

Long-Term Trash Load Reduction Plan and Assessment Strategy

Submitted by:

Town of Hillsborough

1600 Floribunda Avenue
Hillsborough, CA 94010



In compliance with Provisions C.10.c of Order R2-2009-0074

January 31, 2014

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**TOWN OF HILLSBOROUGH
LONG-TERM TRASH LOAD REDUCTION PLAN AND
ASSESSMENT STRATEGY**

CERTIFICATION STATEMENT

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature by Duly Authorized Representative:



1/31/24

Paul Willis, P.E., QSD/QSP
Director of Public Works / City Engineer

Date

TABLE OF CONTENTS

CERTIFICATION STATEMENT2

TABLE OF CONTENTS3

LIST OF TABLES.....4

LIST FIGURES4

ABBREVIATIONS4

PREFACE5

1.0 INTRODUCTION.....5

1.1 PURPOSE OF LONG-TERM TRASH REDUCTION PLAN 5

1.2 BACKGROUND 6

 1.2.1 Long-Term Trash Load Reduction Plan Framework..... 6

 1.2.2 BASMAA Generation Rates Project..... 7

 1.2.3 Short-Term Trash Load Reduction Plan..... 8

1.3 ORGANIZATION OF LONG-TERM PLAN 9

2.0 SCOPE OF THE TRASH PROBLEM..... 10

2.1 PERMITTEE CHARACTERISTICS.....10

2.2 TRASH SOURCES AND PATHWAYS.....10

2.3 TRASH GENERATING AREAS.....11

 2.3.1 Generation Categories and Designation of Areas11

 2.3.2 Summary of Trash Generating Areas and Sources.....13

3.0 TRASH MANAGEMENT AREAS AND CONTROL MEASURES 15

3.1 MANAGEMENT AREA DELINEATION AND PRIORITIZATION.....15

3.2 CURRENT TRASH CONTROL MEASURES.....17

 3.2.1 Trash Management Area #1.....16

 3.2.2 Trash Management Area #2.....16

 3.2.3 Jurisdiction-wide Control Measures16

 3.2.4 Creek and Shoreline Hot Spot Cleanups.....17

 3.2.5 Summary of Trash Control Measures17

4.0 PROGRESS ASSESSMENT STRATEGY..... 18

4.1 SMCWPPP PILOT ASSESSMENT STRATEGY18

 4.1.1 Management Questions.....18

 4.1.2 Indicators of Progress and Success.....18

 4.1.3 Pilot Assessment Methods.....19

4.2 BASMAA “TRACKING CALIFORNIA’S TRASH” PROJECT.....22

 4.2.1 Testing of Trash Monitoring Methods.....23

 4.2.2 Full Capture Equivalent Studies.....24

4.3 LONG-TERM ASSESSMENT STRATEGY.....23

4.4 IMPLEMENTATION SCHEDULE.....23

5.0 REFERENCES..... 25

LIST OF TABLES

- TABLE 1. SAN FRANCISCO BAY AREA TRASH GENERATION RATES BY LAND USE (GALLONS/ACRE/YEAR).
TABLE 2. PERCENTAGES OF THE TOWN OF HILLSBOROUGH'S JURISDICTIONAL AREA WITHIN LAND USE CLASSES IDENTIFIED BY ABAG (2005)
TABLE 3. TRASH GENERATION CATEGORIES AND ASSOCIATED GENERATION RATES (GALLONS/ACRE/YEAR).
TABLE 4. DEFINITIONS OF ON-LAND TRASH ASSESSMENT CONDITION CATEGORIES.
TABLE 5. PERCENTAGE OF JURISDICTIONAL AREA WITHIN THE TOWN OF HILLSBOROUGH ASSIGNED TO EACH TRASH GENERATION CATEGORY.
TABLE 6. JURISDICTIONAL AREA AND PERCENTAGE OF EACH TRASH MANAGEMENT AREA (TMA) COMPRISED OF TRASH GENERATION CATEGORIES
TABLE 7. TRASH CONDITION CATEGORIES USED IN THE DRAFT ON-LAND VISUAL ASSESSMENT PROTOCOL.
TABLE 8. TOWN OF HILLSBOROUGH TRASH PROGRESS ASSESSMENT IMPLEMENTATION SCHEDULE.

LIST FIGURES

- FIGURE 1. EIGHT-STEP FRAMEWORK FOR DEVELOPING, IMPLEMENTING AND REFINING LONG-TERM TRASH REDUCTION PLANS.
FIGURE 2. CONCEPTUAL MODEL OF TRASH GENERATION, INTERCEPTION AND LOAD.
FIGURE 3. TRASH SOURCES CATEGORIES AND TRANSPORT PATHWAYS TO URBAN CREEKS.
FIGURE 4. TRASH GENERATION AREA DEVELOPMENT PROCESS.
FIGURE 5. FINAL TRASH GENERATION MAP FOR THE TOWN OF HILLSBOROUGH
FIGURE 6. TRASH MANAGEMENT AREA MAP FOR THE TOWN OF HILLSBOROUGH.

ABBREVIATIONS

BASMAA	Bay Area Stormwater Management Agencies Association
BID	Business Improvement District
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CDS	Continuous Deflection Separator
CEQA	California Environmental Quality Act
CY	Cubic Yards
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
GIS	Geographic Information System
MRP	Municipal Regional Stormwater NPDES Permit
MS4	Municipal Separate Storm Sewer System
NGO	Non-Governmental Organization
NPDES	National Pollutant Discharge Elimination System
Q	Flow
SFRWQCB	San Francisco Regional Water Quality Control Board
SWRCB	State Water Resource Control Board
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
Water Board	San Francisco Regional Water Quality Control Board
WDR	Waste Discharge Requirements

PREFACE

This Long-Term Trash Load Reduction Plan and Assessment Strategy (Long-Term Plan) is submitted in compliance with provision C.10.c of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I communities in the San Francisco Bay (Order R2-2009-0074). The Long-Term Plan was developed using a regionally consistent outline and guidance developed by the Bay Area Stormwater Management Agencies Association (BASMAA) and reviewed by San Francisco Bay Regional Water Quality Control Board staff. The Long-Term Plan is consistent with the Long-Term Trash Load Reduction Framework developed in collaboration with Water Board staff. Its content is based on the Town of Hillsborough's current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with Municipal Separate Storm Sewer (MS4) discharges. This Long-Term Plan is intended to be iterative and may be modified in the future based on information gained through the implementation of trash control measures. The Town of Hillsborough therefore reserves the right to revise or amend this Long-Term Plan at its discretion. If significant revisions or amendments are made by the Town, a revised Long-Term Plan will be submitted to the Water Board through the Town's annual reporting process.

1.0 INTRODUCTION

1.1 Purpose of Long-Term Trash Reduction Plan

The Municipal Regional Stormwater National Pollutant Discharge Elimination System (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.c of the MRP requires Permittees to submit a *Long-Term Trash Load Reduction Plan* (Long-Term Plan) by February 1, 2014. Long-Term Plans must describe control measures that are currently being implemented, including the level of implementation, and additional control measures that will be implemented and/or increased level of implementation designed to attain a 70% trash load reduction by July 1, 2017, and 100% (i.e., "No Visual Impact") by July 1, 2022.

This Long-Term Plan is submitted by the Town of Hillsborough in compliance with MRP provision C.10.c. Consistent with provision C.10 requirements, the goal of the Long-Term Plan is to solve trash problems in receiving waters by reducing the impacts associated with trash in discharges from the Town of Hillsborough's municipal separate storm sewer system (MS4) that are regulated by NPDES Permit requirements. The Long-Term Plan includes:

1. Descriptions the current level of implementation of trash control measures, and the type and extent to which new or enhanced control measures will be implemented to achieve a target of 100% (i.e. full) trash reduction from MS4s by July 1, 2022, with an interim milestone of 70% reduction by July 1, 2017;
2. A description of the *Trash Assessment Strategy* that will be used assess progress towards trash reduction targets achieved as a result of control measure implementation; and,
3. Time schedules for implementing control measures and the assessment strategy.

The Long-Term Plan was developed using a regionally consistent outline and guidance developed by the Bay Area Stormwater Management Agencies Association (BASMAA) and reviewed by the San Francisco Bay Regional Water Quality Control Board (Water Board) staff. The Long-Term Plan is consistent with the Long-Term Trash Load Reduction Framework (see section 1.2.1) developed in collaboration with Water Board staff. Its content is based on the Town of Hillsborough’s current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with Municipal Separate Storm Sewer (MS4) discharges. The Long-Term Plan builds upon trash control measures implemented by the Town prior to the adoption of the MRP and during the implementation of the Short-Term Trash Load Reduction Plan submitted to the Water Board on February 1, 2012.

1.2 Background

1.2.1 Long-Term Trash Load Reduction Plan Framework

A workgroup of MRP Permittee, Bay Area countywide stormwater program staff and Water Board staff met between October 2012 and March 2013 to better define the process for developing and implementing Long-Term Plans, methods for assessing progress toward reduction goals, and tracking and reporting requirements associated with provision C.10. Through these discussions, an eight-step framework for developing and implementing Long-Term Plans was created by the workgroup (Figure 1).

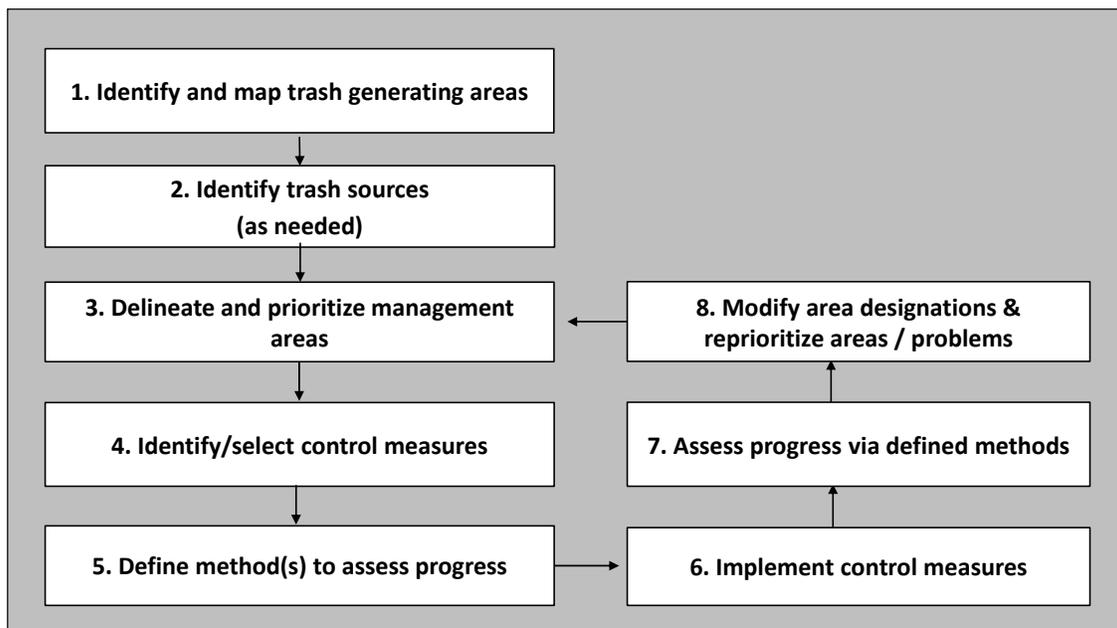


Figure 1. Eight-step framework for developing, implementing and refining Long-Term Trash Reduction Plans.

The workgroup agreed that as the first step in the framework, Permittees would identify very high, high, moderate, and low trash generating areas in their jurisdictional areas. Trash generation rates developed through the *BASMAA Baseline Trash Generation Rates Project* (as discussed below) were used as a starting point for differentiating and delineating land areas with varying levels of trash generation. Permittees would then use local knowledge and field and/or desktop assessments to

confirm or refine the level of trash generation for specific areas within their jurisdiction. Each Permittee would then develop a map depicting trash generation categories within their jurisdiction.

As a next step, Permittees would then delineate and prioritize Trash Management Areas (TMAs) where specific control measures exist or are planned for implementation. TMAs delineated by Permittees are intended to serve as reporting units in the future. Reporting at the management area level provides the level of detail necessary to demonstrate implementation and progress towards trash reduction targets.

Once control measures are selected and implemented, Permittees will evaluate progress toward trash reduction targets using outcome-based assessment methods. As the results of the progress assessments are available, Permittees may choose to reprioritize trash management areas and associated control measures designed to improve trash reduction within their jurisdictions.

1.2.2 BASMAA Generation Rates Project

Through approval of a BASMAA regional project in 2010, Permittees agreed to work collaboratively to develop a regionally consistent method to establish trash generation rates within their jurisdictions. The project, also known as the *BASMAA Trash Generation Rates Project* (Generation Rates Project) assisted Permittees in establishing the rates of trash generation and identifying very high, high, moderate and low trash generating areas.

The term “trash generation” refers to the rate at which trash is produced or generated onto the surface of the watershed and is potentially available for transport via MS4s to receiving waters. Generation rates do not explicitly take into account existing control measures that intercept trash prior to transport. Generation rates are expressed as trash volume/acre/year and were established via the Generation Rates Project.

In contrast to trash generation, the term “trash loading” refers to the rate at which trash from MS4s enters receiving waters. Trash loading rates are also expressed as trash volume/acre/year and are equal to or less than trash generation rates because they account for the effects of control measures that intercept trash generated in an area before it is discharged to a receiving water. Trash loading rates are specific to particular areas because they are dependent upon the effectiveness of control measures implemented within an area. Figure 2 illustrates the difference between trash generation and loading.

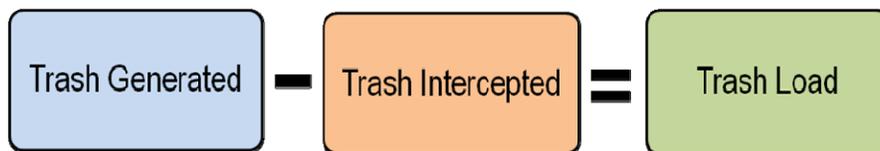


Figure 2. Conceptual model of trash generation, interception and load.

Trash generation rates were estimated based on factors that significantly affect trash generation (i.e., land use and income). The method used to establish trash generation rates for each Permittee builds off “lessons learned” from previous trash loading studies conducted in urban areas (Allison and Chiew 1995; Allison et al. 1998; Armitage et al. 1998; Armitage and Rooseboom 2000; Lippner et al. 2001; Armitage 2003; Kim et al. 2004; County of Los Angeles 2002, 2004a, 2004b;

Armitage 2007). The method is based on a conceptual model developed as an outgrowth of these studies (BASMAA 2011b).

Trash generation rates were developed through the quantification and characterization of trash captured in Water Board-recognized full-capture treatment devices installed in the San Francisco Bay area. Trash generation rates estimated from this study are listed for each land use type in

Table 1. Methods used to develop trash generation rates are more fully described in BASMAA (2011b, 2011c, and 2012).

Table 1. San Francisco Bay Area trash generation rates by land use (gallons/acre/year).

Land Use	Low^b	Best^b	High^b
Commercial & Services	0.7	6.2	17.3
Industrial	2.8	8.4	17.8
Residential ^a	0.3 - 30.2	0.5 - 87.1	1.0 - 257.0
Retail ^a	0.7 - 109.7	1.8 - 150.0	4.6 - 389.1
K-12 Schools	3	6.2	11.5
Urban Parks	0.5	5.0	11.4

^a For residential and retail land uses, trash generation rates are provided as a range that takes into account the correlation between rates and household median income.

^b For residential and retail land uses: Low = 5% confidence interval; Best = best fit regression line between generation rates and household median income; and, High = 95% confidence interval. For all other land use categories: High = 90th percentile; Best = mean generation rate; and, Low = 10th percentile.

1.2.3 Short-Term Trash Load Reduction Plan

In February 2012, Town of Hillsborough developed a Short-Term Plan that described the current level of control measures implementation and identified the type and extent to which new or enhanced control measures would be implemented to attain a 40% trash load reduction from its MS4 by July 1, 2014. Since that time, the Town of Hillsborough has begun to implement its short-term plan. Control measures implemented to date via the short-term trash reduction plan are:

- Public Education and Outreach Programs
- Anti-Littering and Illegal Dumping Enforcement Activities
- Improved Trash Bin/Container Management Activities
- On-Land Trash Pick-up
- Enhanced Storm Drain Inlet Maintenance
- Creek/Channel/Shoreline Cleanups

The Town collaboratively worked with a local, private non-profit community organization to improve an area in Town with history of anti-littering and illegal dumping. The improvement included landscaping and installing right-of-way improvements such as parking strips and curb/gutter. The Town worked with the refuse company to ensure proper disposal of trash during the routine pick-up. During the permitting process, permit staff increased the frequency to outreach to development contractors to properly dispose construction debris while on and off-hauling to and from site. The Town continues to work with the San Mateo County Sheriff's Work Furlough Program and increased frequency with maintenance crew to on-land trash pick-up. In addition to

routine storm drain inlet maintenance during the wet-season, the Town maintenance staff increased frequency during the dry-season.

Control measures described in this Long-Term Plan build upon actions taken to-date via Town of Hillsborough's Short-Term Plan. A full description of control measures implemented via short and long-term plans is included in section 3.2. Outcomes associated with short-term plan implementation will be reported in the Town of Hillsborough's Fiscal Year 2013-14 Annual Report, scheduled for submittal to the Water Board by September 15, 2014.

1.3 Organization of Long-Term Plan

This Long-Term Plan is organized into the following sections:

- 1.0 Introduction;
- 2.0 Scope of the Trash Problem;
- 3.0 Trash Management Areas and Control Measures;
- 4.0 Progress Assessment Strategies; and
- 5.0 References

Section 2.0 is intended to provide a description of the extent and magnitude of the trash problem in the Town of Hillsborough. Control measures that will be implemented by Town of Hillsborough as a result of this Long-Term Plan are described in section 3.0. Section 4.0 describes the methods that will be used to assess progress toward trash reduction targets.

2.0 SCOPE OF THE TRASH PROBLEM

2.1 Permittee Characteristics

Incorporated in 1910, the Town of Hillsborough is located in San Mateo County, and has a jurisdictional area of 6.23 square miles. According to the 2010 Census, it has a population of 10,825, with a population density of 1,732 people per square mile and average household size of 3. Of the 10,825 residents who call the Town of Hillsborough home, 27% are under the age of 18, 73% are 18 and over; and 7% are between the age 20 and 34, 20% are between 35 and 49, 25% are between 50 and 64, and 20% are 65 or older. The median household income was \$193,157 in the 2000 Census. The Town of Hillsborough is zoned residential and home to many mansions, like the Carolands Estates, the Burlingame Country Club golf course, and highly-owned and -ranked public elementary and middle school systems. The Town of Hillsborough has no commercial zoning and thus no businesses within the Town limits. The levels of trash generation is very low in which is well controlled by municipal staff.

Land uses within the Town of Hillsborough depicted in ABAG (2005) are provided in Table 2. The Town of Hillsborough is primarily comprised of four land uses. These include commercial, residential, k-12 schools and urban parks. Commercial land uses is comprised primarily of fire stations, police department and the Town Hall

Table 2. Percentages of Hillsborough's jurisdictional area¹ within land use classes identified by ABAG (2005)

Land Use Category	Jurisdictional Area (Acres)	% of Jurisdictional Area
Commercial and Services	6.1	0.2
Industrial	0.0	0.0
Residential	3229.8	81.8
Retail	0.0	0.0
K-12 Schools	85.4	2.2
Urban Parks	626.9	15.9

2.2 Trash Sources and Pathways

Trash in San Francisco Bay Area creeks and shorelines originates from a variety of sources and is transported to receiving waters by a number of pathways (Figure 3). Of the four source categories, pedestrian litter includes trash sources from high traffic areas along the freeway and highway, schools, and construction activities. Trash from vehicles occurs due to littering from automobiles and uncovered loads. Inadequate waste container management includes sources such as overflowing or uncovered containers and dumpsters as well as the dispersion of household and

¹ A Permittee's jurisdictional area is defined as the urban land area within a Permittee's boundary that is not subject to stormwater NPDES Permit requirements for traditional and non-traditional small MS4s (i.e. Phase II MS4s) or the California Department of Transportation, or owned and maintained by the State of California, the U.S. federal government or other municipal agency or special district (e.g., flood control district).

business-related trash and recycling materials before, during, and after collection. On-land illegal dumping of trash is another source category.

Trash is transported to receiving waters through three main pathways: 1) Stormwater Conveyances; 2) Wind; and, 3) Direct Dumping. Stormwater or urban runoff conveyance systems (e.g., MS4s) consist of curbs/gutters, and pipes and channels that discharge to urban creeks and the San Francisco Bay shorelines. Wind can also blow trash directly into creeks or the Bay. Lastly, trash in receiving waters can also originate from direct dumping into urban creeks and shorelines.

This Long-term Plan and associated trash control measures described in Section 3.0 are focused on reducing trash from one of the transport pathways illustrated in Figure 3– **stormwater conveyances**. Specifically, the Long-term Plan is focused on reducing the impacts of discharges from MS4s to San Francisco Area receiving waters and the protection of associated beneficial uses.

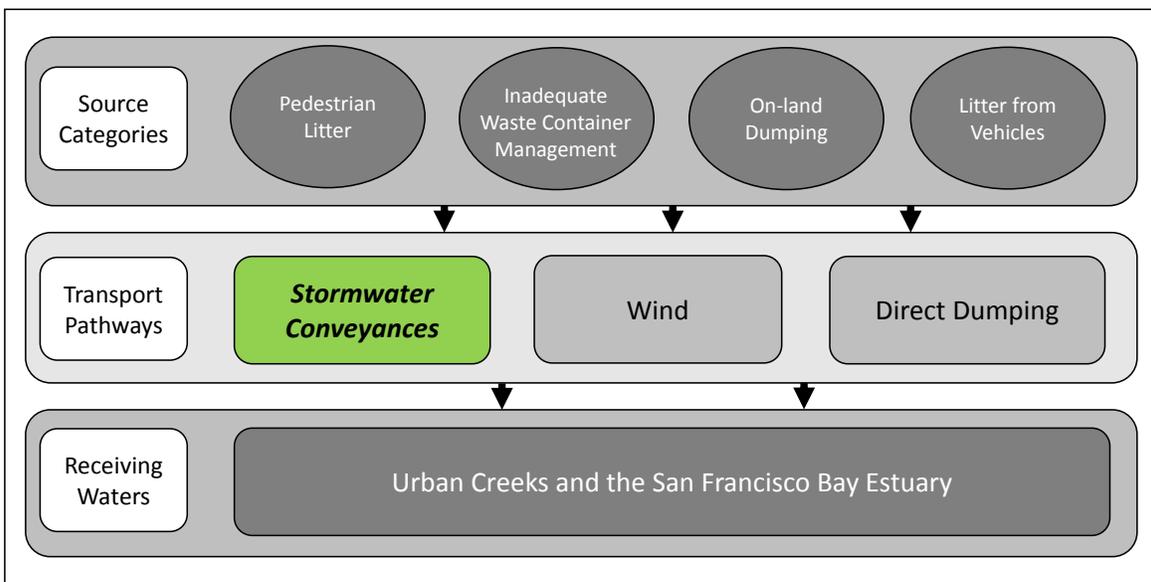


Figure 3. Trash sources categories and transport pathways to urban creeks.

Currently, the haul routes are required for work associated with development which requires all truck loads to be covered as part of the permitting process. The Town does not have any designated routes like other urbanized areas and majority of material transport is for private development.

2.3 Trash Generating Areas

2.3.1 Generation Categories and Designation of Areas

The process and methods used to identify the level of trash generation within the Town of Hillsborough are described in this section and illustrated in Figure 4.

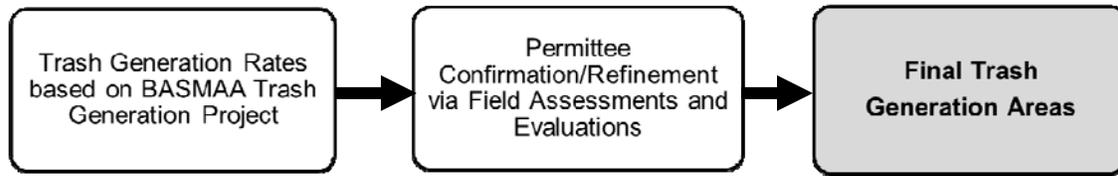


Figure 4. Trash generation area development process.

As a first step, trash generation rates developed through *the BASMAA Trash Generation Rates Project* were applied to parcels within the Town of Hillsborough based on current land uses and 2010 household median incomes. A Draft Trash Generation Map was created as a result of this application. The draft map served as a starting point for the Town of Hillsborough to identify trash generating levels. Levels of trash generation are depicted on the map using four major trash generation rate (gallons/acre/year) categories that are symbolized by four different colors illustrated in Table 3.

Table 3. Trash generation categories and associated generation rates (gallons/acre/year).

Category	Very High	High	Moderate	Low
Generation Rate (gallons/acre/year)	> 50	10-50	5-10	< 5

The Town of Hillsborough then reviewed and refined the draft trash generation map to ensure that trash generation categories were correctly assigned to parcels or groups of parcels. Town staff refined maps using the following process:

1. Based upon our knowledge of trash generation and problem areas within the Town, staff identified areas on the draft map that potentially had incorrect trash generation category designations.
2. Trash generation category designations initially assigned to areas identified in step #1 were then assessed and confirmed/refined by the Town using the methods listed below.

a. On-Land Visual Assessments

To assist Permittees with developing their trash generation maps, BASMAA developed a *Draft On-land Visual Trash Assessment Protocol (Draft Protocol)*. The Draft Protocol entails walking a street segment and visually observing the level of trash present on the roadway, curb and gutter, sidewalk, and other areas adjacent to the street that could potentially contribute trash to the MS4. Based on the level of trash observed, each segment (i.e., assessment area) was placed into one of four on-land assessment condition categories that are summarized in Table 4. Using the Draft Protocol the Town assessed a total of 11 areas to assist in conducting/refining trash generating area designations. These 11 areas consisted of municipal buildings, community parks, schools, Town freeway entrance and exit and the jurisdictional area adjacent to the highway.

Table 4. Definitions of on-land trash assessment condition categories.

On-land Assessment Condition Category	Summary Definition
A (Low)	Effectively no trash is observed in the assessment area.
B (Moderate)	Predominantly free of trash except for a few pieces that are easily observed.
C (High)	Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets.
D (Very High)	Trash is continuously seen throughout the assessment area, with large piles and a strong impression of lack of concern for litter in the area.

b. Querying Municipal Staff or Members of the Public

Of the 11 trash management areas, five areas were assessed by querying municipal staff in addition to the on-land assessment. These five areas included public facilities, the jurisdictional area and the two public parks. Through the querying process, of municipal staff, background information in regards to trash generations and frequency of on-land cleanups were conducted.

- Based on assessments conducted to confirm/refine trash generation category designations, the Town created a final trash generation map that depicts the most current understanding of trash generation within the Town of Hillsborough. The Town documented this process by tracking the information collected through the assessments and subsequent refinements to the Draft Trash Generation Map. The Town of Hillsborough’s Final Trash Generation Map is included as Figure 5.

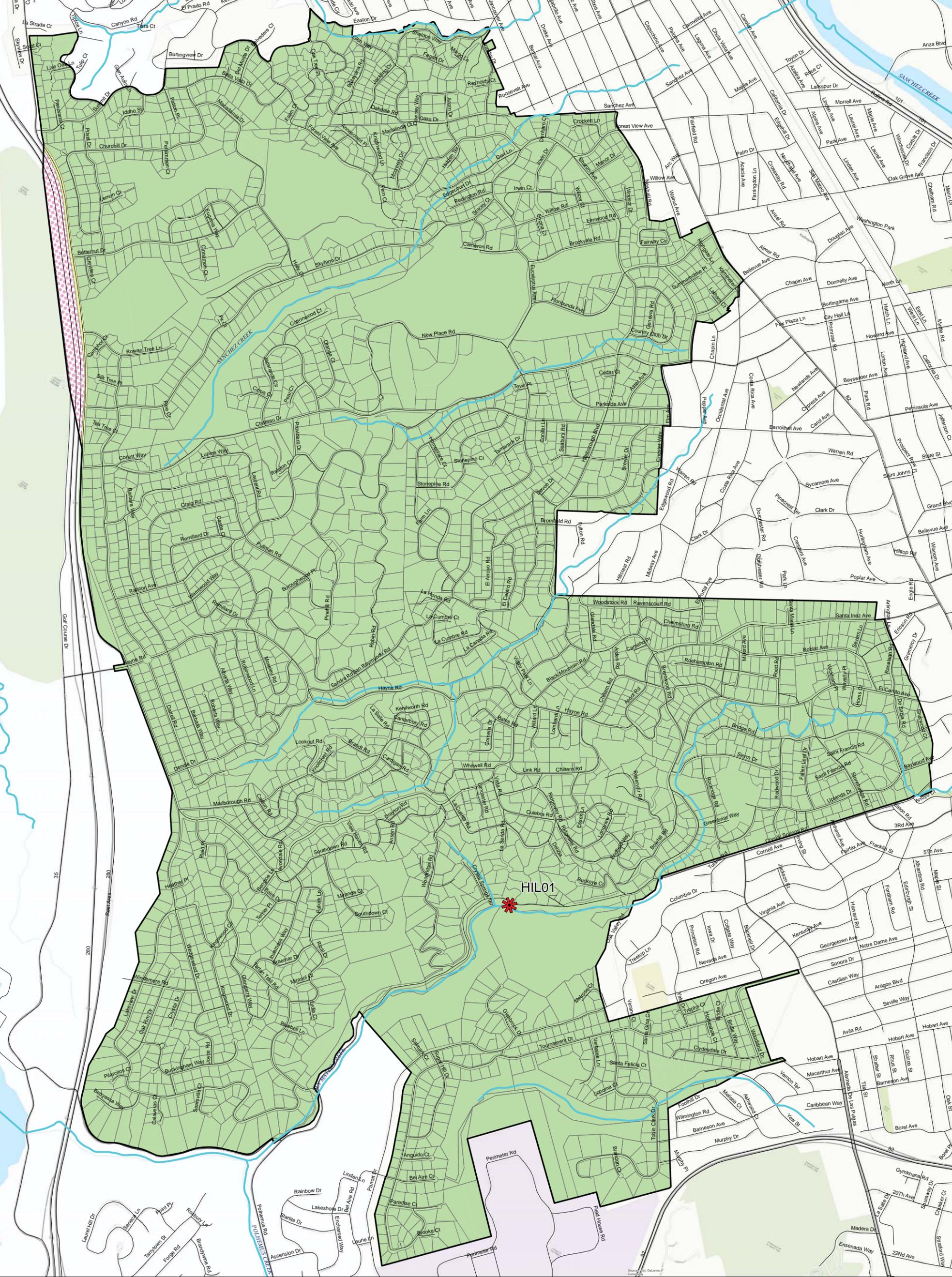
2.3.2 Summary of Trash Generating Areas and Sources

Summary statistics for land use and trash generation categories generated through the mapping and assessment process are presented in Table 5.

Table 5. Percentage of jurisdictional area within the Town of Hillsborough assigned to each trash generation category.

Trash Generation Category	Jurisdictional Area (Acres)	Commercial and Services	Industrial	Residential	Retail	K-12 Schools	Urban Parks	Other
Very High	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
High	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Medium	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Low / Medium	6.8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Low	3943.5	0.2%	0.0%	81.9%	0.0%	2.2%	0.0%	15.7%

Town of Hillsborough Trash Generation Map



Legend

Trash Generation Category

- Low
- Low/Medium
- Medium
- Medium/High
- High
- High/Very High
- Very High

- Creek/Shoreline Hotspot
- Non-Jurisdictional (Dot color = Generation Category)

- Streets
- Agency Boundary
- Creeks
- Parcel Boundary

Figure 5. Final Trash Generation Map for the Town of Hillsborough

Data Sources:
 Roads: San Mateo County
 City Boundaries: San Mateo County
 Background: ESRI World Topographic Map

Map Created By:
 EOA, Inc.

Date:
 December 11th, 2013



3.0 TRASH MANAGEMENT AREAS AND CONTROL MEASURES

This section describes the control measures that the Town of Hillsborough has or plans to implement to solve trash problems and achieve a target of 100% (i.e. full) trash reduction from their MS4 by July 1, 2022. The selection of control measures described in this section is based on the Town of Hillsborough’s current understanding of trash problems within its jurisdiction and the effectiveness of control measures designed to reduce trash impacts associated with MS4 discharges. Information on the effectiveness of some trash control measures is currently lacking and therefore in the absence of this information, the Town based its selection of control measures on existing effectiveness information, their experience in implementing trash controls and knowledge of trash problems, and costs of implementation. As knowledge is gained through the implementation of these control measures, the Town may choose to refine their trash control strategy described in this section. If significant revisions or amendments are made, a revised Long-Term Plan will be submitted to the Water Board through the Town of Hillsborough’s annual reporting process.

3.1 Management Area Delineation and Prioritization

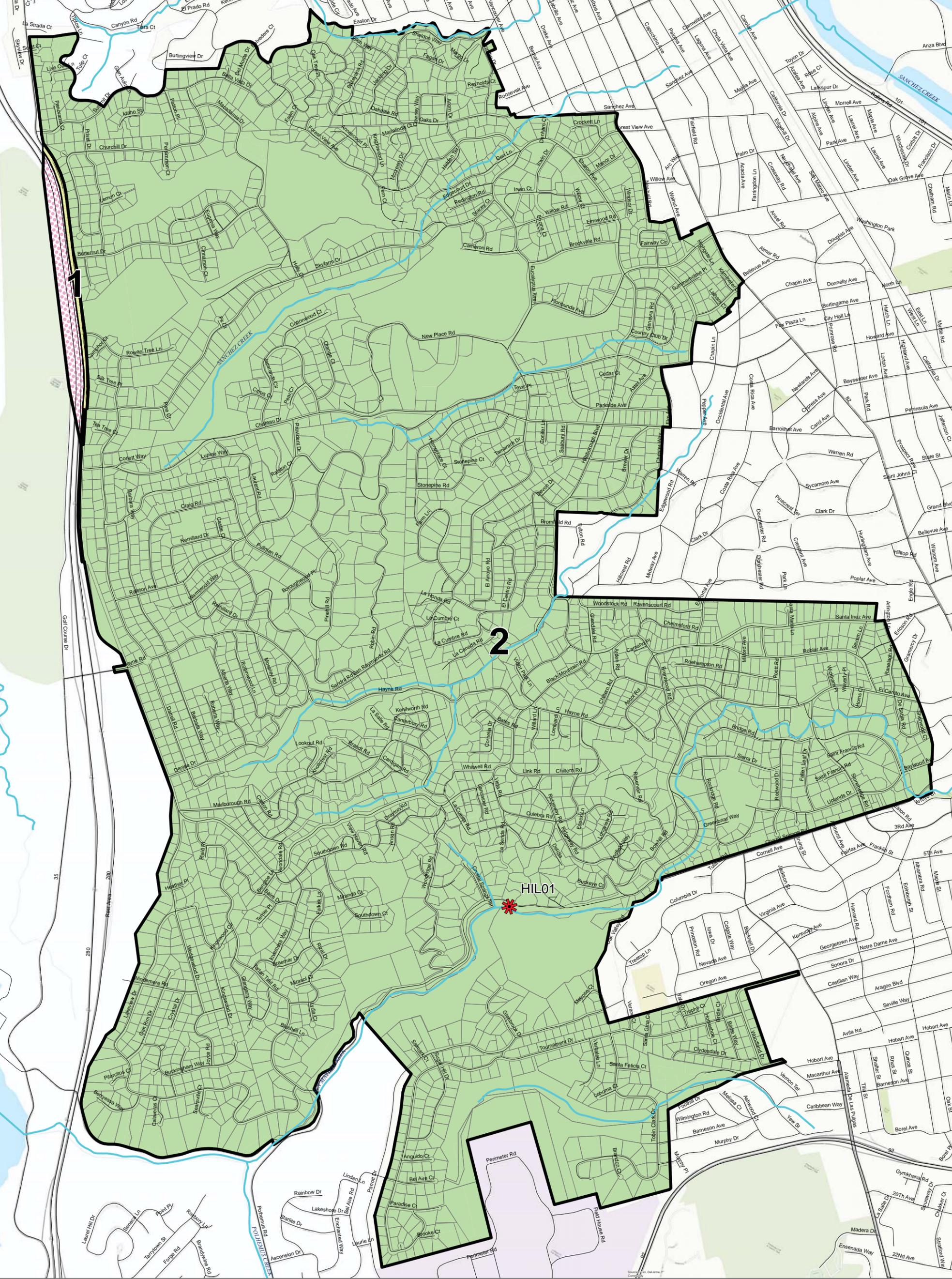
Consistent with the long-term plan framework, the Town of Hillsborough delineated and prioritized trash management areas (TMAs) based on the geographical distribution of trash generating areas, types of trash sources, and current or planned control measure locations. TMAs are intended to form the management units by which trash control measure implementation can be tracked and assessed for progress towards trash reduction targets. Once delineated, TMAs were also prioritized for control measure implementation. The Town of Hillsborough’s primary management areas were selected based on the spatial distribution of trash generating areas and the location of specific existing or planned management actions within Town’s jurisdiction. Town staff used the on-land visual assessments procedure to delineate and prioritize TMAs.

A map depicting the Town’s TMAs is included as **Figure 6**. All jurisdictional areas within the Town are included within a TMA. The amount of jurisdictional land area and associated trash condition categories for each TMA are included in **Table 6**.

Table 6. Jurisdictional area and percentage of each Trash Management Area (TMA) comprised of trash generation categories

TMA	Jurisdictional Area (Acres)	Trash Generation Category			
		Very High	High	Moderate	Low
1	6.8	0.0%	0.0%	100.0%	0.0%
2	3943.5	0.0%	0.0%	0.0%	100.0%

Town of Hillsborough Trash Management Areas Map



Legend

Trash Generation Category

- Low
- Low/Medium
- Medium
- Medium/High
- High
- High/Very High
- Very High

Other Symbols:

- Trash Management Area
- Non-Jurisdictional (Dot color = Generation Category)
- Streets
- Agency Boundary
- Creeks
- Parcel Boundary

Figure 6. Trash Management Area Map for the Town of Hillsborough.

Data Sources:
 Roads: San Mateo County
 City Boundaries: San Mateo County
 Background: ESRI World Topographic Map

Map Created By:
 EOA, Inc.
Date:
 December 11th, 2013

3.2 Current Trash Control Measures

The Town of Hillsborough encompasses a rural geography that's zoned single-family residence, which requires different methods of maintenance compared to common methods used in urbanized areas. The Town's roadways predominantly do not have traditional sidewalks with curbs and gutters. As a result, sidewalk maintenance is not required. The Town has a limited number of rolled curb/gutters where collection of street debris is more likely. When leaves and street debris collects within the rolled curbs and gutters, Town residents are responsible to clean and dispose materials along their property frontage per the Town's Municipal Code and the Town maintenance staff responds diligently if lack of maintenance becomes a nuisance to the public. Currently, control measures that are conducted by the Town are regular maintenance of storm drain inlets and visual on-land assessment.

3.2.1 Trash Management Area #1

Trash Management Area #1 (TMA #1) area is part of the California Highway 35 that was annex to the Town and trash problems is categorized as a medium generation rate. TMA #1 runs parallel to the California Highway 280 in which is the dominant source of trash transported by wind and traffic. Town maintenance staff conducts daily to weekly cleanups and as-needed basis. For TMA#1, the Town will continue to conduct on-land trash cleanups by Town Staff and by the San Mateo County Sheriff's Furlough Program. On-land trash cleanups have been done prior to MRP requirements and will remain.

3.2.2 Trash Management Area #2

Trash Management Area #2 (TMA #2) encompasses the Town's rural geography of zoned single-family residence and open spaces, and trash problems is categorized as a low general rate. The Town will continue to conduct the following control measures within TMA #2:

- On-land Trash Cleanups
- Anti-littering and Illegal Dumping Enforcement Activities
- Improved Trash Bins/Container Management

3.2.3 Jurisdiction-wide Control Measures

The dominant source of trash is primarily material and debris during development projects in Town and secondarily from wind transport from the highways and vehicles. The Town is zoned residential and the Town maintenance staff responds diligently to trash issues that are visually assessed during daily activities. The Town of Hillsborough will continue to implement the following, jurisdictional-wide:

- **On-land Trash Cleanups**
The frequency of on-land trash cleanups is daily to weekly and is conducted by Town Staff's Street Department as regular routine duties. The frequency is increased or immediately attended to if it becomes a public nuisance and/or an emergency. The on-land trash cleanups are completed throughout the entire Town in which is primarily noted as TMA #2.

- **Anti-littering and Illegal Dumping Enforcement Activities**
Enforcement activities for anti-littering and illegal dumping are usually triggered by complaints and notification from the general public by the residents. Once this is brought to the Town's attention, the Code Enforcement Division enforces a process for compliance. This process includes courtesy and warning letters, and to the extent of citations and court hearings. The Town's Municipal Code and the general Civil Laws allow enforcement activities managed by the Police Department. Anti-littering and illegal dumping with enforcement activities occurs on an average quarterly a year.
- **Improved Trash Bins/Container Management**
The Town has worked with the contracted refuse company to ensure that all residents have proper trash bins to accommodate the scheduled trash collection. In addition, the Town completes assessment during routine maintenance of public facilities to ensure that trash bins are adequate and if needed, to be replaced. The current container management for Town-operated facilities is disposed weekly. Appropriate container management is also enforced for all private development is outreached during pre-construction meetings prior to permit issuance, otherwise enforcement activities may be triggered.

These control measures are actions that have been implemented prior and continued after the MRP effective date during December of 2009. The Town will continue to enhance these control measures to ensure that they remain effective to address trash generation. The Town will collaborate efforts with other departments and local community groups to enhance Public Education and Outreach Programs to achieve future implementation.

The Town does not have any businesses and has adopted Ordinance 475 amending Chapter 8.10 of the Municipal Code supporting the international, federal and state bans of all uses of chlorofluorocarbons and polystyrene foam packaging products used in the food services industry. This ordinance was adopted in 1990 before the MRP requirements and has been effective July 1, 1990. As a result, the Town sponsored events or events on Town property are prohibited from using polystyrene based disposable food service packaging materials.

3.2.4 Creek and Shoreline Hot Spot Cleanups

The Town currently has one Creek Hot Spot along the San Mateo Creek in San Mateo County, running parallel Crystal Springs Road that throughout the Town of Hillsborough and City of San Mateo. The 300' trash hot spot is approximately located 250' northeast of Crystal Springs Terrace, upstream and 650' southwest of Merner Road, downstream, on Crystal Springs Road. The selected spot shows visual impact from the adjacent roadway and is a spot more susceptible of trash accumulation than others within the Town. Accessibility of this site is safe and at ease for maintenance crews to clean-up. This creek hot spot is maintained on an annual basis. The trash hot spot is shown on Figure 5 and 6 as "HIL01".

3.2.5 Summary of Trash Control Measures

Trash Management Area 1

The current on-land trash assessment is believed to achieve the “full” trash reduction level in TMA #1.

Trash Management Area 2

The current on-land trash cleanups, anti-littering and illegal dumping enforcement activities, and improvement to trash bins/containers are believed to achieve the “full” trash reduction level in TMA #2.

4.0 PROGRESS ASSESSMENT STRATEGY

Provision C.10.a.ii of the MRP requires Permittees to develop and implement a 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 targets. Early into the MRP, Permittees decided to work collaboratively to develop a trash load reduction tracking method through the Bay Area Stormwater Management Agencies Association (BASMAA). Permittees, Water Board staff and other stakeholders assisted in developing Version 1.0 of the tracking method. On behalf of all MRP Permittees, the Bay Area Stormwater Management Agencies Association (BASMAA) submitted Version 1.0 to the Water Board on February 1, 2012.

The Trash Assessment Strategy (Strategy) described in this section is intended to serve as Version 2.0 of the trash tracking method and replace version 1.0 previously submitted to the Water Board. The Strategy is specific to Permittees participating in the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), including the Town of Hillsborough. The Town intends to implement the Strategy in phases and at multiple geographical scales (i.e., jurisdiction-wide and trash management area) in collaboration with SMCWPPP. Pilot implementation is scheduled for the near-term and as assessment methods are tested and refined, the Strategy will be adapted into a longer-term approach. The Strategy selected by the Town is described in the following sections.

4.1 SMCWPPP Pilot Assessment Strategy

The following SMCWPPP Pilot Trash Assessment Strategy (SMCWPPP Pilot Strategy) was developed by SMCWPPP on behalf of the Town and other San Mateo County Permittees. The SMCWPPP Pilot Strategy will be implemented at a pilot scale on a countywide basis and includes measurements and observations in the Town of Hillsborough.

4.1.1 Management Questions

The SMCWPPP Pilot Strategy is intended to answer the following core management questions over time as trash control measures outlined in section 3.0 are implemented and refined:

- Are the MS4 trash load reduction targets being achieved?
- Have trash problems in receiving waters been resolved?
- If trash problems in receiving waters exist, what are the important sources and transport pathways?

The SMCWPPP Pilot Strategy, including indicators and methods, is summarized in this section and fully described in the SMCWPPP Pilot Trash Assessment Strategy, a compendium document submitted to the Water Board on February 1, 2014 on behalf of all SMCWPPP Permittees (SMCWPPP 2014).

4.1.2 Indicators of Progress and Success

The management questions listed in the previous section will be addressed by tracking information and collecting data needed to report on a set of key environmental indicators. Environmental indicators are simple measures that communicate what is happening in the environment. Since trash in the environment is very complex, indicators provide a more practical and economical way to track the state of the environment than if we attempted to record every possible variable.

With regard to municipal stormwater trash management, indicators are intended to detect progress towards trash load reduction targets and solving trash problems. Ideally, indicators should be robust and able to detect progress that is attributable to multiple types of trash control measure implementation scenarios. Assessment results should also provide Permittees with an adequate level of confidence that trash load reductions from MS4s have occurred, while also assessing whether trash problems in receiving waters have been resolved. Indicators must also be cost effective, relatively easy to generate, and understandable to stakeholders.

Primary and secondary indicators that SMCWPPP Permittees will use to answer core management questions include:

Primary Indicators:

- 1 Reduction in the level of trash present on-land and available to MS4s

Secondary Indicators:

- 2-A Successful levels of trash control measures implementation
- 2-B Reductions in the amount of trash in receiving waters

In selecting the indicators above, the Town of Hillsborough in collaboration with SMCWPPP and other SMCWPPP Permittees recognize that no one environmental indicator will provide the information necessary to effectively determine progress made in reducing trash discharged from MS4s and improvements in the level of trash in receiving waters. Multiple indicators were therefore selected.

The ultimate goal of municipal stormwater trash reduction strategies is to reduce the impacts of trash associated with MS4s on receiving waters. Indicators selected to assess progress towards this goal should ideally measure outcomes (e.g., reductions in trash discharged). The primary indicators selected by SMCWPPP are outcome-based and include those that are directly related to MS4 discharges. Secondary indicators are outcome or output-based and are intended to provide additional perspective on and evidence of, successful trash control measure implementation and improvements in receiving water condition with regard to trash.

As described in Section 2.2, trash is transported to receiving waters from pathways other than MS4s, which may confound our ability to observe MS4-associated reductions in creeks and shorelines. Due to this challenge of linking MS4 control measure implementation to receiving water conditions, the receiving water based indicator is currently considered a secondary indicator.

Evaluations of data on the amount of trash in receiving waters that are conducted over time through the Pilot Assessment Strategy will assist the Town in further determinations of the important sources and pathways causing problems in local creeks, rivers and shorelines.

4.1.3 Pilot Assessment Methods

This section briefly summarizes the preliminary assessment methods that the Town of Hillsborough will implement through the SMCWPPP Pilot Strategy to generate indicator information described in the previous section. Additional information on each method can be found in the SMCWPPP Pilot Trash Assessment Strategy submitted to the Water Board by SMCWPPP on behalf of the Town.

1. On-land Visual Assessments

As part of the Trash Generation Map assessment and refinement process (see Section 2.3.1), a draft on-land visual assessment method was developed to assist Permittees in confirming and refining trash generating area designations (i.e., very high, high, moderate and low trash generating categories). The draft on-land visual assessment method is intended to be a cost-effective tool and provide Permittees with a viable alternative to quantifying the level of trash discharged from MS4s. As part of BASMAA’s *Tracking California’s Trash* grant received from the State Water Resources Control Board (see Section 4.2), quantitative relationships between trash loading from MS4s and on-land visual assessment condition categories will be established. Condition categories defined in the draft on-land assessment protocol are listed in Table

Table 7. Trash condition categories used in the draft on-land visual assessment protocol.

Trash Condition Category	Summary Definition
A (Low)	Effectively no trash is observed in the assessment area.
B (Moderate)	Predominantly free of trash except for a few pieces that are easily observed.
C (High)	Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets.
D (Very High)	Trash is continuously seen throughout the assessment area, with large piles and a strong impression of lack of concern for litter in the area.

On-land visual assessments will be conducted in trash management areas within the Town of Hillsborough as part of the SMCWPPP Pilot Trash Assessment Strategy. On-land assessments are intended to establish initial conditions and detect improvements in the level of trash available to MS4s over time. More specifically, on-land visual assessment methods will be conducted in areas not treated by trash full capture devices in an attempt to evaluate reductions associated with other types of control measures. Assessment methods for areas treated by full capture devices are described in this next section.

Given that the on-land assessment method and associated protocol have not been fully tested and refined, initial assessments will occur at a pilot scale in the Town and in parallel to the *Tracking California's Trash* project. The frequency of assessments and number of sites where assessments will occur during the pilot stage are more fully described in the SMCWPPP Pilot Trash Assessment Strategy (SMCWPPP 2014).

2-A. Control Measure Effectiveness Evaluations

In addition to on-land trash assessments and full capture operation and maintenance verification, the Town will also conduct assessments of trash control measures implemented within their jurisdictional area. Assessment methods will be selected based on trash sources and the type of control measure being implemented. Control measure effectiveness evaluations are more fully described in the SMCWPPP Pilot Trash Assessment Strategy. The following are example assessment methods that may be used to demonstrate successful control measure implementation and progress towards trash reduction targets:

- Product-related Ordinances – Annually tracking and reporting the % of businesses in compliance with the ordinance and the percentage requiring a response.
- Street Sweeping – Reporting the frequency of sweeping and ability to sweep to the curb in specific areas where enhanced sweeping is implemented; and/or documenting the level of trash on streets directly after street sweeping during wet and dry weather seasons.
- Public/Private Trash Container Management – Reporting the magnitude and extent of enhanced actions; and/or visually assessing and documenting conditions around public trash containers before and after implementing enhanced control measures.
- Targeted Outreach and Enforcement – Reporting the magnitude and extent of enhanced actions; tracking and reporting the % increase in enforcement actions; and/or visually assessing and documenting the conditions in targeted areas before and after implementing control measures.
- Public Outreach Campaigns – Reporting the magnitude and extent of enhanced actions, and/or conducting pre and post campaign surveys.
- On-land Cleanups and Enforcement – Reporting the magnitude and extent of enhanced actions; visually assessing and documenting the conditions in targeted areas before and after control measure implementation; and/or tracking the volumes of trash removed.
- Illegal Dumping Prevention – Reporting the magnitude and extent of enhanced actions; and/or tracking and reporting improvements in the number of incidents.
- Business Improvement Districts – Reporting the magnitude and extent of enhanced actions; and/or visually assessing and documenting the conditions in BID areas before and after implementing control measures.
- Prevention of Uncovered Loads - Reporting the magnitude and extent of enhanced actions; tracking and reporting the decreases in the number of incidents; and/or visually assessing and documenting the conditions in targeted areas before and after implementing control measures.
- Partial Capture Devices – Reporting the magnitude and extent of enhanced actions; and/or visually assessing and the amount of trash in storm drains or downstream of partial capture devices.

2-C. Receiving Water Condition Assessments

The ultimate goal of stormwater trash management in the Bay Area is to significantly reduce the amount of trash found in receiving waters. In the last decade, San Mateo County Permittees and volunteers have collected data on the amounts of trash removed during cleanup events. More recently, Permittees have conducted trash assessments in creek and shoreline hotspots

using standardized assessment methods. In an effort to answer the core management question *Have trash problems in receiving waters been resolved?*, the Town of Hillsborough plans to continue conducting receiving water condition assessments at trash hot spots a minimum of one time per year. Assessment will be conducted consistent with Permit hot spot cleanup and assessment requirements. Additional information on receiving water assessment methods can be found in the SMCWPPP Pilot Trash Assessment Strategy (SMCWPPP 2014).

4.2 BASMAA “Tracking California’s Trash” Project

The SMCWPPP Pilot Assessment Strategy described in the previous section recognizes that outcome-based trash assessment methods needed to assess progress toward trash reduction targets are not well established by the scientific community. In an effort to address these information gaps associated with trash assessment methods, the Bay Area Stormwater Management Agencies Association (BASMAA), in collaboration with SMCWPPP, the 5 Gyres Institute, San Francisco Estuary Partnership, the City of Los Angeles, and other stormwater programs in the Bay Area, developed the *Tracking California’s Trash* Project. The Project is funded through a Proposition 84 grant awarded to BASMAA by the State Water Resources Control Board (SWRCB) who recognized the need for standardized trash assessment methods that are robust and cost-effective.

The Project is intended to assist BASMAA member agencies in testing trash assessment and monitoring methods needed to evaluate trash levels in receiving waters, establish control measures that have an equivalent performance to trash full capture devices, and assess progress in trash reduction over time. The following sections provide brief descriptions of tasks that BASMAA will conduct via the three-year Project. Full descriptions of project scopes, deliverables, and outcomes will be developed as part of the task-specific Sampling and Analysis Plans required by the SWRCB during the beginning of the Project. The Project is currently underway and will continue through 2016.

4.2.1 Testing of Trash Monitoring Methods

BASMAA and the 5 Gyres Institute will evaluate the following two types of assessment methods as part of the Project:

- Trash Flux Monitoring** – Trash flux monitoring is intended quantify the amount of trash flowing in receiving waters under varying hydrological conditions. Flux monitoring will be tested in up to four receiving water bodies in San Francisco Bay and/or the Los Angeles areas. Methods selected for evaluation and monitoring will be based on a literature review conducted during this task and through input from technical advisors and stakeholders. Monitoring is scheduled to begin in 2014 and will be completed in 2016.
- On-land Visual Assessments** – As part of the Project, BASMAA will also conduct an evaluation of on-land visual assessment methods that are included in the SMCWPPP Pilot Assessment Strategy. The methods are designed to determine the level of trash on streets and public right-of-ways that may be transported to receiving waters via MS4s. BASMAA plans to conduct field work associated with the evaluation of on-land visual assessment at a number of sites throughout the region. To the extent practical, sites where the on-land methods evaluations take place will be coordinated with trash flux monitoring in receiving waters. On-land assessments will occur in areas that drain to trash full capture devices, and all sites will be assessed during wet and dry weather seasons in order to evaluate on-land methods during varying hydrologic conditions. Monitoring is scheduled to begin in 2014 and will be completed in 2016.

4.2.2 Full Capture Equivalent Studies

Through the implementation of BASMAA's *Tracking California's Trash* grant-funded project, a small set of "Full Capture Equivalent" projects will also be conducted in an attempt to demonstrate that specific combinations of control measures will reduce trash to a level equivalent to full capture devices. Initial BMP combinations include high-frequency street sweeping, and enhanced street sweeping with auto-retractable curb inlet screens. Other combinations will also be considered. Studies are scheduled to begin in 2014 and will be completed in 2016.

4.3 Long-Term Assessment Strategy

The Town of Hillsborough is committed to implementing standardized assessment methods post-2016 based on the lessons learned from pilot assessments and studies that will occur between 2014 and 2016. Assessment activities described in the previous sections will evaluate the utility of different assessment methods to demonstrate progress towards trash reduction targets and provide recommended approaches for long-term implementation. Lessons learned will be submitted to the Water Board with the FY 2015-2016 Annual Report and a revised Strategy will be developed and submitted, if necessary. The revised Strategy will include agreed upon assessment methods that will be used to demonstrate progress during the remaining term of trash reduction requirements. Reporting using the new/revised methods will begin with the FY 2016-17 Annual Report.

4.4 Implementation Schedule

The implementation schedule for the SMCWPPP Pilot Implementation Strategy, BASMAA's *Tracking California's Trash* project, and the Long-Term Assessment Strategy are included in Table 8. Load reduction reporting milestones are also denoted in the table. The schedule is consistent with the

need for near-term pilot assessment results to demonstrate progress toward short-term targets, while acknowledging the need for testing and evaluation of assessment methods and protocols prior to long-term implementation. For more detailed information on implementation timelines, refer to the SMCWPPP Pilot Trash Assessment Strategy (SMCWPPP 2014) and monitoring plans developed as part of BASMAA’s Tracking California’s Trash project.

Table 8. Town of Hillsborough trash progress assessment implementation schedule.

Trash Assessment Programs and Methods	Prior to FY 2013-14	Fiscal Year								
		2013-14 ^a	2014-15	2015-16	2016-17 ^b	2017-18	2018-19	2019-20	2020-21	2021-22 ^c
Pilot Trash Assessment Strategy (SMCWPPP)										
On-land Visual Assessments										
Initial (Baseline) Assessments	X									
Pilot Progress Assessments		X	X	X	X					
Full Capture Operation and Maintenance Verification			X	X	X					
Control Measure Effectiveness Evaluations	X	X	X	X	X					
Receiving Water Condition Assessments	X	X	X	X	X					
Tracking California’s Trash Project (BASMAA)										
Testing of Trash Monitoring Methods										
Trash Flux Monitoring Protocol Testing			X	X	X					
On-land Visual Assessment Evaluations			X	X	X					
Long-Term Trash Assessment Strategy (SMCWPPP)						X	X	X	X	X

^aJuly 1, 2014 - 40% trash reduction target
^bJuly 1, 2017 - 70% trash reduction target
^cJuly 1, 2022 - 100% trash reduction target

5.0 REFERENCES

- Allison R.A. and F.H.S. Chiew 1995. Monitoring stormwater pollution from various land uses in an urban catchment. Proceedings from the 2nd International Symposium on Urban Stormwater Management, Melbourne, 551-516.
- Allison, R.A., T.A. Walker, F.H.S. Chiew, I.C. O'Neill and T.A McMahon 1998. From Roads to rivers: Gross pollutant removal from urban waterways. Report 98/6. Cooperative Research Centre for Catchment Hydrology. Victoria, Australia. May 1998.
- Armitage, N. 2003. The removal of urban solid waste from stormwater drains. Prepared for the International Workshop on Global Developments in Urban Drainage Management, Indian Institute of Technology, Bombay, Mumbai India. 5-7 February 2003.
- Armitage, N. 2007. The reduction of urban litter in the stormwater drains of South Africa. *Urban Water Journal* Vol. 4, No. 3: 151-172. September 2007.
- Armitage N., A. Rooseboom, C. Nel, and P. Townshend 1998. "The removal of Urban Litter from Stormwater Conduits and Streams. *Water Research Commission* (South Africa) Report No. TT 95/98, Pretoria.
- Armitage, N. and A. Rooseboom 2000. The removal of urban litter from stormwater conduits and streams: Paper 1 – The quantities involved and catchment litter management options. *Water S.A.* Vol. 26. No. 2: 181-187.
- ABAG (Association of Bay Area Governments). 2005. Bay Area Land Use Geographical Information Systems Datalayer.
- BASMAA (Bay Area Stormwater Management Agencies Association). 2011a. Progress Report on Methods to Estimate Baseline Trash Loads from Bay Area Municipal Stormwater Systems and Track Loads Reduced. February 2011.
- BASMAA (Bay Area Stormwater Management Agencies Association). 2011b. Method to Estimate Baseline Trash Loads from Bay Area Municipal Stormwater Systems: Technical Memorandum #1. Prepared by EOA, Inc. April 2011.
- BASMAA (Bay Area Stormwater Management Agencies Association). 2011c. Sampling and Analysis Plan. Prepared by EOA, Inc. April 2011.
- BASMAA (Bay Area Stormwater Management Agencies Association). 2012. Trash Baseline Generation Rates: Technical Report. Prepared by EOA, Inc. February 1, 2012.
- County of Los Angeles. 2002. Los Angeles County Litter Monitoring Plan for the Los Angeles River and Ballona Creek Trash Total Maximum Daily Load. May 30, 2002.
- County of Los Angeles. 2004a. Trash Baseline Monitoring Results Los Angeles River and Ballona Creek Watershed. Los Angeles County Department of Public Works. February 17, 2004.
- County of Los Angeles 2004b. Trash Baseline Monitoring for Los Angeles River and Ballona Creek Watersheds. Los Angeles County Department of Public Works. May 6, 2004.
- Kim, L.H, M. Kayhanian, M.K. Stenstrom 2004. Event mean concentration and loading of litter from highways during storms. *Science of the Total Environment* Vol 330: 101-113.
- Lippner, G., R. Churchwell, R. Allison, G. Moeller, and J. Johnston 2001. A Scientific Approach to Evaluating Storm Water Best Management Practices for Litter. *Transportation Research Record*. TTR 1743, 10-15.
- SMCWPPP (San Mateo Countywide Water Pollution Prevention Program). 2014. Pilot Trash Assessment Strategy. Prepared by EOA. February 1.