# Stopping Trash Where It Starts

**A Trash Reduction Toolkit for NY-NJ Communities**

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**New York-New Jersey Harbor & Estuary Program**

New York - New Jersey Harbor & Estuary Program
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HUDSON RIVER FOUNDATION
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## *Executive Summary*

New York and New Jersey has taken measures to address marine debris through the municipal separate sewer system (MS4) and combined sewer overflow (CSO) permits. Both states capture and remove marine debris through floating barriers, skimmer vessels, netting or screening facilities, as well as source control programs such as street sweeping and stewardship programs (i.e., adopt-a-catch-basin, adopt-a-beach or clean streets-clean beaches). These efforts solely address the issue of trash once it becomes marine debris.

To address the issue sustainability, New York and New Jersey will need to consider pollution prevention options that address trash at its source before it becomes marine debris. In 2016, Columbia University, with support from the New York City Department of Environmental Protection (NYCDEP) and in collaboration with the NY-NJ Harbor & Estuary Program (HEP), conducted a litter survey in New York City. In 2017, HEP and Montclair State University's Passaic River Institute (PRI) conducted a litter survey in several municipalities in New Jersey along the Passaic River. Both studies concluded that single-use plastics and food-related wrapping items are the most prevalent materials found in the streets. This finding is comparable to similar studies around the nation.

Based on this data, educational campaigns focused on reducing the use of single-use, disposable plastics in the harbor are recommended. To help municipalities and community organizations move forward, this toolkit provides an overview of the various communication and policy campaigns being undertaken around the region nationally. For communities interested in conducting their own litter survey, the final section provides detailed instructions on litter survey recommendations based on both the New York City and Passaic River Watershed reports.

## *Marine Debris in the Estuary*

Marine debris consists of common trash from consumer goods that are transported from land to the ocean by wind, stormwater conveyances, and streams and rivers. Accounting for 80% of marine debris in the oceans, trash has a negative impact on marine habitats, the ecology of aquatic systems (chemical and biological), and human health. These impacts can lead to beach closures, adverse impacts on commercial and recreational boating, and the reduced tourism and other economic activity **(United States Environmental Protection Agency, 2018) (New York-New Jersey Harbor & Estuary Program, 1996)**. In 1989, the Floatables Action Plan was put into place by the NY-NJ Harbor & Estuary Program's Floatables Work Group and resulted in a significant reduction in beach closures in the harbor and estuary. Additional programs were implemented to address the reduction of the accumulation of trash and floatable debris such as the Sanctuary Act (also referred to the Ocean Dumping Act) and the Marine Plastic Pollution Research and Control Act.

Despite the progress made by New York and New Jersey, most efforts to address floatable debris begin once it becomes marine debris. Rather than attacking the root of the problem, most efforts to reduce marine debris include aerial surveillance to spot slicks, skimmer vessels to collect the debris, shoreline cleanup programs, and booms and nets to contain debris from storm and sewer system outfalls. In 2014, an estimated total of $59M was spent on marine debris waste management activities in the Hudson-Raritan Estuary **(Kim, et al., 2015)**.

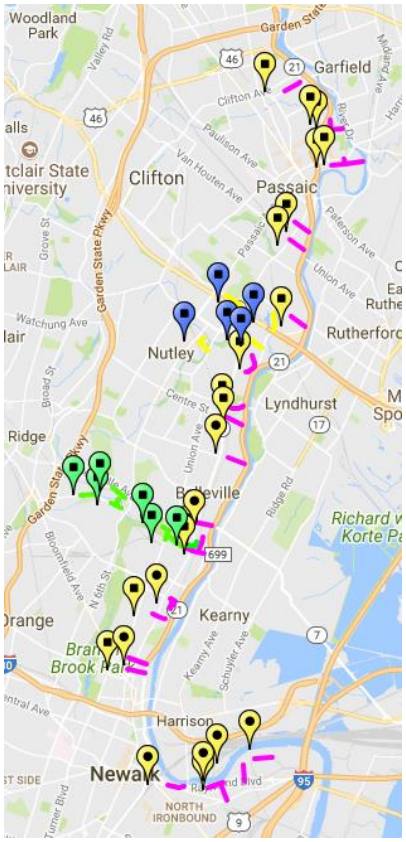
While efforts to clean up floatable debris will continue to be necessary, pollution prevention options are more sustainable and rational manner of tackling the issue. The U.S. Environmental Protection Agency (EPA) established the *Trash Free Waters* initiative to begin to address land-based sources of trash and reduction of the land-based trash that enters into waterways through research, education, outreach, and partnerships. In 2016, EPA Region 2 and the NYCDEP collaborated with Columbia University's School of International and Public Affairs (SIPA) and the Data Science Institute to design a street litter survey protocol to collect information about the type, quantity, and sources of street litter. The litter survey, developed with input from HEP, aimed to highlight the causes of floatable debris and provide an understanding to develop effective source reduction strategies **(NYC Environmental Protection, 2016)**. Similar to national surveys, plastic and food or beverage-related items were the most prevalent type of trash found in the street across survey sites in New York City and its boroughs regardless of income levels or land use **(Cortes, Kim, Rubin, & Villela de Faria, 2016) (United States Environmental Protection Agency, 2018)**. In an effort to extend this approach to New Jersey, and explore additional pollution prevention opportunities throughout the estuary, a litter survey and protocol was developed by HEP and PRI for the Passaic River Watershed in 2017 with funding from the New England Interstate Water Pollution Control Commission (NEIWPCC).

## *Passaic River Watershed Litter Survey Project*

HEP and PRI partnered with local community groups (NY/NJ Baykeeper, Friends of Bonsal Preserve, Hackensack Riverkeeper, and the Ironbound Community Corporation) to collect data in the Passaic River Watershed in New Jersey on the types, sources and conditions leading to litter generation and dispersal. The results of the 2017 Passaic River Watershed litter survey and the 2016 Columbia University litter survey provides a snapshot of floatable and marine debris in the estuary. Together, these two studies provide insight to address effective source reduction actions to include voluntary source control, preventative and reactive policy opportunities, and targeted public awareness and education campaigns.

### *Litter Survey Methodology*

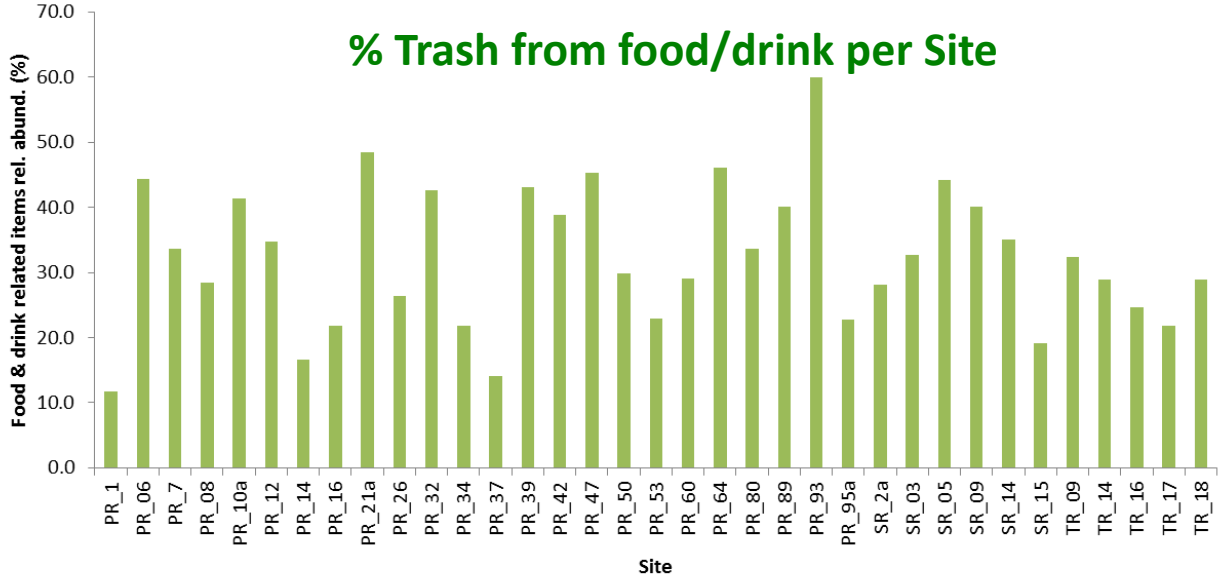
To achieve a high degree of comparability between studies, HEP and PRI built upon Colombia University's litter survey protocol to develop a protocol used in the Passaic River Watershed project. The project team selected a total of 35 sites in the Passaic River watershed as indicated in the right inset; 24 sites along the Western Lower Passaic River, six (6) along the Second River, and five (5) along the Third River. The team refined a protocol for the litter survey and tally matrix for data collection and prepared a quality assurance project plan (QAPP), approved by EPA in September 2017. Training was provided by PRI to the local community groups and volunteers to adhere to the QAPP guidelines and to familiarize the partners on the protocols and parameters to follow during field investigations.




Each site was visited twice between October 11, 2017 and December 17, 2017 by a team of two or three consisting of a project supervisor (Friends of Bonsal Preserve, NY/NJ Baykeeper, and PRI), representatives from other community groups (Hackensack Riverkeeper and the Ironbound Community Corporation), and local volunteers. For each survey, a 400 meter segment on one side of the street and about one (1) meter into the street was inspected. Trash found within the designated survey area was identified, sorted based on different categories, subcategories, and material (e.g. food-related items, bags and plastic bottles, drink-related items, tobacco-related litter as indicated on the tally matrix), and quantified by number, volume and weight. The minimum debris size for the survey was 2.5 centimeters (the size of a cigarette butt). Large, bulk items and hazardous materials were not included in the survey. Additionally, the survey was avoided during or within 48 hours of a rain event, street sweeping, and trash collection schedule per municipality.

## *Litter Survey Results*

A total of 28,431 items were collected during the 70 visits at the 35 sites. On average, 406 items were documented during each site visit. The average weight was recorded at 3.5 kilograms and a volume at 68 cubic centimeters ($cm^3$). Per the survey protocol, volunteers also recorded vehicle and foot traffic during site visits. Upon analysis, no correlation was found between trash volume and vehicle traffic ($R^2$=0.009) or foot traffic ($R^2$=0.011); weak correlations were found between foot traffic and trash weight ($R^2$=0.282) and trash count ($R^2$=0.119). The results suggest that foot traffic seemed to impact the amount of trash on the street more than the vehicle traffic in the study. Floatable items accounted for 66% of the total number of items collected in the survey; 57% of the floatable trash was composed of plastic, rubber, and styrofoam materials while cigarette butts were the most numerous among all items, representing 43% of all the buoyant objects documented. Food/drink related items accounted for 32% of the total items documented in the Passaic River Watershed survey.




Comparable to the survey conducted in New York City boroughs, the most prevalent items found in the trash survey in the Passaic River Watershed was single-use, disposable plastic packaging and food/drink related items **(Cortes, Kim, Rubin, & Villela de Faria, 2016)**. Based on national beach clean up surveys, single-use plastics and food-related wrapping make up one-third to two-thirds of all marine debris **(United States Environmental Protection Agency, 2018)**. Overall, both studies in New York City boroughs and the Passaic River Watershed concluded with food/drink related plastics as the prevalent trash found and a key focus for source reduction actions. Like the Columbia University study, recommendations of educating local businesses and residents about trash impacts and solutions to encourage responsible vendor and consumer behavior and stewardship on single-use, disposable plastics is important to begin changing behavior and reduce marine debris.

## *Recommendations for Pollution Prevention*

The most effective way to prevent marine debris is to prevent waste from occurring, specifically single-use, disposable plastics such as bottles, bags, straws, stirrers, and food/dink related wrapping **(United States Environmental Protection Agency, 2018)**. Like Columbia University's survey, the results of the Passaic River Watershed project suggest trash reduction strategies should focus on pro-environmental behavior changes or actions targeting smokers (to reduce cigarette butt litter) and consumers or producers of food/drink related litter **(Cortes, Kim, Rubin, & Villela de Faria, 2016)**. Pro-environmental behavior is defined as a set of actions or conscience decisions by an individual that reduce the negative impact of human activity on the environment or enhance the quality of the environment **(Sawitri, 2015)**. Through educational campaigns, communities can begin to increase the individual's awareness to the harmful impacts of single-use, disposable plastics to begin broadening their environmental awareness and increase pro-environmental behaviors.

HEP recommends that a focused campaign or outreach materials targeting residential neighborhoods or schools on the reduction of single-use, disposable plastics or food/drink related plastics will reduce marine debris in the harbor **(NY/NJ Baykeeper, 2016) (UNEP and GRID-Arendal, 2016)**. Media campaigns and outreach that increase pro-environmental behaviors in the harbor and estuary can amplify single events such as beach or river clean ups. Communities in New York and New Jersey are encouraged to explore the media campaigns that target the reduction of single-use, disposable plastics. Existing campaigns in the region include New York City's Don't Trash Our Waters campaign guide located online by visiting http://www.nyc.gov/html/dep/pdf/water_sewer/trash-free-nyc-waters-media-campaign-plan.pdf, New York City's How You Can Help Keep our Waterways Trash Free by visiting http://www.nyc.gov/html/dep/html/harborwater/trash-free-waters-citizens.shtml and NY/NJ Baykeeper's Plastic Pollution Reduction campaign by visiting http://nynjbaykeeper.org/plastic-free-tips/.

Expanding on GreeNYC, a marketing and data-driven program aimed to change behavior through campaigns and events, NYCDEP created the *Don't Trash Our Waters* campaign focusing on specific neighborhoods where street litter is a persistent challenge in municipal separate sewer system (MS4) areas **(NYC Environmental Protection, 2016)**. For example, a targeted anti-littering campaign was implemented in Coney Island in 2017 (http://www.nyc.gov/html/dep/html/press_releases/17-054pr.shtml#.Ww752e4vyUk ). The campaign promotes local residents and businesses to play a role in keeping waterways trash-free by generating less trash (i.e., Zero Waste Pledge, The B.Y.O. Movement Pledge available by visiting https://www1.nyc.gov/site/greenyc/small-steps/at-home.page), guidelines for keeping streets clean, adopt-a-basket (notify sanitation team when bins are full by filing out a complaint form online at http://www1.nyc.gov/assets/dsny/site/contact/complaints/overflowing-litter-basket-service-request), and organize clean ups **(NYC Environmental Protection, 2018) (NYC Sanitation, 2016)**. NYCDEP, Mayor's Office of Sustainability, and the New York City Department of

Sanitation are exploring partnership opportunities with other city departments and private partners to promote reusable items **(NYC Environmental Protection, 2016)**. Partnerships with local businesses and vendors can improve waste management strategies by placing of trash bins near exits along with anti-littering signs, adopt alternatives to single-use, disposable plastics, or offering discounts to patrons who bring their own reusable items such as bags or mugs.

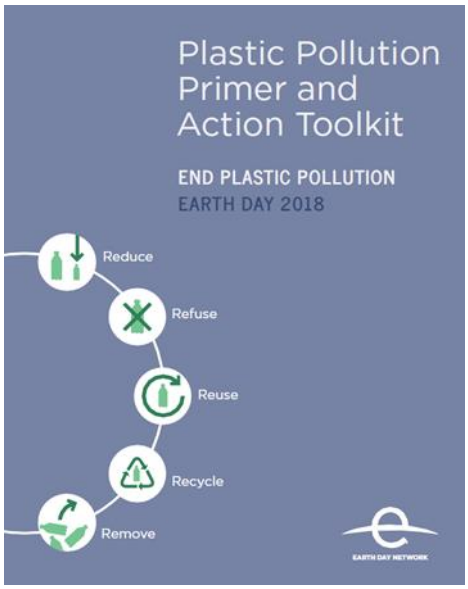
New Jersey's litter-abatement program, created by the Clean Communities Act in 1986, established the New Jersey Clean Communities to provide funding to 558 municipalities and 21 counties to support clean up, enforcement, and education throughout the state. Like New York, the New Jersey Clean Communities administers adopt-a-beach and adopt-a-highway program to develop partnerships with local businesses, organizations, or residents to reduce marine debris. The program generates $20 million each year by placing a tax on fifteen categories of businesses that may produce litter-generating products and distributes funds to muncipalities and counties **(New Jersey Clean Communities, 2018)**. Although clean ups are ongoing in both states, an anti-littering campaign at a local level can increase pro-environmental behavior to reduce street litter and marine debris. Alternatively to a municipal-led campaign, organizations can also be successful in engaging local businesses and residents with an anti-littering campaign. For example, the NY/NJ Baykeeper created the *Plastics Pollution Reduction Campaign* (http://nynjbaykeeper.org/resources-programs/advocacy/plastic/). This campaign focuses on communities and local businesses to reduce single-use plastics through alternative plastic pollution prevention strategies, social media campaigns such as #SkipTheStraw, #BeTheSolution2PlasticPollution, and #BreakThePlasticHabit, and a guidance document to become a straw-free ambassador **(NY/NJ Baykeeper, 2017)**.

In addition to educational campaigns, an increase of local and state laws has been introduced to reduce plastic bags. Municipalities and states across the country have implemented plastic bag bans and plastic bag fees to reduce plastic pollution from entering streets, sewerage systems, and waterways. In New York, Governor Andrew M. Cuomo's Plastic Bag Task Force was established to provide recommendations on plastic bag policies which led to state senators' introduction of a bill (S7760) in 2018 that would ban plastic carryout bags and place a ten-cent fee on all carryout bags **(Krueger, 2018; Fallon, 2017)**. In May 2018, over 100 organizations from across New York State sent a letter to Governor Cuomo urging him to support a ban on single-use plastic bags and a fee on alternative bags as the most effective way to reduce single-use, disposable plastics and learning from the success of others in the United States **(Riverkeeper, 2018)**. In New Jersey, several variations of a plastic bag ban (A4552, A1218) have been introduced since 2007, but have not made it to the governor's desk for a state-wide ban. With Governor Phil Murphy's election, environmentalists anticipate a successful bill will be bought forward as several New Jersey municipalities have already passed such laws **(Zimmer, 2018; Warren, 2018)**. Most recently, the Borough of Monmouth Beach passed local ordinance No. 2018-02 in Chapter 3 Section 3.17 to ban single-use plastic bags, straws and food containers, as well as take-out Styrofoam boxes **(Strunsky, 2018)**. The ordinance, passed on May

22, defines that no business or store shall provide any single-use, plastic carryout bags, polystyrene foam containers and/or plastic straws to a customer at the check stand, cash register, point of sale, or other point of departure for the purpose of transporting products or goods out of the business or store, with only one exception to business or stores for the sale of bait. Taking effect on June 1, the ordinance includes fines of up to $2,400 but warnings will be issues for initial violations **(Strunsky, 2018)**. Unlike other municipalities in New Jersey, this is the first ordinance that tackles bags, straws, and containers and should serve as a model ordinance for other communities across the harbor.

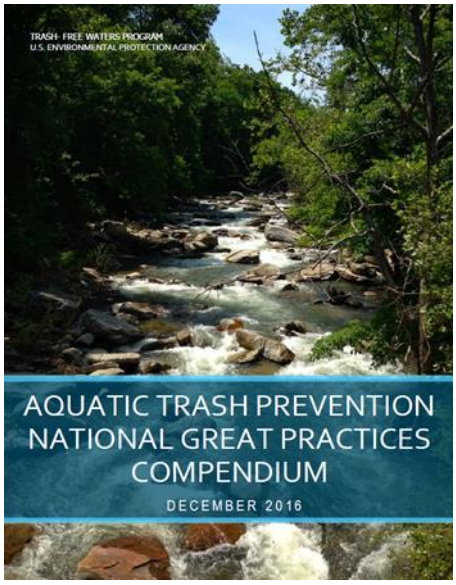
## *A Guide to Recommended Available Resources*

The following is a synopsis of available resources that can support community efforts in communication and outreach to prevent plastic pollution prior to becoming marine debris.




The Earth Day Network identified plastic pollution as one of the most important environmental problems as it impacts not just the environment, but also human health. The toolkit provides an overview of plastic pollution, its harmful effect to marine life, and microplastics. The toolkit includes a plastic pollution footprint calculator, self-evaluation checklists to reduce, refuse, reuse, recycle, remove plastics, and a personal plastic reduction plan guidance. In addition, research articles, storytelling links, and organizations are referenced to further build outreach and communication efforts.

***Reference:*** **Earth Day Network, 2018. *Plastic Pollution Primer and Action Toolkit: End Plastic Pollution*. Retrieved from www.earthday.org/earthday/toolkits/.**

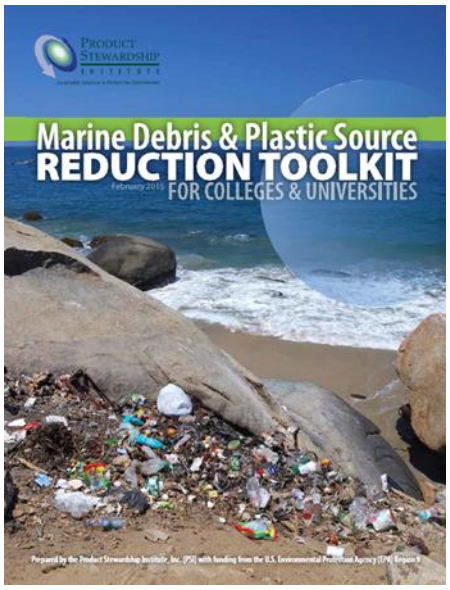



The National Great Practices Compendium provides an overview of case studies that prevent trash from entering the aquatic environment and/or that reduce the overall volume of trash that is generated.

***Reference:*** United States Environmental Protection Agency, 2016. *Aquatic Trash Prevention National Great Practices Compendium*. Trash-Free Waters Program. Retrieved from www.epa.gov/trash-free-waters/aquatic-trash-prevention-national-great-practices-compendium.


The *Marine Debris Monitoring Toolkit for Educators* was created utilizing marine debris resources, the MDP's Marine Debris Monitoring and Assessment Project, a robust citizen science monitoring initiative. The toolkit was created for classroom use designed to assist teachers in educating students about marine debris research through marine debris surveys, analyzing data in a national database, and stewardship.

***Reference:*** National Oceanic and Atmospheric Administration, 2018. *Marine Debris Toolkit For Educators*. Retrieved from www.marinedebris.noaa.gov/curricula/marine-debris-monitoring-toolkit-educators.

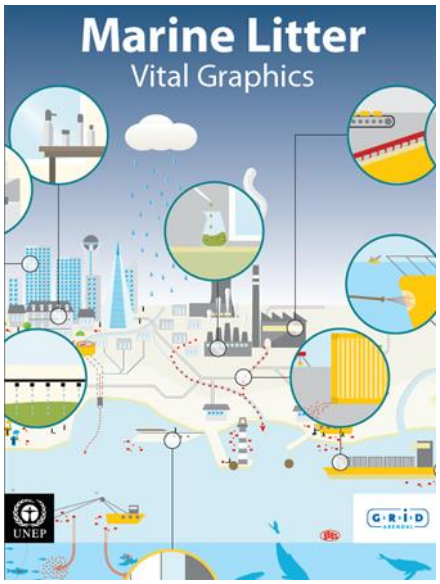



The *Marine Debris and Plastic Source Reduction Toolkit for Colleges and Universities* recognizes the opportunity to improve waste management at colleges and universities. Many plastic food service ware items originate on college and university campuses. This toolkit provides a "how to" guide for reducing plastic waste on college campuses and other institutions to understand the plastic footprint, creating a source reduction plan, changing campus procurement practices, and establishing source reduction policies.

***Reference:*** Product Stewardship Institute, Inc., 2015. *Marine Debris and Plastic Source Reduction Toolkit for Colleges and Universities.* Retrieved from *www.epa.gov/trash-free-waters/marine-debris-and-plastic-source-reduction-toolkit*.


The state of New South Wales, Australia created a guide to assist people and communities to tackle local litter problems. The NSW Litter Prevention Kit provides an overview of the litter problem, identifies five key successful actions, how to establish partnerships and supporters, measuring success, and education and outreach efforts.

***Reference:*** State of NSW and Environment Protection Authority, 2013. NSW Litter Prevention Kit: Run an Effective Litter Prevention Project. Environment Protection Authority. Sydney, Australia. Retrieved from www.epa.nsw.gov.au/your-environment/litter-and-illegal-dumping/epa-work-prevent-litter/run-litter-prevention-project.




In an effort to understand plastic litter in oceans, the United Nations Environment Programme released the *Marine Litter Vital Graphics* report to encourage behavioral change and action to avoid living in a sea of plastic. The report promotes upstream governance actions and long-term solutions through behavioral and system changes to encourage sustainable production and consumption patterns through engaging synthesis diagrams and graphics.

***Reference:*** UNEP and GRID-Arendal, 2016. *Marine Litter Vital Graphics.* United Nations Environment Programme and GRID-Arendal. Retrieved from www.grida.no/publications/60.

## *Conducting Your Own Litter Survey*

Characterizing local sources and types of floatable debris before it enters the estuary requires implementing a survey protocol where data collected can be used to inform effective source reduction actions. Conduct a survey in your own community! The data collected in a litter survey provides an opportunity for communities to identify the most effective source reduction actions to target resources for source control.

The following section of the toolkit breaks down the litter survey forms using the approved QAPP litter survey from the Passaic River Watershed project. As you prepare to develop your litter survey, this section highlights what you will need to consider and create a litter survey for your community needs. Reach out to HEP at (212) 483-7667 or info@harborestuary.com to connect with a staff member who can assist you further on developing your litter survey and share your results!

### *Identify Survey Location(s)*

Acceptable survey locations are likely to be sites within areas that are highly impacted by trash, close to public shorelines and spaces, and other environmentally sensitive areas. Collect community input by speaking to community groups and residents that could later be recruited to assist in completing the survey as each site will need to be visited at least twice for data collection.

All survey locations are to consist of a 400 meter stretch of road and only on one side of the street. The starting point for the survey is recommended to be a particular cross-street identified on Google Maps and coordinates. The ending point will be identified through an address/landmark and coordinates. Coordinates will be taken with a GPS and reported in decimal degrees with at least 5 decimal places. While slecting survey locations, priority should be given to areas within a buffer distance of 300 meters from the nearest waterway. If assessing mutliple waterbodies, consider variations of sites along the main stream and its tributaties. It is believed that at this distance, trash will have a higher probability in entering the waterway without incurring into much obstruction. Conduct an in-person scouting to verify access to sites and good representation of the survey parameters. Consider the following criteria which will influence accumulation of trash in selecting sites:

- Flood areas
- Slope
- Surface runoff
- Impervious surfaces
- Stuctures vs. empty spaces (i.e., roads, empty lots)

Once the sites have been randomly selected using GIS or other methods, visit the municipality's office and inquire about the following information:

- Municipal ownership
- Storm drain/system maintenance (protocols and schedules, if available)
- Street sweeping frequency
- Trash pickup schedule

Street sweeping, trash pickup, and rain events will be crucial for a free-of-bias schedule of the surveys at each site. Surveying should be avoided during wet weather events. This information will determine survey scheduling against the site criteria. It is recommended to avoid surveying for 48 hours after streets have been swept and trash has been picked up. The number of sites to be identified is dependent on the resources available. To be comparable to the litter surveys conducted in the NY-NJ harbor and estuary, consider identifying between 30 and 35 sites (between five to 10 sites per neighborhood or municipality). Conclusions will still be able to be drawn with a smaller dataset of 15 to 18 sites and would still be acceptable for a litter survey. In addition, it is recommened that more than one survey should be conducted per site to have a better representation of the trash condition at each site.

### *Equipment Needed*

The following supplies will be needed per surveying team (each team must be composed of at least 2 individuals, preferably 3, for safety reasons and to ensure an additional level of data verification such as removing any uncertainty in the identification of litter matierial, type, or brand):

- Clipboards
- White board
- Pens
- Erasable marker
- Work gloves/Latex gloves
- Safety vests
- Trash pickers
- Trash & recycling bags
- Phone/iPad capable of taking photos or digital camera
- Tally counters (one for foot traffic & one for vehicle traffic)
- GPS
- Survey forms and instructions
- Site ID List (street names delimiting the area to be surveyed and indicative coordinates)

### *Recommended Survey Protocol*

The survey should take place on the pre-scheduled dates that avoid street sweeping and trash collection, but dependent on the absence of wet weather events. Surveyors are to be provided with the SITE DESCRIPTION FORM and TALLY FORM (paper format preferred) and labeled by DATE_SITEID (date should be in the format ddmmyy). The SITE DESCRIPTION FORM is the first form that has to be completed in the field. After completion of this document, the surveyor can move to the TALLY FORM, qualifying and quantifying the trash items found. Attempting to record the SITE DESCRIPTION FORM, collect, photograph, complete the TALLY FORM and properly dispose of materials at each site visit is time constraining. It is recommended that the surveyor complete the trash collection and labeling bags (DATE-SITEID) during site visits. The bags can be transported to an indoor facility off-site to sort materials and complete the TALLY FORM on a different day. It is recommended that sorted materials per site be photographed to provide a database for brand annotation. Photographs provide a reference for visual analysis of brand abundance and brand annotation can be documented in the TALLY FORM.

Meteorological information should be noted from a reliable site on the same day, before heading out to the site (e.g. NOAA, Newark International Airport). Survey start and end times should be written in military format (24 hour-method) and surveyors first and last names are to be recorded with each form. In addition, surveyors are recommended to tally food-related businesses within an 800 meter by 800 meter area from the midpoint of each site. Lastly, surveyors are to be reminded of trash collection limits. Trash should only be collected from within the segment study area from the edge of a building or fence to the end of the curb and one foot or end of the storm drain equivalent into the street. Volunteers are to be discouraged from collecting trash in the street, front yards, or vacant lots as this is a survey and not a public service.

## *Litter Survey Forms*

The following litter survey forms were used during the Passaic River Watershed study (2018) which was modified from several litter survey studies such as Columbia University's SIPA New York City study (2016), Environmental Resources Planning's Texas litter survey (2013), Alice Ferguson Foundation trash survey handbook (2008), and the San Francisco Bay Region's Surface Water Ambient Monitoring Program (2007). The litter survey forms are color coded to guide you on selecting the parameters for your litter survey based upon available resources and project scope. Parameters indicated in red represent information that will need to be collected for all litter surveys and reflect the minimum amount of resources necessary to complete the survey. If additional resources become available, in addition to the items in red, surveyors should also record parameters indicated in green. To replicate the Passaic River Watershed and the New York City litter study, the survey form should be completed in its entirety; those parameters are indicated in the color blue.

As you identify your scope of work to conduct a litter survey, it is important that you refer to Appendix I and Appendix II of this toolkit. Appendix I provides descriptions to each of the parameters

listed below and will further your understanding for the reasoning behind collecting the data. Appendix II provides guidance for surveyors when on-site conducting the survey. Anticipate a minimum of 30 minutes per site to complete trash collection, SITE DESCRIPTION FORM, and photographs. Anticipate a minimum of 40 to 60 minutes to sort materials and complete the TALLY FORM at an off-site location. In general, it is recommended that the project manager maintain clear communication with surveyors to address misconceptions as early as possible. The project manager is recommended to communicate with surveyors to confirm survey dates, re-review the survey protocol with community group supervisors pre-field work, regroup with the community group supervisors post-field work and tally form completions.

### *Site Description Form*

1. **Date _____ Site ID_____ Name(s) of Surveyor(s) _____**

2. **Starts at: Lat_____ Long_____**
   **Ends at: Lat_____ Long_____**

3. **Today: Temperature (°C/°F) _____ Rain (mm/inch) _____**

4. **Past 24 h: Avg Temp (°C/°F) _____ Rain (mm/inch) _____**

5. **Past 48 h: Avg Temp (°C/°F) _____ Rain (mm/inch) _____**

6. **Wind speed today (miles/h or km/h) _____**

7. **Survey start time _____ Survey end time_____**

**8.**

| Assessment parameter | Least disturbed | Sub optimal urban | Marginal urban | Most disturbed | Average |
|---|---|---|---|---|---|
| **Trash level first glance** | Little or no trash detected (small pieces) which could be easily cleaned up in a short timeframe by one person. | Low levels of trash (few pieces) that could be easily cleaned up by two people in a relatively short time. | Medium quantity of trash evenly distributed or small piles of trash are visible. Site clearly shows MODERATE usage by people (e.g. cigarette butts, food and beverage containers, clothing) | Substantial quantity of trash throughout with large piles of trash . Site clearly shows HEAVY usage by people (e.g. cigarette butts, food and beverage containers, clothing) | |
| Surveyor 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| Surveyor 2 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| **Access to the waterbody from the site** | No access or difficult access due to any sort of barrier (vegetation or gate). Not used by people. Private or restricted area. | Limited access and no evidence of usage by people. | Public access is fair to good but no evidence of frequent use by people. | Optimal access (even dedicated trails) to the waterbody. Evident usage by people (e.g. food and/or drink items, cigarette butts). | |
| Surveyor 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| Surveyor 2 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| **Floatability of litter found** | Little (<25 items) or no floatable litter (transportable) litter (e.g. plastics, Styrofoam, cigarette butts) | Low to moderate (26-75 items) presence of buoyant (transportable) litter (e.g. plastics, Styrofoam, cigarette butts) | Moderate (76-200 items) presence of buoyant (transportable) litter (e.g. plastics, Styrofoam, cigarette butts) | Consistent (>200 items) presence of buoyant (transportable) litter (e.g. plastics, Styrofoam, cigarette butts) | |
| Surveyor 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| Surveyor 2 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| **Large & or household items** | No sign of illegal trash disposal. Trash is accidental or carried by surface runoff. | Some evidence of illegal dumping coupled with limited access. | One to two items (e.g. furniture, shopping carts, green waste) illegally dumped coupled with an almost facilitated vehicular access. | More than two items (e.g. furniture, shopping carts, green waste) illegally dumped coupled with an easy vehicular access. | |
| Surveyor 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| Surveyor 2 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 | |
| FINAL SCORE OUT OF A TOTAL OF 80 POSSIBLE POINTS | | | | | |

**9. Ground cover (%): Paved____ Grass_____ Shrubs/Bushes ____ Wooded _____Sand/Soil _____**

**10. Number of landscaped areas (e.g. flowers, mowed areas) _____ Specify _____**

**11. Number of people that walk by you:**

**1st 10-min period _____ 2nd 10-min period _____ 3rd 10-min period _____**

**12. Number of vehicles that pass by you:**

**1st 10-min period _____ 2nd 10-min period _____ 3rd 10-min period _____**

13. Number of food-related business activities within the block (If 0 skip to question 14): _____
    a) Number of Grocery stores (e.g. Shop Rite, Walmart, Trader Joe's) _____
    b) Number of Convenience stores (e.g. 7-eleven, Dollar Tree)_____
    c) Number of Restaurants/Diners (e.g. Olive Garden, IHOP) _____
    d) Number of Coffee shops (e.g. Starbucks, Dunkin Donut) _____
    e) Number of Fast-foods (e.g. Mc Donald's, Burger King) _____
    f) Number of Food carts (e.g. hot dog, halal, bagels) _____
    g) Number of Food trucks (e.g. Ice cream truck) _____
    h) Number of Other _____ Describe_____

14. Number of open bed vehicles (e.g. construction trucks, road maintenance) _____
15. Number of Public areas within the block _____ near-by_____ Distance _____
16. Number of Construction sites within the block_____ near-by _____ Distance _____
17. Number of Loading docks within the block _____ near-by _____ Distance _____
18. Number of Public buildings within the block _____ near-by _____ Distance _____

19. Number of trash cans on the block (both sides of the street) _____ (If 0 skip to question 21)
    a) Number of Trashcan with plastic bag liner _____ Without _____
    b) 100% full_____ 75% full_____ 50% full_____ 25% full_____ 0% full_____
    c) Number of trashcan with trash on the ground around the trashcan _____
    d) Among the trashcans with trash on the ground next to them, how many are:
       100% full_____ 75% full_____ 50% full_____ 25% full_____ 0% full_____
20. Number of recycling bins on the block (both sides of the street) _____ (If 0 skip to question 21)
    a) 100% full_____ 75% full_____ 50% full_____ 25% full_____ 0% full_____
    b) Number of recycling bins with litter on the ground around the bin _____
    c) Among the recycling bins with litter on the ground next to them, how many are:
       100% full_____ 75% full_____ 50% full_____ 25% full_____ 0% full_____

21. Number of manhole covers _____
22. Have you seen anyone collecting plastic bottles/cans? Yes _____ No _____
23. Number of storm drains (both sides of the street) _____
24. Number of storm drains clogged with litter or debris:
    100% clogged__ 75% clogged__ 50% clogged__ 25% clogged__ 0% clogged__?
25. Is there a particular spot in which you see the most litter (next to trash bins, on storm drains, on sidewalk, on the road, in tree pits, etc.)?_____
26. Pictures taken before & after site collection (Y/N) _____

Notable/Unusual weather conditions (or NOTES in general) _____
_____
_____

Measurements of the collected trash (provide at least one decimal place in each measurement):

27. Volume determination of the bin:

a) **<u>Bin sides (cm)</u>: *height*_____ (cm) *width*_____ (cm) *length*_____ (cm)**

b) **<u>Volume of the bin</u>: *height* x *width* x *length* = _____ ($cm^3$)**

**28. Volume determination of the trash collected:**

**Trash volume (full bin) (Same volume of the bin at b): _____ $cm^3$**

**Trash volume (not-full bin): _____ $cm^3$**

- Measure the *new height* of the trash inside the bin
- As for the *length* and *width* use the bin's measures from a).
- Compute the volume applying the multiplication at b).

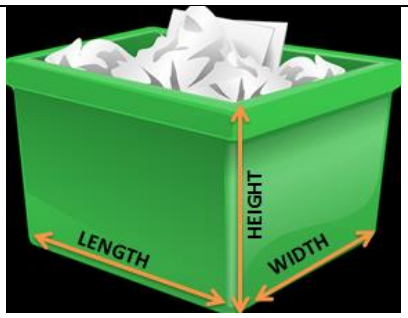
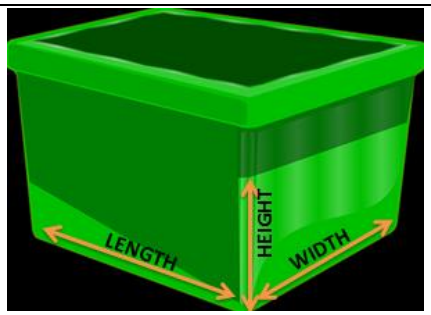
**29. Weight determination of the trash:**

Put either the trash bag(s) or the bin with the garbage content on a digital scale.

If using the bin, weight the bin first or put the bin on the scale first and reset the scale to 0. Then weight the content, either loose or inside a trash bag.

**Trash weight: _____ kg (one decimal point minimum).**

NOTE: If measures are taken in pounds or inches or feet, this MUST be specified.

| Bin with trash – example of FULL bin | Bin with trash – example of a NOT-FULL bin |
|---|---|
|  |  |





## *Tally Form*

| Category | Subcategory | Material | Tally | Brand/Notes |
|---|---|---|---|---|
| DRINKS CONTAINERS AND PARTS | Liquor Bottles | Glass | | |
| | Non-Liquor Bottles | Plastic | | |
| | | Glass | | |
| | | Metal | | |
| | Juice boxes | Composite | | |
| | Cups | Styrofoam | | |
| | | Plastic | | |
| | | Paper | | |
| | | Glass/Ceramics | | |
| | Caps | Plastic | | |
| | | Metal | | |
| | Lid | Plastic | | |

| | | | | |
|---|---|---|---|---|
| | | Metal | | |
| | Straw | Plastic | | |
| | Coffee stirrer | Plastic | | |
| | Cup sleeves | paper | | |
| | Four or Six pack rings for cans | Plastic | | |
| | Bottle neck ring | Plastic | | |
| | Liquor Cans | Metal | | |
| | Non-Liq. Cans | Metal | | |
| | Drink carrier/tray | Paper | | |
| | Pull tabs | Metal | | |
| FOOD WRAPPING & PACKAGING | Gum/Snacks/ candies Wrappers | Plastic | | |
| | | Aluminum | | |
| | | Paper | | |
| | Utensils | Plastic | | |
| | Ziplock bag | Plastic | | |
| | Lollipop stick | Paper | | |
| | | Plastic | | |
| | Popsicle stick | Plastic | | |
| | | Wood | | |
| | Food Wrappers/Packaging | Plastic | | |
| | | Styrofoam | | |
| | | Metal | | |
| | | Paper | | |
| | | Composite | | |
| | Food Containers | Plastic | | |
| | | Styrofoam | | |
| | | Metal | | |
| | | Paper | | |
| | | Composite | | |
| | Plates | Styrofoam | | |
| | | Paper | | |
| | | Glass/Ceramics | | |
| | | Metal | | |
| | | Plastic | | |
| MEDICAL RELATED | Drug vials | Plastic | | |
| | Drug vials with content | Composite | | |
| | Condoms | Plastic | | |

| | | | | |
|---|---|---|---|---|
| | Bandages | Plastic | | |
| | Wound wrapping | Textile | | |
| | Syringe | Composite | | |
| | Pipette tips | Plastic | | |
| ORGANIC WASTE | Human waste | Organic | | |
| | Loose Pet waste | Organic | | |
| | Wrapped Pet waste | Composite | | |
| | Food waste | Organic | | |
| | Yard waste | Organic | | |
| | Leaves | Organic | | |
| LARGER AND OR HOUSEHOLD ITEMS | Furniture | Composite | | |
| | Mattresses | Composite | | |
| | Bags with trash | Composite | | |
| | Tires | Plastic | | |
| | Appliances | Metal | | |
| | Shopping carts | Metal | | |
| | Vehicle batteries | Composite | | |
| | Bike | Composite | | |
| | Bike wheel | Composite | | |
| | Vehicle wheel | Composite | | |
| | Vehicle (specify) | Composite | | |
| | Vehicle parts | Plastic | | |
| | | Metal | | |
| TOBACCO PRODUCTS | Lighters | Composite | | |
| | Cigarette/cigars butts | Composite | | |
| | Tobacco wrap (cellophane) | Plastic | | |
| | | Cellophane/ Foil | | |
| | Tobacco box | Paper | | |
| | Cigarette holder | Plastic | | |
| | Matches | Composite | | |
| CONSTRUCTION MATERIALS/TOOLS | Concrete waste | Rock | | |
| | Bricks | Rock | | |
| | Wood boards | Organic | | |
| | Wood chips | Organic | | |
| | Rebar | Metal | | |
| | Tiles | Rock | | |
| | Tarp | Plastic | | |
| | Tools | Composite | | |

| | | | | |
|---|---|---|---|---|
| | Gloves | Textile | | |
| MISCELLANEOUS | Balls (type) | Plastic | | |
| | Toys | Plastic | | |
| | Toys | Textile | | |
| | Non-vehicle batteries | Composite | | |
| | Pen/pencil | Plastic | | |
| | | Metal | | |
| | | Wood | | |
| | Chemical containers | Composite | | |
| | Personal care bottle | Plastic | | |
| | Home care bottle | Plastic | | |
| | Make up item | Plastic | | |
| | | Composite | | |
| | Greasy layer on water (either oil or surfactant) | Composite | | |
| | Spray paint cans (or bottles) | Composite | | |
| | Hose/Pipe parts | Plastic | | |
| | | Metal | | |
| | Wire/cable/rope | Plastic/ Synthetic | | |
| | | Metal | | |
| | | Electric | | |
| | | Composite | | |
| | Tarp | Plastic | | |
| | Foam materials | Styrofoam | | |
| | Dryer sheets | Textile | | |
| | Non-food Wrappers/Packaging | Plastic | | |
| | | Metal | | |
| | | Styrofoam | | |
| | Human diapers/pads | Composite | | |
| | Wipes | Textile | | |
| | Tampon applicators | Plastic | | |
| | Grocery/Shopping bags | Plastic | | |
| | | Textile | | |
| | | Paper | | |
| | Non-food containers | Plastic | | |

| | | | | |
|---|---|---|---|---|
| | | Metal | | |
| | | Styrofoam | | |
| MISCELLANEOUS | Product tag/label | Paper | | |
| | | Plastic | | |
| | | Textile | | |
| | | Metal | | |
| | Newspaper | Paper | | |
| | Magazine | Paper | | |
| | Office paper | Paper | | |
| | Cardboard | Paper | | |
| | Tissue/Napkin | Paper | | |
| | Flyer | Paper | | |
| | Shoe/Boot | Composite | | |
| | Clothes | Fabric | | |
| | Bedding | Fabric | | |
| | Cleaning bottles/spray | Plastic | | |
| | | Metal | | |
| | Dead animals | Organic | | |
| FRAGMENTS | Fragments/ Pieces | Glass | | |
| | | Plastic | | |
| | | Textile | | |
| | | Paper | | |
| | | Metal | | |
| | | Styrofoam | | |
| | | Composite | | |
| | | Other | | |
| OTHERS (SPECIFY) | | | | |
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## *Appendix I: Site Description Form Guidance*

**Assessment parameter table:** This table is meant to provide an initial general visual assessment of the visited site. Since this information is mostly subjective to the surveyor's opinion, both surveyors at each site should select the value that better describes (from least disturbed to most disturbed) each of the four parameters provided in the assessment parameter table. Two lines are provided in the table (one per each surveyor). No need to indicate who is surveyor 1 or 2. The values assigned to each parameter under evaluation will be averaged and each averaged value will be summed up to a final score reported out of the total of 80 possible points. This final score will help us to classify each site based upon an initial visual evaluation. For each parameter, four situations are described, and for each situation 5 values are available.

1. Trash level first glance: the surveyors should express in a value from 0 to 20, what is the level of trash presence in a first glance (pictures with examples to be provided).
2. Access to the waterbody from the site: each site was selected at a maximum distance of 300 m from the waterbody meaning that they are located fairly close to the waterbody. Despite their vicinity, some site may not have direct access to the waterbody (e.g. there is a private passage and/or a gate is present; it is densely vegetated and no pathways are cutting through the vegetation). On the other hand, direct access could be present that would easily allow for trash to accumulate along the shoreline.
3. Floatability of litter found: the amount of trash found at the site might be significant but only a part of it is light enough to be easily transported by the wind or surface runoff to the waterbody. Estimate the approximate quantity of items that potentially could reach the water because of light-weighted items (e.g. plastic, Styrofoam, paper, cardboard).
4. Large or household items: in addition to the light trash that potentially could be transported to the waterbody, evaluate the eventual presence of large and/or heavy items or any household object dumped on the street illegally that would negatively affect aesthetics.

**Ground cover (%):** The surveyor is required to estimate the percent coverage at the ground level of the following ground cover categories: 1) Paved 2) Grass 3) Shrubs/Bushes 4) Wooded 5) Sand/Soil. For instance: Paved 80%, Grass 0%, Shrubs/Bushes 5%, Wooded 5%, and Sand/Soil 10%.

**Landscaped areas:** Usually, signs of beautification like, presence of flowers, mowed areas, trimmed bushes, is a sign of people taking care of the neighborhood and interested in keeping the area clean.

**People and vehicles that pass by you:** This information will provide an idea of how busy the site is and the relative frequentation of vehicles versus pedestrians. While two surveyors are collecting and tallying the trash found along the surveyed segment, a third surveyor will be in charge of counting people and vehicles passing by in the street segment designated for the survey. The surveyor will conduct the count for 10 consecutive minutes using tally counters. One tally counter will be used for

counting the vehicles and one for counting pedestrians. Ideally, the 10-minute intervals should be repeated two more times any time during the permanence of the surveyors on the site that date. It is suggested that the surveyor choose a spot in the block and maintain it, approximately, for the entire duration of the count.

**Food related business activities within the block:** Distinguish the different types of food related businesses with the purpose of later finding the sources of litter, especially when the wraps and containers found are showing a brand. The different types are grocery and convenience stores, restaurants are grouped with diners, coffee shops, fast-foods. These are the stores that are always present, but there also could be food-carrying vehicles like ice cream trucks and carts. Some examples are provided in parentheses for each category and an extra line is available for any other food business not listed.

**Open bed vehicles:** Vehicles that do not cover or secure their loads may allow for the release of items into the environment while operating or when parked and may represent a noticeable contribution of trash to local waterways. New Jersey regulates this issue through section 39:4-77 and any violator may be fined. For this reason, surveyors should write notes (e.g. plate number, construction business name) of any open-bed truck vehicle, within the surveyed segment site, which load is not secured.

**Public areas, constructions sites, loading docks, public buildings:** These areas are potential sources or carriers of trash. Public areas include playgrounds and parks and may be a source of food and drink-related containers and packages. Construction sites and loading docks may be sources of big plastic wraps, debris and cardboard. Public buildings like hospitals, libraries, and post offices might represent highly-frequented meeting areas that may result in litter generation. These trash sources might be within the delineated surveyed area (within the 400m pre-determined segment(s)) and/or near-by. In this last case, the surveyors have to estimate the approximate distance (in m) from the limits of the surveyed block.

**Trash cans and recycling bins:** The presence of trash cans and recycling bins is extremely important in the intent to keep the environment in which we live clean. The higher the number of these containers and the better they are maintained to keep the street clean. In addition, the presence or absence of plastic bag liners is important especially when liquids are disposed and when trash is in small pieces. The presence of a liner would prevent liquids and small parts to be spread out on the ground and also leach into draining systems when rain dilutes and washes them. It is important to be consistent in tallying the bins on only the side of the segment visited or including both sides of the segment visited, but consistency should be applied to all sites.

**Manhole covers:** A manhole cover is a small opening in the street and covered by a lid, in order to allow staff in charge of maintenance to have access underneath it. This opening usually leads to a sewer. Depending on how the cover is made and what condition it is in, there could be a passage for trash.

**Collectors of recyclables:** People (mostly homeless) are seen sorting plastic bottles and aluminum cans from the trash bins and from the street and collecting them in big plastic bags to sell to recycle points. If one of these individuals are seen, it is important to mention it because they may remove these items in that area and cause a bias in the tallying.

**Storm drains:** Storm drains in between the curb and the street usually have large openings to allow a good drainage of stormwater flow along the street. Unfortunately, when trash is present on the street, it can be transported along with the same stormwater and very often ends in these storm drains. Items smaller than the openings can be drained together with the stormwater but larger items may remain stuck against the storm drain structure.

**Particular spot with a lot of litter:** Surveyors should write down (and take a picture) if they see any particular spot in which the debris seems to accumulate most. The location of accumulated debris could shed light to the movement of material at that site or about particular activities or conditions which should receive the most attention.

**Pictures:** Suggest taking pictures of significant areas/points/events/situations. Before doing this, the first picture to take should be of a white board showing site-specific information (date, Site ID, Initials of the surveyors) written with a dry erasable marker. In this way all the following pictures taken at the site will be consecutive to the board displaying the site-specific information.

**General Notes:** Surveyors can write here anything that they think might need to be mentioned. For example if there is any unusual weather condition or activity.

**Measurements of the collected trash:**

Volume determination of the bin ($cm^3$): the measurements of the bin should be taken and multiplied by one another. This will provide the volume of the bin.

Volume determination of the trash collected ($cm^3$): this value will be the same of the volume of the bin if the bin is filled with trash. If the bin is not full of trash, only the height of the bin will be different. The surveyor will have to measure the new height and multiply this new measurement by the same width and length. If both a full bin AND a portion of the bin are the case, both values need to be reported in the proper blank spaces.

Weight determination of the trash (kg): the surveyor should put the trash on a field scale and record it in the proper blank spaces (one decimal point). Put either the trash bag(s) or the bin with the garbage content on a digital scale. If using the bin, weight the empty bin first or put the bin on the scale first and reset the scale to 0. Then weight the content, either loose or inside a trash bag. NOTE: If measures are taken in pounds or inches or feet, this MUST be specified.

## *Appendix II: Tally Form Guidance*

The first column lists the ten categories we grouped the item into: Drink containers and parts, Food wrapping and packaging, medical related, Organic waste, Larger and/or household items, Tobacco products, Construction material /tools, Miscellaneous, Fragments, Others.

The second column shows a long list of subcategories per each category, describing in details the several items that might be found as trash in an area. The subcategories indicate the individual items that will be tallied.

In the third column are listed all possible materials the individual items can be made of. The different materials listed are: metal, plastic, paper, glass, composite (when more than one material is present in the same item), Styrofoam, textile, fabric, organic (e.g.: food waste, material from pruning), and rock (e.g.: concrete, brick, tile).

The fourth column is for the tally. The person in charge tally lines (|) for each subcategory in the specific material it has been found. Tallies will be added up during the data analysis phase. A trash grabber or metal tongs and or latex/textile gloves should be used for picking up the trash.

The last column is intended for notes of any type. In particular, whenever it is possible and clear, the brand of the tallied item clearly coming from a particular store/discount/retailer should be specified. This will later help to trace back the sources of particular trash items and evaluate what could be done to reduce these sources.

Once trash has been tallied it has to be disposed in trash or recycle bags (except the large and/or heavy items) in plastic bags. These bags can be placed on a field scale in order to determine the weight of the entire collection from each site for each individual survey date. The weight value (in kg) should be reported on page 3 of the SURVEY FORM. Still on page 3 of the SURVEY FORM, the size (volume in $cm^3$) of the collected trash from the day should also be reported. Detailed instructions regarding how to determine the volume of the trash are provided in the same SURVEY FORM (still page 3). . The purpose of recording both volume and weight of the collected trash at the different locations is to provide results that can be compared with other projects even when the sites are in a totally different area. In some projects information about trash surveys is reported as count of items. In other researches, weight of the trash collected is provided. Finally, trash may be reported as a volume estimation. Having the opportunity to record both counts, weight and volume of the litter will provided an exhaustive set of information which will allow different projects with different methodologies applied to be compare.

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