DC-WASA Combined Sewer Overflow Anacostia River Trash Reduction Demonstration Project: Fresh Creek Netting TrashTrap™ System

Prepared for

CSO Control Program
District of Columbia Water and Sewer Authority

Prepared by

Department of Environmental Programs
Metropolitan Washington Council of Governments
777 North Capitol Street, NE
Washington, DC 20002

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Executive Summary

The District of Columbia is one of over 1,100 communities in the United States with a combined sewer system. The District of Columbia Water and Sewer Authority (DC-WASA) operates a combined storm and sanitary sewer system dating from the late 1800's, which serves approximately 12,955 acres or 33 percent of the city. The combined sewer system is one of the sources of floating trash on the receiving waters. A significant portion of this trash originates on streets, road right-of-ways, and sidewalks where it is picked up by stormwater runoff and conveyed through the roadway drainage network into the combined sewer system.

In 1994, the U.S. Environmental Protection Agency, in accordance with the 1972 Clean Water Act (CWA), began requiring cities with CSO's to implement "Nine Minimum Controls," a series of Best Management Practices designed to reduce CSO-related impacts through the rapid implementation of a number of relatively simple controls, in concert with a long-term CSO control plan that evaluates alternatives for attaining compliance with the CWA.

As part of its ongoing work on the development of its Long-Term Control Plan and implementation of the Nine Minimum Controls, DC-WASA selected Anacostia River CSO Outfall number 018 as the site for its floatables control pilot demonstration project. The Fresh Creek Technologies, Inc. Netting TrashTrap™ system was selected for use and evaluation at a site located along the west bank of the river, which is representative of many of the CSO outfalls located along the Anacostia and Potomac Rivers. The total cost for the two-net Netting TrashTrap™ system employed at CSO 018, including design, installation, and one year of maintenance was $300,000. Out of this total, approximately $32,600 was dedicated for a one-year-long maintenance contract with Dan White and Sons, Inc.

Based on its many years of experience in the areas of trash surveying and floatables trash reduction in the Anacostia River and familiarity with the District of Columbia's CSO system, COG was selected by DC-WASA in March of 2000 to perform an independent analysis of the Fresh Creek Technologies, Inc. Netting TrashTrap™ system performance, as well as an evaluation of the system's design and maintenance requirements.

During the period from August 2000 to April 2001 COG staff characterized the composition and quantity of CSO floatable materials and quantities captured, as well as determined overall netting system trapping efficiency and CSO catchment trash conditions. The four major study tasks included:

- Roadside and storm drain inlet trash surveys to evaluate trash generation in the study area;
- Fresh Creek netting system monitoring to determine floatables capture efficiency;
- Storm tracking to anticipate major rainfall events and, therefore, CSOs; and
- Data analysis and development of recommendations to reduce floatables according to EPA guidelines.

This report documents the above efforts and addresses the following three questions:

- How effectively does the Fresh Creek Netting TrashTrap™ capture floatables under different seasonal and CSO discharge conditions, and could its performance be enhanced?

- What are the associated maintenance requirements, including labor and equipment, and how do they influence long-term operation and TrashTrap™ system efficiency?

- What are the lessons learned from the CSO 018 experience and what considerations should be given to improving future TrashTrap™ system performance?

1. Roadside and Storm Drain Inlet Trash Surveys

To evaluate the street trash problem, COG staff conducted roadside trash surveys in July and November 2000 within an expanded CSO sewershed 018 and 017 study area encompassing approximately 291 acres. Based on the COG Trash Index and Verbal Ranking System (Galli and Corish, 1998) two of the eight street segments surveyed had "Moderate" levels of trash (i.e., 25.1-50 items/100 ft.), three had "Light" levels (i.e., 10.1-25.0 items/100 ft.), and three had levels of "Very Light/None" (i.e., 0-10.0 items/100 ft.). While trash levels varied throughout the study area, residential streets showed a tendency toward lower trash levels than commercial or mixed use streets.

In addition to the roadside trash surveys, COG staff selected at random and surveyed 77 (40 percent of the total) storm drain inlets throughout the study area in August 2000. The survey results revealed a significant level of blockage in study area catch basins, with 8 (10 percent) exhibiting partial blockage (i.e., outlet pipe more than 50 percent submerged) and 59 (77 percent) exhibiting complete blockage (i.e., outlet pipe 100 percent submerged). Estimates by COG staff suggest that the approximate quantity of floatables and debris trapped within catch basins in the study area is on the order of 9,500 lbs. It is likely that such blockages inadvertently reduce the solids and floatables load incident to CSO 018 and that more solids at the outfall could be anticipated with cleaner catch basins.

Although not part of this study, COG staff also conducted roadside trash surveys in two additional Rock Creek CSO sewersheds in the District of Columbia. It should be noted that those surveys revealed significantly lower trash levels, suggesting the need for a 'tailored' approach to street litter control and catch basin cleaning in different CSO catchments within the District, with special consideration to high traffic areas and other trash 'hot spots.'

2. Fresh Creek Netting System Monitoring

COG staff separated, counted, and weighed captured floatables from 10 Netting TrashTrap™ net changes during a 9-month period. The wet weight (drained for 5 minutes) of floatables removed by the system was approximately 453 lbs per month or 4,078 lbs total. The majority of this material was organic debris such as leaves and small tree branches, with the remainder consisting of manufactured materials such as plastic bottles and bags, paper, glass, styrofoam, aluminum cans, etc. Using the observed capture rate, COG staff further estimated that the netting system would be expected to capture approximately 6,345 lbs annually.

To determine the system's floatables capture efficiency, floatables were separated into two broad categories on the basis of actual trapping location: 'netted' floatables, which included all material removed from the CSO effluent by the TrashTrap™ nets and 'fugitive' floatables, which included all material that escaped capture by the nets, but which were contained within the outer floating boom system. Overall floatables capture efficiency of the TrashTrap™ system at CSO Outfall No. 018 was determined to be approximately 86 percent.

To further address the question of capture efficiency COG staff performed a 'mark-recapture' experiment involving the release (into the CSO system) and recapture (from the netting system) of floating plastic balls of various sizes representing the approximate diameters and floatation characteristics of observed floatable materials. The results of the mark-recapture trial suggest a floatables capture efficiency of approximately 83.3 percent. This was comparable to the floatables monitoring results and to the figure indicated by the manufacturer.

Early in the study period COG staff observed CSO-related debris on the netting system platform, a condition suggesting its partial or complete submergence during periods of heavy CSO flow. In an effort to verify such submergence COG staff attached a Global System Model WL-14 Water Level Logger pressure transducer to the netting system deck. Although data were limited due to a lack of high-intensity rainfall events during the recording period, the COG pressure transducer yielded six data points showing deck submergence under either heavy CSO discharge or tidal action. This finding suggests that netting system trapping efficiency may be somewhat reduced under heavy CSO flow conditions.

The Fresh Creek Netting TrashTrap™ system at CSO Outfall No. 018 performed well under four-season use and generally met manufacturer claims, requiring only minor repairs and adjustments, which were performed by the maintenance contractor. Overall, the evaluation of the Fresh Creek Netting TrashTrap™ by COG staff suggests that under appropriate site conditions the system can be a highly effective means of floatables control in the tidal Anacostia River as long as proper maintenance, including regular net changes and system repairs, is performed by a trash removal/river maintenance staff.

3. Storm Tracking

COG staff monitored daily (Monday through Friday) weather patterns between July 2000 and April 2001 via web-based National Oceanic & Atmospheric Administration (NOAA) and Intellicast weather mapping systems. In addition, COG staff regularly downloaded rain gauge data. The results, presented as cumulative precipitation totals, were used to show the relationship between CSO flows and cumulative floatables totals.

4. Conclusions

In an effort to provide a comprehensive assessment of the Fresh Creek Netting TrashTrap™ system performance and to highlight potential design and maintenance modifications that might improve its efficiency, COG staff developed the following suite of recommendations.

Summary of Recommended Design Changes/Modifications

1. Monitoring results underscored the need to incorporate an outer boom feature into the TrashTrap™ system. In COG staff's opinion, this feature should be viewed as an integral part of the netting system.

2. To reduce the likelihood of floatables breaching the outer boom and thereby improve the overall effectiveness of the system, the following design modifications/changes should be considered:

    - Increase the rigidity of the outer boom skirt to reduce excessive flexing/deformation between the integrated floatation blocks as observed under low tide conditions. Alternatively, replacement of the existing clam shell boom with a boom of the smooth, inflatable type might increase floatables retention at low tide while also facilitating the removal of fugitive floatables by maintenance personnel (Note: the clam shell floats have a tendency to trap certain types of floatables, thereby hindering their removal with hand nets).

    - To further increase retention of neutrally buoyant objects, a perforated curtain (similar to one which directs floatable materials into the two nets) should be affixed to the outer boom.

3. To help reduce the likelihood of their being damaged during CSO events, as well as prevent access to the nets by unauthorized individuals, a locking feature integral with the TrashTrap™ system's net access grates should be added.

4. During the course of the study, the rear or riverside portion of the deck showed a gradual decrease in buoyancy amounting to a reduction of several inches in its above water height (i.e., freeboard). Therefore, COG staff recommends that the situation be monitored and that repairs and/or design changes be made as necessary.

5. Consider modifications to the system to prevent submergence of the deck. Possible causes of this include:

- Failure of the relief curtain to lift. Large sections of the curtain were observed folded at the bottom and covered with silt during low tide. This may make it difficult for the curtain to lift during high flows.
- Low freeboard and high turbulence during wet weather.
- Inadequate distance between outfall face and netting system.

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Appendix 1. Table 2. Netting TrashTrap™ Survey Data

1.0 Introduction

1.1 Background

The District of Columbia is one of over 1,100 communities in the United States with a combined sewer system. The District of Columbia Water and Sewer Authority (DC-WASA) operates a combined storm and sanitary sewer system dating from the late 1800's, which serves approximately 12,955 acres or 33 percent of the city. Along with stormwater the combined sewer system (CSS) conveys large quantities of floating trash to the District's receiving waters. A significant portion of this trash originates on streets, road rights-of-way, and sidewalks where it is picked up by stormwater runoff and conveyed through the roadway drainage network into the CSS (Figures 1 and 2).

Figure 1. Roadside Trash in the Anacostia CSO 018 Sewershed

Figure 2. Anacostia CSO 018 Sewershed Storm Drain Inlet Filled with Trash and Debris

In 1994, the U.S. Environmental Protection Agency, in accordance with the 1972 Clean Water Act (CWA), began requiring cities with CSO's to implement "Nine Minimum Controls," a series of Best Management Practices (BMPs) designed to reduce CSO-related impacts through the implementation of a number of relatively simple controls, in concert with a long-term CSO control plan that evaluates alternatives for attaining compliance with the CWA. The Policy also requires CSO permittees to characterize their CSO discharges and to demonstrate implementation of minimum technology-based controls identified in the Policy.

As part of its Nine Minimum Controls program, DC-WASA selected CSO 018 as a demonstration site for a floating, end of pipe netting system. Based on its many years of experience in the areas of trash surveying and floatable trash reduction in the Anacostia River watershed and familiarity with the District of Columbia's CSO system and Anacostia River restoration goals and programs, DC-WASA contracted the Metropolitan Washington Council of Governments (COG) in March 2000 to perform a one-year long independent evaluation of a CSO floatables control netting system. The Fresh Creek Technologies, Inc. Netting TrashTrap™ system was specifically chosen for this Anacostia River pilot demonstration project based on its potential as a floatables control device. This report summarizes the results of a performance evaluation of the facility.

1.2 CSO Floatables Reduction Demonstration Project Area and Outfall Description

Project Area

In its 1999 *Review of BMP's for Solids and Floatables Control* report to DC-WASA the consulting firm of Greeley and Hansen identified CSO Outfall No. 018 (Figure 3) as a potential demonstration site for a floating end-of-pipe netting system. The location, along M Street on the west side of the Anacostia River, approximately 1,000 feet downstream of the Pennsylvania Avenue Bridge, was deemed appropriate for its ease of access and proximity to DC-WASA's skimmer boat off-loading facility. Greeley and Hansen staff also determined that, in addition to CSOs, a large portion of the flow to the CSO 018 site comes from a separate storm water conveyance system and, therefore, the outfall is likely to discharge during every rain event even if a CSO does not occur. The 291-acre study area, portions of which drain to both CSO 017 and CSO 018 (under overflow conditions, approximately 166 acres drain to CSO 018), includes both residential (84 percent) and mixed commercial areas (16 percent) (Figure 4).

Outfall Description

River depth at the outfall site, at mean high tide, averages approximately 10 feet, with a tidal amplitude on the order of 3.5 feet. Among the outfall site's more prominent features is a massive 5.2-foot high stone seawall constructed by the U.S. Army Corps of Engineers in the 1930's. It also includes the reinforced concrete housing with a hinged ten-foot wide by six-foot high wooden tidal gate. Although revitalization plans underway for major portions of the Anacostia River waterfront could ultimately result in dramatic changes to the area, at present there is little recreational or economic activity in the immediate vicinity of the CSO 018 outfall.

1.3 The Fresh Creek Netting TrashTrap™

The Fresh Creek Technologies, Inc. Netting TrashTrap™ floatables collection systems were developed in the mid-1990's in New Jersey for the purpose of capturing and removing floatables from combined sewer overflows. These systems, which can be used for either CSO or stormwater floatables control, rely on the force of flowing water to trap floatables in disposable nylon mesh bags of varying mesh sizes and storage volumes, and can be configured, fabricated and installed to meet a wide range of site conditions. The three available versions of the Netting TrashTrap™ include an in-line version (Figure 5), which is housed in a concrete vault that is generally installed between the combined sewer system regulator chamber and the outfall, an end-of-pipe design typically retrofitted at the end of the outlet using the existing structure (Figure 6), and a floating modular version configured to accommodate the floatables volume and weight anticipated at the receiving waterbody (Figure 7). The systems are serviced from ground level by a truck equipped with a boom and hoist for removing and installing the bags and a dumpster for holding the full bags. In some situations, floating systems can also be serviced by boat.

According to the manufacturer, calculations of peak flow volume, which the system must transmit, peak velocity, which the system will experience, and floatables volume anticipated during the maximum wet weather event are used in the selection of the Netting TrashTrap™ system and, ultimately, are the limiting parameters for most CSO outfalls. With the appropriate

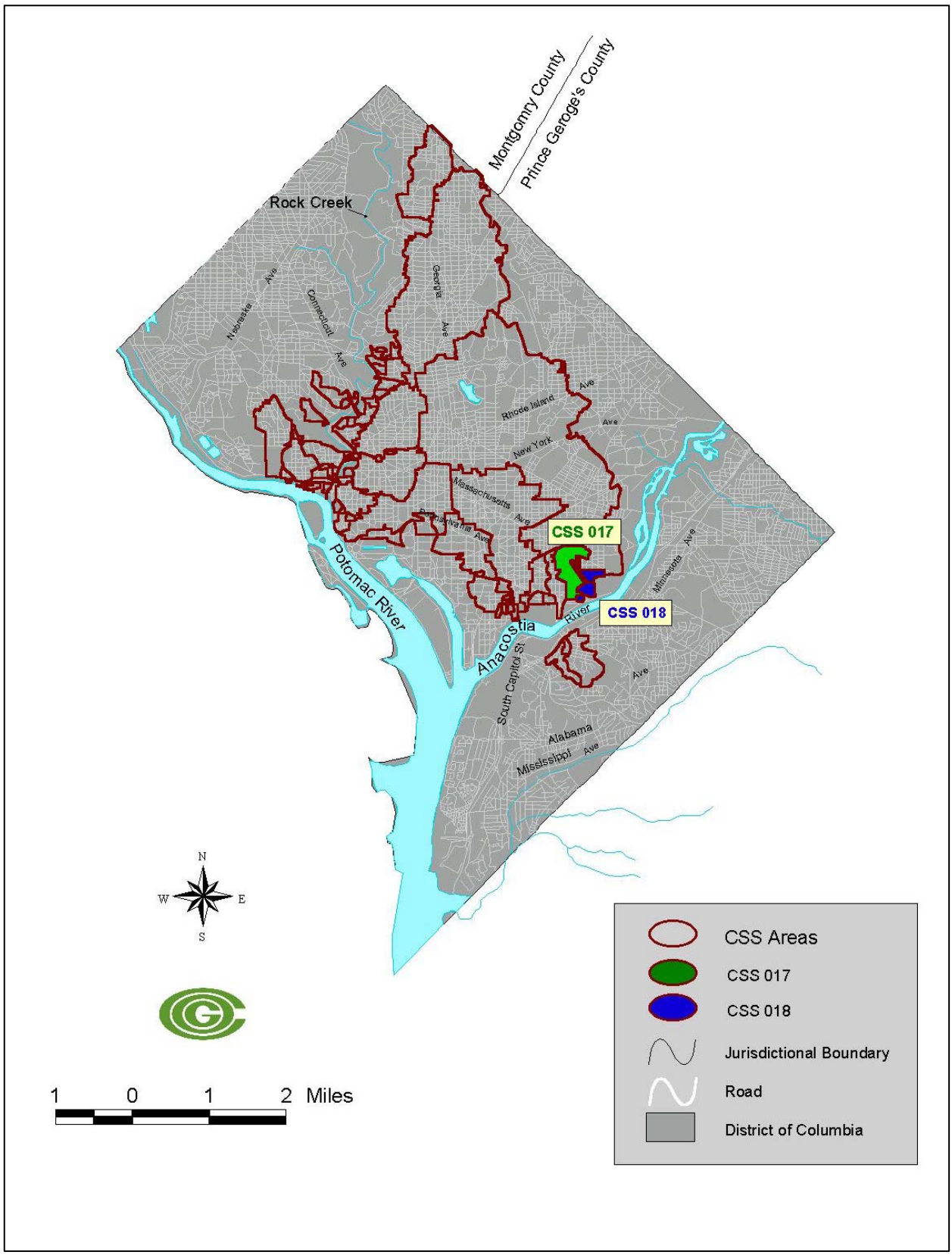

Figure 3. Combined Sewer Areas in the District of Columbia including the Anacostia 017 and 018 Combined Sewer System (CSS) Drainage Areas

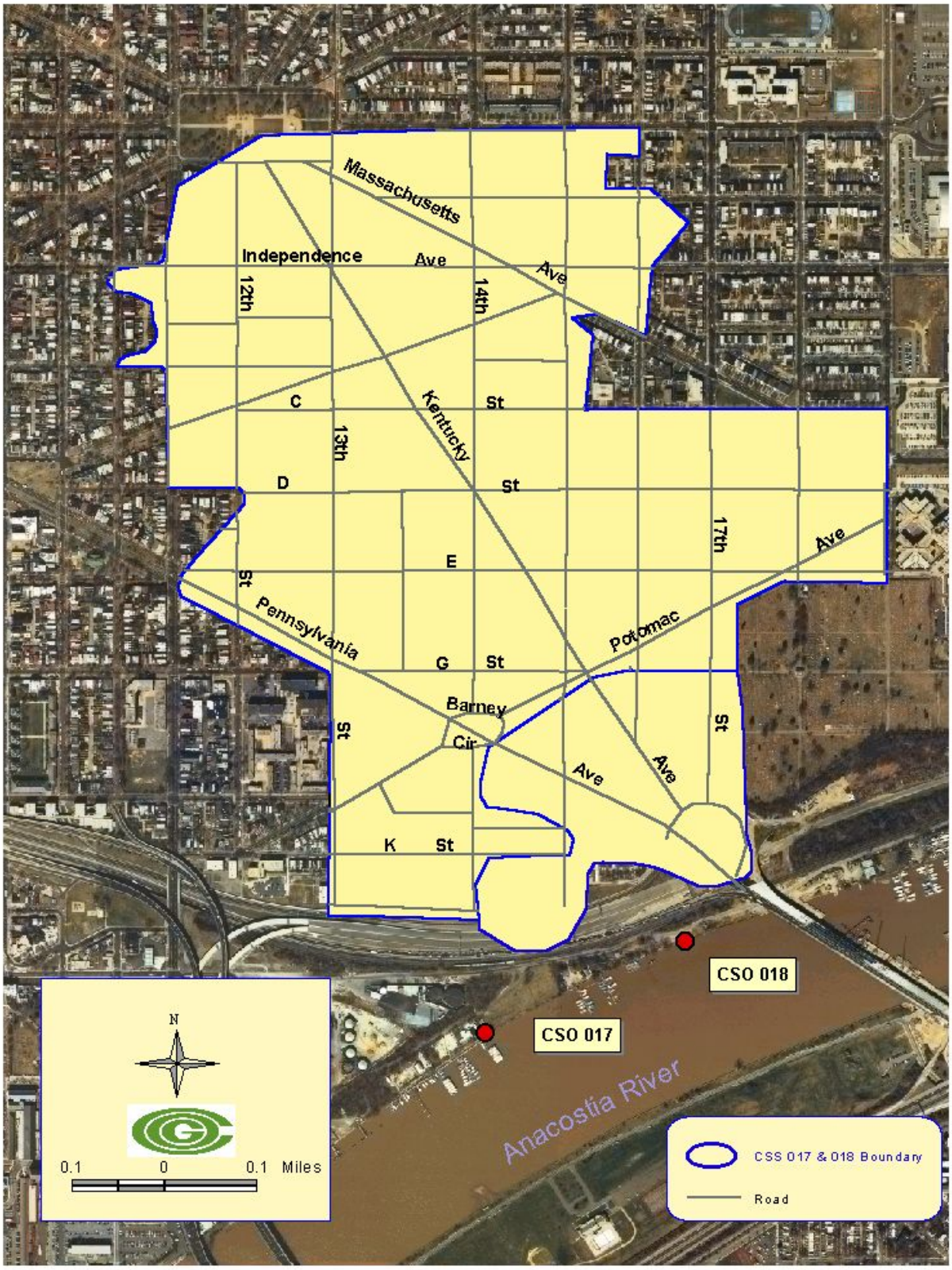

Figure 4. Anacostia CSO 017 and 018 Outfalls and Associated Drainage Areas

system size, bag capacity is generally sufficient to store floatables from multiple CSO events. Each disposable mesh bag has a floatables capacity of up to 25 ft^3 (0.7 m^3) or 500 lbs. (227 kg).

The floating, end-of-pipe Netting TrashTrap™ design utilized at the CSO 018 site supports two nets within a floating frame of aluminum, stainless, and galvanized steel. Two galvanized steel retainer arms with hinged couplings secure the system to the concrete outfall. Two steel pilings immediately adjacent to the seawall feature vertical rollers attached to two heavy-duty PVC coated polyester fabric floating boom/skirt sections, which direct CSO effluent into the nets. Together, the hinged retainer arms and vertical rollers allow the netting system platform and boom to rise and fall with the tides. Surrounding the entire system is a second floating boom. This outer boom was added (per DC-WASA recommendations) to capture 'fugitive' floatables that circumvent the nets. The outer boom is secured to the floating platform via six flexible fiberglass 'outriggers'.

Figure 5. In-Line Fresh Creek Netting System

Figure 6. End-of-Pipe Fresh Creek Netting System

The total cost for the two-net Netting TrashTrap™ system, including design, installation, and one year of maintenance was $300,000. Approximately $53,000 of the total was dedicated for the year-long maintenance contract with Dan White and Sons, Inc., which included replacement nets at a cost of approximately $125 each. The Fresh Creek system is designed and manufactured with a reported life expectancy of at least 20 years. The netting system was made operational in April 2000.

Figure 7. Floating Fresh Creek Netting System at CSO 018

1.4 Study Objectives

As previously stated, COG was selected by DC-WASA in March of 2000 to perform an independent analysis of the Fresh Creek Technologies, Inc. Netting TrashTrap™ System performance, as well as an evaluation of the system's design and maintenance requirements. During the period from August 2000 to April 2001 COG staff characterized the composition and quantity of CSO floatable materials and quantities captured, determined overall netting system trapping efficiency and CSO catchment trash conditions, and prepared tables, graphs, and maps. The four major study tasks included:

- Roadside and storm drain inlet trash surveys to evaluate trash generation in the study area;
- Fresh Creek netting system monitoring to determining floatables capture efficiency;
- Storm tracking to anticipate major rainfall events and, therefore, CSOs; and
- Data analysis and development of recommendations to reduce floatables.

This report documents the above efforts and addresses the following three questions:

1. How effectively does the Fresh Creek Netting TrashTrap™ capture floatables under different seasonal and CSO discharge conditions, and could its performance be enhanced?

2. What are the associated maintenance requirements, including labor and equipment, and how do they influence long-term operation and TrashTrap™ system efficiency?

3. What are the lessons learned from the CSO 018 experience and what considerations should be given to future netting system applications?

2.0 Methodology

2.1 Roadside and Storm Drain Inlet Trash Surveys

Barring its removal by manual or mechanical means, accumulated litter and debris generally finds its way into curbside storm drain inlets. Once there, much of this material, known collectively as floatables, is carried by stormwater runoff to urban waterways via either separate stormwater or combined sewer systems. To gain a more representative picture of the severity of the street trash problem, COG staff conducted roadside trash surveys within an expanded CSO sewershed 018 and 017 study area encompassing approximately 291 acres. The roadside trash surveys were completed in July and November 2000 according to the COG trash survey protocols. Eight street segments totaling approximately two linear miles were selected to provide a representative sample of residential, commercial, and mixed use areas (Figure 6). Trash items observed along the survey segments were tallied and categorized as: 1) paper, plastic bags, and styrofoam, 2) plastic bottles, 3) glass bottles, 4) aluminum cans, 5) oil containers, 6) syringes, 7) condoms, and 8) other. The number of trash items per 100 feet of street length was applied to a relative trash index, which yielded verbal trash level rankings of High, Moderate, Light, or

None/Very Light for each survey segment. The Global Positioning System (GPS) plotted survey segments and trash level data were mapped using GIS.

In August 2000 COG staff selected at random and surveyed 77 storm drain inlets or catch basins representing approximately 40 percent of the total in the same 291-acre catchment area (Figure 8). After removing the manhole cover COG staff inspected each catch basin and recorded the number of items in each of the floatables categories listed above. The height of standing water, the amount of organic debris/sediment, and the degree of blockage of the pipe outlet, if any, were also recorded. For mapping purposes a GPS point was recorded for each inlet surveyed.

2.2 Fresh Creek Netting System Monitoring

COG staff monitored 10 net changes between August 8, 2000 and April 30, 2001 in an effort to capture seasonal influences on netting system operation. An independent maintenance crew, plus a boom truck operator carried out each net change (Figures 9 and 10). After removing and draining the two TrashTrap™ system nets for five minutes the maintenance crew weighed the nets and lowered them into a front end loader operated by the DC-WASA skimmer boat off-load facility staff. The TrashTrap™ maintenance crew then replaced the nets. Fugitive floatables were collected using a long handled skimmer net, placed into a large, heavy gauge plastic bag, and weighed. As illustrated by Figures 11 and 12, upon delivery of the full nets to a concrete pad at the adjacent DC-WASA skimmer boat facility two COG staff members opened the net bags and spread the contents over a large plastic sheet. The contents were then separated into the following categories: 1) paper, plastic bags, and styrofoam, 2) plastic bottles, 3) glass bottles, 4) aluminum cans, 5) oil containers, 6) syringes, 7) condoms, and 8) other. Floatables in each category were counted and weighed separately using a Hanson scale with a 200 lb. capacity (Figure 13). All of the material, including the used nets, was placed into a nearby dumpster for disposal in a landfill.

For the purpose of determining the system's floatables capture efficiency, the CSO 018 floatables were separated into two broad categories on the basis of actual trapping location: 'netted' floatables, which included all material removed from the CSO effluent by the TrashTrap™ nets and 'fugitive' floatables, which included all material that escaped capture by the nets, but which were contained within the outer floating boom system.

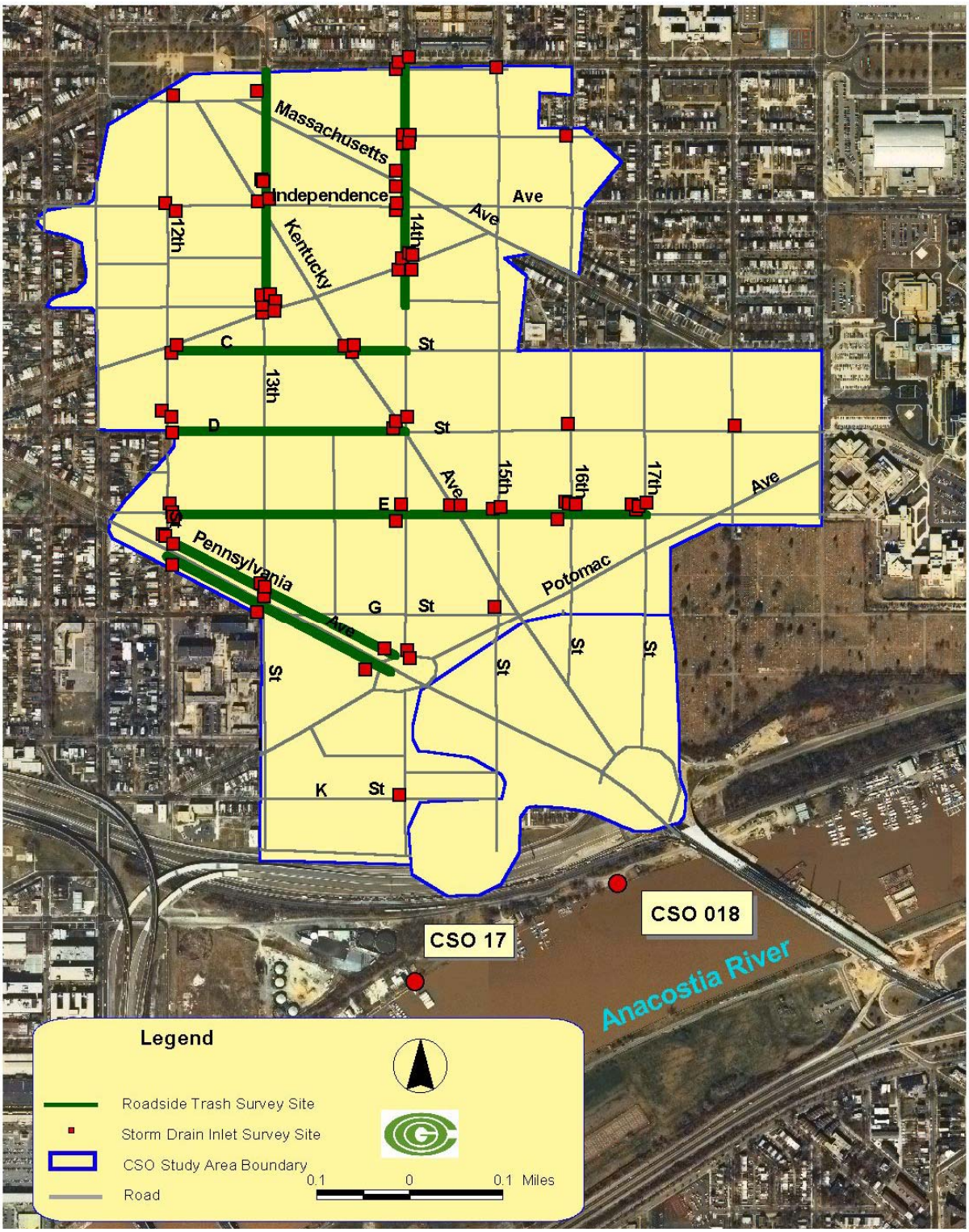

Figure 8. Roadside Trash and Storm Drain Inlet Survey Segments and Locations

Figure 9. Netting Fugitive Floatables from within Outer Boom

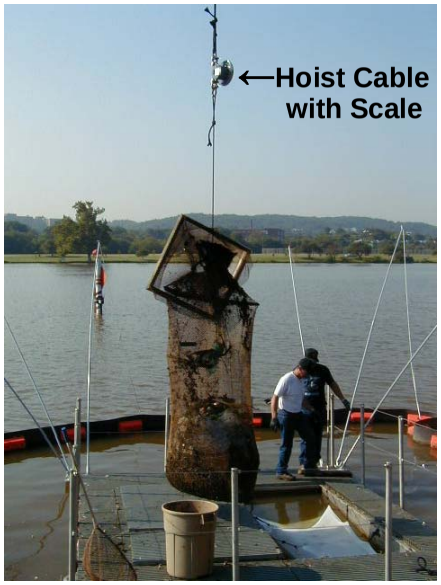

Figure 10. New Net Installed during Dewatering of Netted Floatables

Figure 13. Weighing Floatables

Figure 11. Preparing to Open Nets at DC-WASA Skimmer Boat Off-Load Facility

Figure 12. Separating Organic Debris from Manufactured Floatables

To further address the question of capture efficiency COG staff performed a 'mark-recapture' experiment involving the release (into the CSO system) and recapture (from the netting system) of floating plastic balls of various sizes representing the approximate diameters and floatation characteristics of observed floatable materials. The experiment involved the March 2001 release of a total of 108 balls, each (36 each of plastic balls approximately 2, 3, and 4 inches in diameter) into the CSO 018 outfall housing just 'upstream' from the hinged flood-gate, following a change of the TrashTrap nets by the maintenance contractor (Figure 14).

Figure 14. Mark-Recapture Balls Following Release into CSO 018 System

The observation by COG staff of CSO-related debris on the netting system deck suggested its partial or complete submergence during periods of heavy CSO flow. Additional evidence resulted from the temporary installation of a simple submergence indicator consisting of a section of PVC pipe containing a wooden yardstick and featuring drilled water inlet holes. In an effort to further elucidate the potential submergence of the netting system deck attributable to large CSO discharges and/or tidal activity, COG staff attached a Global System Model WL-14 Water Level Logger pressure transducer to the netting system deck (operational as of 12/8/2000) (Figure 15). COG staff downloaded its pressure transducer data on a monthly basis.

Figure 15. Pressure Transducer Mounted on Netting System Platform

2.3 Storm Tracking

To keep track of meteorological conditions during the study period and to anticipate major precipitation events and, therefore, likely CSOs, COG staff monitored weather patterns between July 2000 and April 2001. Daily (Monday through Friday) tracking of potential storm events was accomplished through the use of the web-based National Oceanic & Atmospheric Administration (NOAA) and Intellicast weather mapping systems. In addition, COG staff regularly downloaded rain gauge data from the Greeley and Hansen CSO rain gauge station network, the USDA – Beltsville Agricultural Research Center (BARC) weather station network, Reagan National Airport, and an Isco Model 3220 Tipping Rain Gauge on loan from DC-DOH/EHA and located near Delcarlia Reservoir in the District of Columbia.

3.0 Results

3.1 Roadside and Storm Drain Inlet Trash Surveys

Roadside Survey

The results of the roadside trash surveys indicate that trash levels vary throughout the study area. As expected, residential streets tended to have lower trash levels than commercial or mixed use ones. Based on the COG Trash Index and Verbal Ranking System (Galli and Corish, 1998) two of the eight street segments surveyed had "Moderate" level of trash (i.e., 25.1-50 items/100 ft.), three had "Light" levels (i.e., 10.1-25.0 items/100 ft.), and three had levels of "Very Light/None" (i.e., 0-10.0 items/100 ft.). It should be noted that the values initially obtained via the COG Trash Index method were subsequently converted and reported on a more commonly used 'items per mile' basis (Figure 16).

On several occasions during the nine-month study period COG staff observed District of Columbia street sweeping machines in operation along Pennsylvania Avenue. It is likely that the on-going sweeping operations account for the notably low trash levels in this high traffic area. It should also be noted that the two segments with "Moderate" rankings are characterized by mixed commercial/institutional use owing to the presence of a large Safeway grocery store and the Catherine R. Watkins Elementary School. Figure 17 shows an aerial photo with the color-coded trash index scores. Table 1 provides a summary of roadside trash survey results. The complete roadside trash survey data set is available as Appendix 1, Table 1.

Storm Drain Inlet Survey

The storm drain inlet survey results revealed that a significant quantity of floatables were captured and contained in catch basins in the study area (Figure 18). Of the 77 catch basins surveyed, 8 (10 percent) were partially filled (i.e., outlet pipe more than 50 percent covered by floatables) and 59 (77 percent) were filled (i.e., outlet pipe 100 percent covered by floatables) (Table 2).

Estimates by COG staff based on the total number of catch basin inlets and the quantity of floatables measured in the surveyed basins suggest that the approximate quantity of floatables and debris trapped within catch basins in the study area may be on the order of 9,500 lbs. It is likely that the floatables captured in the catch basins reduce the overall trash load delivery to the CSO 018 outfall and, hence, to the floating netting system. It should be noted that the results of the storm drain inlet survey influenced the decision by COG staff to release the 'mark-recapture' balls directly behind the CSO 018 tide gate rather than into the storm drain inlet system as originally planned.

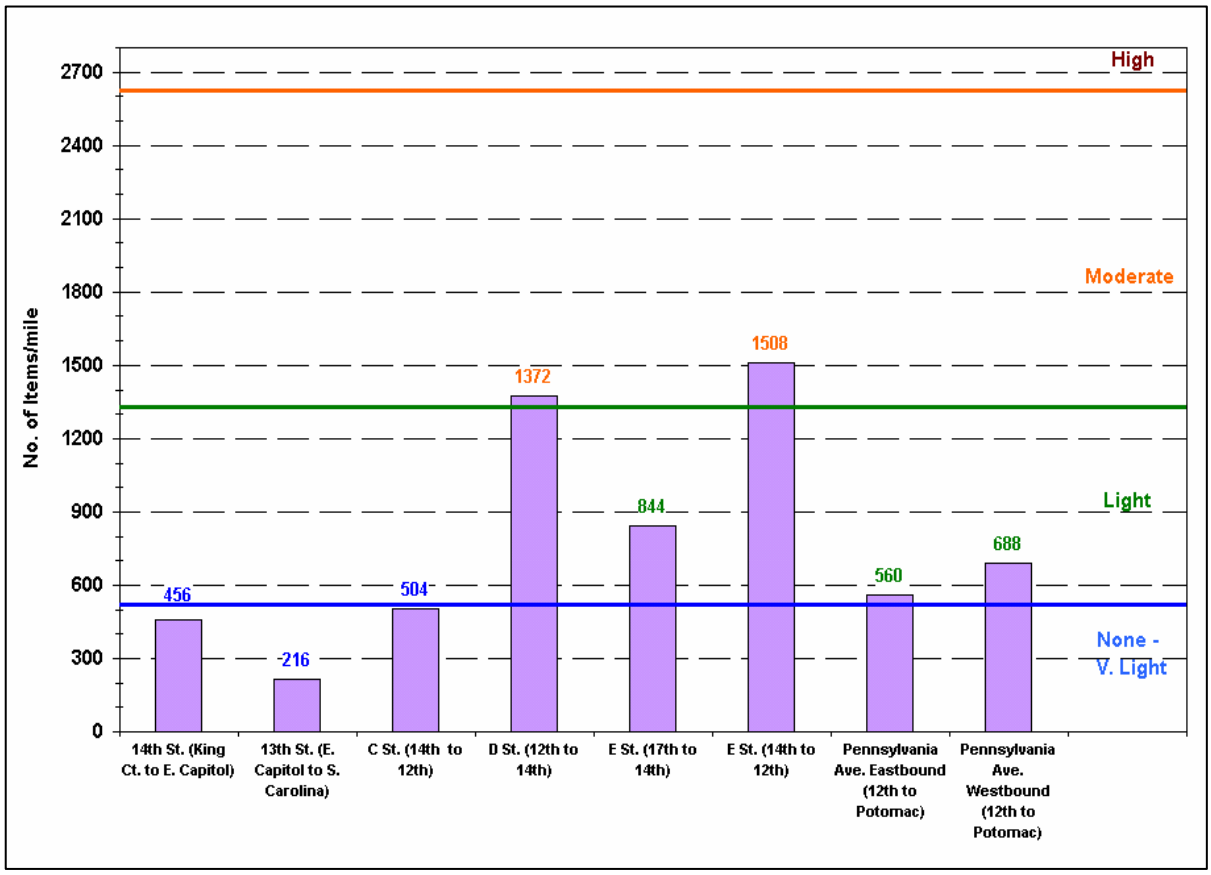

Figure 16. Roadside Trash Survey Results (November 8, 2000)

3.2 Fresh Creek Netting System Monitoring

As shown in Figure 19, the wet weight of floatables removed by the Netting TrashTrap™ system during the 9-month period was approximately 453 lbs per month or 4,078 lbs total for nine months. The majority of this material was organic debris such as leaves and small tree branches, with the remainder consisting of manufactured materials such as plastic, paper, styrofoam, glass, aluminum cans, etc. Using the observed capture rate, COG staff further estimated that the netting system would be expected to capture approximately 6,345 lbs annually (Figure 19). The nets, not included in the above totals weighed approximately 38 lbs each and were disposed of along with their contents. COG staff counted a total of fourteen used hypodermic syringes, some of which contained blood, among the netted and fugitive floatables. Maintenance personnel are, therefore, advised to use caution when handling used nets and their contents and to dispose of syringes and other medical waste according to DC/DOH guidelines.

A summary of both the TrashTrap™ survey results and flow weighted trapping efficiency are shown in Tables 3 and 4. The complete survey data set is available as Appendix 1, Table 3. Figures 20 and 21 shows the composition of floatables.

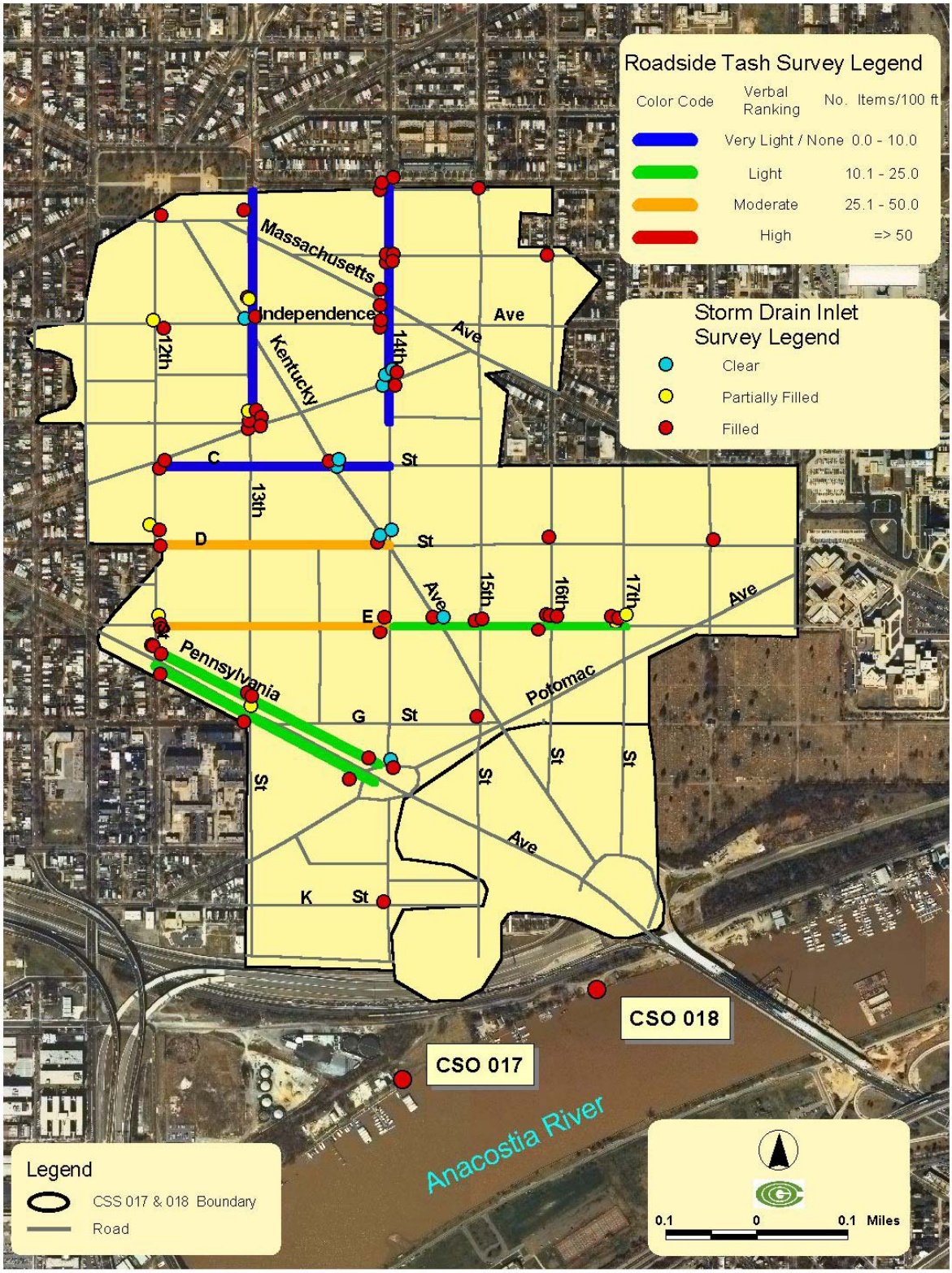

Figure 17. Sample Roadside Trash (10/8/2000) and Storm Drain/Catch Basin Survey Results

Table 1. Summary of July and November 2000 Roadside Trash Survey Results

Survey Segment	1st Survey (July 18, 2000)				2nd Survey (November 8, 2000)			
	Total No. of Items	Items/100 ft.	Items/Mile	Verbal Ranking	Total No. of Items	Items/100 ft.	Items/Mile	Verbal Ranking
14th St. (King Ct. to E. Capitol)	135	10.2	540	Light	114	8.6	456	None-Very Light
13th St. (E. Capitol to S. Carolina)	73	5.5	292	None-Very Light	54	4.1	216	None-Very Light
C St. (14th to 12th)	130	9.9	520	None-Very Light	126	9.5	504	None-Very Light
D St. (12th to 14th)	244	18.5	976	Light	343	26.0	1372	Moderate
E St. (17th to 14th)	155	11.7	620	Light	211	16.0	844	Light
E St. (14th to 12th)	201	15.2	804	Light	377	28.6	1508	Moderate
Penn. Eastbound (12th to Potomac)	142	10.8	568	Light	140	10.6	560	Light
Penn. Westbound (12th to Potomac)	136	10.3	544	Light	172	13.0	688	Light
	1216				**1537**			

Verbal Ranking	Number of Items per 100-ft
None - Very Light	0-10.0
Light	10.1-25.0
Moderate	25.1-50
High	≥50.1

Table 2. Summary of Storm Drain Inlet Survey Results

Date	Street Segment	Total No. of Inlets/ Catch Basins	No. of Partially Filled Catch Basins		No. of Completely Filled Catch Basins		Days Since Last Rain	Mean Height of Standing Water (inches)	Total Number of									
									Plastic Bottles	Alum. Cans	Oil Quart Containers	Glass Bottles	Styro-foam Cups	Paper	Plastic Bags	Trash Items	Trash Items Per Basin	Organic Debris/ Sediment (Mean % of Total Basin Contents)
08/04/2000	12th St. to Kent. Ave.	5	1		3		0.0	16.0	65	1	5	12	75	0	2	160	32.0	44.0
08/04/2000	12th to 14th St.	6	0		3		0.0	7.8	15	7	4	1	21	0	16	64	10.7	67.5
08/04/2000	King Ct. to E. Capitol St.	16	0		13		0.0	23.1	153	5	17	27	138	18	35	393	24.6	39.6
08/04/2000	E. Capitol St. to S. Carolina Ave.	11	2		8		0.0	22.5	74	3	3	17	94	5	31	227	20.6	51.8
08/04/2000	17th to 14th St.	17	3		13		0.0	25.9	252	17	5	16	234	12	62	598	35.2	47.9
08/07/2000	12th St to Potomac Ave.	22	2		19		0.5	18.2	477	19	5	30	344	38	84	997	45.3	55.1
		77	**8**	**10% of Total**	**59**	**77% of Total**												**51.0 % Overall**

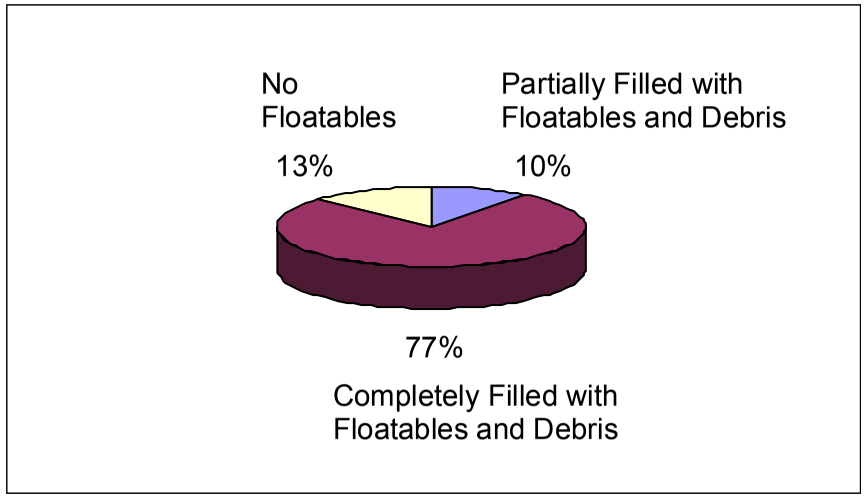

Figure 18. Storm Drain Inlet Survey Results

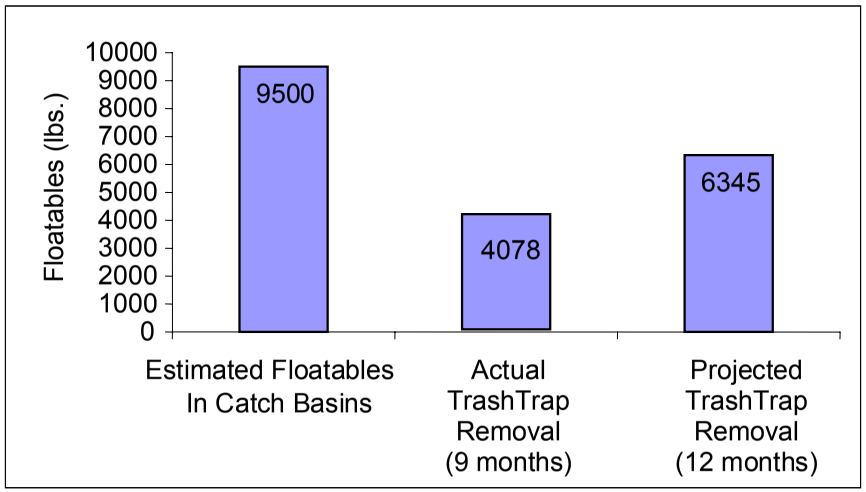

Figure 19. Bar Graph of TrashTrap Survey Results

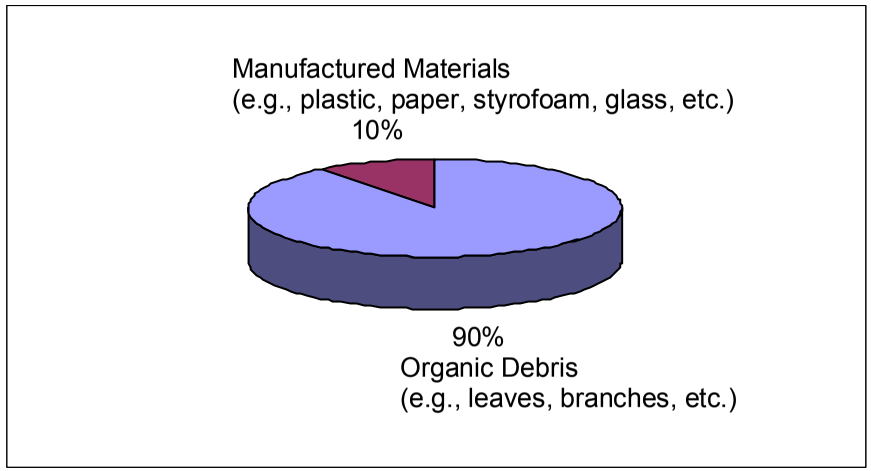

Figure 20. Composition of Debris Captured in TrashTrap
(includes netted and fugitive debris, i.e., floatables)

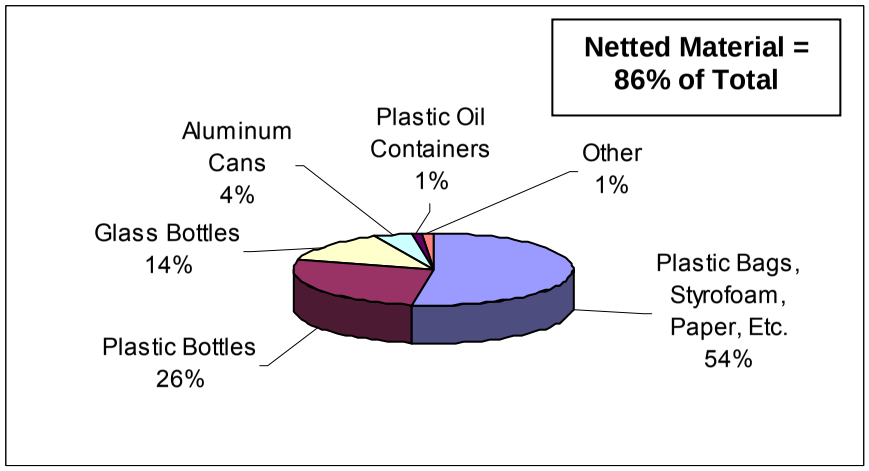

Figure 21. Composition of TrashTrap Net Contents
(from "Manufactured" portion of net contents, by weight)

effluent and the TrashTrap™ net contents, respectively, while Figure 22 shows the composition of fugitive floatables. Figure 23 shows overall floatables capture efficiency of the system, which is based on the amount of floatables retained by the netting system as a percentage of the total net contents plus the 'fugitive' materials captured by the outer boom (i.e., capture efficiency = netted fraction ÷ netted fraction + fugitive fraction x 100; e.g., 3504 lbs ÷ 4078 lbs x 100 = 85.9%).

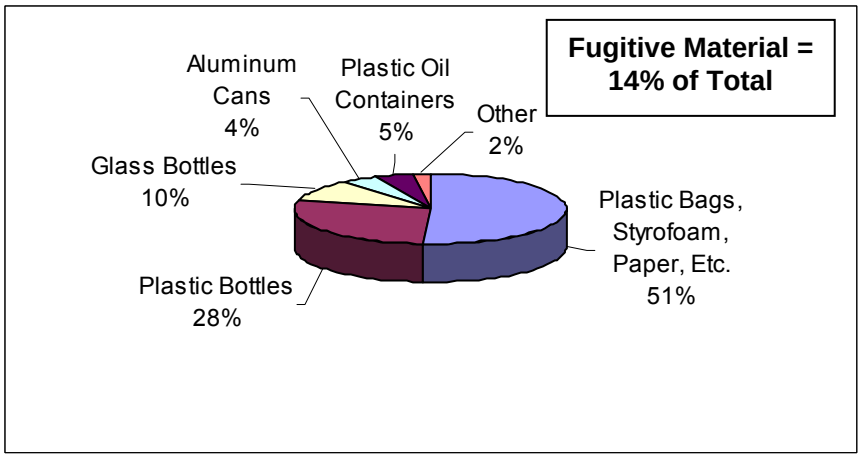

Figure 22. Composition of Fugitive Floatables
(from "Manufactured" portion of fugitive material, by weight)

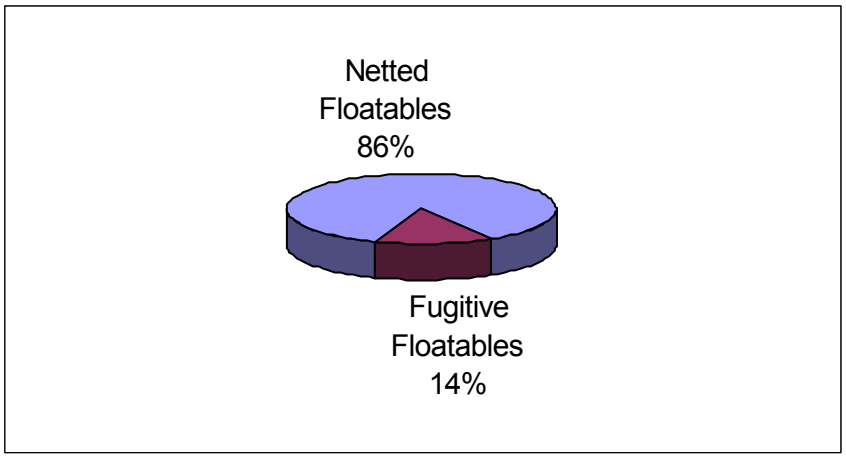

Figure 23. TrashTrap™ CSO Capture Efficiency (86%)

The results of the mark-recapture trial suggest a floatables capture efficiency of approximately 83 percent. This was comparable to the floatables monitoring results and to the figure indicated by the manufacturer. In all, 31 three-inch, 28 four-inch, and 31 six-inch diameter balls were retrieved at the time of the following net change, representing a loss of 18 balls.
One additional four-inch ball was retrieved from one of the nets following a subsequent net change, suggesting that it had failed to pass through the floodgate at the time of the first 'recapture' event. The remaining balls are presumed to have circumvented both the nets and the outer boom, resulting in their discharge into the river

Table 3. Summary of TrashTrap Survey Results, August 2000 - April 2001

Date of Net Change	Netted Floatables								Fugitive Floatables								Overall Total (lbs)
	Manufactured Material				Organic Material			Total (lbs)	Manufactured Material				Organic Material			Total (lbs)	
	No. of Items	Weight (lbs)	% of Net Total	% of Total Material	Weight (lbs)	% of Net Total	% of Total Material		No. of Items	Weight (lbs)	% of Fugitive Material	% of Total Material	Weight (lbs)	% of Fugitive Material	% of Total Material		
8/2/00	522	59	19	16	255	81	68	**314**	Not Separated*							**0**	**314**
8/11/00	208	33.5	15	10	191.5	85	55	**225**	85	17	14	5	103	86	30	**120**	**345**
8/29/00	290	35	9	8	339	91	75	**374**	129	13.5	17	3	66.5	83	15	**80**	**454**
9/14/00	136	15	8	7	174	92	81	**189**	48	7.25	28	3	18.75	72	9	**26**	**215**
9/27/00	270	31	8	8	344	92	83	**375**	134	9.75	24	2	30.25	76	7	**40**	**415**
11/14/00	253	31	6	5	513	94	82	**544**	241	16	20	3	64	80	10	**80**	**624**
12/4/00	69	8.5	3	3	277.5	97	94	**286**	19	1.5	15	1	8.5	85	3	**10**	**296**
12/16/00	229	28.7	6	5	435.3	94	77	**464**	157	11.5	11	2	88.5	89	16	**100**	**564**
2/13/01	Not Surveyed																
3/26/01	248	36.25	8	6	426.75	92	76	**463**	205	27.75	28	5	72.25	72	13	**99.8**	**563**
4/3/01	264	24.5	2	15	129.5	84	79	**154**	14	1	10	1	9	90	5	**10**	**164**
4/30/01	74	10.5	9	8	105.5	91	85	**116**	19	1.75	22	1	6.25	79	5	**7.8**	**124**
Tot/Avg	**2563**	**312.95**	**9**	**8**	**3191.05**	**90**	**78**	**3504**	**1051**	**107**	**18.9**	**2.6**	**467**	**81.2**	**11.3**	**574**	**4078**

Netted Floatables = all material contained within the nets
Fugitive Floatables = all material retrieved from within the outer boom
Manufactured Material = paper, plastic bags, styrofoam, plastic bottles, glass bottles, aluminum cans, oil containers, syringes, condoms, etc.
Organic Material = leaves, sticks, and other organic debris.
* Although not separated, Fugitive Floatables and Organic Debris combined comprised 16% of material captured on this date.

Table 4. Estimated Flow-Weighted Floatables Trapping Efficiency (N=5)

Date of Net Change	Precipitation		Captured Material Weight (lbs)			Total CSO Flow[1] (million-gallons)	Total Material Captured (lbs/million-gallons)
	Number of Events	Total Rainfall (inches)	Netted	Fugitive	Total Captured		
8/2/00	1	0.75	380	60	440	0.210	2095
8/11/00	5	1.29	225	120	345	0.999	345
8/29/00	5	0.64	374	80	454	0.405	1121
9/14/00	5	1.5	189	26	215	0.850	253
9/27/00	2	3.88	375	40	415	2.75	151
							Mean = 566

CSO Flow Period is the total flow between each net change date. Total CSO Flow data for CSO 18 was provided by Greeley and Hansen Consultants.

3.3 Storm Tracking

As previously stated, COG staff monitored daily (Monday through Friday) weather patterns between July 2000 and April 2001 via web-based National Oceanic & Atmospheric Administration (NOAA) and Intellicast weather mapping systems. In addition, COG staff regularly downloaded rain gauge data. The results (Figure 24) are presented as cumulative precipitation totals along with corresponding net change and cumulative floatables weights.

3.4 Pressure Transducer

Although data were limited due to a lack of high-intensity rainfall events during the recording period, the COG pressure transducer yielded six data points suggesting deck submergence (Figure 25). These findings, along with the occasional appearance of trash and organic debris on the netting system deck, suggest that the floating platform experiences some degree of submergence during periods of heavy CSO flow and/or tidal action (Figure 26). This finding further suggests that netting system trapping efficiency may be somewhat reduced under such CSO flow conditions.

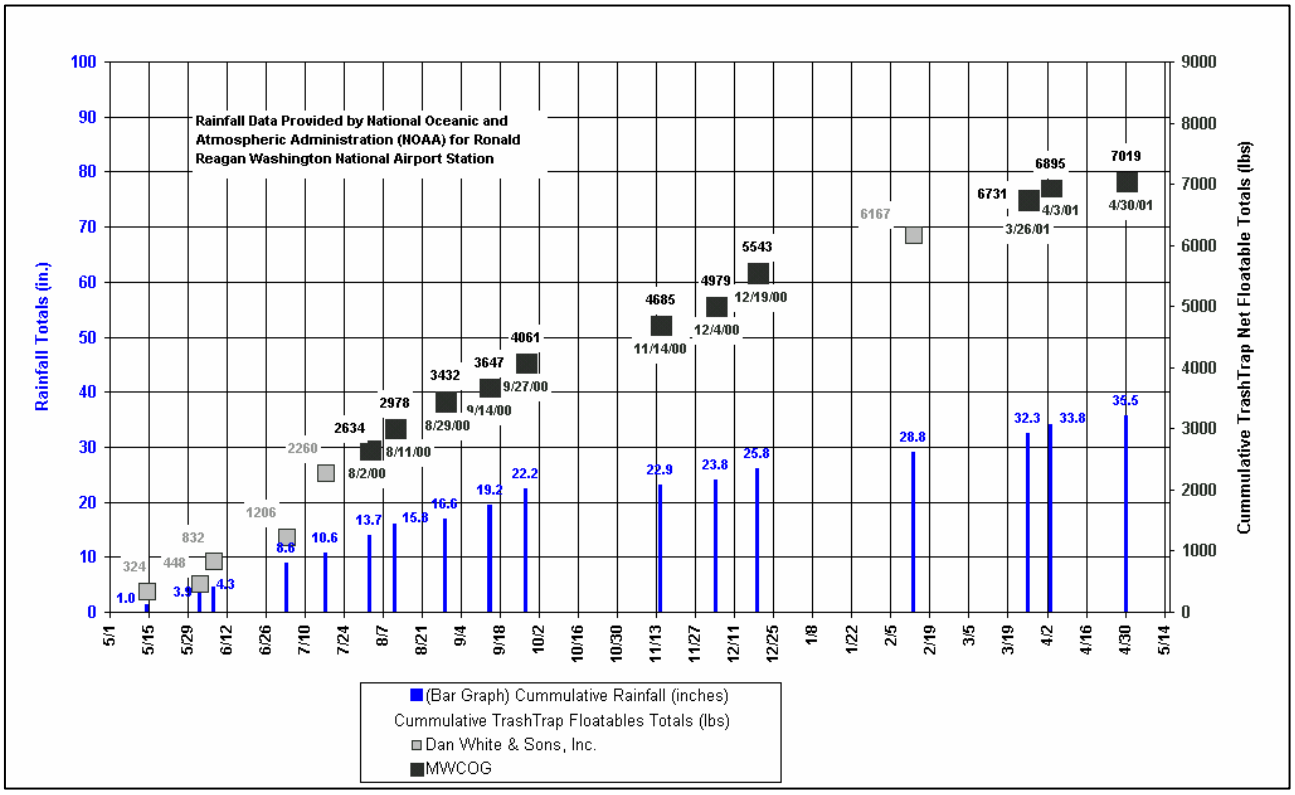

Figure 24. Cumulative Rainfall Totals and Corresponding Net Change/Floatables Survey Dates and Cumulative Floatables Weights

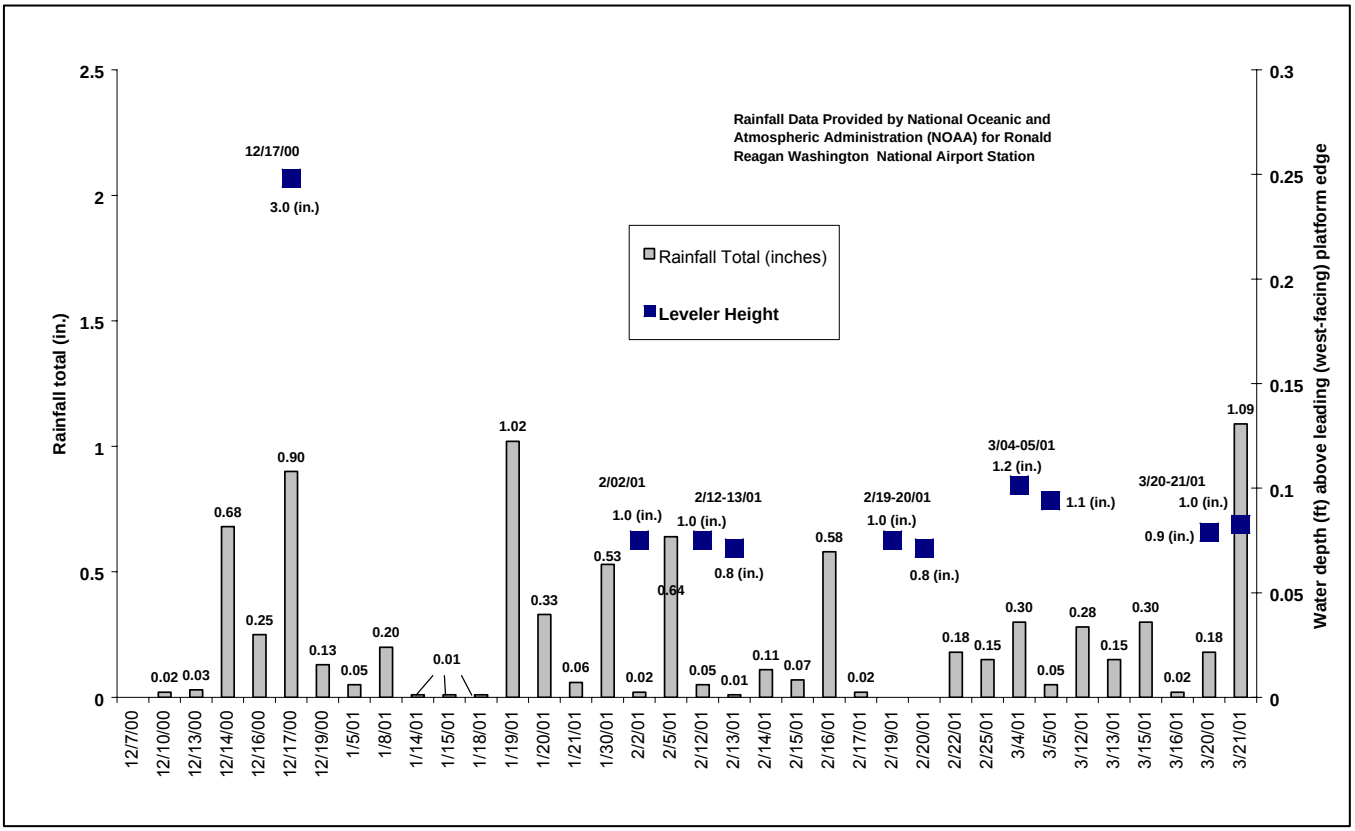

Figure 25. Daily Rainfall Totals and Recorded Platform Submergence as Indicated by Deck Mounted Pressure Transducer

4.0 Discussion

Owing to its location and various other hydrodynamic-related factors the tidal portion of the Anacostia River presents special problems to trash control efforts. Although it is a characteristically sluggish river, typically retaining trash and other pollutants for extended periods, strong river currents and heavy tidal action associated with major storm flows and/or strong winds challenge in-river floatable containment solutions.

The following sections elaborate on the evaluation by COG staff of the current netting system's trapping efficiency, and outline recommendations for improving floatables control by enhancing future netting system performance and maintenance.

Figure 26. Debris on Upper Surface of Netting System Deck as Evidence of Submergence During Periods of Heavy CSO Flow and/or Tidal Action

4.1 Netting System Performance and Design Evaluation

The Fresh Creek Netting TrashTrap™ system at CSO Outfall No. 018 performed well under four-season use and generally met manufacturer floatable capture efficiency claims, requiring only minor repairs and adjustments, which were performed by the maintenance contractor. For illustrative purposes, a schematic diagram of the system's design and function is provided in Figure 27.

It should be noted that, during the study period, the netting system incurred some minor storm-related damage. The first known incidence involved one of the hinged, non-skid net access grates, which was forced open and subsequently damaged during a period of heavy CSO flow. To reduce the likelihood of such occurrences in the future, each of the access grates could be fitted with a stainless steel hasp and locked with a weather resistant padlock (Figure 28). This would also reduce the potential for access by unauthorized individuals. In a separate storm-related incident, one of the two corner stainless steel support brackets for the fiberglass 'outrigger' attachments designed to hold the outer boom in place broke loose and fell into the river. Although the bracket in question was re-welded (Figure 29), modification and/or reinforcement of the other bracket may be warranted.

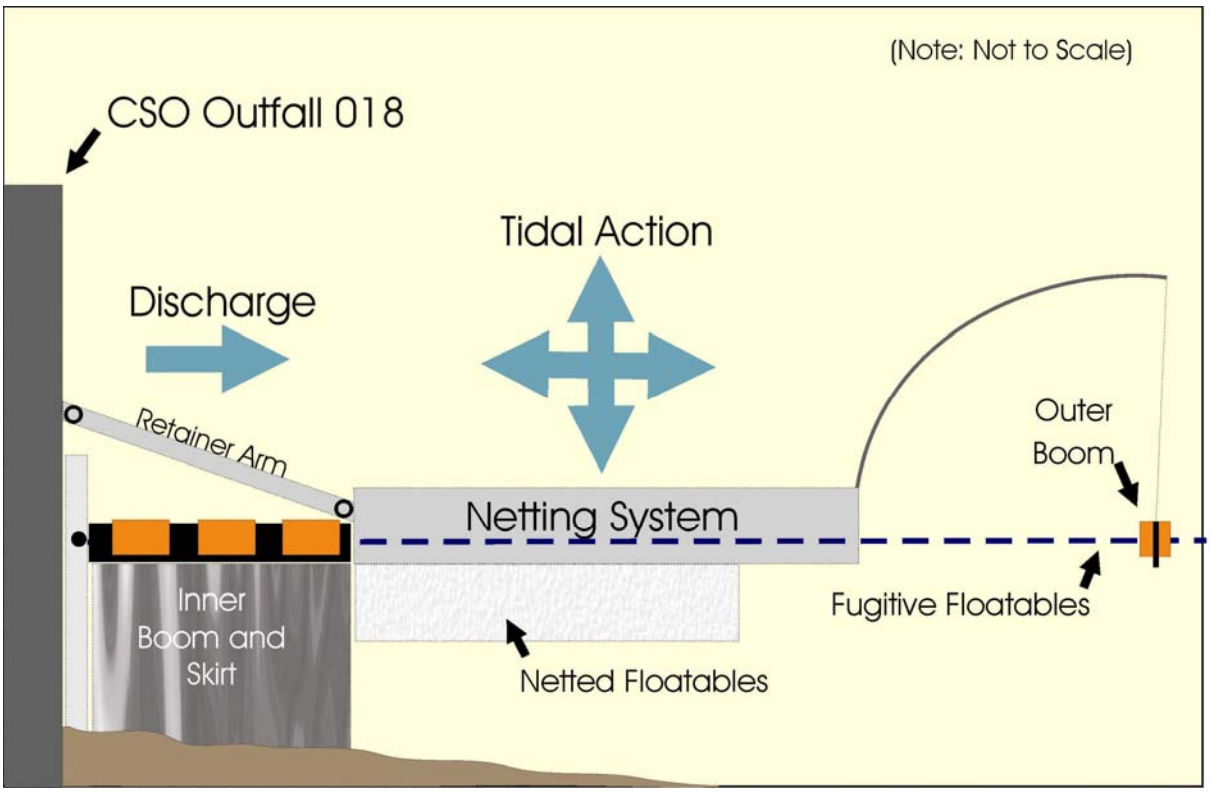

Figure 27. Schematic Diagram of the Floating Fresh Creek TrashTrap™ and CSO Outfall No. 018 Installation Site

As a result of both the exposure of the riverbed at low tide and its irregular contour, a section of the outer floating boom adjacent to the sea wall often rests on its side during low tide. As observed on several occasions by COG staff this condition allows the periodic movement of 'fugitive' floatables over the boom and into the river (Figure 30). This potential for loss of fugitive floatables, which, according to the monitoring results, represents approximately 14 percent of the known floatables from CSO 018, warrants corrective measures. Possible solutions might include the addition of reinforcement to the existing boom to enable it to maintain its vertical position during low tide or experimentation with water filled or inflatable booms.

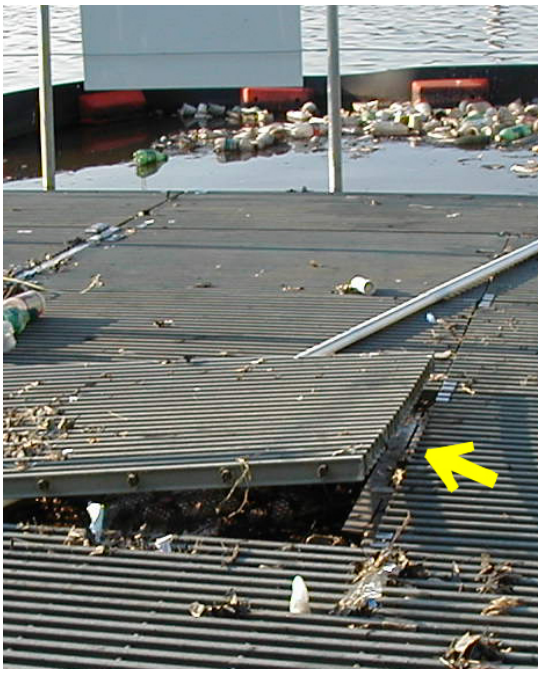

Figure 28. Potential Access Panel Hasp Installation Location

5.0 Operation and Maintenance

In developing an operation and maintenance plan and budget, consideration should be given to the fact that the Netting TrashTrap™ system operates in a hostile environment that is subject to storms, wave action and other unpredictable forces. As such, regular and frequent visual inspections of the system along with timely maintenance in compliance with the manufacturer's guidelines and repairs by qualified personnel are necessary to ensure its long-term viability and maximum trapping efficiency.

Maintenance costs associated with Netting TrashTrap™ units are largely dependent upon the frequency and size of CSO events. Aside from frequency, the principal budget considerations include the cost of replacement nets, the cost of removing and disposing of used nets and floatables, boom truck operating costs and routine maintenance and repairs.

Figure 29. Vulnerable 'Outrigger' Mounting Brackets

The net change procedure can generally be completed in one to two hours by two maintenance personnel plus a boom truck operator. In addition to periodic, detailed inspections of the system, certain features and characteristics of the CSO 018 installation site such as water depth and protective fencing should also be monitored and inspected.

Figure 30. Floatables Breaching Flexible Floating Boom During Low Tide

The following data are available regarding operation and maintenance costs:

- CSO 018 – the bid price for one year of operation, maintenance and flow monitoring was $53,000. Based on other projects (EPA, 1999), flow monitoring is expected to cost approximately $1,700 per month or $20,400 per year. Subtracting this amount yields a total operation and maintenance cost of approximately $32,600 per year. In the nine months of the performance evaluation, the nets were changed 12 times. If this frequency were maintained, there would be approximately 16 net changes per year.

- According to an EPA summary (EPA, 1999), operation and maintenance costs for a typical two-net system during a demonstration in Newark were approximately $20,095 per year ($18,000 for the netting system plus $2,095 per year for waste disposal).

The estimated one-year demonstration project operation and maintenance budget of $32,600 represents approximately 13 percent of the total project budget. Although future costs are projected to be somewhat lower, the maintenance intensive nature of this system dictates that operation and maintenance costs will remain relatively high compared to the typical range of 1-8 percent for typical capital facilities (EPA, 1993). Minimum annual time and cost estimates for TrashTrap™ operation and maintenance are presented in Table 5 in an effort to provide DC-WASA staff with a summary of inspection and preventative maintenance items, as well as projected repairs to the system over its 20 + year operational life-span. A parts list with associated costs for those components expected to require repair and/or replacement over the netting system's operational life span is included in Table 6.

Table 5. Minimum Annual Time and Cost Estimates for TrashTrap™ Operation and Maintenance (based on 2001 costs)

Description	Labor Hours[1]/ Frequency	Estimated Annual Labor and Materials Cost
Inspection		
1. Outer boom - inspect by boat for tears/deterioration	I.0 hr/annually	$20
2. Inner boom/skirt - inspect for tears/ deterioration at low tide	0.5 hr/annually	$10
3. Nets - inspect for capacity/tears	0.25 hr/15 days[2]	$122
4. Bulkhead rollers and fittings – inspect for wear	0.25 hr/annually	$5
5. Deck grating – inspect for structural integrity	0.25 hr/annually	$5
6. Freeboard height – check water level marks	0.25 hr/annually	$5
7. Water depth – check for pontoon clearance at low tide	0.25 hr/annually	$5
8. Signage – check fasteners/ legibility- replace as needed	0.25 hr/5 yrs.	$1
9. Fence/Gate –check for stability	0.25 hr/5 yrs.	$1
10. Netting system removal and pontoon Inspection	32.0 hrs/15 yrs.	$43
Subtotal	10.80 hrs/yr	$217
Floatables Removal and Disposal		
11. Net change[3] @ $120/net, using DC-WASA boom truck	4.0 hrs/20 days	$11,160
12. Fugitive floatables	1.0 hr/15 days	$973
13. Disposal, including 8 yd dumpster contract @ $190/month	1.0 hr/20 days	$3,010
Subtotal	115.60 hrs/yr	$15,143
Major Maintenance and Repairs		
14. Inner boom/skirt replacement	16.0 hrs/2 yrs.	$2,120
15. Outer boom replacement	16.0 hrs/2 yrs.	$3,080
Subtotal	16.00 hrs/yr	$5,200
Total	**142.40 hrs/yr**	**$20,560**

[1]Labor costs based on a two-person crew at an estimated $20/hr wage. Boom truck operating costs are based on an estimated rate of $50/hr.
[2]Days = calendar days
[3]Net change frequencies based on an estimated rate of 18 net changes per year

Table 6. Netting System Parts List and Associated Costs[1]

Part	No. of Items	Unit Cost
1. Side curtain (i.e., inner boom)	2	$1,8000
2. Tide riser @ headwall roller (attachment point for Inner boom)	2	$700
3. Fiberglass deck panel a. 4' x 3' hinged b. 6' x 3'	6 -	$1,000 $1,260
4. Hinge hold down rod assembly (i.e., stainless steel fitting for access grate panels)	-	$70
5. Clips and flathead screws for fixed deck grating	-	$8
6. Mooring whip (i.e., fiberglass outrigger pole)	6	$325
7. Mooring whip mounting plate (i.e., stainless steel outrigger mounting/support)	2	$1,250
8. Spring clip (for attaching outrigger line to outer boom)	6	$10
9. Outer boom	1	$46/ft
10. Orange float with hardware (part of boom system)	-	$35
11. Handrail post for deck and catwalk	-	$200
12. Aluminum universal end connector with hardware	-	$190
13. Netting system net	2/change	$120[2]

[1] Source: Fresh Creek Technologies, Inc.
[2] Nets may be purchased in quantities of 50 or more at a cost of $99.00 each

6.0 Summary of Recommended Design Changes/Modifications

In an effort to provide a comprehensive assessment of the Fresh Creek Netting TrashTrap™ system performance and to highlight potential modifications that might improve its efficiency, COG staff developed the following suite of recommendations.

2. Monitoring results underscored the need to incorporate an outer boom feature into the TrashTrap™ system. In COG staff's opinion, this feature should be viewed as an integral part of the netting system.

3. To reduce the likelihood of floatables breaching the outer boom and thereby improve the overall effectiveness of the system, the following design modifications/changes should be considered:

    - Increase the rigidity of the outer boom skirt to reduce excessive flexing/deformation between the integrated floatation blocks as observed under low tide conditions. Alternatively, replacement of the existing clam shell boom with a boom of the smooth, inflatable type might increase floatables retention at low tide while also facilitating the removal of fugitive floatables by maintenance personnel (Note: the clam shell floats have a tendency to trap certain types of floatables, thereby hindering their removal with hand nets).

- To further increase retention by the system of neutrally buoyant objects, a perforated curtain (similar to one which directs floatable materials into the two nets) should be affixed to the outer boom.

4. To help reduce the likelihood of their being damaged during CSO events, as well as prevent access to the nets by unauthorized individuals, a locking feature integral with the TrashTrap™ system's net access grates should be added.

5. During the course of the study, the rear or riverside portion of the deck showed a gradual decrease in freeboard amounting to a reduction of several inches in its above water height (Figure 31 A and B). It should be noted that this situation was unaffected by net changes. Therefore, COG staff recommends that the situation be monitored and that repairs and/or design changes be made as necessary.

6. Consider modifications to the system to prevent submergence of the deck. Possible causes of this include:

   - Failure of the relief curtain to lift. Large sections of the curtain were observed folded at the bottom and covered with silt during low tide. This may make it difficult for the curtain to lift during high flows.
   - Low freeboard and high turbulence during wet weather.
   - Inadequate distance between outfall face and netting system.

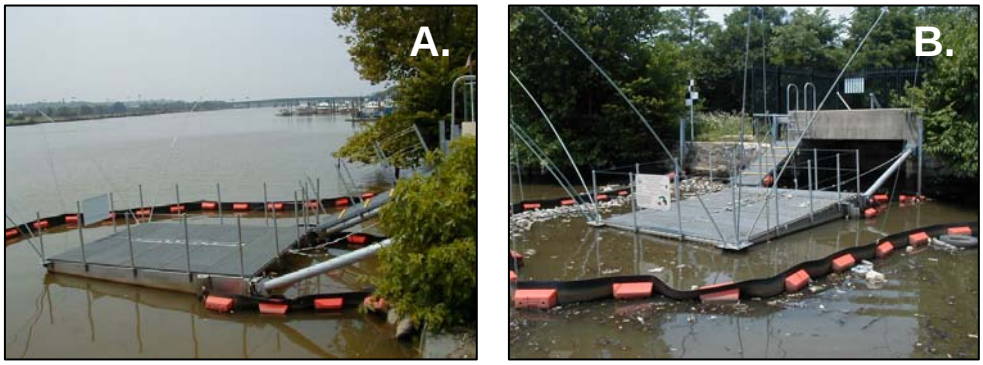

Figure 31. Rear Deck Height June 2000 Versus June 2001

8.0 References

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9.0 Appendices

Appendix 1. Table 1. Roadside Trash Survey Data

Survey Date: July 18, 2000
Roadside Mileage: 2.0 mi.
Total Number of Items Observed: 1216

Trash Category	Survey Segment								Total
	14th St. (King Ct. to E. Capitol)	13th St. (E. Capitol to S. Carolina)	C St. (14th to 12th)	D St. (12th to 14th)	E St. (17th to 14th)	E St. (14th to 12th)	Penn. Eastbound (12th to Potomac)	Penn. Westbound (12th to Potomac)	
1. Plastic Bags	16	20	21	67	41	35	35	24	259
2. Plastic Bottles	12		10	16	14	26	7	17	102
3. Glass	6	1	4			11	4	5	31
4. Aluminum Cans	6	3	5	10		6	13	10	53
5. Styrofoam Cups, etc.	10	5	6	13	6	4	2	5	51
6. Paper, Cardboard, Cloth, etc.	75	35	68	130	87	114	71	70	650
7. Cigarette Packs	4	6	12	7	5	3	9	4	50
8. Aluminum Foil	1		1			2		1	5
9. Wood Misc.	1	1							2
10. Auto Parts, Wire, Metal	2		1				1		4
11. Diapers			1	1					2
12. Condoms	1								1
13. Newspaper Ties	1	2							3
14. Carpet			1						1
15. Antifreeze Containers					1				1
16. Tennis Balls					1				1
Total	135	73	130	244	155	201	142	136	1216
Segment Length (mi.)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
No. Items/100 ft.	10.2	5.5	9.9	18.5	11.7	15.2	10.8	10.3	
Estimated Items/mi.	540	292	520	976	620	804	568	544	

Verbal ranking of number of trash items/100 ft: None – V. Light = 0 – 10.0, Light = 10.1 – 25.0, Moderate = 25.1 - 50.0, High ≥ 50.1.

Appendix 1. Table 1. Roadside Trash Survey Data

Survey Date: November 8, 2000
Roadside Mileage: 2.0 mi.
Total Number of Items Observed: 1537

Trash Category	Survey Segment								Total
	14th St. (King Ct. to E. Capitol)	13th St. (E. Capitol to S. Carolina)	C St. (14th to 12th)	D St. (12th to 14th)	E St. (17th to 14th)	E St. (14th to 12th)	Penn. Eastbound (12th to Potomac)	Penn. Westbound (12th to Potomac)	
1. Plastic Bags	10	9	25	69	55	101	22	37	328
2. Plastic Bottles	7	5	20	21	19	27	10	10	119
3. Glass			2	12		13	3	3	33
4. Aluminum Cans	8	3	8	23	4	7	5	7	65
5. Styrofoam Cups, etc.	10	6	13	24	13	44	18	21	149
6. Paper, Cardboard, Cloth, etc.	64	27	50	163	101	151	72	84	712
7. Cigarette Packs	9	2	5	22	9	23	9	6	85
8. Aluminum Foil	4	1	3	6		10	1		25
9. Wood Misc.									0
10. Auto Parts, Wire, Metal								2	2
11. Diapers									0
12. Condoms				1	1				2
13. Newspaper Ties	1	1		1	9	1		1	14
14. Carpet									0
15. Antifreeze Containers									0
16. Tennis Balls									0
17. Oil Containers	1			1					2
18. Tire								1	1
Total	114	54	126	343	211	377	140	172	1537
Segment Length (mi.)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
No. Items/100 ft.	8.6	4.1	9.5	26.0	16.0	28.6	10.6	13.0	
No. Items/mi.	456	216	504	1372	844	1508	560	688	

Verbal ranking of number of trash items/100 ft: None – V. Light = 0 – 10.0, Light = 10.1 – 25.0, Moderate = 25.1 - 50.0, High ≥ 50.1.

Appendix 1. Table 2. Fresh Creek Netting TrashTrap™ System Performance Evaluation Results

Date	8/2/2000		8/11/2000		8/29/2000		9/14/2000	
NET CONTENTS								
	# of Items	lbs.	# of Items	lbs.	# of Items	lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	156	26	54	10	47	10	41	5
Glass	12	9	5	4	13	8	3	2
Aluminum Cans	19	2	10	3	6	.5	6	1
Oil Containers	5	1	1	.5	2	.5		
Syringes	3						1	
Condoms	5				7		2	
Plastic Crate	1	2						
Shoe	1	1						
Miscellaneous**	320	18	138	16	215	16	83	7
Floatables* Total	522	59	208	33.5	290	35	136	15
% of Net Total		19		15		9		8
Organic Debris								
Leaves, Branches, etc.		254		190.5		339		174
Rats	1	1	1	1				
Organic Total		255		191.5		339		174
% of Net Total		81		85		91		92
Net Total		314		224		374		189
% of Outfall Total		84		65		82		88
FUGITIVE MATERIALS								
Material	# of Items	lbs.	# of Items	lbs.	# of Items	lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	No data	No data	25	4	19	2	8	.5
Glass	No data	No data	2	2	2	1	2	1
Aluminum Cans	No data	No data	4	.5	3	.5	3	.5
Oil Containers	No data	No data	2	.5	3	3	1	.25
Syringes	No data	No data			2			
Condoms	No data	No data	5					
Purse	No data	No data			1	2		
Miscellaneous**	No data	No data	47	10	99	5	33	5
Floatables* Total	No data	No data	85	17	129	13.5	48	7.25
% of Fugitive Total	No data	No data		14		17		28
Organic Debris								
Leaves, Branches, etc.	No data	No data		103		66.5		18.75
Rats	No data	No data						
Organic total	No data	No data		103		66.5		18.75
% of Fugitive Total	No data	No data		86		83		72
Fugitive Total	No data	60	85	120	129	80	48	26
Overall Total	522	374	293	344	419	454	184	215

Appendix 1. Table 2. Fresh Creek Netting TrashTrap™ System Performance Evaluation Results

Date	9/27/2000		11/14/2000		12/4/2000		12/19/2000	
NET CONTENTS								
	# of Items	lbs.	# of Items	lbs.	# of Items	Lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	46	6	44	6	5	.5	35	8
Glass	7	6	13	10	2	1	5	4
Aluminum Cans	13	2	14	2	2	.5	7	.5
Oil Containers	3	1	1		1	.5	2	.2
Syringes					1		1	
Condoms	3		1		4		3	
Plastic Crate								
Fix-A-Flat Tire Repair Can			1	1				
Shoe								
Miscellaneous**	198	16	179	12	54	6	176	16
Floatables* Total	270	31	253	31	69	8.5	229	28.7
% of Net Total		8		6		3		6
Organic Debris								
Leaves, Branches, etc.		343		513		275.5		435.3
Rats	1	1			3	2		
Organic Total		344		513		277.5		435.3
% of Net Total		92		94		97		94
Net Total		374		544		284		464
% of Outfall Total		90		87		97		82
FUGITIVE MATERIALS								
	# of Items	lbs.	# of Items	lbs.	# of Items	Lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	31	4	39	6	2	.5	22	2
Glass	1	.5	1	.5				
Aluminum Cans	1	.25	6	1			4	.5
Oil Containers			1	.5	1	.5		
Syringes			5				1	
Condoms	2		3		1		1	
Miscellaneous**	99	5	186	8	15	.5	129	9
Floatables* Total	134	9.75	241	16	19	1.5	157	11.5
% of Fugitive		24		20		15		11
Organic Debris								
Leaves, Branches, etc.		30.25		64		8.5		88.5
Rats								
Organic Total		30.25		64		8.5		88.5
% of Fugitive		76		80		85		89
Fugitive Total	134	40	241	80	19	10	157	100
OVERALL TOTAL	404	414	494	624	88	294	386	564

Appendix 1. Table 2. Fresh Creek Netting TrashTrap™ System Performance Evaluation Results

Date	2/13/2001		3/26/2001		4/3/2001		4/30/2001	
NET CONTENTS								
	# of Items	lbs.	# of Items	Lbs.	# of Items	Lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	Not Surveyed		22	5	16	4	13	2
Glass			2					
Aluminum Cans			5	1	3	.5	4	.5
Oil Containers			2	.25				
Syringes								
Condoms			1					
Plastic Crate								
Fix-A-Flat Tire Repair Can								
Shoe								
Miscellaneous**			215	30	245	20	57	8
Floatables* Total			248	36.25	264	24.5	74	10.5
% of Net Total				8		16		9
Organic Debris								
Leaves, Branches, etc.	Not Surveyed			426.75		129.5		105.5
Rats								
Organic Total				426.75		129.5		105.5
% of Net Total				92		84		91
Net Total		620		464		154		166
% of Outfall Total		87		82		94		94
FUGITIVE MATERIALS								
	# of Items	lbs.	# of Items	Lbs.	# of Items	Lbs.	# of Items	lbs.
Floatables*								
Plastic Bottles	Not Surveyed		63	10	1	.25	6	1
Glass			7	6				
Aluminum Cans			2	.5	1	.25	3	.5
Oil Containers			2	.25				
Syringes							1	
Condoms								
Miscellaneous**			131	11	12	.5	9	.25
Floatables* Total			205	27.75	14	1	19	1.75
% of Fugitive Total				28		10		22
Organic Debris								
Leaves, Branches, etc.	Not Surveyed			72.25		9		6.25
Rats								
Organic Total				72.25		9		6.25
% of Fugitive				72		90		78
Fugitive Total		80		100		10		8
OVERALL TOTAL		624		564		164		124