On-land Visual Trash Assessment Protocol for Stormwater

PROTOCOL C – AREA BASED SURVEY

Establishing baseline levels of trash generation and assessing changes in trash levels

Version 1.0

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Preface

The On-Land Visual Trash Assessment (OVTA) Protocol was originally developed by EOA, Inc. in 2015 to provide public agencies subject to the San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (MRP) requirements with a mechanism to establish baseline trash levels on streets and sidewalks and demonstrate trash load reductions from their stormwater conveyance systems due to trash prevention and reduction controls. The original protocol focused on conducting surveys of trash on streets and sidewalks and was revised in 2017. The 2017 version of the protocol is now referred to as *Protocol A – Street and Sidewalk Survey*.

In response to the need to apply similar assessment concepts to areas that do not have sidewalks or safe pedestrian access, or are not associated with streets/sidewalk, EOA developed two additional OVTA protocols in 2017. *Protocol B – Driving Survey* should be used in situations where pedestrian access is not safe or available (e.g., highways). *Protocol C – Area-based Survey* should be used in situations where the area of interest is not associated with the adjacent roadway or sidewalk, such as parking lots. Protocols A, B and C may be updated/revised periodically by EOA, Inc.

Disclaimer

INTRODUCTION

The On-land Visual Trash Assessment Protocol for Stormwater is designed to provide qualitative estimates of the amount of trash that accumulates on specific street segments, sidewalks and adjacent land areas that may be transported to a municipal stormwater conveyance system. Trash accumulation is a term used to describe the level of trash deposited onto land areas and available for transport to the conveyance system prior to removal via street sweeping or other significant management actions that intercept trash before entering the stormwater conveyance system. Trash generation is a term used to describe the remaining level (i.e., volume) of trash transported by the stormwater conveyance system to receiving waters (e.g., creeks, rivers, lakes, estuaries, bays and oceans).

The On-land Visual Trash Assessment Protocol for Stormwater serves the following two purposes:

1) **Establishing Baseline Levels of Trash Generation -** to establish baseline levels of trash generation for specific land areas using four trash generation categories[1], and;

2) **Assessing Changes in Levels of Trash Generation -** to provide a qualitative tool to assist in evaluating changes in the level of on-land trash that is transported by the stormwater conveyance system to receiving waters.

This protocol (C) focuses primarily on evaluating trash levels that accumulates on the interiors of properties, such as parking lots of large commercial properties, and drains to a storm drain inlet located on the property (i.e., not an inlet located in the public ROW). When conducting assessments on streets and sidewalks that have sidewalks and are safe to walk, please refer to *Protocol A – Street and Sidewalk Survey*. For streets that do not have sidewalks or are unsafe to walk, please refer to *Protocol B – Driving Survey*. All three protocols are available at http://eoainc.com/ovta_fc/.

When using this methodology, the definition of trash or litter is generally consistent with the definition included in the California Code Section 68055.1(g)[1], but excludes sediments, sand, vegetation, oil and grease, exotic species, food waste (e.g., apple cores, banana peels), landscaping material that has been improperly disposed on the public right-of-way, and pet wastes. Additionally, mattresses, shopping carts, furniture, appliances, contained bags of trash, and all other illegally dumped large items not capable of fitting in a storm drain inlet opening; and trash that is less than 5mm in length are also excluded from the definition of trash.

PERSONNEL

This methodology requires at least two trained personnel, both for objectivity and safety. An additional person in the office should be designated as a point-of-contact with cell phone numbers of both field personnel and their planned schedule (i.e., location and time).

[1] Defined as 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 waters of the state, but not including the properly discarded waste of the primary processing of agriculture, mining, logging, sawmilling, or manufacturing.

EQUIPMENT

The following equipment is needed to properly apply the protocol:

- Clipboard
- Pencils and colored markers/sharpie
- Digital camera (preferably with GPS capabilities)
- One copy of field form for each assessment area (including map)

Wearing bright clothing or safety vests is also recommended.

ASSESSMENT AREA

Baseline Assessment Area

When establishing baseline trash generation for the purposes of complying with the California State Water Resource Control Board's Trash Amendments, assessments should be conducted in land areas associated with Priority Land Use (PLU) areas or equivalent alternative land areas. When using this protocol, a PLU area is defined as the land area that drains to a storm drain inlet or other entry point to a stormwater conveyance system that is owned or maintained by the agency subject to the Trash Amendments. This protocol (C) focuses primarily on evaluating trash levels that accumulate on the interiors of such properties, including parking lots of large commercial properties that drain to a storm drain inlet(s) located on the property (i.e., not an inlet located in the public ROW). For the purposes of conducting a baseline assessment using this protocol, the assessment area is therefore defined as the portion of the PLU area that drains to a storm drain inlet(s) not located in the public ROW (e.g., street).

Baseline trash generation levels observed in assessment areas should be delineated on a map by assessing the entire PLU area (to the extent possible) using the steps described in this protocol.

Progress Assessment Area

When measuring changes in trash levels over time, a representative portion of the PLU area may be assessed. Representative transect(s) should be developed for each PLU area prior to conducting field work. Transects allow future assessments to occur along the same assessment area for consistency. At least one transect should be established for each baseline trash generation category observed within the PLU area. Transects should be established using the following protocol:

1. Identify all inlets on the property. Transects should be delineated in a way to maximize the number of storm drain inlets within the assessment area. (See Figure 1)

2. Transects should be established considering baseline trash generation levels. At least one transect should be developed for each baseline trash generation level observed within a PLU area.

3. Assessment areas should include the area within 50-feet of each transect (see Figures 2 and 3), a distance equal to about 5 parking stall widths, but not extend beyond the boundary of the PLU area. If there are no parking spaces near, then this distance can be measured or estimated visually.

Any trash in visible areas that could theoretically reach the stormwater conveyance system should be considered when assigning a trash generation category to a transect. If there are obstructions such as a building or fence that would prevent trash from moving to the stormwater drainage system, the area should *not* be included in the assessment area.

Figure 1. Example Priority Land Use (PLU) area that drains to storm drain inlets on the interior of a property.

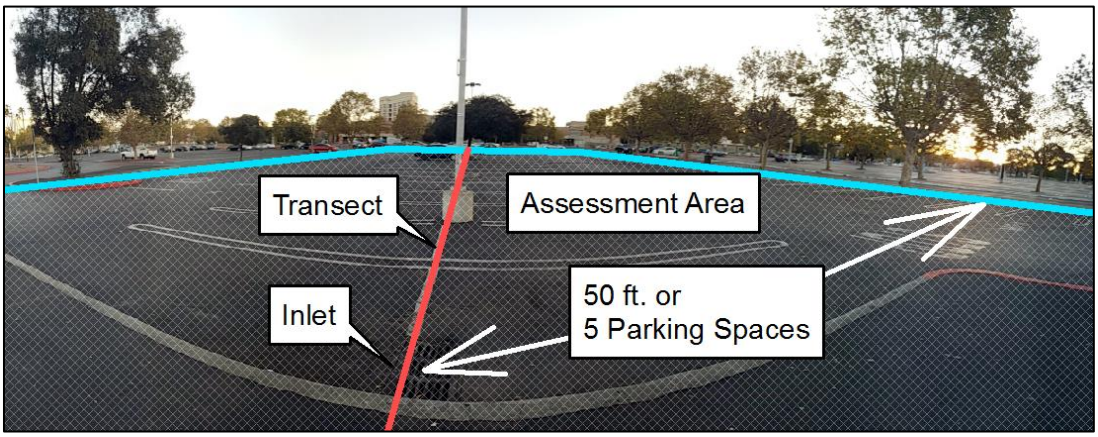


Figure 2. Example of an assessment area in proximity to a curb drain inlet. Note the assessment area also includes the area behind the photographer.

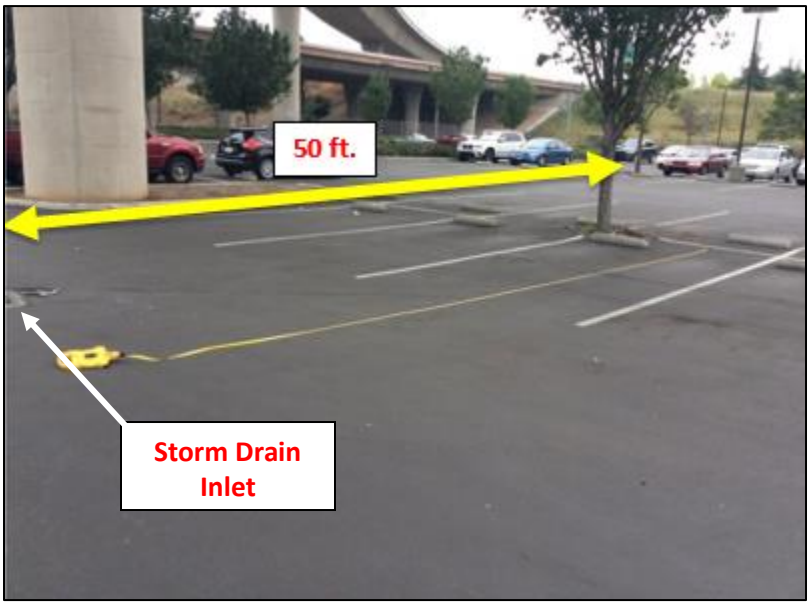


Figure 3. Example of a measuring the distance to assess from an area drain surface inlet.

TIMING OF ASSESSMENT

Establishing Baseline Trash Generation

When using this protocol to assess baseline trash levels, the timing of the assessment should be selected carefully in accordance with the following directions. To ensure that the level of baseline trash generation is not underestimated, assessments should be conducted prior to reoccurring trash control measure implementation events (e.g. street-sweeping). At a minimum, the assessment should be performed sometime after the half-way point between sweeping events (or other reoccurring control measure implementation events). This will ensure that the trash conditions observed are most likely at or above typical levels for that location.

When to Conduct OVTAs

Establishing Baseline – So that baseline levels are not underestimated, conduct assessments **prior to** reoccurring trash control measure events, such as street-sweeping or on-land cleanup events.

Assessing Change/Progress – To obtain an average condition, conduct assessments roughly **half-way between** reoccurring control measure events.

Assessing Changes in Trash Levels

When using this protocol to assess changes in trash levels over time, the timing of the assessment should be selected carefully in accordance with the following directions. To ensure that the level of observed is not under or overestimated, assessments should be conducted roughly half-way between reoccurring trash control measure implementation events (e.g. street-sweeping).

Considerations of Rainfall (Transport) Events

To reduce the influence of recent rainfall-runoff events on the levels of trash accumulated at visible during assessments, assessments should not be conducted after a significant rainfall-

runoff event. For the purposes of this protocol, a significant rainfall event is defined as at least 0.5 inches of rain in a 24-hour period occurring within a 48-hour period before the assessment. Rainfall volumes can be tracked at the following websites or other local rainfall data management systems:

http://cdec.water.ca.gov/cgi-progs/precip/DLYPCP
http://www.wrh.noaa.gov/mtr/versprod.php?pil=RR5&sid=RSA.

If more than one half-inch of rainfall has fallen within a 24-hour period prior to the assessment, then the assessment should be rescheduled.

TRASH LEVEL CATEGORIES

Trash levels established by using this protocol are based visual observations of the magnitude and extent of trash observed in a defined assessment area. There are four trash level categories (A, B, C and D). The definitions for each are provided in Table 1. Example images and links to videos illustrating trash levels are provided in **Appendix A**.

Table 1. Definitions of trash levels defined by the On-land Visual Trash Assessment protocol.

Trash Level	Definition
A **Not Littered**	• Effectively no trash is observed in the assessment area. • There may be some trash in the area, but it is not obvious at first glance. • One individual could easily clean up all the trash observed while walking at normal pace. • No additional trash reduction measures are needed in the assessment area.
B **Slightly Littered**	• Predominantly free of trash, except for a few littered areas. • Some trash is noticeable at first glance. • The trash observed could be collected by one or two individuals, but would require walking at a slower than normal pace. • Additional trash reduction measures are needed in the assessment area.
C **Littered**	• Predominantly littered, except for a few clean areas. • Trash is widely/evenly distributed and/or small accumulations are noticeable on the streets and sidewalks. • It would take multiple people to remove all trash from the area, frequently requiring individuals to stop walking to remove the trash. • Roughly 4 times as much trash as a "B" level.
D **Very Littered**	• Trash is continuously seen throughout the assessment area and there is a strong impression of lack of concern for litter. • Large piles of trash may be observed. • It would take a large number of people during an organized effort to remove all trash from the area, consistently requiring individuals to stop to remove the trash. • Roughly 3 times as much trash as a "C" level.

Important Note: Because the visual assessment protocol is intended to assess the level of trash greater than 5mm in length that is observed on-land and can reasonably be transported to the stormwater conveyance system, *only* trash that appears to be mobile or could be mobilized in a storm event should be considered in the assessment. Large items such as furniture, tires, and appliances that cannot fit into a storm drain inlet should not be included in this assessment. Additionally, graffiti on roads, buildings, or landscaping in disrepair should not affect the assessment grading.

ASSESSMENT PROTOCOL

Establishing Baseline Trash Generation

The following on-land visual assessment protocol should be used to establish baseline trash levels for a specific land area. The time to complete the protocol will depend on the size of the PLU area.

The following steps should be conducted in sequential order:

1. **Identify Assessment Areas.** The assessment areas should be identified on the map using a unique ID or other label, which should also be used on the data collection form and/or tracking database.
2. **Confirm Timing.** Assessments to establish baseline should fall directly before reoccurring control measure implementation such as street sweeping and should not follow a significant rainfall event.
3. **Assemble equipment** needed to conduct the assessment including the data collection form and map(s) delineating the assessment area(s) (see **Appendix B**).
4. **Review trash condition category definitions** presented in Table 1 (also included on the data collection form) and photo examples in Appendix A.
5. After arriving at the assessment area, **safely walk at a normal pace along** the whole assessment area, but not extending beyond the boundary of the PLU area. Each assessment area should be assigned one of four trash condition categories.
6. **Take at least one photograph per assessment area** to document the site visit. The photograph should represent the level of trash identified in the assessment area. Photographs of trash sources or other items of interest are optional. Identify photos in section II of the data collection form.
7. If, based on the observations made during the assessment, there is **a significant difference in the trash condition category within an assessment area,** on the field form indicate that significant variation within the assessment area exists and identify on the map the location of the area that received the specific OVTA scores.
8. Team members may individually choose a trash generation category initially, but must **collectively agree on the appropriate trash generation category** to assign to the area. Mark the category observed in section II on the data collection form and/or on the field map.
9. At the end of each assessment, review the data collection form for accuracy, legibility, and completeness. Upon completing the final assessment of the day, review all form to ensure that there is no missing information

Assessing Changes in Trash Levels (Progress Assessments)

The following on-land visual assessment protocol should be used to assess changes in trash levels over time for a specific land area. The time to complete the protocol will depend on the size of the PLU area and the number of transects within the area.

The following steps should be conducted in sequential order:

1. **Identify Transects or Assessment Area**. The transects should be identified on the map using a unique ID or other label, which should also be used on the data collection form and/or tracking database. At minimum, at least one transect should be delineated within each baseline trash generation category within the PLU area.
2. **Confirm Timing.** Assessments to assess change in trash levels over time should fall half-way between reoccurring control measure implementation such as street sweeping, and should not follow a significant rainfall event.
3. **Assemble equipment** needed to conduct the assessment including the data collection form and map(s) delineating the assessment area(s) (see **Appendix B**).
4. **Review trash condition category definitions** presented in Table 1 (also included on the data collection form) and photo examples in Appendix A.
5. After arriving at the assessment area, **safely walk at a normal pace along** the defined transect, assessing trash levels within 50-feet on either side of the transect (about 5 parking spaces), but not extending beyond the boundary of the PLU area. If there are no parking spaces near, then this distance can be measured or estimated visually. Each transect, or segment of a transect, should be assigned one of four trash condition categories.
6. **Take at least one photograph per transect** to document the site visit. The photograph should represent the level of trash identified in the transect assessment area. Photographs of trash sources or other items of interest are optional. Identify photos in section II of the data collection form.
7. If, based on the observations made during the assessment, there is **a significant difference in the trash condition category within a transect,** on the field form indicate that significant variation within the site is present and identify the portions of the transect that received the specific OVTA scores.
8. Team members may individually choose a trash generation category initially, but must **collectively agree on the appropriate trash generation category** to assign to the area. Mark the category observed in section II on the data collection form and/or on the field map.

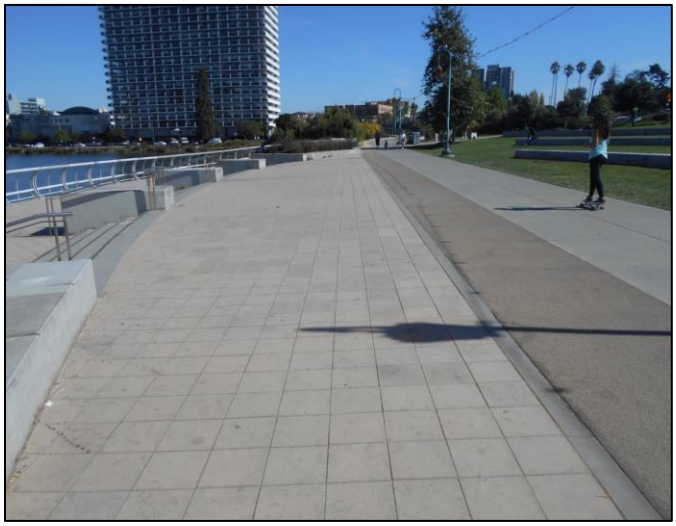
9. At the end of each assessment, review the data collection form for accuracy, legibility, and completeness. Upon completing the final assessment of the day, review all form to ensure that there is no missing information.

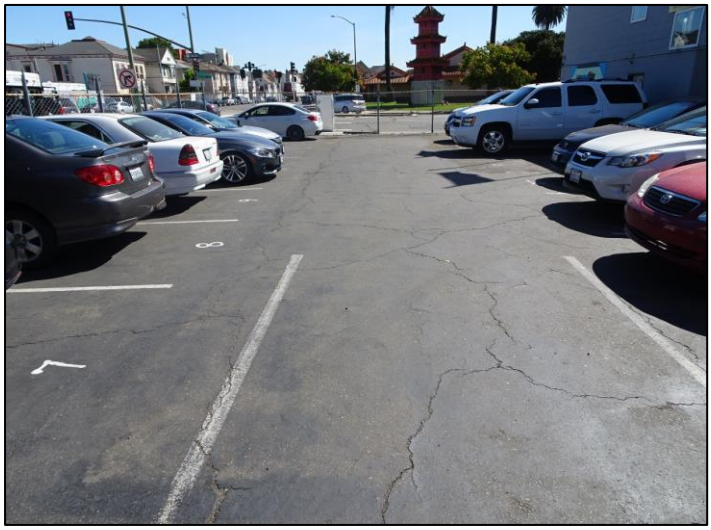
APPENDIX A

PHOTOGRAPH EXAMPLES OF TRASH CONDITION CATEGORIES

CATEGORY A - LOW TRASH LEVEL (NOT LITTERED)

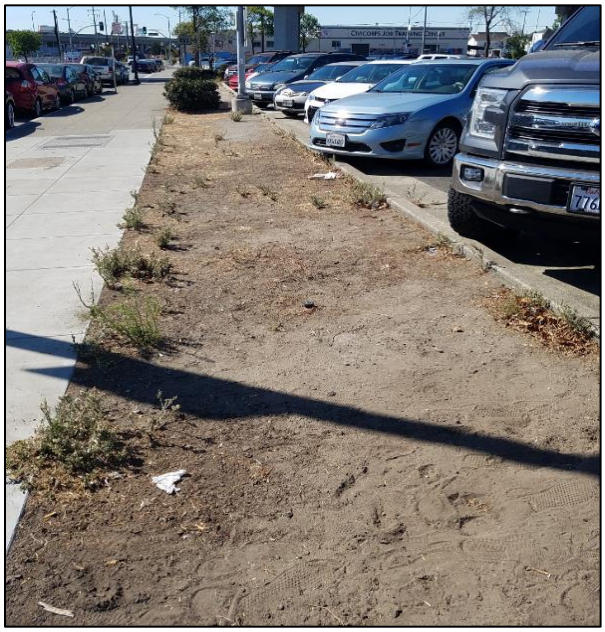
Effectively no trash is observed in the assessment area. There may be some trash in the area, but it is not obvious at first glance. One individual could easily clean up all the trash observed while walking at normal pace. No additional trash reduction measures are needed in the assessment area. To see videos of sites with Category "A" trash levels, click here.

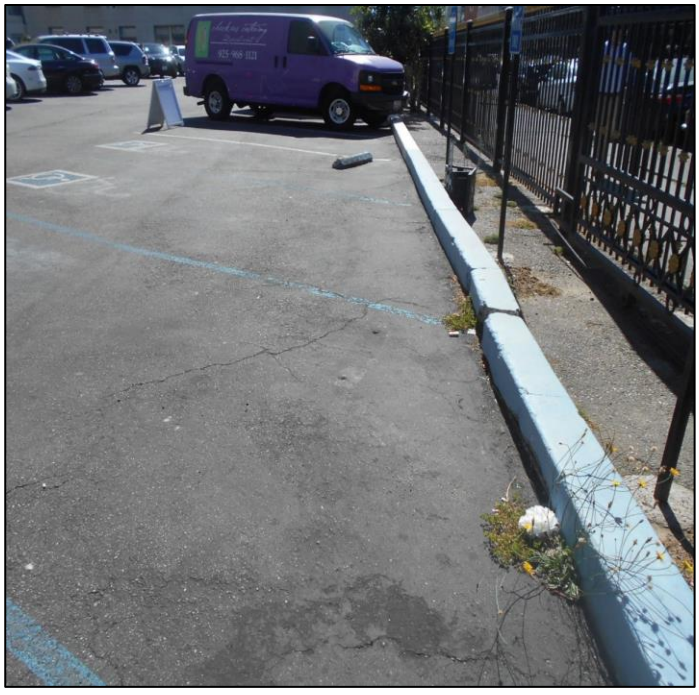




CATEGORY B – MODERATE TRASH LEVEL (SLIGHTLY LITTERED)

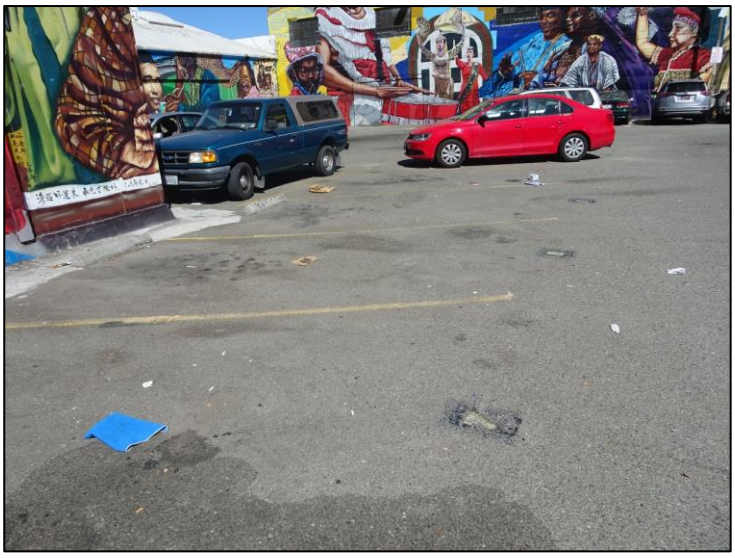
Predominantly free of trash, except for a few littered areas. Some trash is noticeable at first glance. The trash observed could be collected by one or two individuals, but would require walking at a slower than normal pace. Additional trash reduction measures are needed in the assessment area. To see videos of sites with Category "B" trash levels, click here.

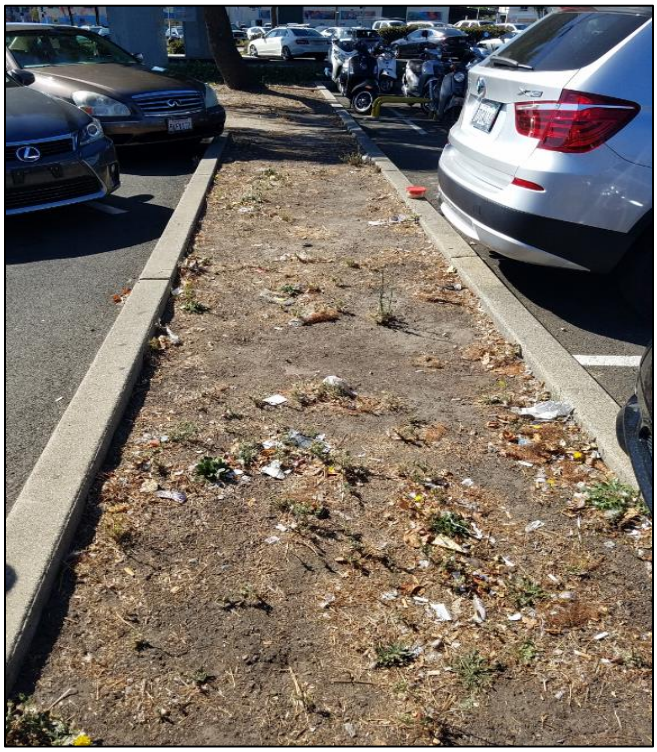




CATEGORY C: HIGH TRASH LEVEL (LITTERED)

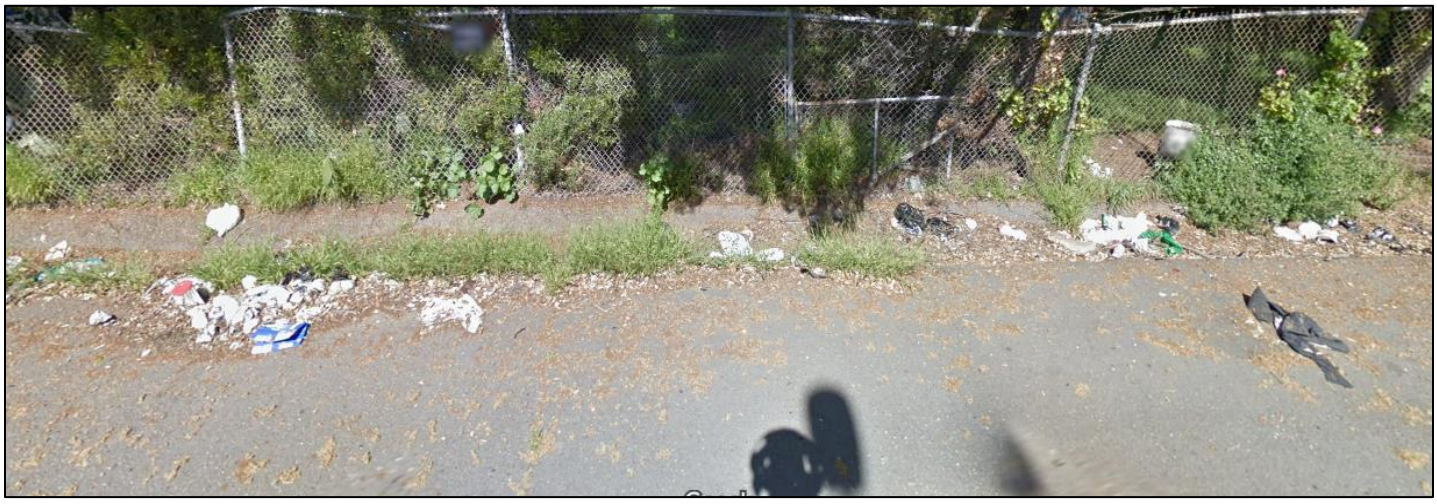
Predominantly littered, except for a few clean areas. Trash is widely/evenly distributed and/or small accumulations are noticeable on the streets and sidewalks. It would take multiple people to remove all trash from the area, frequently requiring individuals to stop walking to remove the trash. Roughly 4 times as much trash as a "B" level. To see videos of sites with Category "C" trash levels, click here.





CATEGORY D: VERY HIGH TRASH LEVEL (VERY LITTERED)

Trash is continuously seen throughout the assessment area and there is a strong impression of lack of concern for litter. Large piles of trash may be observed. It would take a large number of people during an organized effort to remove all trash from the area, consistently requiring individuals to stop to remove the trash. Roughly 3 times as much trash as a "C" level. To see videos of sites with Category "D" trash levels, click here.



APPENDIX B

EXAMPLE FIELD FORM FOR ESTABLISHING BASELINE TRASH LEVELS

OVTA Data Collection Form – Area Based Surveys *Baseline Trash Generation*

Agency: _____ **Date:** _____

Team Members: _____ **Contact E-mail:** _____

Note: Fill out a separate Data Collection Form for each assessment area

I. Assessment Area

MAP ID	**Assessment Area:** Delineate the assessment area on your jurisdictional map, create a map ID, and mark the ID on the map and place in the box provided to the left. Below, describe the location and boundaries of the assessment area. Include the street segment name, length of the street based on cross streets, and land area description (if applicable).

_____

_____

_____

II. Condition Category Assignment

Trash Condition Category

Conduct the assessment in accordance with the Visual On-land Assessment Protocol for Stormwater (Refer to Definitions below). Check one of the below categories based on the assessment.

❑ Low (**A**) ❑ Moderate (**B**) ❑ High (**C**) ❑ Very High (**D**)

Photograph Documentation

Indicate if photographs were taken and are maintained by your agency.

Photographs: ❑ Number of photographs taken: _____

Measureable Rainfall in past 48 hours:

❑ Yes ❑ No

Trash Condition Category	Definition
A Not Littered	• Effectively no trash is observed in the assessment area. • Approximately less than one piece per two car lengths on average • There may be some small pieces in the area, but they are not obvious at first glance • One individual could easily clean up all trash observed in a very short timeframe.
B Slightly Littered	• Predominantly free of trash except for a few littered areas. • On average, one piece per two car lengths • The trash could be collected by one or two individuals in a short period of time.
C Littered	• Predominantly littered except for a few clean areas. • Trash is widely/evenly distributed and/or small accumulations are visible on the street, sidewalks, or inlets. • At least two or three pieces per car length on average • It would take a more organized effort to remove all trash from the area.
D Very Littered	• Trash is continuously seen throughout the assessment area, • Large piles and a strong impression of lack of concern for litter in the area. • There is often significant litter along gutters. • It would take a large number of people during an organized effort to remove all trash from the area.

III. Preliminary Source Identification (Optional)

Stormwater trash sources identified within the assessment area during assessments (CHECK ALL SOURCES THAT APPLY).

Vehicles

- ❑ Moving Vehicles
- ❑ Parked Cars
- ❑ Uncovered Loads
- ❑ Other _____

Inadequate Waste Container Management

- ❑ Overflowing or uncovered receptacles/dumpsters
- ❑ Dispersal of household trash and recyclables before, during and after collection
- ❑ Other _____

Pedestrian Litter

- ❑ Restaurants
- ❑ Convenience Stores
- ❑ Liquor Stores
- ❑ Bus Stops
- ❑ Special Events
- ❑ Other _____

Illegal Dumping

- ❑ Illegal dumping on-land
- ❑ Homeless encampments
- ❑ Other _____

IV. Comments and Additional Information about the Assessment Area and Sources

_____

_____

_____

_____

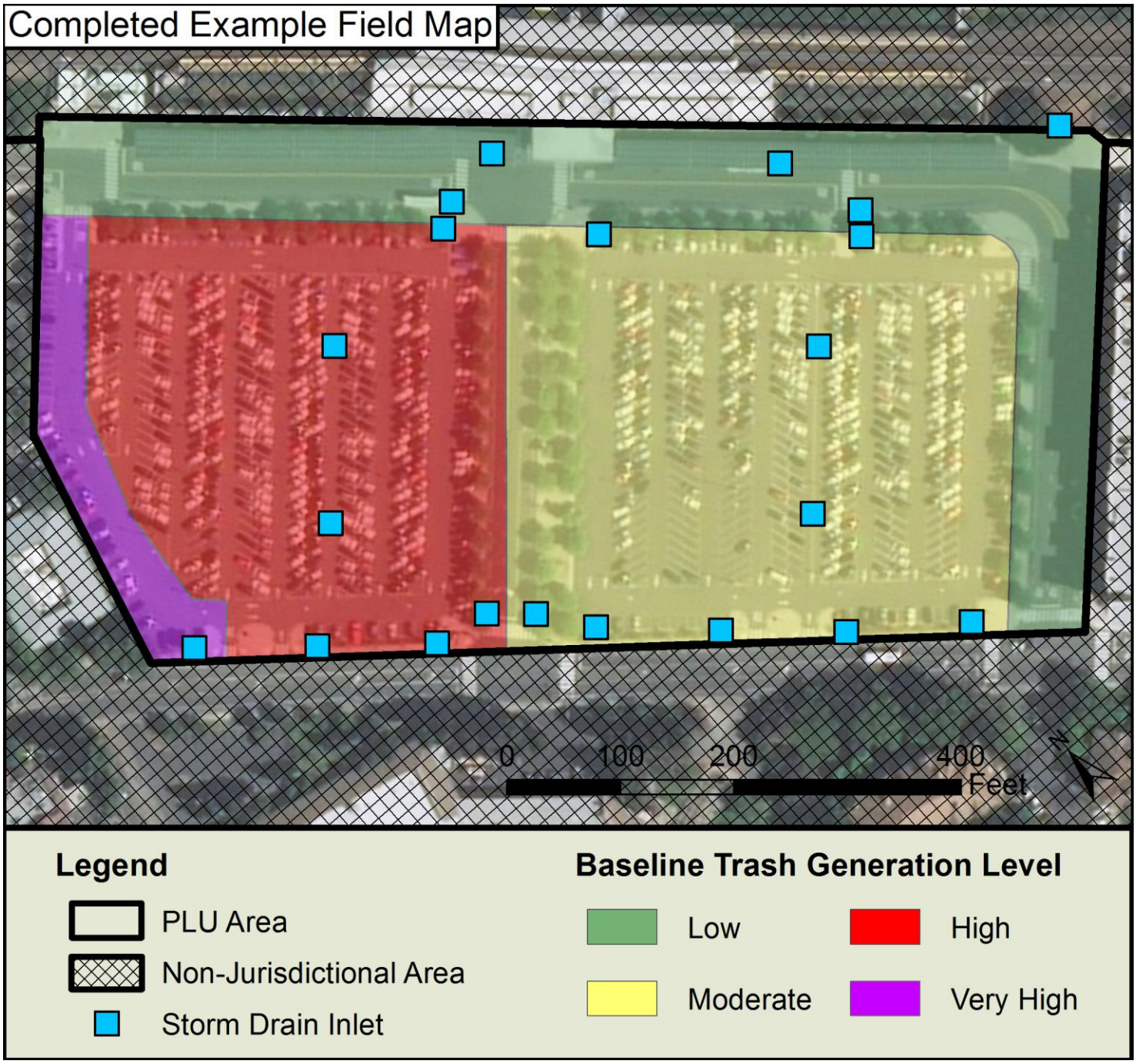
_____

_____

_____

_____

Completed Example Field Map



Legend

- PLU Area
- Non-Jurisdictional Area
- Storm Drain Inlet

Baseline Trash Generation Level

- Low
- High
- Moderate
- Very High

APPENDIX C

EXAMPLE FIELD FORM FOR ASSESSING CHANGES IN TRASH LEVELS

Visual Trash Assessment Form

Assessment ID: _____

Staff: _____ Date: _____ Duplicate: ☐

Field Site Location Image

Trash Sources:

1 Transit Stop
2 Convience Store/Gas Station
3 Restaurants/Cafes
4 Overflowing Trash Receptacle
5 Dispersal from Garbage Pickup
6 Construction Site
7 Special Event (e.g. farmers market, fair)
8 Parking Lot
9 Illegal Dumping
10 Other: _____

Observed Trash Category: _____ Substantial Variation in Category? yes / no (If yes, see below)

# of Plastic Bags Observed: _____ * Substantial Inlet Trash Picture ID #: _____

Posted Street Sweeping Schedule: _____

Percent Food & Beverage: none 0-25% 25-50% 50-75% 75-100% NA

Comments: _____

_____

FOR OFFICE USE ONLY: For Events with Substantial Variation in Category				
Low Results (ft)	Mod Results (ft)	High Results (ft)	Very High Results (ft)	Total Site Length (ft)