used by all individuals monitoring (cleaning) material from sites. The procedures included specified labeling of bags of material collected from sites and mandatory cleaning instructions. A training event was also conducted for field crews to ensure proper understanding of field monitoring and quality control procedures.

For the vast majority of sites/events, field monitoring procedures were followed and no issues were observed. However, of the 149 monitoring sites, data from 12 sites were removed from the project due to one or more of the following issues:

- **Installation Errors** – device was installed incorrectly or in the wrong location;
- **Maintenance Errors** – monitoring occurred at the incorrect site and as a result a storm drain inlet without a device was cleaned;
- **Book-keeping Errors** – the location of the device that was cleaned or cleanout date could not be confirmed;
- **Land Use Errors** – following delineation of the site drainage area and land use analysis, the site could not be defined as depicting a single land use category.
- **Jurisdictional Errors** – sites included streets swept by the California Department of Transportation and not a Permittee.

Quality assurance procedures performed during trash characterization included oversight by two project managers, and reweighing/measurements of material to ensure consistency, accuracy and completeness. Material from 8 and 19 sites was reweighed and measured during the first and second characterization events, respectively. Relative percent difference (RPD) calculations were used to assess the accuracy of measurements. These results are presented in Appendix B.

3.0 MONITORING AND CHARACTERIZATION RESULTS

The results of the first two characterization events are described below. Though both weights and volumes were measured, only trash volumes are discussed in this technical memorandum. Volume was chosen as the standard measurement unit because weights are not representative of lighter more prevalent trash categories, such as Styrofoam, paper, and single use plastic grocery bags; and weight measurements can be biased by the moisture content of the material, which varies based on site and event. Results for both weight and volume measurements will be presented in the Final Technical Report anticipated for completion in 2012.

3.1. Material Composition and Trash Types

3.1.1. Monitoring Event #1

A total of 626 gallons of material was removed and characterized from 71 sites during the first monitoring/characterization event. On average (mean), trash represented 22% (by volume) of all material removed and characterized. Plastic material (other than CRV-labeled containers and plastic grocery bags) comprised the largest percentage (54%) of trash characterized during the first event. Trash identified as CRV-labeled containers (14%) and paper (12%) made up the next most prevalent trash types. Plastic grocery bags and polystyrene foam accounted for 7% and 6% of the trash volume characterized, respectively. Trash percentages in each category are shown in Figure 3.1.

3.1.2. Monitoring Event #2

A total of 1,353 gallons of material was removed and characterized from 149 sites during the second monitoring/characterization event. Similar to Event #1, on average, trash represented 27% (by volume) of all material removed and characterized. Plastic material (other than CRV-labeled containers and plastic grocery bags) again comprised the largest percentage (47%) of trash characterized. Paper items were the second most prevalent trash category, comprising 25% of the trash volume. Plastic grocery bags and polystyrene foam accounted for 8% and 7% of the trash volume, respectively. The percentages of trash in each category are shown in Figure 3.1.

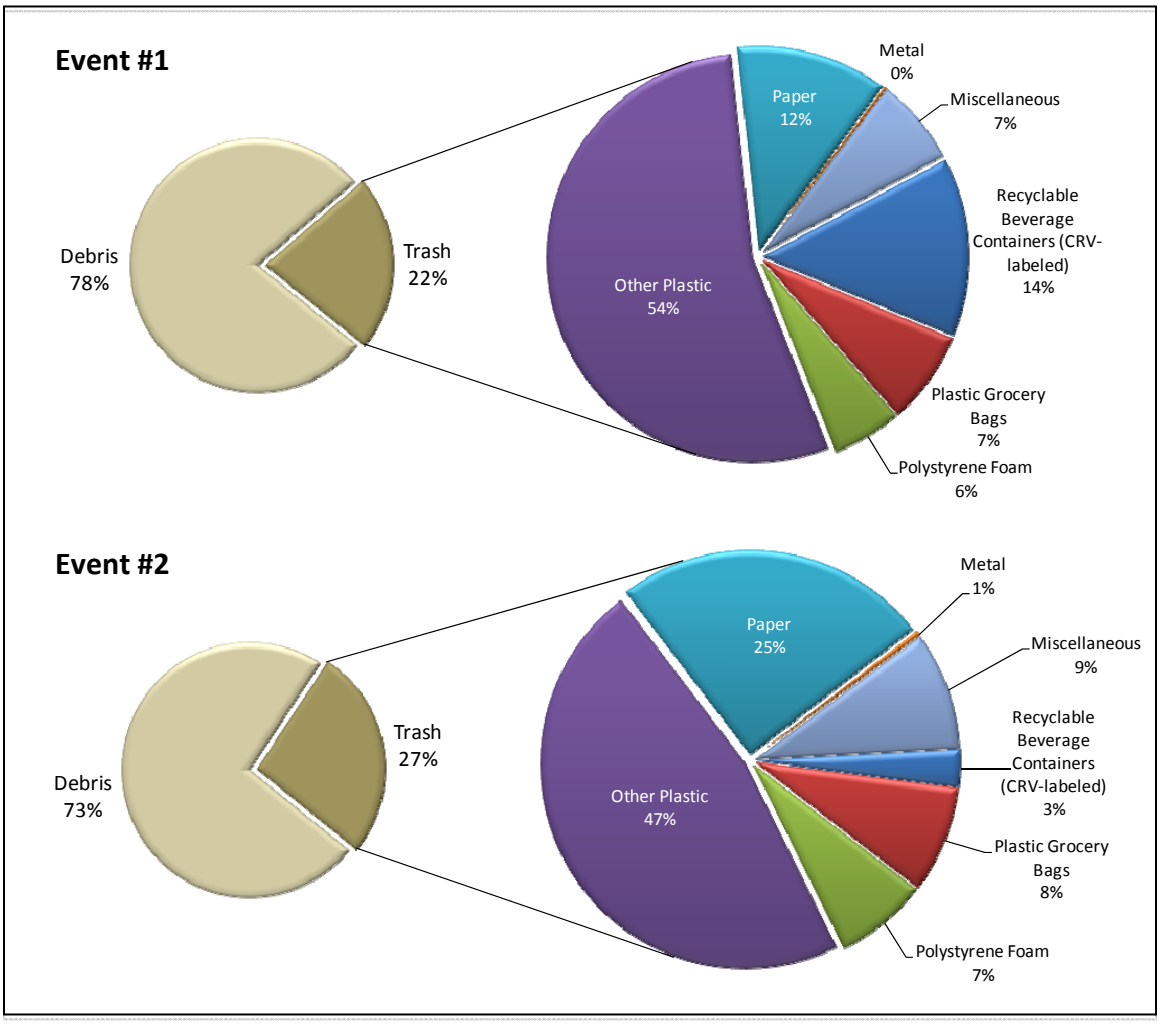

Figure 3.1. Trash types characterized in monitoring events 1 and 2.

3.2. Calculation of Generation Rates

All existing data and associated information on trash captured via monitored full capture treatment devices at project monitoring sites were compiled into a simple Microsoft Excel spreadsheet. Data underwent quality assurance checks prior to being utilized for generation rate calculation. Any data deemed suspect was checked and either corrected or removed from the dataset if the data quality could not be verified. The following sections briefly describe the preliminary data analysis and calculation methods that were used in developing the preliminary trash generation rates presented in this section.

3.2.1. Individual Site Generation Rate Calculations

Data from 137 sites collected during monitoring events 1 and 2 were used to calculate preliminary trash generation rates. A site-specific trash generation rate was developed for each site by performing the following steps:

1. For both events, the total volume of trash observed and the total accumulation period for each site were calculated. The result was a total volume of trash collected to-date at each site and a total accumulation period (i.e., number of days trash accumulated).

2. For each site, the total number of wet weather days (i.e., days with >0.2 inches of rain observed in the nearest rainfall gage) during the total accumulation period was calculated.
3. The street sweeping effectiveness for each monitoring site was then estimated using the effectiveness curve presented in Figure 3.2 and based on storm frequency (i.e., number of wet weather days) during the accumulation period, parking enforcement and street sweeping frequency.
4. A generation rate (volume per day) was then calculated by dividing the total trash volume by the product of the total accumulation period and the inverse of the street sweeping effectiveness, as shown in Equation 1.

$$R = \frac{V}{D \cdot (1 - E)} \quad \textbf{(1)}$$

where:

R	=	site-specific trash generation rate (gal/day)
V	=	total trash volume for a site during the monitoring period(s)[6] (gallons)
D	=	total accumulation period for a site (days)
E	=	the street sweeping effectiveness for a site (fraction), as determined from Figure 3.2.

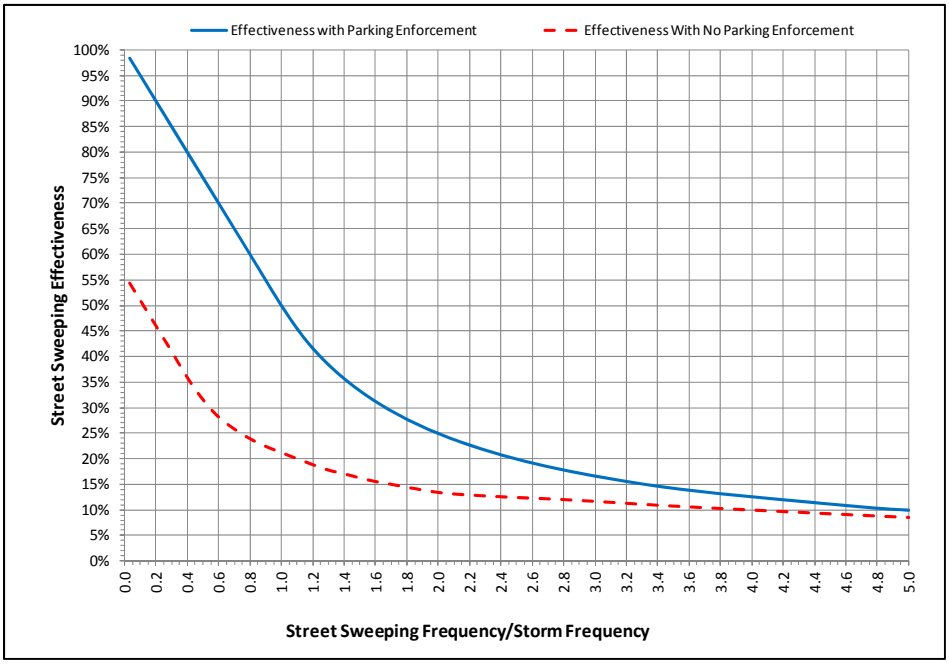

Figure 3.2. Street sweeping effectiveness curve based on level of parking enforcement and the ratio of street sweeping frequency to storm frequency (adapted from Armitage 2001).

[6] For sites monitored during both events, the sum of the volume for the two events was used.

3.2.2. Comparison to Explanatory Factors

Based on the conceptual model of trash baseline loads from MS4s (see Figure 2-1), a number of factors (e.g., land use, economic profile, rainfall) may affect trash baseline generation and loading. Preliminary comparisons were made to evaluate the potential relationships between calculated generation rates and these factors. The results of these comparisons are presented in the following sections.

Land Use

The average percentage of material identified as trash, varied by site and land use. As illustrated in Table 3.1, the lowest average percentages of trash were observed at sites with land uses classified as rural, low density residential, or urban parks. The highest percentages were observed in sites with industrial, high density residential and retail/wholesale land uses. Variations in trash percentages are likely due to both variations in trash generation (i.e., sources) and sources of vegetation (e.g., deciduous trees).

Table 3.1. Number of monitoring sites and percentages of trash in each land use category.

Land use	# of sites	% Trash
Rural Residential	1	1
Low Density Residential	17	6
Urban Parks	5	6
K-12 Schools	9	14
Commercial and Services	8	21
Retail and Wholesale	52	28
High Density Residential	28	30
Light and Other Industrial	9	31
Heavy Industrial	4	33
Total	**137**	

To assess relationships between trash generation rates and land use, sites were grouped into their specific land use classes and box-plots were created (Figure 3.3). Visual comparisons of plots suggest that land use appears to play an important factor in trash generation, and therefore generation rates were developed for seven land use class categories. Due to the limited number of sites and lack of differentiation in generation rates, sites depicting light industrial, heavy industrial and commercial/services were grouped together.

Once additional data are obtained via the third monitoring event, more robust statistical comparisons between land uses will be conducted to further assess the relationships and differences in generation rates between land uses.

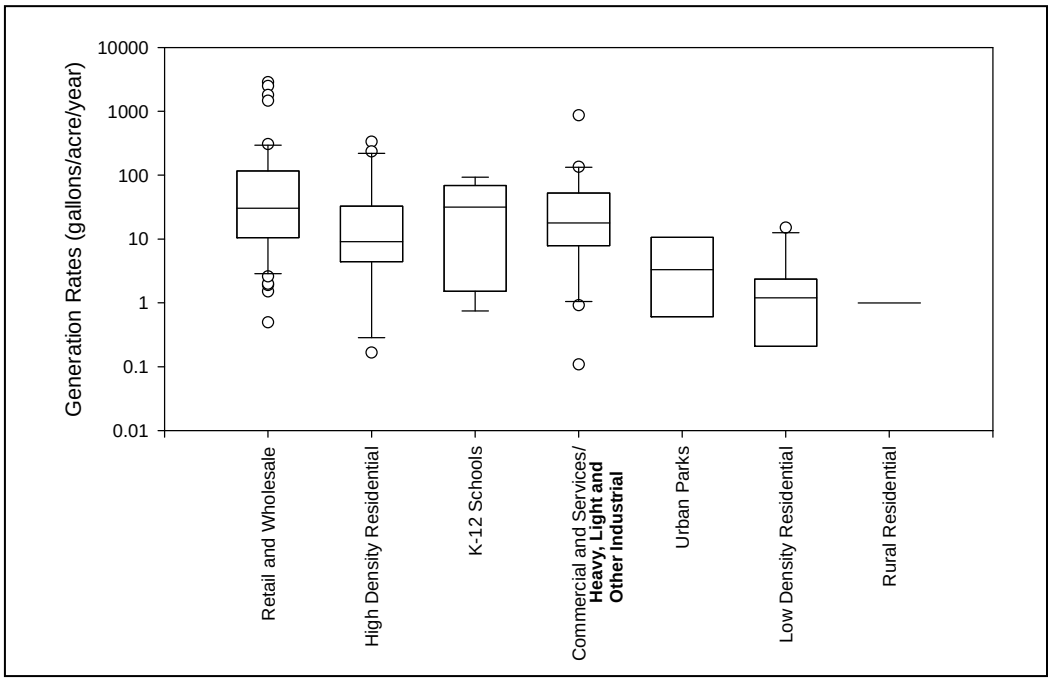

Figure 3.3. Comparison of generation rates by land use class.

Economic Profile and Population Density

Sites monitored to-date represent a range of economic profiles (i.e., household median incomes) and population densities. These factors may affect trash generation and further explain variability within each land use class. However, due to the limited timeframe available to complete this portion of the project and knowing that additional data collected via event #3 would soon be available, statistical tests of correlations between these potentially important factors and generation rates have not yet been conducted. As part of the Final Technical Report development in 2012, statistical analyses will be conducted on the entire trash generation rate dataset (including data from event #3) to better assess the importance of economic profiles and population densities in trash generation.

3.2.3. Baseline Generation Rates

Based on the initial analyses described in the previous sections, preliminary trash generation rates were developed for seven land use classes. An average generation rate for each land use class was developed by simply dividing the sum of the site-specific daily generation rates for sites within that class, by the sum of the effective loading areas for those set of sites. Then, the average daily generation rate for each land use category was simply multiplied by 365 days to estimate the preliminary annual baseline trash generation rate for each land use class. These preliminary generation rates are illustrated in Table 3.2.

Table 3.2. Preliminary Trash Generation Rates by Land Use Category.

Land Use	Annual Generation Rate (gal/acre/yr)
Retail and Wholesale	29.99
High Density Residential	17.04
K-12 Schools	13.14
Commercial/Services and Heavy, Light and Other Industrial	7.08
Urban Parks	2.14
Low Density Residential	1.25
Rural Residential[7]	0.17

4.0 DEVELOPING TRASH BASELINE LOADING RATES AND LOADS

Provisions C.10.a(ii) of the MRP requires Permittees to develop and submit a baseline trash load to the Water Board. The following sections describe the methods and equation used to convert generation rates into baseline loads. In summary, Permittees first applied these rates to their effective loading areas within the their jurisdictional areas. The result was a **generated load** that did not account for key baseline control measures implemented by a Permittee. The generated load, therefore, must be adjusted based on the estimated effectiveness of these baseline control measures. The result of these adjustments is a **baseline load**.

4.1. Baseline Trash Loading Equation

Based on the MS4 trash loads equation presented in Armitage and Rooseboom (2000), Equation 2 was developed to establish the annual trash baseline load from MS4s. This equation is based on the factors described in the previous section and methods described in the project sampling and analysis plan (EOA 2011b).

$$\boldsymbol{T_{Load}} = \sum_{i}^{n}[\{\boldsymbol{R_i A_i}\ (\mathbf{1}-\boldsymbol{S_i})\}(\mathbf{1}-\boldsymbol{P_i})]\ (\mathbf{1}-\boldsymbol{D}) \qquad (2)$$

where:

T_{Load} = preliminary baseline trash load from MS4 (gal/year)
i = land use category
n = total number of land use categories (7)
R_i = average annual trash generation rate for land use category *i* (gal/acre) from Table 4.2
A_i = total effective loading area in land use category *i* (acre)

[7] Due to the limited sample size in the rural residential land use class, low density residential sites with generation rates in the bottom quartile were included in this calculation.

S_i = Estimated baseline street sweeping effectiveness for an effective loading area with land use *i* (dimensionless) based on Figure 3.2

P_i = Estimated effectiveness of baseline maintenance conducted at a pump station with a trash rack (0.25) draining an effective loading area with land use *i* (dimensionless)

D = Estimated effectiveness of baseline storm drain inlet maintenance (0.05)

4.2. Jurisdictional and Effective Loading Areas

For the purpose for developing baseline trash loads, a Permittee's **jurisdictional area** was defined as all urban land areas within its geographical boundaries that are directly subject to MRP requirements. Land use areas identified by a Permittee that were not included within a Permittee's jurisdictional area include:

- Federal and State of California Facilities and Roads (e.g., Interstates, State Highways, Military Bases, Prisons);
- Roads Owned and Maintained by other municipalities (e.g., Unincorporated Counties);
- Public and Private Colleges and Universities;
- Non-urban Land Uses (e.g., agriculture, forest, rangeland, open space, wetlands, water);
- Communication or Power Facilities (e.g., PG & E Substations);
- Water and Wastewater Treatment Facilities; and,
- Other Transportation Facilities (e.g., airports, railroads, and maritime shipping ports).

Permittee jurisdictional areas were further delineated into **effective trash loading areas** in an attempt to represent the land areas that are believed to generate the vast majority of trash that could reach an MS4. The goal was to eliminate land areas not directly connected to the MS4 or contributing trash to a Permittee's MS4 (e.g., large backyards and rooftops), while providing consistency with areas affected by control measure implementation. Effective trash loading areas obviously vary between sites and sources, making delineation challenging. As a first order approximation, effective loading areas were developed by creating a 200-foot buffer that extends from either side of street center lines within Permittee jurisdictional areas (i.e., 400-foot total). This effective loading area serves as the land area for which generation and baseline loading rates are applied to develop a baseline load. An illustration of an example effective loading area is presented in Figure 4.1.

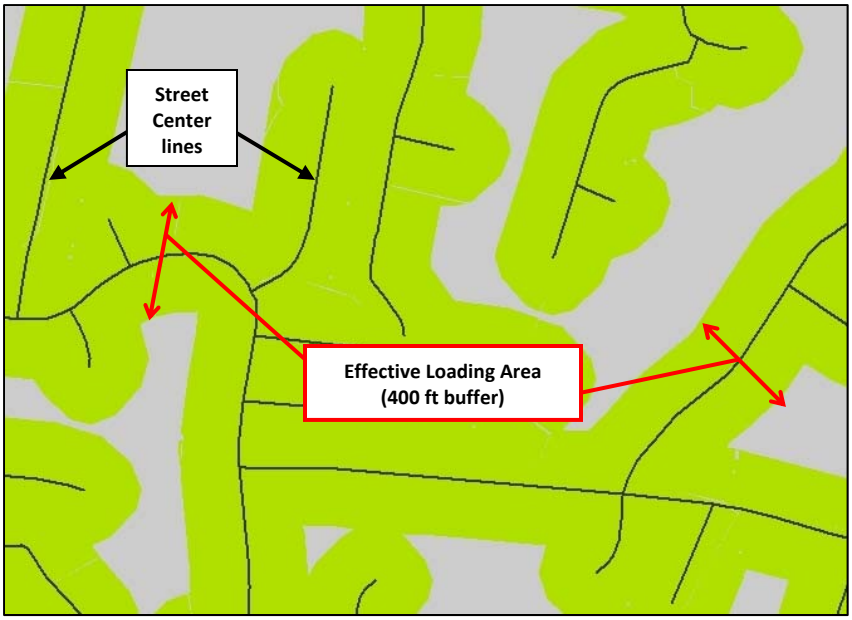

Figure 4.1 Example of effective trash loading areas.

4.3. Accounting for Baseline Control Programs

To account for current load reductions due to baseline control measures, trash generation rates were adjusted based on the estimated effectiveness (i.e., percent removal) of three key control measures. These control measures are described in the following sections.

4.3.1. Baseline Street Sweeping

Street sweeping programs can substantially affect trash loads to MS4s (BASMAA 2011a). Specifically, the effectiveness of a sweeping program in reducing trash is governed by the frequency of sweeping and the ability of a sweeper to reach the curb, as a result of parking enforcement or the lack of parked during sweeping hours. A "baseline" street sweeping program is defined as the sweeping frequency and parking enforcement (or equivalent) implemented by Permitee prior to effective date of the MRP. To not penalize implementers of effective street sweeping programs prior to the effective date of the MRP, however, a baseline street sweeping frequency ceiling was established. The baseline frequency ceiling was defined as once per week for retail land uses and twice per month for all other land uses. These sweeping frequencies represent the average frequency currently implemented by Permittees.

For those Permittees that currently sweep at an enhanced level (i.e., at a frequency greater than the baseline ceiling), only trash load reductions up to the baseline ceiling level are accounted for in a Permittee's baseline trash load (Figure 4.2). Consistent with the *Trash Load Reduction Tracking Method*, load reductions associated with implementation levels greater than the baseline ceiling are accounted for as "enhanced" control measures (i.e., toward load reduction goals). For those Permittees that sweep less frequent than the baseline ceiling, sweeping frequencies currently implemented by a Permittee serve as the baseline level of implementation.

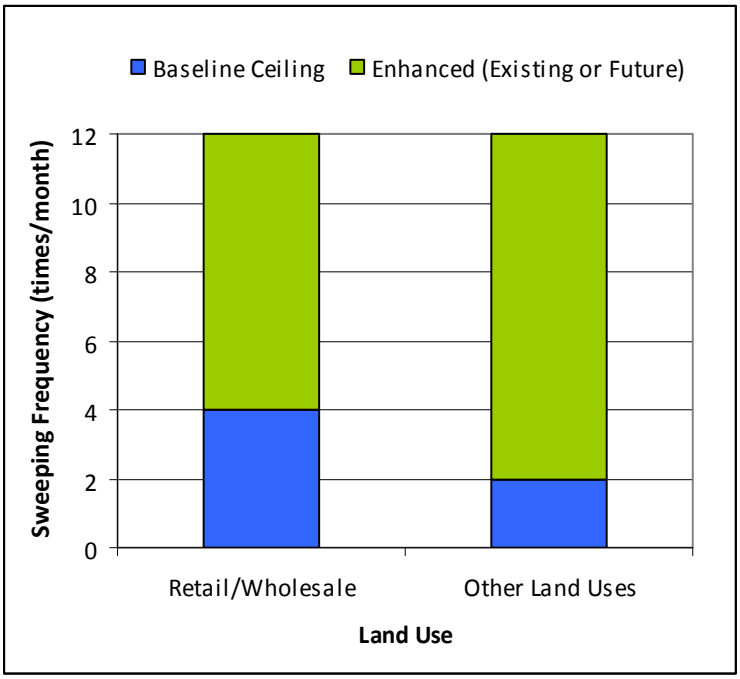

Figure 4.2. Baseline ceilings for street sweeping frequencies in retail/wholesale and other land uses.

4.3.2. Baseline Storm Drain Inlet Cleaning

In addition to street sweeping, baseline storm drain inlet maintenance (cleaning) can also remove trash that would have otherwise entered an MS4. Based on a review of annual reports and queries of Permittee staff, a baseline ceiling for storm drain inlet maintenance was established at an average frequency of once per year. For those Permittees that currently maintain their storm drain inlets at an enhanced level (i.e., at a frequency greater than the baseline ceiling), only trash load reductions up to the baseline ceiling level are accounted for in a Permittee's baseline trash load. Consistent with the *Trash Load Reduction Tracking Method*, load reductions associated with implementation levels greater than the baseline ceiling are accounted for as "enhanced" control measures (i.e., toward load reduction goals). For those Permittees that maintain less frequent than the baseline ceiling, the current frequency implemented by a Permittee serve as the baseline level of implementation.

Based on the literature review conducted by BASMAA (2011a), maintaining an annual maintenance frequency provides a reduction of 5% of the trash load remaining after accounting for the load removed via baseline sweeping.

4.3.3. Baseline Stormwater Pump Station Maintenance

For Permittees that maintain pump stations with trash racks, the estimated volume of trash removed annually from each pump station prior to the effective date of the MRP is considered the baseline level of implementation. Baseline pump station maintenance was assumed to capture roughly 25% of the trash draining to the pump station. This effectiveness rating was based on the review of control measure effectiveness conducted by BASMAA (2011a).

4.4. Reporting of Trash Baseline Loads

Preliminary estimates of trash baseline loads from Bay Area MS4s are reported in Permittee-specific Short-Term Trash Load Reduction Plans submitted to the Water Board on February 1, 2012. Baseline trash loads were developed consistently among all Permittees and are based on the best available information. As additional information becomes available and knowledge is gained through the development process, methods described in this technical memorandum to develop baseline loading rates may be revised. Additionally, trash generation and baseline loading rates and loads may be revised based on new information.

5.0 REFERENCES

Armitage, N., & Rooseboom, A. (2000). The removal of urban litter from stormwater conduits and streams: Paper 1 - The quantities involved and catchment litter management options. *Water SA , 26* (2), 181-187.

Armitage, N. (2001). 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.

BASMAA (2011a). Methods to Estimate Baseline Trash Loads from Bay Area Municipal Stormwater Systems: *Technical Memorandum #1.* Prepared for the Bay Area Stormwater Management Agencies Association (BASMAA). Oakland. Prepared by Eisenberg, Olivieri and Associates (EOA).

BASMAA (2011b). *Baseline Trash Loading Rates from Bay Area Municipal Stormwater Systems: Sampling and Analysis Plan*. Prepared for the Bay Area Stormwater Management Agencies Association (BASMAA). Oakland. Prepared by Eisenberg, Olivieri and Associates (EOA).

GLOSSARY

Baseline Implementation: The level of implementation for a specific trash control measure that forms the starting point for tracking progress toward trash load reduction.

Baseline Load: the sum of the pollutant loads from a Permittee's effective loading area, adjusted for baseline implementation of street sweeping, storm drain inlet maintenance, and pump station maintenance.

Best Management Practice (BMP): Any activity, technology, process, operational method or measure, or engineered system, which when implemented prevents, controls, removes, or reduces pollution. A BMP is also referred to as a control measure.

Conceptual Model: A model that explicitly describes and graphically represents all existing knowledge on the sources of a pollutant, its fate and transport, and/or its effects in the ecosystem.

Control Measure: See Best Management Practice.

Discharge: A release or flow of stormwater or other substance from a stormwater conveyance system.

Effectiveness (with regard to Control Measures): A measure of how well a control measure reduces trash from entering the MS4.

Effective Loading Area: The land area that directly contributes trash to a Permittee's MS4. Operationally defined as a 200-foot buffer outward from street centerlines within a Permittee's jurisdictional area.

Full Capture Device: A single device or series of devices that can trap all particles retained by a 5 mm mesh screen, and has a treatment capacity that exceeds the peak flow rate resulting from a one-year, one-hour storm in the subdrainage area treated by the BMP.

Generated Load: The load (volume) of trash that is available to an MS4 under a no street sweeping, storm drain inlet and pump station maintenance scenario.

Generation Rate: The rate (expressed as volume/acre/year) for specific land areas at which trash is available to an MS4 under a no street sweeping, storm drain inlet and pump station maintenance scenario.

Jurisdictional Area: All urban land areas within a Permittee's boundaries that are subject to the requirements in the MRP and for which a municipality has oversight.

Litter: As defined by California Code Section 68055.1(g), litter means all improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials, thrown or deposited on the lands and water.

Municipal Separate Storm Sewer System (MS4): "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created to or pursuant to state law) including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States. (ii) Designed or used for collecting or conveying stormwater; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2." (40 CFR 122.26(b)(8))

Receiving Waters: Natural water bodies (e.g., creeks, lakes, bays, estuaries)

Stormwater: Runoff from roofs, roads and other surfaces that is generated during rainfall and snow events and flows into a stormwater conveyance system.

Storm Drain Inlet: Part of the stormwater drainage system where surface runoff enters the underground conveyance system. Includes side inlets located adjacent to curbs and grate inlets located on the surface of a street or parking lot.

Storm Drain Insert: A device (e.g., screen or basket) designed to capture trash capture within a storm drain inlet.

Stormwater Conveyance System: Any pipe, ditch or gully, or system of pipes, ditches, or gullies, that is owned or operated by a governmental entity and used for collecting and conveying stormwater.

Trash: Litter (as defined by California Code Section 68055.1g), excluding sediments, sand, vegetation, oil and grease, and exotic species, that cannot pass through a 5 mm mesh screen.

Urban Runoff: All flows in a stormwater drainage system and consists stormwater (wet weather flows) and non-storm water illicit discharges (dry weather flows).

APPENDIX A

Monitoring Site Descriptions

Appendix A - Monitoring Site Descriptions

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
BE01	Brisbane	San Mateo	37.68004	-122.39849	High Density Residential	none	no	$58,600	15.56
BK01	Berkeley	Alameda	37.85756	-122.26772	Retail and Wholesale	3.5	yes	$35,300	20.12
BK02	Berkeley	Alameda	37.86734	-122.27033	K-12 Schools	none	yes	$13,100	30.03
BK03	Berkeley	Alameda	37.87002	-122.28412	Retail and Wholesale	1.4	yes	$27,800	23.74
BK04	Berkeley	Alameda	37.85653	-122.29489	Heavy Industrial	15	no	$33,800	0.43
BR01	Brentwood	Contra Costa	37.9618	-121.73534	Retail and Wholesale	7	yes	$98,300	6.3
BR02	Brentwood	Contra Costa	37.93997	-121.73777	Retail and Wholesale	14	yes	$141,600	5.44
BR04	Brentwood	Contra Costa	37.93134	-121.69672	Retail and Wholesale	7	yes	$54,600	8.88
DN01	Dublin	Alameda	37.70407	-121.91489	Urban Parks	7	yes	$72,100	4.67
DN02	Dublin	Alameda	37.70386	-121.914	Urban Parks	7	yes	$72,100	4.67
DN03	Dublin	Alameda	37.71684	-121.92666	Low Density Residential	7	yes	$76,700	9.32
DN04	Dublin	Alameda	37.71481	-121.92721	Low Density Residential	15	yes	$73,900	10.5
FR01	Fremont	Alameda	37.57133	-122.03228	Retail and Wholesale	30	yes	$73,200	12.8
FR02	Fremont	Alameda	37.56358	-122.01732	K-12 Schools	30	yes	$66,700	12.39
FR03	Fremont	Alameda	37.53444	-121.96659	Retail and Wholesale	30	yes	$35,000	28.05
FR04	Fremont	Alameda	37.53171	-121.95881	Retail and Wholesale	30	yes	$52,700	14.31
LV01	Livermore	Alameda	37.7015	-121.81461	Commercial and Services	7	yes	$199,100	1.21
LV02	Livermore	Alameda	37.69917	-121.77336	Retail and Wholesale	7	yes	$107,800	3.54
OK01	Oakland	Alameda	37.77387	-122.22911	Retail and Wholesale	none	yes	$30,200	8.01

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
OK02	Oakland	Alameda	37.76932	-122.2291	Heavy Industrial	none	yes	$37,500	4.97
OK04	Oakland	Alameda	37.80312	-122.28091	Retail and Wholesale	7	yes	$13,700	14.62
OR01	Orinda	Contra Costa	37.87842	-122.18295	Retail and Wholesale	7	yes	$103,900	0.97
PL01	Pleasanton	Alameda	37.70028	-121.87022	Retail and Wholesale	15	yes	$99,300	8.19
PL02	Pleasanton	Alameda	37.69915	-121.89833	Commercial and Services	7	yes	$71,100	1.64
RI01	Richmond	Contra Costa	37.93302	-122.32921	Retail and Wholesale	7	yes	$40,200	13.96
RI02	Richmond	Contra Costa	37.92248	-122.34367	High Density Residential	30	yes	$14,400	1.6
RI03	Richmond	Contra Costa	37.9241	-122.3478	High Density Residential	7	yes	$14,400	1.6
SJ01	San Jose	Santa Clara	37.36732	-121.86348	Light Industrial	30	no	$54,800	14.23
SJ03	San Jose	Santa Clara	37.36713	-121.86334	Light Industrial	30	no	$54,800	14.23
SJ04	San Jose	Santa Clara	37.36661	-121.86423	Light Industrial	30	no	$54,800	14.23
SJ05	San Jose	Santa Clara	37.36611	-121.8652	Light Industrial	30	no	$54,800	14.23
SJ06	San Jose	Santa Clara	37.36483	-121.86717	Light Industrial	30	no	$49,600	11.35
SJ07	San Jose	Santa Clara	37.36437	-121.87085	Light Industrial	7	yes	$39,000	4.07
SJ08	San Jose	Santa Clara	37.36299	-121.86952	Light Industrial	7	no	$39,000	4.07
SJ09	San Jose	Santa Clara	37.35981	-121.86945	Heavy Industrial	7	yes	$39,000	4.07
SJ10	San Jose	Santa Clara	37.35989	-121.86932	Heavy Industrial	7	yes	$39,000	4.07
SJ11	San Jose	Santa Clara	37.36332	-121.86296	High Density Residential	30	yes	$54,800	14.23
SJ12	San Jose	Santa Clara	37.36332	-121.86279	High Density Residential	30	yes	$54,800	14.23
SJ15	San Jose	Santa Clara	37.34758	-121.82962	High Density Residential	30	yes	$39,500	29.4

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
SJ16	San Jose	Santa Clara	37.3469	-121.82911	High Density Residential	30	yes	$39,500	29.4
SJ17	San Jose	Santa Clara	37.34649	-121.82872	High Density Residential	30	yes	$39,500	29.4
SJ19	San Jose	Santa Clara	37.35354	-121.82326	Retail and Wholesale	7	yes	$74,600	19.31
SJ20	San Jose	Santa Clara	37.35593	-121.81929	Retail and Wholesale	7	yes	$66,700	20.65
SJ21	San Jose	Santa Clara	37.35635	-121.81903	Retail and Wholesale	7	yes	$66,200	19.42
SJ22	San Jose	Santa Clara	37.35018	-121.81949	High Density Residential	30	no	$63,800	21.97
SJ23	San Jose	Santa Clara	37.35009	-121.8192	High Density Residential	30	yes	$71,000	21.76
SJ24	San Jose	Santa Clara	37.35158	-121.81481	High Density Residential	22	yes	$75,700	22.59
SJ25	San Jose	Santa Clara	37.35165	-121.81287	High Density Residential	30	yes	$73,300	26.52
SJ26	San Jose	Santa Clara	37.35168	-121.81274	High Density Residential	30	yes	$72,900	26.82
SJ27	San Jose	Santa Clara	37.31965	-121.82803	Retail and Wholesale	30	yes	$43,000	20.91
SJ28	San Jose	Santa Clara	37.31951	-121.82705	Retail and Wholesale	30	yes	$43,000	20.91
SJ29	San Jose	Santa Clara	37.31884	-121.82336	Commercial and Services	30	yes	$43,000	20.91
SJ30	San Jose	Santa Clara	37.32169	-121.82715	Retail and Wholesale	7	yes	$50,800	25.63
SJ31	San Jose	Santa Clara	37.32269	-121.82606	Retail and Wholesale	7	yes	$55,900	24.45
SJ32	San Jose	Santa Clara	37.32282	-121.82496	Retail and Wholesale	7	yes	$62,800	13.66
SJ33	San Jose	Santa Clara	37.32402	-121.82375	Retail and Wholesale	7	yes	$58,800	19.87
SJ34	San Jose	Santa Clara	37.32645	-121.82018	Retail and Wholesale	7	no	$63,100	5.77
SJ35	San Jose	Santa Clara	37.31279	-121.8524	Light Industrial	19	yes	$42,100	3.1
SJ36	San Jose	Santa Clara	37.2981	-121.83446	Low Density Residential	30	yes	$45,100	26.32

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
SJ37	San Jose	Santa Clara	37.29903	-121.82384	Retail and Wholesale	30	yes	$93,200	10.03
SJ38	San Jose	Santa Clara	37.29407	-121.83206	K-12 Schools	30	yes	$60,300	11.19
SJ39	San Jose	Santa Clara	37.31618	-121.78791	High Density Residential	30	yes	$91,500	18.62
SJ40	San Jose	Santa Clara	37.31412	-121.77331	Retail and Wholesale	30	no	$151,100	2.72
SJ41	San Jose	Santa Clara	37.30691	-121.76065	High Density Residential	30	yes	$151,100	22.84
SJ42	San Jose	Santa Clara	37.30727	-121.76765	High Density Residential	30	yes	$151,100	10.72
SJ43	San Jose	Santa Clara	37.30241	-121.77415	Urban Parks	7	yes	$134,500	2.99
SJ44	San Jose	Santa Clara	37.29503	-121.77499	Rural Residential	30	yes	$133,800	3.43
SJ46	San Jose	Santa Clara	37.24728	-121.7758	Commercial and Services	7	yes	$123,200	0.79
SJ47	San Jose	Santa Clara	37.23881	-121.77704	Light Industrial	7	yes	$91,000	1.77
SJ48	San Jose	Santa Clara	37.23055	-121.82958	Low Density Residential	30	yes	$104,100	7.93
SJ49	San Jose	Santa Clara	37.20577	-121.83005	Low Density Residential	30	yes	$200,000	10.37
SJ50	San Jose	Santa Clara	37.19833	-121.83663	Low Density Residential	30	yes	$122,000	0.61
SJ51	San Jose	Santa Clara	37.24086	-121.87439	Urban Parks	30	yes	$189,800	5.18
SJ52	San Jose	Santa Clara	37.25049	-121.85738	Retail and Wholesale	7	yes	$146,900	12.35
SJ53	San Jose	Santa Clara	37.25258	-121.85863	Retail and Wholesale	7	yes	$159,800	10.37
SJ54	San Jose	Santa Clara	37.24645	-121.9148	Low Density Residential	30	yes	$81,400	10.82
SJ55	San Jose	Santa Clara	37.26037	-121.93147	Retail and Wholesale	none	yes	$95,600	8.47
SJ56	San Jose	Santa Clara	37.27349	-121.93459	Retail and Wholesale	7	yes	$113,800	9.47
SJ58	San Jose	Santa Clara	37.30137	-121.95665	High Density Residential	30	yes	$135,000	36.06

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
SJ59	San Jose	Santa Clara	37.30102	-121.95654	High Density Residential	30	yes	$150,400	44.47
SJ61	San Jose	Santa Clara	37.29803	-122.00955	Low Density Residential	30	yes	$110,700	13.69
SJ64	San Jose	Santa Clara	37.34276	-121.84025	High Density Residential	30	yes	$48,600	33.11
SJ65	San Jose	Santa Clara	37.36837	-121.91488	Commercial and Services	7	yes	$60,100	5.76
SJ66	San Jose	Santa Clara	37.37709	-121.90272	Commercial and Services	7	yes	$59,900	4.55
SJ69	San Jose	Santa Clara	37.38494	-121.89051	High Density Residential	7	yes	$87,300	20.98
SJ70	San Jose	Santa Clara	37.39061	-121.86838	Low Density Residential	30	yes	$67,000	12.44
SJ71	San Jose	Santa Clara	37.38723	-121.8483	High Density Residential	30	yes	$112,900	19.38
SJ72	San Jose	Santa Clara	37.40462	-121.84836	High Density Residential	30	yes	$183,500	0.67
SJ74	San Jose	Santa Clara	37.36014	-121.85287	High Density Residential	30	yes	$53,500	45.31
SJ75	San Jose	Santa Clara	37.36017	-121.853	High Density Residential	30	yes	$53,300	45.51
SJ76	San Jose	Santa Clara	37.3594	-121.84981	High Density Residential	30	yes	$55,500	42.52
SL01	San Leandro	Alameda	37.72223	-122.15454	Retail and Wholesale	7	yes	$41,700	11.89
SL02	San Leandro	Alameda	37.72278	-122.15629	Retail and Wholesale	2.3	yes	$42,400	8.4
SL03	San Leandro	Alameda	37.70068	-122.14023	Retail and Wholesale	7	yes	$43,500	20.99
SL04	San Leandro	Alameda	37.69638	-122.13911	Retail and Wholesale	7	yes	$46,700	20.93
SL05	San Leandro	Alameda	37.72063	-122.15486	Low Density Residential	30	no	$39,800	22
SL06	San Leandro	Alameda	37.72227	-122.15397	Retail and Wholesale	none	no	$41,300	13.86
SL07	San Leandro	Alameda	37.72223	-122.15371	Retail and Wholesale	none	no	$40,900	15.85
SL08	San Leandro	Alameda	37.72218	-122.15189	Low Density Residential	30	no	$41,200	17.84

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
SL09	San Leandro	Alameda	37.72256	-122.15269	Retail and Wholesale	2.3	yes	$41,000	17.74
SL10	San Leandro	Alameda	37.72288977	-122.152863	Retail and Wholesale	2.3	no	$42,000	16.1
SL11	San Leandro	Alameda	37.72362	-122.1538	Retail and Wholesale	2.3	no	$42,600	15.52
SL12	San Leandro	Alameda	37.72303	-122.1549	Retail and Wholesale	2.3	yes	$42,400	8.4
SL13	San Leandro	Alameda	37.72434	-122.15504	Retail and Wholesale	2.3	yes	$42,500	12.97
SL14	San Leandro	Alameda	37.72449	-122.1574	Retail and Wholesale	2.3	yes	$42,400	8.4
SL15	San Leandro	Alameda	37.72501	-122.15565	Commercial and Services	7	yes	$41,000	17.63
SL16	San Leandro	Alameda	37.72544	-122.15455	Commercial and Services	7	yes	$39,800	22.97
SL17	San Leandro	Alameda	37.72616	-122.15451	Commercial and Services	2.3	yes	$37,900	24.13
SL18	San Leandro	Alameda	37.72693	-122.1561	High Density Residential	30	yes	$37,900	24.13
SL19	San Leandro	Alameda	37.7175	-122.14295	K-12 Schools	7	yes	$43,100	13.27
SL20	San Leandro	Alameda	37.71527	-122.13972	High Density Residential	19	no	$42,900	15.53
SL21	San Leandro	Alameda	37.7134	-122.13728	Low Density Residential	25	no	$42,800	18.64
SL22	San Leandro	Alameda	37.71283	-122.13644	K-12 Schools	19	yes	$45,500	17.7
SL23	San Leandro	Alameda	37.71211	-122.16221	Retail and Wholesale	7	yes	$57,700	6.15
SL24	San Leandro	Alameda	37.68676	-122.13872	Retail and Wholesale	7	yes	$42,200	10.9
SL25	San Leandro	Alameda	37.68674207	-122.1370364	Retail and Wholesale	7	yes	$45,000	10.07
SM01	San Mateo	San Mateo	37.53978	-122.31383	K-12 Schools	15	yes	$74,800	9.09
SM02	San Mateo	San Mateo	37.54567	-122.32826	Low Density Residential	15	yes	$119,500	9.8
SM03	San Mateo	San Mateo	37.53572	-122.31082	Low Density Residential	15	yes	$87,600	10.61

BASMAA Site ID	City	County	Latitude	Longitude	Dominant Land Use within Hydrologic Drainage Area and 2-acre buffer around site	Days Between Street Sweeping	Parking Enforcement (or Equivalent)	Average Median Household Income in 2-acre buffer around site	Pop Density-within 2-acre buffer around site (Individuals/acre)
SM04	San Mateo	San Mateo	37.53647	-122.30906	Low Density Residential	15	yes	$77,700	13.11
SM05	San Mateo	San Mateo	37.55487	-122.32848	Low Density Residential	15	yes	$119,100	9.46
SM06	San Mateo	San Mateo	37.55719	-122.33249	Low Density Residential	15	yes	$122,500	9.07
SM07	San Mateo	San Mateo	37.56544	-122.32262	Retail and Wholesale	none	yes	$47,000	15.13
SM08	San Mateo	San Mateo	37.56728	-122.32005	Retail and Wholesale	15	yes	$54,100	20.32
SM09	San Mateo	San Mateo	37.55509	-122.30704	Retail and Wholesale	15	yes	$61,300	12.59
SM10	San Mateo	San Mateo	37.55388	-122.30559	Retail and Wholesale	15	yes	$60,000	5.44
SM11	San Mateo	San Mateo	37.52993	-122.28971	Retail and Wholesale	2.3	yes	$47,400	13.38
SM12	San Mateo	San Mateo	37.53267	-122.31431	K-12 Schools	15	no	$90,000	7.63
SP01	San Pablo	Contra Costa	37.95202	-122.33293	Retail and Wholesale	7.5	yes	$33,700	14.3
SU01	Sunnyvale	Santa Clara	37.41715	-122.01632	Urban Parks	14	yes	$59,100	0.14
SU02	Sunnyvale	Santa Clara	37.38306	-122.05709	High Density Residential	14	no	$67,900	46.17
SU03	Sunnyvale	Santa Clara	37.39502	-122.01828	K-12 Schools	14	yes	$56,500	20.46
SU04	Sunnyvale	Santa Clara	37.39301	-122.01894	K-12 Schools	14	no	$56,700	20.83
WC01	Walnut Creek	Contra Costa	37.92923912	-122.0160505	Retail and Wholesale	15	yes	$96,600	6.28
WC02	Walnut Creek	Contra Costa	37.91897	-122.03771	Retail and Wholesale	7	yes	$120,500	8.53
WC03	Walnut Creek	Contra Costa	37.89737	-122.06758	Retail and Wholesale	2.3	yes	$48,700	9.94
WC04	Walnut Creek	Contra Costa	37.87905	-122.07484	Retail and Wholesale	30	yes	$105,100	6.38

APPENDIX B

Quality Assurance

Relative Percent Reduction Calculations

Event 1

BASMAA ID	Sample Total Volume (gallons)	Duplicate Total Volume (gallons)	Relative Percent 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	19.50	-6.2%
OK02	8.87	8.15	-8.1%
SL02	6.50	6.80	4.5%
SL03	9.34	9.58	2.5%
SL04	20.91	19.65	-6.0%
Mean			-4.0%

Event 2

BASMAA ID	Sample Total Volume (gallons)	Duplicate Total Volume (gallons)	Relative Percent Difference
OK02	18.52	17.99	-2.90%
OK04	9.44	8.87	-6.00%
RI01	72.84	72.77	-0.10%
RI02	21.19	20.04	-5.40%
SJ11	7.73	5.71	-26.20%
SJ12	4.81	5.01	4.20%
SJ29	8.91	7.16	-19.60%
SJ30	11.51	10.66	-7.40%
SJ31	11.04	9.35	-15.20%
SJ51	8.91	8.23	-7.60%
SJ74	6.15	5.96	-3.10%
SL09	12.52	11.39	-9.00%
SL11	11.16	10.61	-4.90%
SL23	15.91	15.59	-2.00%
SL25	25.42	25.35	-0.30%
SM12	23.89	22.37	-6.40%
SP01	42.38	38.37	-9.50%
SU03	23.84	22.51	-5.60%
WC01	28.2	27.73	-1.70%
Mean			-6.80%

APPENDIX C

Monitoring Results

Trash Characterization Volumes

Appendix C - Monitoring Results Trash Characterization Volumes (gallons)

Event 1 (May 2011)

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
BK01	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07
BK02	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54
BK03	4.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.64
BK04	2.14	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	2.19
DN01	1.07	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	1.12
DN02	2.14	0.13	0.00	0.00	0.00	0.08	0.05	0.00	0.00	2.27
DN03	11.61	0.17	0.00	0.00	0.00	0.17	0.00	0.00	0.00	11.78
DN04	0.71	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.91
FR01	18.57	0.22	0.06	0.00	0.00	0.10	0.04	0.00	0.03	18.80
FR02	4.11	0.25	0.00	0.00	0.00	0.17	0.08	0.00	0.00	4.35
FR03	2.14	0.26	0.00	0.00	0.00	0.15	0.11	0.00	0.00	2.41
FR04	5.71	0.28	0.00	0.00	0.00	0.11	0.11	0.05	0.00	5.99
LV01	5.00	0.34	0.00	0.00	0.00	0.23	0.11	0.00	0.00	5.34
LV02	2.14	0.36	0.00	0.00	0.00	0.11	0.17	0.00	0.08	2.50
OK01	7.32	0.37	0.00	0.00	0.00	0.28	0.05	0.00	0.04	7.69
OK02	5.00	0.39	0.00	0.00	0.00	0.34	0.05	0.00	0.00	5.39
OK04	1.07	0.45	0.00	0.00	0.06	0.28	0.08	0.00	0.04	1.52
PL01	3.75	0.50	0.00	0.17	0.00	0.23	0.10	0.00	0.00	4.25
PL02	1.79	0.54	0.00	0.15	0.00	0.34	0.00	0.00	0.05	2.33
SJ01	2.86	0.63	0.00	0.00	0.17	0.45	0.00	0.00	0.00	3.48
SJ03	0.00	0.67	0.00	0.00	0.00	0.23	0.44	0.00	0.00	0.67
SJ04	1.43	0.83	0.00	0.00	0.00	0.67	0.05	0.00	0.11	2.26

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SJ05	2.50	0.87	0.00	0.00	0.00	0.54	0.22	0.00	0.11	3.37
SJ06	17.14	0.87	0.13	0.00	0.00	0.54	0.11	0.00	0.10	18.01
SJ07	3.93	0.89	0.00	0.00	0.00	0.67	0.17	0.00	0.06	4.82
SJ08	24.64	0.94	0.00	0.00	0.00	0.89	0.05	0.00	0.00	25.59
SJ09	1.79	0.98	0.26	0.00	0.00	0.71	0.00	0.00	0.00	2.76
SJ10	2.86	1.01	0.00	0.00	0.00	0.34	0.67	0.00	0.00	3.86
SJ11	3.93	1.07	0.00	0.17	0.34	0.56	0.00	0.00	0.00	5.00
SJ12	5.36	1.09	0.47	0.15	0.00	0.40	0.08	0.00	0.00	6.45
SJ15	2.50	1.18	0.13	0.00	0.00	0.71	0.17	0.00	0.17	3.68
SJ16	8.04	1.42	0.00	0.28	0.17	0.11	0.83	0.00	0.03	9.46
SJ17	18.75	1.53	0.00	0.00	0.00	0.67	0.14	0.11	0.61	20.28
SJ19	9.11	1.60	0.00	0.00	0.06	0.89	0.10	0.00	0.56	10.71
SJ20	10.00	1.67	0.09	0.23	0.00	1.25	0.05	0.00	0.05	11.67
SJ21	8.57	1.73	0.00	0.44	0.07	1.07	0.05	0.00	0.10	10.30
SJ22	5.00	1.76	0.00	0.23	0.00	0.89	0.56	0.00	0.09	6.76
SJ23	3.93	1.85	0.00	0.15	0.00	1.07	0.45	0.00	0.18	5.78
SJ24	18.26	1.89	0.00	0.67	0.00	0.94	0.14	0.00	0.14	20.15
SJ25	7.50	1.94	0.00	0.00	0.00	1.61	0.11	0.00	0.22	9.44
SJ26	8.66	1.95	0.13	0.28	0.13	1.16	0.17	0.00	0.09	10.61
SJ27	3.75	1.95	0.00	0.11	0.00	1.61	0.17	0.00	0.06	5.70
SJ28	7.50	2.25	0.00	0.56	0.00	1.25	0.33	0.00	0.11	9.75
SJ29	1.61	2.34	0.22	0.17	0.11	1.43	0.33	0.00	0.08	3.95
SJ30	6.16	2.35	0.00	0.00	0.00	1.61	0.61	0.03	0.11	8.51
SJ31	8.39	2.41	0.16	0.28	0.00	1.43	0.26	0.00	0.28	10.80
SJ32	10.36	2.43	0.20	0.00	0.00	1.00	0.13	0.00	1.11	12.79

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SJ33	2.68	2.56	0.00	0.13	0.67	1.43	0.28	0.00	0.06	5.24
SJ34	10.18	2.58	0.00	0.06	0.22	1.25	1.00	0.00	0.06	12.76
SL01	13.57	2.67	0.11	0.11	0.11	1.79	0.22	0.00	0.33	16.25
SL02	1.79	2.79	0.00	0.44	0.06	1.79	0.33	0.06	0.11	4.58
SL03	6.96	2.98	0.00	0.00	0.17	2.14	0.44	0.00	0.22	9.94
SL04	5.36	3.07	0.34	0.22	0.44	1.79	0.28	0.00	0.00	8.43
SM01	1.43	3.20	0.69	0.28	0.28	1.43	0.34	0.00	0.17	4.62
SM02	5.54	3.41	0.64	0.00	0.10	2.05	0.44	0.00	0.17	8.94
SM03	5.71	3.44	0.09	0.00	0.44	2.68	0.16	0.00	0.07	9.16
SM04	15.40	3.71	0.19	0.72	0.20	1.79	0.44	0.00	0.36	19.11
SM05	7.41	3.72	0.16	0.22	0.20	2.41	0.50	0.00	0.23	11.13
SM06	2.59	4.06	0.09	0.00	0.26	3.21	0.23	0.07	0.20	6.65
SM07	3.93	4.34	1.00	0.45	0.00	2.14	0.45	0.00	0.28	8.26
SM08	29.64	4.48	0.50	0.00	0.33	2.86	0.34	0.00	0.44	34.12
SM09	7.32	4.84	0.09	0.67	0.56	2.86	0.44	0.00	0.22	12.16
SM10	7.68	4.85	0.89	0.00	0.78	2.50	0.40	0.00	0.28	12.53
SM11	6.07	4.87	1.33	0.89	0.44	1.79	0.08	0.00	0.34	10.94
SM12	3.21	6.04	0.19	1.33	0.08	2.50	1.78	0.00	0.17	9.26
SU01	25.00	6.22	1.94	0.00	0.39	2.95	0.44	0.00	0.50	31.22
SU02	28.57	12.15	7.51	0.44	0.67	2.86	0.23	0.00	0.44	40.72

Appendix C - Monitoring Results Trash Characterization Volumes (gallons)

Event 2 (September 2011)

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
BE01	11.07	0.50	0.00	0.00	0.22	0.17	0.00	0.00	0.11	11.57
BK01	2.68	0.78	0.00	0.00	0.00	0.44	0.22	0.00	0.11	3.46
BK02	15.36	4.67	0.00	0.67	0.00	2.00	1.67	0.00	0.33	20.02
BK03	11.25	2.77	0.00	0.00	0.11	1.33	1.22	0.03	0.08	14.02
BK04	6.61	1.89	0.00	0.22	0.00	0.56	0.89	0.00	0.22	8.50
BR01	5.18	2.19	0.00	0.56	0.05	0.67	0.67	0.03	0.22	7.36
BR02	11.43	2.41	0.13	0.00	0.44	1.44	0.22	0.00	0.17	13.84
BR03	6.43	0.92	0.25	0.00	0.00	0.22	0.33	0.00	0.11	7.35
BR04	6.43	3.09	0.09	0.33	1.00	1.33	0.00	0.00	0.33	9.52
DN01	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
DN02	10.89	0.77	0.00	0.00	0.00	0.44	0.22	0.00	0.10	11.66
DN03	12.68	1.89	0.00	0.22	0.00	1.33	0.22	0.00	0.11	14.57
DN04	6.25	0.41	0.00	0.00	0.03	0.33	0.03	0.00	0.03	6.66
FR01	2.14	0.33	0.00	0.00	0.00	0.06	0.22	0.03	0.03	2.47
FR02	10.54	0.86	0.00	0.11	0.06	0.33	0.33	0.00	0.03	11.39
FR03	3.39	0.94	0.00	0.00	0.00	0.78	0.00	0.00	0.17	4.34
FR04	6.61	2.89	0.00	0.00	0.11	2.50	0.06	0.00	0.22	9.50
LV01	16.61	0.17	0.00	0.00	0.00	0.11	0.03	0.00	0.04	16.78
LV02	2.14	0.78	0.00	0.00	0.00	0.44	0.22	0.11	0.00	2.92
OK01	1.96	2.68	0.00	0.67	0.22	1.33	0.22	0.01	0.22	4.64
OK02	10.36	8.17	0.05	1.00	1.00	2.50	3.39	0.00	0.22	18.52
OK03	3.57	0.77	0.00	0.00	0.05	0.44	0.22	0.00	0.05	4.34
OK04	5.71	3.72	0.00	0.22	0.17	1.44	1.67	0.00	0.22	9.44
OR01	0.20	0.30	0.00	0.00	0.00	0.17	0.11	0.03	0.00	0.50

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
OR02	1.61	0.30	0.00	0.00	0.00	0.22	0.05	0.00	0.03	1.90
PL01	2.32	0.88	0.00	0.00	0.05	0.44	0.11	0.05	0.22	3.20
PL02	3.57	0.21	0.00	0.00	0.00	0.11	0.05	0.00	0.05	3.78
RI01	30.00	42.84	0.13	4.00	3.56	25.00	9.37	0.00	0.78	72.84
RI02	11.07	10.12	1.34	0.67	0.22	5.00	1.44	0.00	1.44	21.19
RI03	3.93	7.15	0.68	0.22	1.33	1.78	1.78	0.03	1.33	11.08
SC01	3.21	8.74	0.00	0.22	0.78	3.75	3.39	0.04	0.56	11.95
SJ01	3.39	0.87	0.09	0.00	0.00	0.67	0.11	0.00	0.00	4.26
SJ03	3.39	2.73	0.26	0.22	0.11	1.89	0.22	0.00	0.03	6.13
SJ04	8.75	1.03	0.29	0.00	0.05	0.56	0.11	0.00	0.03	9.78
SJ05	7.68	0.33	0.00	0.00	0.00	0.11	0.22	0.00	0.00	8.01
SJ06	1.07	4.10	0.55	0.00	0.22	1.56	1.78	0.00	0.00	5.17
SJ07	3.75	2.26	0.26	0.00	0.00	1.56	0.22	0.11	0.11	6.01
SJ08	6.79	4.79	0.00	1.11	0.67	1.78	1.11	0.00	0.13	11.58
SJ09	0.71	0.15	0.00	0.00	0.00	0.03	0.10	0.00	0.03	0.86
SJ10	0.71	1.11	0.00	0.00	0.00	1.00	0.00	0.00	0.11	1.83
SJ11	5.18	2.56	0.00	0.22	0.67	1.00	0.22	0.00	0.44	7.73
SJ12	1.43	3.38	0.00	0.44	0.03	1.11	0.22	0.36	1.22	4.81
SJ13	6.96	4.56	0.00	0.00	0.56	2.00	1.56	0.00	0.44	11.52
SJ14	6.07	3.03	0.09	0.22	0.05	0.67	0.22	0.00	1.78	9.10
SJ15	0.89	3.00	0.00	0.56	0.33	1.67	0.33	0.00	0.11	3.89
SJ16	1.07	6.73	0.36	0.11	0.89	3.93	0.78	0.00	0.67	7.80
SJ17	1.61	1.61	0.00	0.00	0.22	1.11	0.22	0.00	0.05	3.21
SJ19	4.11	3.07	0.18	0.00	0.67	0.89	1.00	0.00	0.33	7.18
SJ20	13.04	2.78	0.00	0.11	0.22	1.72	0.33	0.06	0.33	15.81
SJ21	3.04	2.48	0.37	0.00	0.11	1.56	0.22	0.00	0.22	5.51
SJ22	7.68	5.04	0.00	1.11	0.00	3.04	0.44	0.00	0.44	12.71

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SJ23	4.82	1.78	0.00	0.11	0.00	0.44	0.11	0.00	1.11	6.60
SJ24	1.96	2.84	0.40	0.56	0.22	0.89	0.33	0.00	0.44	4.80
SJ25	6.96	2.89	0.89	0.00	0.22	1.33	0.22	0.00	0.22	9.85
SJ26	7.32	2.35	0.00	0.44	0.00	1.78	0.08	0.00	0.05	9.67
SJ27	1.79	2.56	0.00	0.11	0.00	1.44	0.89	0.00	0.11	4.34
SJ28	5.36	2.24	0.13	0.00	0.56	1.22	0.22	0.00	0.11	7.60
SJ29	5.00	3.91	0.13	0.89	0.11	2.00	0.56	0.00	0.22	8.91
SJ30	8.21	3.30	0.00	0.11	0.00	1.22	1.89	0.00	0.08	11.51
SJ31	3.75	7.29	0.00	0.22	0.56	2.00	4.29	0.00	0.22	11.04
SJ32	6.43	1.74	0.25	0.00	0.05	0.78	0.44	0.00	0.22	8.17
SJ33	4.64	3.00	0.00	0.11	0.00	1.33	1.44	0.00	0.11	7.64
SJ34	3.93	1.74	0.13	0.00	0.05	1.44	0.00	0.00	0.11	5.67
SJ35	3.39	2.51	0.00	0.00	0.33	1.67	0.22	0.06	0.22	5.90
SJ36	6.96	1.38	0.00	0.22	0.44	0.56	0.05	0.00	0.11	8.35
SJ37	4.64	1.11	0.00	0.33	0.11	0.56	0.00	0.00	0.11	5.75
SJ38	6.25	9.92	0.00	1.11	0.22	3.04	5.00	0.00	0.56	16.17
SJ39	2.14	1.78	0.00	0.67	0.11	0.89	0.00	0.00	0.11	3.92
SJ40	1.25	1.83	0.00	0.00	0.11	0.44	1.22	0.00	0.05	3.08
SJ41	2.68	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.00	2.70
SJ42	3.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04
SJ43	3.04	0.48	0.09	0.00	0.00	0.22	0.11	0.00	0.05	3.51
SJ44	1.07	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.17
SJ46	1.43	0.44	0.00	0.44	0.00	0.00	0.00	0.00	0.00	1.87
SJ47	3.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
SJ48	3.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
SJ49	3.21	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	3.26
SJ50	3.21	0.22	0.00	0.00	0.00	0.22	0.00	0.00	0.00	3.44

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SJ51	8.57	0.34	0.00	0.00	0.00	0.00	0.22	0.00	0.11	8.91
SJ52	2.50	0.78	0.00	0.00	0.00	0.67	0.00	0.00	0.11	3.28
SJ53	2.86	2.22	0.00	0.00	0.11	1.67	0.33	0.00	0.11	5.08
SJ54	4.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.82
SJ55	0.71	1.28	0.06	0.00	0.00	0.44	0.33	0.00	0.44	2.00
SJ56	6.43	2.33	0.00	0.00	0.11	1.44	0.33	0.00	0.44	8.76
SJ57	3.57	0.11	0.00	0.00	0.00	0.11	0.00	0.00	0.00	3.68
SJ58	2.50	1.00	0.00	0.11	0.00	0.67	0.22	0.00	0.00	3.50
SJ59	4.11	1.00	0.00	0.22	0.00	0.78	0.00	0.00	0.00	5.11
SJ60	1.96	0.28	0.00	0.22	0.00	0.06	0.00	0.00	0.00	2.24
SJ61	4.29	0.25	0.00	0.00	0.00	0.22	0.00	0.00	0.03	4.53
SJ62	2.86	0.67	0.00	0.00	0.00	0.56	0.00	0.00	0.11	3.52
SJ64	4.11	2.34	0.23	0.11	0.00	1.11	0.78	0.00	0.11	6.44
SJ65	5.36	0.89	0.00	0.00	0.44	0.44	0.00	0.00	0.00	6.25
SJ66	1.79	0.33	0.00	0.11	0.00	0.11	0.11	0.00	0.00	2.12
SJ67	4.29	1.23	0.00	0.00	0.03	0.33	0.78	0.00	0.09	5.51
SJ68	0.89	0.11	0.00	0.00	0.00	0.11	0.00	0.00	0.00	1.00
SJ69	1.79	1.11	0.00	0.22	0.00	0.89	0.00	0.00	0.00	2.90
SJ70	2.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32
SJ71	2.50	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.11	2.61
SJ72	5.71	0.89	0.00	0.00	0.00	0.78	0.11	0.00	0.00	6.60
SJ73	5.71	1.24	0.00	0.00	0.11	1.00	0.13	0.00	0.00	6.95
SJ74	5.00	1.15	0.26	0.11	0.11	0.44	0.11	0.00	0.11	6.15
SJ75	4.82	0.58	0.00	0.00	0.11	0.44	0.00	0.00	0.03	5.40
SJ76	5.36	3.62	0.40	0.33	1.00	1.78	0.11	0.00	0.00	8.98
SL01	4.64	1.22	0.00	0.00	0.05	0.50	0.56	0.00	0.11	5.86
SL02	4.82	1.67	0.00	0.00	0.44	0.56	0.56	0.00	0.11	6.49

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SL03	11.79	3.28	0.00	0.33	0.33	1.67	0.78	0.00	0.17	15.06
SL04	10.89	2.36	0.00	0.22	0.22	1.33	0.33	0.03	0.22	13.25
SL05	1.43	1.27	0.00	0.00	0.00	1.11	0.11	0.00	0.05	2.70
SL06	11.79	2.33	0.00	0.00	0.05	1.22	1.00	0.00	0.06	14.11
SL07	6.96	1.59	0.09	0.78	0.00	0.44	0.22	0.00	0.05	8.55
SL08	5.36	0.16	0.00	0.00	0.00	0.11	0.05	0.00	0.00	5.52
SL09	8.39	4.13	0.13	0.89	0.00	1.22	1.67	0.00	0.22	12.52
SL10	6.43	0.89	0.00	0.00	0.00	0.44	0.33	0.00	0.11	7.32
SL11	9.11	2.05	0.00	0.33	0.00	0.56	1.11	0.00	0.05	11.16
SL12	3.04	1.36	0.00	0.00	0.11	0.67	0.56	0.00	0.03	4.39
SL13	25.71	2.53	0.00	0.00	0.00	1.00	1.33	0.03	0.17	28.24
SL14	3.75	1.38	0.00	0.00	0.05	0.67	0.44	0.00	0.22	5.13
SL15	4.11	2.78	0.00	0.33	0.00	0.33	2.00	0.00	0.11	6.88
SL16	1.43	0.49	0.00	0.00	0.00	0.44	0.05	0.00	0.00	1.92
SL17	0.54	0.23	0.07	0.00	0.00	0.11	0.03	0.00	0.03	0.76
SL18	8.57	8.06	0.00	0.67	0.44	1.00	1.33	0.00	4.62	16.63
SL19	10.18	2.01	0.00	0.00	0.05	1.11	0.78	0.03	0.05	12.19
SL20	9.46	2.44	0.00	0.33	0.11	1.33	0.56	0.00	0.11	11.91
SL21	4.29	0.59	0.00	0.00	0.00	0.17	0.33	0.00	0.09	4.88
SL22	1.96	3.03	0.00	0.00	0.03	0.78	2.00	0.00	0.22	4.99
SL23	13.66	2.25	0.13	0.00	0.04	1.67	0.17	0.03	0.22	15.91
SL24	5.18	1.89	0.00	0.00	0.11	1.22	0.22	0.00	0.33	7.07
SL25	18.75	6.67	0.26	0.78	1.22	3.04	1.00	0.04	0.33	25.42
SM01	10.36	2.72	0.00	0.11	0.05	1.78	0.67	0.00	0.11	13.07
SM02	20.54	0.58	0.00	0.00	0.00	0.44	0.11	0.00	0.03	21.12
SM03	8.93	0.58	0.00	0.00	0.00	0.33	0.22	0.00	0.03	9.51
SM04	4.64	0.70	0.00	0.22	0.00	0.44	0.00	0.00	0.04	5.35

BASMAA Site ID	Total Debris	Trash Total	Trash Types							Grand Total
			Recyclable Beverage Containers (CRV-labeled)	Plastic Grocery Bags	Styrofoam Food and Beverage Ware	Other Plastic	Paper	Metal	Miscellaneous	
SM05	18.04	0.50	0.00	0.00	0.17	0.28	0.06	0.00	0.00	18.54
SM06	11.96	0.58	0.00	0.00	0.00	0.56	0.03	0.00	0.00	12.54
SM07	8.21	7.65	0.20	0.89	1.67	2.68	1.67	0.00	0.56	15.87
SM08	2.32	1.64	0.00	0.00	0.03	0.78	0.17	0.00	0.67	3.96
SM09	9.29	0.39	0.00	0.00	0.06	0.33	0.00	0.00	0.00	9.68
SM10	5.71	0.56	0.00	0.00	0.00	0.44	0.00	0.00	0.11	6.27
SM11	16.25	0.98	0.00	0.22	0.05	0.22	0.44	0.00	0.04	17.23
SM12	20.89	3.00	0.00	0.33	0.22	2.06	0.17	0.00	0.22	23.89
SP01	24.11	18.27	0.33	1.11	0.89	6.06	8.21	0.00	1.67	42.38
SU01	4.82	1.11	0.00	0.00	0.00	1.11	0.00	0.00	0.00	5.93
SU02	11.43	3.23	0.23	0.56	0.00	1.33	0.22	0.11	0.78	14.65
SU03	19.64	4.20	0.31	0.78	0.11	1.89	0.78	0.11	0.22	23.84
SU04	16.07	2.13	0.13	0.44	0.11	1.22	0.00	0.00	0.22	18.20
WC01	26.34	1.86	0.00	0.22	0.03	0.61	0.33	0.00	0.67	28.20
WC02	9.11	0.88	0.25	0.22	0.00	0.33	0.03	0.03	0.03	9.99
WC03	2.32	1.14	0.00	0.22	0.11	0.44	0.33	0.00	0.03	3.46
WC04	28.04	0.33	0.00	0.00	0.01	0.28	0.00	0.00	0.04	28.36