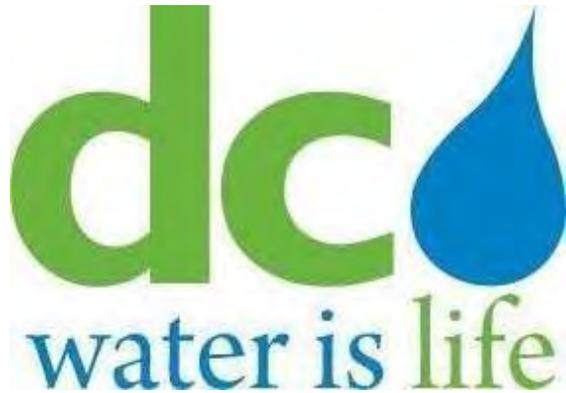


PREPARED FOR:



**DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY**

**5000 OVERLOOK AVENUE, SW
WASHINGTON DC 20032**

PREPARED FOR:



**1200 FIRST STREET, NE
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WASHINGTON, DC 20002**

**PROJECT: MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4)
REPORT ON OPTIMAL PLAN FOR CATCH BASIN
CLEANING, INSPECTION, AND REPAIR**

LOCATION: CITYWIDE, WASHINGTON, D.C.

DATE: JUNE 2013

DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY

MS4 – OPTIMAL PLAN FOR CATCH BASIN CLEANING AND REPAIR

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EXECUTIVE SUMMARY

Discharges from the storm sewer system to water bodies are regulated by the National Pollutant Discharge Elimination System (NPDES) program as part of the Clean Water Act. The Environmental Protection Agency (EPA) issues an NPDES permit to the District of Columbia (District) for discharges from its Municipal Separate Storm Sewer System (MS4). The District was issued its first permit in April 2000; subsequent permits were issued in August 2004 and October 2011. These permits regulate discharges to waters of the United States from the District's MS4 areas within limitations of the permit.

Under Section 4.3.5.1 of the permit, the District is required to prepare "...a plan for optimal catch basin inspections, cleaning, and repair..." The goal of an optimal plan is to improve operation of the MS4 by reducing "solids and floatables." U.S. Environmental Protection Agency (EPA) issued a notice to reset the effective and enforceable date of the permit to January 22, 2012 (see letters attached in Appendix B).

The purpose of this report is to:

1. Evaluate the existing DC Water catch basin inspection, cleaning, and repair program and;
2. Present a plan for optimizing the inspection, cleaning, and repair of catch basins in the District of Columbia.

Pursuant to D.C. Official Code §8-202(b), DC Water is only authorized to maintain the public sewer system, including appurtenances such as catch basins, from the public sewer main to the property line of each lot, i.e. "public space." D.C. Official Code defines "public space" as all the "*publicly owned property between lines on a street, as such property lines are shown on the records of the Surveyor of the District of Columbia, and includes any roadway, tree space, sidewalk, or parking between such property lines.*" Also, pursuant to Section 4.3.7 of the MS4 Permit, the Government of the District of Columbia is responsible for implementing the operation and maintenance program at all municipal facilities located in the DC MS4 Permit Area. In this regard, catch basins located within a District facility property, installed for the purpose of stormwater management, are the responsibility of that facility agency. Although DC Water cleans and maintains catch basins located in public space throughout the District including high capacity thoroughfares, DC Water does not clean and maintain those catch basins with granite

top slabs, and those owned and maintained by the National Park Service (NPS).

The District's municipal sewer system is comprised of both a separate sewer system and a combined sewer system. The system also includes two types of catch basins: Standard and Water Quality which are discussed in detail in the following section. Table ES-1 below shows the number of catch basins within the two sewer systems. The area served by the separate storm sewer system is also referred to as the MS4 area.

Table ES - 1: District of Columbia 2012 Catch Basin Inventory per Sewer System Type

Catch Basin Type	Sewer System		Total
	Separate / MS4	Combined	
Standard	14,082	10,702	24,784
Water Quality	388	27	415
Total	14,470	10,729	25,199

Standard catch basins were installed during road construction to prevent street flooding, predating concerns about water quality impacts from stormwater runoff. The new generation of catch basins are also installed during road reconstruction but incorporate water quality protection into their design. Water quality protection objectives also require efficient cleaning of standard catch basins and an effective street sweeping program.

Crews from the Department of Sewer Services (DSS), Maintenance and Inspection Division at DC Water conduct the cleaning and inspection of standard catch basins. Table ES-2 shows the personnel and equipment used in this program.

Table ES - 2: Catch Basin Cleaning Equipment and Personnel Data

Parameter	Quantity / Type
Equipment Type	9 / Stetco Clamshell Bucket
Age of Equipment (Average)	7 years old
Number of Crews per Day	6 to 7
Number of Employees per Crew	2

The daily goal of the program is to clean and inspect a minimum of 25 standard catch basins per day per crew. The annual goal of the program is to clean all catch basins at least once per year in accordance with the MS4 permit requirement. The daily cleaning production average is between 27-32 catch basins. The lower end of this range yields approximately 40,000 catch

basins annually, which results in a cleaning frequency of approximately 1.6 times per year. Areas susceptible to flooding are cleaned more frequently, especially when a heavy rainfall event is expected. Inspection of catch basins is limited to visual assessment of any obvious defects at the time of cleaning. When a catch basin is found to have a structural defect, DC Water deploys a repair crew to perform the necessary repairs.

Debris collected by the catch basin cleaning crew is taken to a dedicated pad at the Benning Road Transfer Station to decant excess water. A debris contractor hauls the debris to landfills. At the landfill, the weight of debris is recorded and submitted to DC Water for invoicing and payment.

At present, cleaning and inspection of water quality catch basins (WQCB) in the MS4 area are funded by DDOE. Currently, DC Water has contracted Gann Tek, Inc. to clean and inspect the District's WQCBs. Gann Tek provides DC Water with the following:

- Cleaning and inspection schedule;
- Environmentally responsible and compliant catch basin cleaning service (no unlawful discharges of wash water into the District's MS4);
- Environmentally responsible debris management services by separating recyclable materials and vacuumed materials; and
- Documentation of cleaning and inspection by providing a video recording of the catch basin before and after cleaning, and submission of cleaning and inspection activities reports.

WQCBs are cleaned based on a systematic route developed for each identified area. The cleaning of all WQCBs for 2012 was completed in a six week period. The cleaning duration per catch basin is dependent on the amount of debris and traffic characteristics, but ranges from 10 to 22 catch basins per day. Location and rush hour traffic are taken into consideration when scheduling the cleaning and inspection and in choosing which side of the street will be cleaned first. The contractor notifies DC Water and DDOE (Watershed Protection Division, Inspection and Enforcement Branch) with the location and number of catch basins to be cleaned every day. Public safety is the main objective of the repair program. As catch basins are typically located near street corners, these are susceptible to vehicle impact. Reports of damaged catch basins are received from either the public through DC Water Customer Service or from the catch basin cleaning crew.

The frequency of cleaning is the metric of the program's success or failure. The current goal is an average of one annual cleaning per catch basin averaged throughout the entire system which

is met or exceeded every year.

To determine industry standards for cleaning, inspecting, and repair of catch basin, a benchmarking survey was conducted. Thirty municipalities were approached for data collection and eleven participated in this survey which included 25 questions. A comparison of the survey results and DC Water's current program yields the following findings:

- Most of the municipalities that participated in this survey have a cleaning frequency of once per year for both the water quality catch basins and the standard catch basins. This is similar to the cleaning frequency for the District.
- Half of the municipalities that participated have a catch basin inspection program separate from the catch basin cleaning program. DC Water conducts the inspection during the cleaning operation.
- The annual budget that each municipality allots to catch basins is for activities such as cleaning, inspection, repair, and debris management. Disposal to a landfill is the universal means of disposal, including for the District.
- All municipalities surveyed indicated that the top three goals and drivers of their cleaning and inspection program are (1) customer service, (2) regularly scheduled maintenance, and (3) to minimize flooding. These three goals are consistent with DC Water catch basin maintenance program goals.
- The jet-vacuum combination truck is the most widely used cleaning equipment among those surveyed, while the District relies on clamshells.
- Out of the 5 municipalities that provided supporting data, crew production was in the range of 25-30 catch basins a day, In the District, the average number of catch basins cleaned per day per crew is 27-32.
- All municipalities surveyed indicate the number of catch basins cleaned and inspected during a year is the top performance metric to measure success of their program. More than half of the respondents indicate that reduction in the number of complaints is another performance metric they use. DC Water uses the number of catch basins cleaned in a year as its performance metric.
- Among the municipalities that were surveyed, ArcGIS is the most widely used software. DC Water uses Maximo and ArcGIS.
- On average, municipalities surveyed spend about \$50 per year per catch basin on cleaning and inspection. DC Water spends about \$48 per year per catch basin on cleaning and inspection.
- More than half of the survey respondents indicate public safety is the most important priority for catch basin repair. In DC, public safety is the top priority.

- Among the municipalities that were surveyed, no single technology could be identified that is commonly used for water quality improvement. There is a range of technologies that has been used with varying degrees of success. Six out of the 11 municipalities is using a type of catch basin water quality feature. The most common catch basin water quality feature among the municipalities is the baffle box or an oil/grit separator. In the District, most catch basins have a sump.
- The District's daily catch basin cleaning production equivalent and its overall catch basin cleaning, inspection and repair program meets the industry standard based on the benchmarking survey responses recorded.

The benchmarking survey results indicated that DC Water's current catch basin cleaning, inspection, and repair program is comparable to the best management practices employed by a number of municipalities throughout the United States. Based on the survey results and the review of DC Water's current catch basin program, a plan for optimizing the catch basin cleaning, inspection, and repair program is being developed. The main features of the proposed plan are:

1. Development of Catch Basin Mobile Tracking Application
2. Coordination with DPW Street Sweeping Program
3. Pilot Study for Vacuum Truck
4. Development of a Written Standard Operating Procedure
5. Development of a Training Program

Once approved, we anticipate that the proposed optimization plan would be operational in five years. A timeframe for the proposed optimization plan is shown on Table ES-3.

Table ES - 3: Optimization Plan Implementation Timeframe

Year	Action
Year 1	<ul style="list-style-type: none">• Develop catch basin mobile application• Develop processes for timely submittal and updating of GIS to reflect as-built conditions.• Develop scope and determine funding for vacuum truck pilot study• Conduct training program on SOP• Coordinate with DPW Street Sweeping Program
Year 2	<ul style="list-style-type: none">• Locate catch basins using GPS technology (two years)• Update and populate GIS maps• Conduct pilot study and prepare report
Year 3	<ul style="list-style-type: none">• Locate catch basins using GPS technology (two years)• Continue to develop and populate GIS maps• Test catch basin mobile application• Conduct training program/refresher on SOP
Year 4	<ul style="list-style-type: none">• Revised SOP to include catch basin mobile application• Develop Training Program• Obtain computers needed for catch basin application
Year 5	<ul style="list-style-type: none">• Conduct training program on catch basin mobile application• Conduct training program on SOP

1.0 INTRODUCTION

1.1 PURPOSE

Discharges from the storm sewer system to water bodies are regulated by the National Pollutant Discharge Elimination System (NPDES) program as part of the Clean Water Act. The Environmental Protection Agency (EPA) issues an NPDES permit to the District of Columbia (District) for discharges to local waterways from its Municipal Separate Storm Sewer System (MS4). The District was issued its first permit in April 2000; subsequent permits were issued in August 2004 and October 2011. These permits regulate discharges to waters of the United States from the District's MS4 within limitations of the permit.

Among the requirements in the permit are the following:

- Section 4.3.5 of the permit describes the operation and management of the MS4 as well as the reduction of solids and floatables.
- Section 4.3.5.1 stipulates that within 18 months of the effective date of the permit, the District is required to develop a plan for optimal catch basin inspection, cleaning, and repair.
- Section 4.3.5.2 requires the District to clean each catch basin within DC MS4 Permit Area at least once annually until the optimal plan has been completed and approved.

The goal of an optimal plan is to improve operation of the MS4 by reducing "solids and floatables." On November 4, 2011, separate petitions for review of the permit were filed by DC Water and Wet Weather Partnership, Friends of the Earth, Anacostia Riverkeeper, Potomac Riverkeeper, and the Natural Resources Defense Council. Consequently, on December 20, 2011, the U.S. Environmental Protection Agency (EPA) issued a notice to stay the contested provisions of the permit and reset the effective and enforceable date of the permit to January 22, 2012 (see letters attached in Appendix B).

The purpose of this report is to:

1. Evaluate the existing DC Water catch basin inspection, cleaning, and repair program and;
2. Present a plan for optimizing the inspection, cleaning, and repair of catch basins in the District of Columbia.

Pursuant to D.C. Official Code §8-202(b), DC Water is only authorized to maintain the public sewer system, including appurtenances such as catch basins, from the public sewer main to the property line of each lot, i.e. “public space.” D.C. Official Code defines “public space” as all the “publicly owned property between lines on a street, as such property lines are shown on the records of the Surveyor of the District of Columbia, and includes any roadway, tree space, sidewalk, or parking between such property lines.” Also, pursuant to Section 4.3.7 of the MS4 Permit, the Government of the District of Columbia is responsible for implementing the operation and maintenance program at all municipal facilities located in the DC MS4 Permit Area. In this regard, catch basins located within a District facility property, installed for the purpose of stormwater management, are the responsibility of that facility agency. Although DC Water cleans and maintains catch basins located in the public space throughout the District, including high capacity thoroughfares per the Memorandum of Understanding (MOU), DC Water does not clean and maintain the following:

- Catch Basins with granite top slabs; and
- Catch Basins collecting runoff from areas owned and maintained by the National Park Service.

The District’s municipal sewer system is comprised of both a separate sewer system and a combined sewer system (See Figure 1-1). The system also includes two types of catch basins: Standard and Water Quality which are discussed in detail in the following section. Table 1-1 shows the number of catch basins within the two sewer systems that are maintained by DC Water. The area within the separate storm sewer system is also referred to as the MS4 area.

Table 1-1: District of Columbia 2012 Catch Basin Inventory per Sewer System Type

Catch Basin Type	Sewer System		Total
	Separate / MS4	Combined	
Standard	14,082	10,702	24,784
Water Quality	388	27	415
Total	14,470	10,729	25,199

1.2 CATCH BASIN CATEGORIES

Standard Catch Basin

Standard catch basins are designed to allow storm runoff to enter the storm water conveyance network and prevent flooding on the streets. These were installed as part of road construction projects. The primary function of a standard catch basin as they have been designed for decades is to take storm runoff off the streets with no attempt to improve water quality. In a standard catch basin, removal of large debris and trash before entering into the sewer collection system has historically only occurred to prevent flooding in the streets. The current design of standard catch basins predates the Clean Water Act.

There are two main types of standard catch basins: grate and inlet. A grate-type catch basin allows water to enter into the basin from the top while the inlet-type allows water to enter through the curb and gutter. Standard catch basins are designed with a sump that retains heavy solids and settled silt and are equipped with an outlet pipe that conveys the stormwater flow into the system. See Appendix C for standard catch basin details. Although some standard catch basins in the District have two or more chambers, the separate chambers do not trap oil, grit, and sediment. DC Water cleans catch basins with an average frequency of more than once per year (detailed numbers are discussed in following chapters).

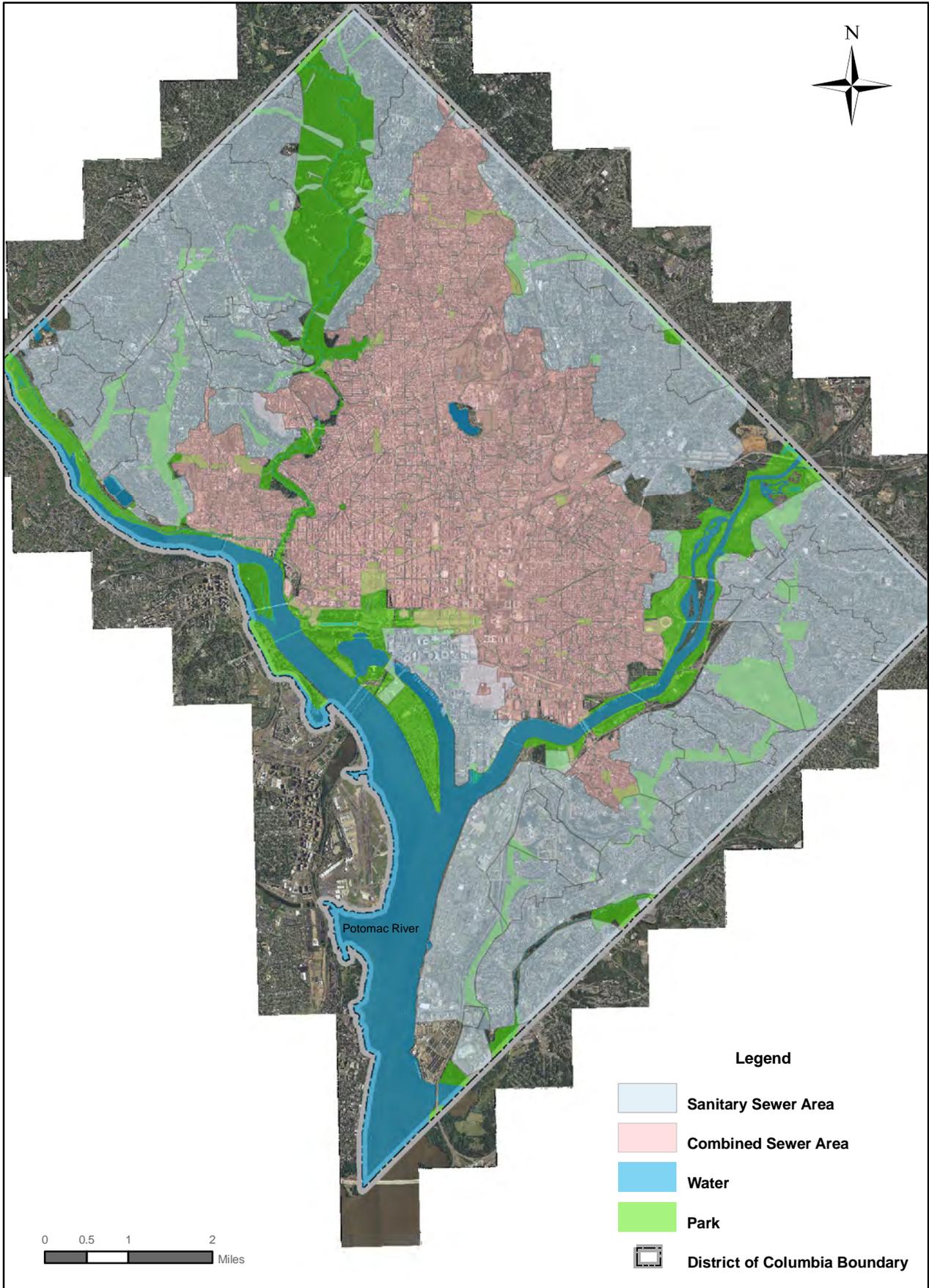


Figure 1-1
District of Columbia
Sewer System Delineation

Water Quality Catch Basin

The Water Quality Catch Basin (WQCB) has three compartments designed to manage flood water as well as improve storm water quality. The different compartments improve water quality by intercepting heavy solids such as trash, gravel, and sand, as well as separating floatable materials such as trash, oils, and organic material. Sediment collected in WQCBs has been found to contain elevated concentrations of heavy metals.

In order to maintain the storm sewer system's effectiveness, all three compartments of the WQCB must be periodically cleaned. Under an MOU, DC Water cleans WQCB catch basins in the area of the District served by the MS4. This work is funded by the District's Stormwater Permit Compliance Enterprise Fund.

There are approximately 410 WQCBs installed throughout the District. Most WQCBs are in the MS4 area. DDOE provides DC Water of a list of catch basins to be cleaned in a fiscal year. Table 1-1 above provides a breakdown of WQCBs per sewer system. Detailed drawings of the WQCB design are featured in Appendix D.

1.3 WATER QUALITY CATCH BASINS INSTALLATION PROGRAM

In the District of Columbia, existing standard catch basins are gradually replaced throughout the MS4 area. WQCBs are installed per the direction given by the District Department of Transportation (DDOT). Replacement of a standard catch basin into a WQCB is conducted during two types of projects: Roadway Reconstruction Projects and Private Developer Projects.

DC Water receives periodic updates from DDOT regarding the location of WQCBs that have been installed so as to include these in its cleaning schedule. The process of installing new catch basins includes coordination between DDOT, DDOE, and DC Water. DDOT submits construction documents to DDOE and DC Water at 65%, 90%, and final design. DDOT reviews road design and traffic controls. DDOE reviews the erosion and sediment controls required for project. DC Water reviews the water and sewer specifications and new connections to the water system and sewer system.

Conversion of an existing catch basin or addition of a WQCB involves participation from DDOT, DDOE and the design engineer. Table 1-2 shows the responsibilities of each agency. The responsibility of the design engineer is to comply with the recommendations from both agencies.

Table 1-2: WQCB Installation Decision Responsibilities

DDOT	DDOE
Determines the location of new catch basins	Evaluates project area to determine if WQCB is required
Ensures proper construction of new catch basins.	Evaluates design according to DC Storm Water Regulations

1.4 UPDATING CATCH BASIN INVENTORY

After construction, as-built construction plans are generated by the contractor and submitted to DDOT, DDOE, and DC Water. These as-builts are used to update the catch basin inventory. During the catch basin optimization analysis, the following inventory coordination difficulties were noted:

1. Delays Submitting As-Builts to DC Water by Contractor

Ideally, as-built conditions are reflected on construction drawings after the completion of each roadway reconstruction project. In cases where a contractor is awarded multiple roadway reconstruction projects with similar completion dates, some updates to the construction drawings to reflect as-built conditions are conducted when all projects are completed. Because of this, delays in submitting as-builts to DC Water occur. Mitigating this challenge involves coordination with the contractor or the developer to ensure that the as-builts are prepared and submitted in a timely manner, and independent of any other on-going projects the contractor might have.

2. Multiple Departments at DC Water

The department receiving the as-builts is dependent on the type of project. Private developers submit as-builts to the DC Water Permitting Section of the Department of Engineering and Technical Services (DETS) while the road reconstruction contractor submits as-builts to the Construction Management Section of the DETS. Once as-builts are received by these two sections, the goal is to forward these drawings to the GIS Unit of the DETS – Design Section for incorporation into the GIS Enterprise system. Delays updating the GIS are common because challenge of coordination among the many sections involved. Proper coordination between sections and development of a standard operating procedure in transferring of data must be established through the participation of its respective

managers.

Having an accurate catch basin inventory is necessary before optimizing the cleaning, inspection, and repair program. Inventory accuracy impacts a number of aspects of the program. Typical consequences include the following:

- Inaccurate budget
- Uncleaned catch basins
- Impaired sewer system operations
- Impaired public safety

Updating the catch basin inventory in a timely manner is imperative to mitigate these consequences. Developing and implementing stricter workflow processes from contractor development of as-builts through to GIS integration of the as-built records along with the cooperation by all parties are important components to achieve a successful catch basin cleaning, inspection, and repair program.

2.0 CURRENT CATCH BASIN CLEANING AND INSPECTION PROGRAM

This section describes the current catch basin cleaning, inspection, and repair program in the District. Examination of the current program is essential to fully understand the process and potential areas for optimization. To accomplish this, field observations of the crews were completed as well as interviews with key personnel at DC Water's Department of Sewer Services (DSS) and the WQCB cleaning contractor.

2.1 CURRENT CATCH BASIN CLEANING AND INSPECTION PROGRAM

A catch basin is a structure designed to allow storm water runoff to enter into the conveyance system. Historically standard catch basins were not designed with water quality in mind; rather, standard catch basins were designed solely to remove water from roadways. Nevertheless, provisions were made to intercept large to medium sized debris; some sediment trapping is also achieved in older designs. Newer WQCBs are designed to prevent solids and floatables from being discharged into receiving waters. As WQCBs trap coarse debris, periodic cleaning is required. Unmaintained catch basins can cause street flooding and in some areas, basement flooding. The following sections describe the cleaning and inspection for standard catch basins and WQCBs.

2.1.1 STANDARD CATCH BASIN CLEANING AND INSPECTION PROGRAM

DSS crews conduct the cleaning and inspection of standard catch basins. The crews are part of the Maintenance and Inspection Division at DSS. Table 2-1 shows the personnel and equipment used in this program. Crews usually include an employee who is relatively new to cleaning and a more experienced one. Even though no written standard operation procedure is in place, the more experienced employee is knowledgeable of the cleaning and inspection procedures and trains the new employee over a long-term partnership with the crew.

Table 2-1: Catch Basin Cleaning Equipment and Personnel Data

Parameter	Quantity / Type
Equipment Type	9 / Stetco Clamshell Bucket
Age of Equipment (Average)	7 years old
Number of Crews per Day	6 to 7
Number of Employees per Crew	2

The daily goal of the program is to clean and inspect a minimum of 25 standard catch basins per day per crew. The annual goal of the program is to clean all catch basins at least once per year which corresponds to the MS4 permit requirement. In the past 4 years, DC Water consistently meets the cleaning frequency of once per year per the MS4 requirement. See the Figure 2-1. Currently, the daily cleaning production average is between 27-32 catch basins. The lower end of this range yields approximately of 40,000 catch basins annually which results in a cleaning frequency of approximately 1.6 times per year. Areas susceptible to flooding are cleaned more frequently, especially when a heavy rainfall event is expected.

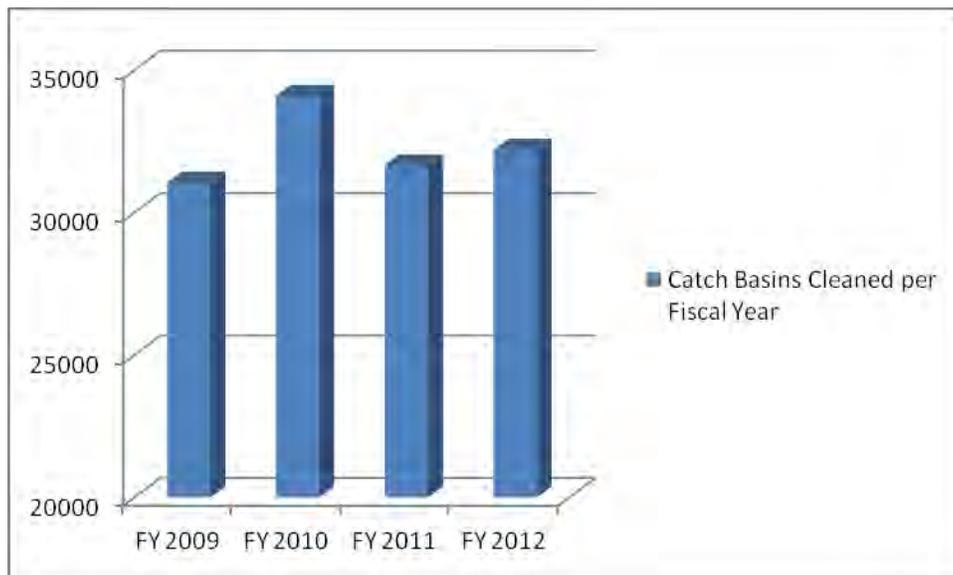


Figure 2-1: Number of Catch basins Cleaned (2009 - 2012)

Normal work hours of the catch basin cleaning crew are from 7:30 AM until 4:00 PM, Mondays through Fridays. Cleaning crews all report to the general foreman's office located at 125 O St. Southeast, Washington D.C. Once there, the cleaning crew is given its cleaning assignment area for the day and drives to the destination in the Stetco truck. In some cases, cleaning crews may have to work outside their normal working hours to clean catch basins located in areas that

are heavily travelled. Catch basins which are difficult to access are cleaned on the weekends and/or after hours to ensure the safety of the crew, comply with guidance from DDOT and minimize traffic disruptions. Heavily travelled locations are listed below.

1. Dalecarlia Parkway
2. Connecticut Ave. under pass at DuPont Circle, NW
3. 16th St. and Massachusetts Ave. NW under pass at Scott Circle
4. K St. NW under pass at Washington Circle NW
5. South Capitol St. SE under pass at Malcolm X Ave. SE
6. Suitland Parkway under pass at MLK Ave SE
7. K St. NW from 29th St. NW to 9th St. NW
8. East Capitol St. NE under pass at Minnesota Ave. NE
9. McCormack Rd NE/Fort Totten Ave NE around Catholic University
10. New York Ave. NE (Florida Ave. NE to Bladensburg Rd. NE)
11. I-295
12. North Capitol St. NE under pass (New York Ave. NE to Rhode Island Ave. NE)
13. Canal Rd. NW

Inspection of catch basins is limited to visual assessment of any obvious defects at the time of cleaning. When a catch basin is found to have a structural defect, DC Water deploys a repair crew to perform the necessary repairs.

2.1.1.1 Standard Catch Basin Cleaning and Inspection Schedule

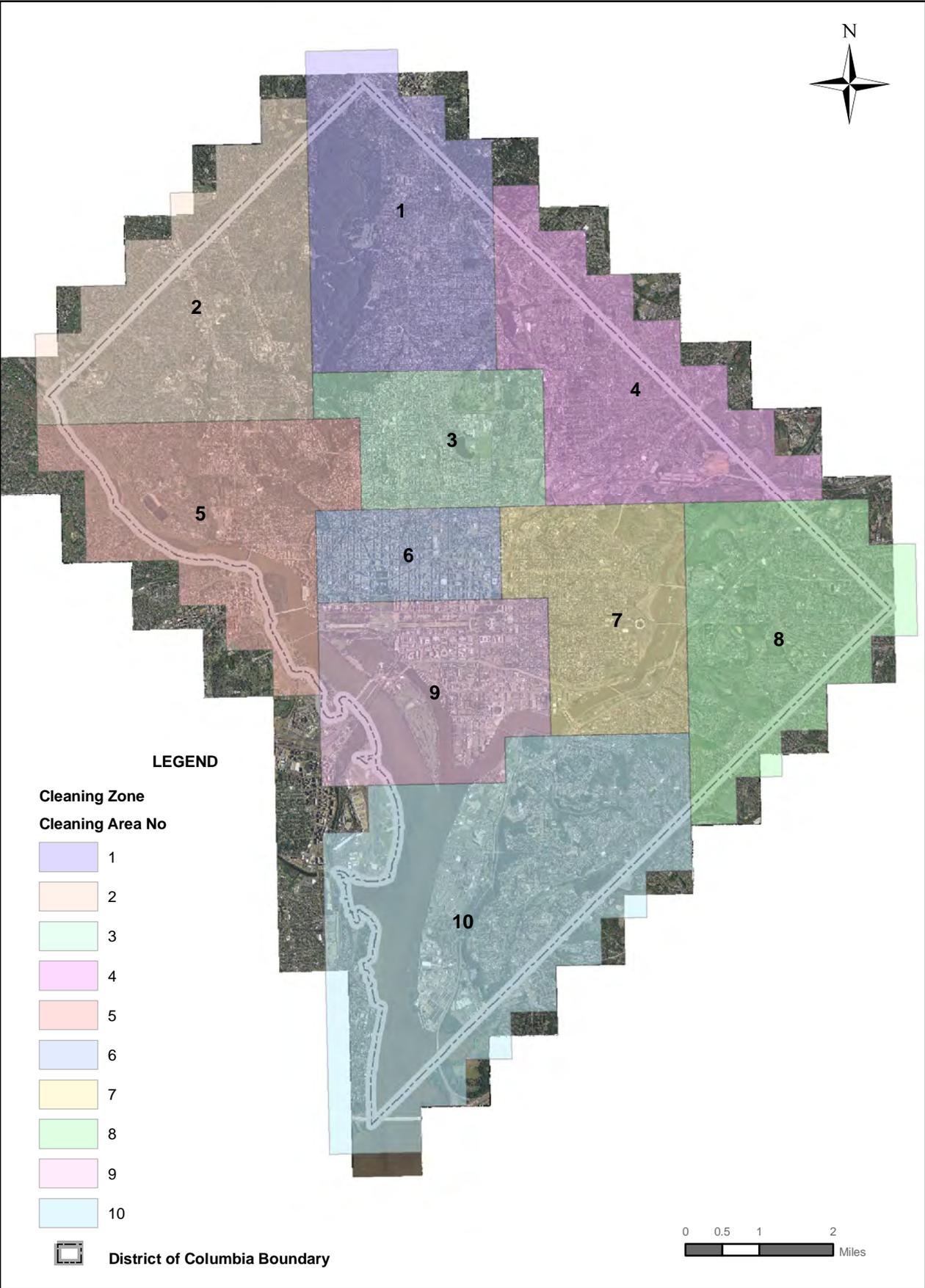
Maximo, an asset management tool, is used to schedule catch basin cleaning and inspection. This tool divides the District into ten (10) cleaning areas (see Figure 2-1). Maps of the individual areas are in Appendix E. Table 2-2 below shows the breakdown of standard catch basin per cleaning area.

Table 2-2: Catch Basin Cleaning Areas

Grid (Cleaning Area)	Number of Catch Basins
Grid 1	2,591
Grid 2	2,767
Grid 3	2,439
Grid 4	2,515
Grid 5	2,242
Grid 6	2,247
Grid 7	2,472
Grid 8	2,664
Grid 9	2,618
Grid 10	2,644

Within a grid, catch basins are given a unique identifier then grouped together in clusters. At the beginning of each work day, maps of each cluster are printed and provided to the crew. Each crew receives a minimum of 50 catch basins per day by the foreman. As the cleaning operation progresses, a member of the crew uses the hard copy of the maps to record whether it was cleaned or not and to document any discrepancies between the maps and actual field conditions. At the end of the day, the crew submits the cluster map with hand written notes to the foreman. See Appendix F for samples of blank and completed cluster maps.

Inaccessibility of catch basins due to a parked vehicle is an occasional challenge encountered by the crews during daily operations. When parked cars block access to a catch basin, the crew proceeds to the next catch basin and returns later in the day. If the catch basin is still blocked by a parked car, the crew reschedules the task for another day.



2.1.1.2 Standard Catch Basin Cleaning and Inspection Procedure

Engineers in the Department of Engineering and Technical Services at DC Water observed all six cleaning crews to document the current cleaning and inspection procedures. The list below enumerates the standard operating procedure (SOP) that is practiced by all six catch basin cleaning crews.

1. Crew reports to foreman and obtains their daily assignment list.
2. Crew travels to first catch basin for cleaning.
3. Crew establishes traffic controls (see Figure 2-3).



Figure 2-3: Standard Catch Basin Traffic Control

4. One crew member removes the manhole lid and determines if cleaning is required (Figure 2-4).



Figure 2-4: Standard Catch Basin Manhole Lid

5. Crew places a sticker with the crew identification number and cleaning date on the catch basin (Figure 2-5). Placing the sticker after cleaning is difficult because the adhesive does not adhere on the wet surface. During rain events, attaching stickers on the catch basin is challenging as the adhesive does not attach properly to wet surfaces.



Figure 2-5: Standard Catch Basin Sticker

6. The second crew member begins to clean the catch basin using a clamshell bucket while the first crew member opens the next catch basin lid for inspection (Figure 2-6).



Figure 2-6: Standard Catch Basin Cleaning

7. After the catch basin is cleaned, the crew member replaces the lid to close the catch basin. During the summer a sachet of mosquito pellets supplied by the Department of Health (DOH) is deposited in the catch basin before closing the catch basin lid.
8. Crew removes the traffic control and the clamshell truck (Stetco) is moved to the next location. If the truck is full of debris, the crew goes to the Benning Road Transfer Station to unload the debris before proceeding to the next catch basin and continuing with the cleaning activity.
9. At the end of the work day the crew fills out the Catch Basin Maintenance Report form (see Appendix G). This form is returned to the foreman for recordkeeping.

2.1.1.3 Debris Management

Debris collected by the catch basin cleaning crew is taken to a dedicated pad at the Benning Road Transfer Station to decant excess water. A debris contractor hauls the debris to landfills. At the landfill, the weight of debris is recorded and submitted to DC Water for invoicing and payment (see Figure 2-7).

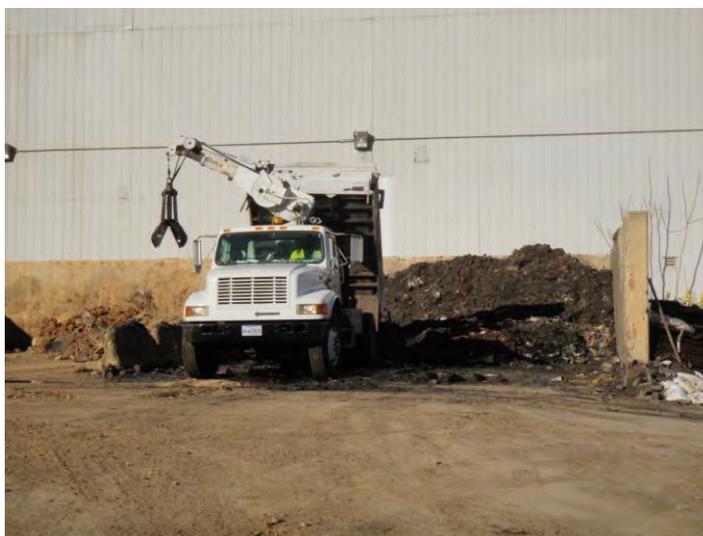


Figure 2-7: Debris Disposal at Benning Road Transfer Station

The amount of debris collected and disposed by the debris contractor in 2011 and 2012 is shown on Table 2-3.

Table 2-3: Standard Catch Basin Debris

Year	Debris Collected (ton)
2011	4,589
2012	5,190

2.1.2 WATER QUALITY CATCH BASIN CLEANING AND INSPECTION

Cleaning and inspection of water quality catch basins (WQCB) are funded by DDOE. Currently, DC Water has contracted Gann Tek, Inc. to clean and inspect the District's WQCBs. Gann Tek provides DC Water with the following:

- Cleaning and inspection schedule;
- Environmentally responsible and compliant catch basin cleaning service (no unlawful discharges of wash water into the District's MS4);
- Environmentally responsible debris management services by separating recyclable materials and vacuumed materials; and
- Documentation of cleaning and inspection by providing a video recording of the catch basin before and after cleaning and submission of cleaning and inspection activities reports.

WQCBs are cleaned following a systematic route within the identified area. The cleaning of all WQCBs for 2012 was completed in a six week period. The cleaning duration per catch basin is dependent on the amount of debris and traffic characteristics but ranges from 10 to 22 catch basins per day. Location and rush hour traffic are taken into consideration when scheduling the cleaning and inspection and in choosing which side of the street will be cleaned first. The contractor notifies DC Water and DDOE (Watershed Protection Division, Inspection and Enforcement Branch) with the location and number of catch basins to be cleaned every day.

2.1.2.1 Water Quality Catch Basin Cleaning and Inspection Procedure

Water quality catch basin cleaning and inspection is performed by a five-man crew. The vehicles at the site include a jet-vacuum combination truck and a pick-up truck. The vacuum truck has the following specifications:

- 600 psi for spraying water;
- 2,500 psi hose spray (also called Hydro-Excavator);
- 8-foot telescope boom with 30-feet of flexible suction piping to allow easy maneuvering of the suction pipe into the catch basin chambers;
- 15 cubic yards debris tank with a sensor to signal that it is full (tank can be dewatered directly to a nearby sanitary or combined sewer). and
- 2,500 rpm vacuum blower supplying a pressure of about -0.6 in Hg.

During the field observation, the following procedure in cleaning the WQCB was observed with some details provided by the contractor.

1. Upon arrival at the WQCB, traffic controls are set by placing traffic safety cones. If cars are blocking the access to the catch basin, the crew skips the catch basin and proceeds to the next catch basin indicated on the map. The contractor returns later in the day to check if access is possible. If it is still inaccessible, the contractor reschedules the cleaning (Figure 2-8).



Figure 2-8: WQCB Traffic Controls

2. Catch basin lids of each chamber are removed (Figure 2-9).



Figure 2-9: WQCB Manhole Lid

3. Shown in this picture above is a Dual Throat WQCB. The two left most lids are over a single compartment with inlets collecting water from the street while the two right-most lids are for the second and third compartments which allow for water quality improvements.
4. A sticker with the contractor's name and date of cleaning is placed on the catch basin top before the cleaning activity. Placing the sticker after cleaning is impractical because the adhesive does not adhere on the wet surface properly (see Figure 2-10).



Figure 2-10: WQCB Sticker

5. Large debris and bulk trash are removed using a rake and shovel. The debris is placed in a large, heavy-duty trash bag. Once the bag is full, it is loaded into the pick-up truck.
6. The vacuum suction hose is positioned inside the first chamber.
7. Hardened sediments, especially those deposited in the corners of the chambers, are loosened using the high pressure water jet. While the sediment is loosened, the vacuum is operated to prevent sediment from entering the conveyance system. This step is a two-man operation (Figure 2-11).

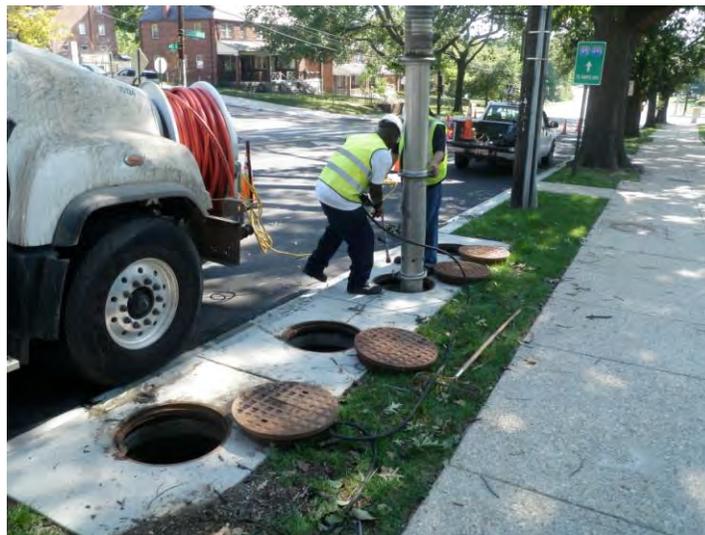


Figure 2-11: WQCB Cleaning

8. While the first chamber is vacuumed, large debris and trash are removed from the second chamber by the third crew member.
9. These steps are repeated for all three chambers.

10. After power washing and vacuuming the chambers, the WQCB is inspected for cracks or physical damage that may require repair.
11. Once all the chambers are cleaned and inspected, the manhole lids are replaced and the top of the WQCB is power washed.

If necessary, water in the truck debris tank is decanted into a combined or sanitary sewer line after obtaining a permit from DC Water. This allows the crew to clean more catch basins in one day. Locations of the nearest combined or sanitary sewer lines for discharge are provided by DC Water.

Typically, the water tank on the truck is filled prior to the cleaning process. If more water is needed, water is obtained from a fire hydrant (Figure 2-12). A hydrant permit must be obtained from the DC Water Permitting Section prior the use of a fire hydrant.



Figure 2-12: WQCB Water Source

2.1.2.2 Water Quality Catch Basin Debris Management

Debris management is included in the cleaning contract for water quality catch basins. Debris collected from WQCBs is taken to the contractor's facility where it is sorted into recyclables and trash. Recyclables are placed in trash bags and are taken to a recycling facility. While debris that are considered as trash are taken to Prince George's County Government Brown Station Road Sanitary Landfill. DC Water receives a monthly invoice with the date of cleaning, amount and type of sediment collected, and ID numbers of the water quality catch basin cleaned.

2.1.2.3 Water Quality Catch Basin Cleaning Reporting Documentation

Once all water quality catch basins are cleaned and inspected, a report which contains the location of the catch basin, date of cleaning, and type of debris collected is submitted to DSS Supervisor of Sewer Maintenance. See Appendix H for this report.

2.2 CATCH BASIN REPAIR PROGRAM

Public safety is the main objective of the repair program. As catch basins are typically located near street corners, they are susceptible to vehicle impact. Reports of damaged catch basins are received from either the public through DC Water Customer Service or from the catch basin cleaning crew.

Currently, the standard operating procedure to initiate the repair work is as follows:

1. A work order is placed in Maximo by Customer Service (if the complaint is received from the public) or by DSS staff (if notification is received from the cleaning and inspection crew).
2. Staff from the Division of Investigation and Maintenance in DSS is notified through Maximo. A site investigation is performed to identify the issue and the materials needed for repair. Investigation is conducted within two days of the complaint being reported and safety measures are taken to protect the public, as needed.
3. A work order is forwarded to the Construction and Repair Division and materials are ordered if needed.
4. Once materials are available, the Construction and Repair Department schedules the work. Depending on the severity of the defect and public safety impact, some repair work may be addressed as high priority.
5. The repair crew performs the repair. Repairs are performed within three days of completion of the investigation unless materials must be ordered. Once the repair is complete, the work order is closed in Maximo.

Repairs conducted in the last two years are shown on the table below

Table 2-4: Quantity of Repair Work Completed

Year	Number of Repairs Completed
2011	349
2012	342

Depending on the type of repair, the work is either completed by an in-house crew or a contractor. In-house DSS crews complete most repairs. A DSS repair crew is composed of five people: one heavy machinery operator, one foreman, one finisher/mason, and two laborers. The basic standard operating procedure to conduct the repair work is as follows:

1. Traffic controls are set up as soon as the crew arrives at the site (Figure 2-13).



Figure 2-13: Repair Traffic Controls

2. The defective portion is demolished and removed (Figure 2-14).



Figure 2-14: Removal of Defective Part

3. Preparation of site (Figure 2-15).



Figure 2-15: Preparation of Site

4. Repair or installation of new component (Figure 2-16).



Figure 2-16: Installation of Component

5. Once the repair work is completed, the repair crew coordinates with the cleaning crew to ensure that any debris in the catch basin as a result of the work is removed (Figure 2-17).



Figure 2-17: Completed Repair Work

Most repairs are needed on standard catch basins because the WQCBs were installed within the last six years. Although no structural defects have been documented on WQCBs, the cleaning contractor is instructed to report any defects to DC Water.

2.3 CURRENT PROGRAM PERFORMANCE METRIC

To identify areas of improvements, certain metrics must be recorded and compared to a benchmark. These metrics are ideally concentrated on the program goals and regulatory compliance. The current metric is described in the paragraph below and the benchmark is discussed in the next Chapter.

The focus of the current catch basin program is to provide flood relief. The frequency of cleaning is the metric of the program's success or failure. The current goal is an average of one annual cleaning per catch basin averaged throughout the entire system which is met or exceeded every year.

3.0 PERFORMANCE BENCHMARK

3.1 GENERAL

To determine industry standards for cleaning, inspecting, and repair of catch basins, a benchmarking survey was conducted to gather firsthand information from catch basin programs of other municipalities and agencies. This section discusses the findings of the survey and compares it with the current catch basin cleaning, inspection, and repair program at DC Water.

3.2 BENCHMARKING SURVEY RESULTS:

A total of eleven municipalities (out of the thirty surveyed) participated in the survey which included about 25 questions. These questions include the following topics:

- Inventory
- Budget
- Cleaning and Inspection Program
- Repair Program
- Personnel
- Fleet
- Program Goals

The table below shows a summary of the benchmarking survey results comparing the existing DC Water program with the industry average based on the eleven municipalities. See Appendix I for a copy of the survey and more comprehensive tables showing responses for each municipality.

Table 3-1: Benchmarking Survey Results

Category	Benchmark	Industry Average	DC Water
Sewer System Characteristics	Separate Only	64% of respondents	No
	Combined & Separate	27% of respondents	No
	Combined, Separate, & Sanitary	9% of respondents	Combined, Separate, & Sanitary
	Number of Catch Basins	23,000	25,199
	Average Age of System	50 years old	75 years old
Financial	Spending per Catch Basin ⁽¹⁾ per Year	\$54	\$48
	Activities in Budget	Cleaning, Inspection, Repair, Debris Management	Cleaning, Inspection, Repair, Debris Management
	Performance Metrics	Cleaning Frequency, Flooding Reduction, Reduction in Complaints	Cleaning frequency
Cleaning Program	Cleaning Frequency Std. Catch Basin per Year	1	1.6
	Cleaning Frequency WQCB per Year	Less than 1	1
Inspection Program	Separate System (Catch Basin Frequency per Year)	1	1
	Combined System (Catch Basin Frequency per Year)	Less than 1	1
Repair Program	Main Driver	Public Safety	Public Safety
Personnel	Number of Crews	2	6
	Personnel per Crew	2	2 (Standard CB); 5 (WQCB - Contractor)
	No. of Catch Basin Cleaned per Crew per Day ⁽³⁾	25-30	27-32 (Standard); 10-22 (WQCB)
Fleet	Type of Fleet (Quantity)	Jet/Vacuum Combo (5)	Clamshell (9)
Technology	Software	ArcGIS; SAP	Maximo, ArcGIS
Environmental	Debris Management	Deposits in Landfill	Deposits in Landfill

Definitions:

(1) Spending Per Catch Basin = Annual Budget / No. of Catch Basins

(2) Cleaning Frequency = Time to inspect and/or clean entire inventory of catch basins

(3) Only 4 out of 11 cities responded: Arlington, Cincinnati, Newark, & Portland. While Arlington provided a response, they do not monitor the cleaning production as it is conducted by a private contractor.

3.3 FINDINGS

A comparison of the survey results and DC Water's current program yields the following findings:

- Most of the municipalities that participated in this survey have a cleaning frequency of once per year for both the water quality catch basins and the standard catch basins. This is similar to the cleaning frequency for the District.
- Half of the municipalities that participated have a catch basin inspection program separate from the catch basin cleaning program. DC Water conducts the inspection during the cleaning operation.
- The annual budget that each municipality allots to catch basins is for activities such as cleaning, inspection, repair, and debris management. Disposal to a landfill is the universal means of disposal including the District.
- All municipalities surveyed indicated that the top three goals and drivers of their cleaning and inspection program are (1) customer service, (2) regularly scheduled maintenance, and (3) to minimize flooding. These three goals are consistent with DC Water catch basin maintenance program goals.
- The jet-vacuum combination truck is the most widely used cleaning equipment among those surveyed while the District relies on clamshells.
- Out of the 5 municipalities that provided supporting data, crew production was in the range of 25-30 catch basins a day. In the District, the average number of catch basins cleaned per day per crew is 27-32.
- All municipalities surveyed indicate the number of catch basins cleaned and inspected during a year is the top performance metric to measure success of their program. More than half of the respondents indicate that reduction in number of complaints is another performance metric they use. DC Water uses the number of catch basins cleaned in a year as its performance metric.
- Among the municipalities that were surveyed, ArcGIS is the most widely used software. DC Water uses Maximo and ArcGIS.
- On average, municipalities surveyed spend about \$50 per year per catch basin on cleaning and inspection. DC Water spends about \$48 per year per catch basin on cleaning and inspection.
- More than half of the survey respondents indicate public safety is the most important priority for catch basin repair. In DC, public safety is the top priority.
- Among the municipalities that were surveyed, no single technology could be identified that is commonly used for water quality improvement. There is a range of technologies that has been used with varying degrees of success. Six out of the 11 municipalities is using a type of catch basin water quality feature. The most common catch basin water quality feature among the municipalities is the baffle box or an oil/grit separator. In the District, most catch basins have a sump.

- The District's daily catch basin cleaning production and its overall catch basin cleaning, inspection and repair program meets the industry standard based on the benchmarking survey responses recorded.

4.0 OPTIMIZATION ALTERNATIVES

The Department of Public Works (DPW) manages the District's street sweeping program and sweeps all public thoroughfares on a regular basis. DPW has deployed a new generation of street sweepers that are effective in picking up even fine dust. In various parts of the District with heavy concentration of commercial establishments, the business communities have also set up cleaning crews that collect trash all throughout the day. Development of an optimized plan warrants identification of alternatives that may improve the current program. This section describes and evaluates alternatives currently available on the market.

4.1 DESCRIPTION OF ALTERNATIVES

Seven alternatives for optimizing the current catch basin cleaning, inspection, and repair program include: 1) installation of retrofits, 2) use of new cleaning equipment (vacuum trucks), 3) use of a new device to make it easier for crews to open manhole lids, 4) development of new tracking application, 5) outreach to the public, 6) coordination with various agencies, 7) develop a written SOP to document the cleaning and repair process, and 8) develop a training program for staff. A description of these alternatives follows.

1. Installation of Retrofit Technologies for Catch Basins

Numerous retrofit technologies for catch basins are currently available to capture sediments, debris, and pollutants in catch basins. While these products come in a wide variety of designs, most are in the form of an insert and can be categorized in three general types: A) insert filter/barrier, B) outlet screen insert, and C) snout/hood. The three general categories of retrofit products are described below.

A. Insert Filter/Barrier

As the name implies, a catch basin insert filter is a type of retrofit technology that is designed to filter the solids and floatables before they would enter the collection system. The solids and floatables are collected either in the catch basins or in the gutter of the street. There are several types of inserts currently available. Some work for grate-style catch basins while the others work for inlet-style catch basins.

Common to most of these filters is a filter screen made of stainless steel wire mesh or a plastic barrier which traps large debris and a filter media which traps silts and sediments.

Some include material for absorption of hydrocarbons.



Figure 4-1: Catch Basin Insert Filters
Photo Credit (Clockwise): FloGard[®], Ultra-Curb Guard Plus[®],
DC Water Debris Barrier, Ultra-Drain Guard[®], Ultra-Urban Filter

B. Outlet Screen Inserts

Made out of steel wire and a polyethylene frame, outlet screen inserts are installed over the outlet pipe on the wall of the catch basin (see Figure 4-2). This type of retrofit technology is designed to prevent debris from being discharged at the outlet. Solids and floatables are trapped in the catch basin. Although this has a similar concept as the insert filter, this type of retrofit does not have a filter media that traps sediments or materials that absorb hydrocarbons.



Figure 4-2: Outlet Screen Inserts
Photo Credit: Ultra-Curb Debris Screen®

C. Snout/Hood

A snout or a hood is a type of device that is installed at the outlet pipe (see Figure 4-3). This creates a baffle which allows debris, oils, and grease to float in the main part of the basin while sediments continue to settle. This mimics the functionality of a water quality catch basin.

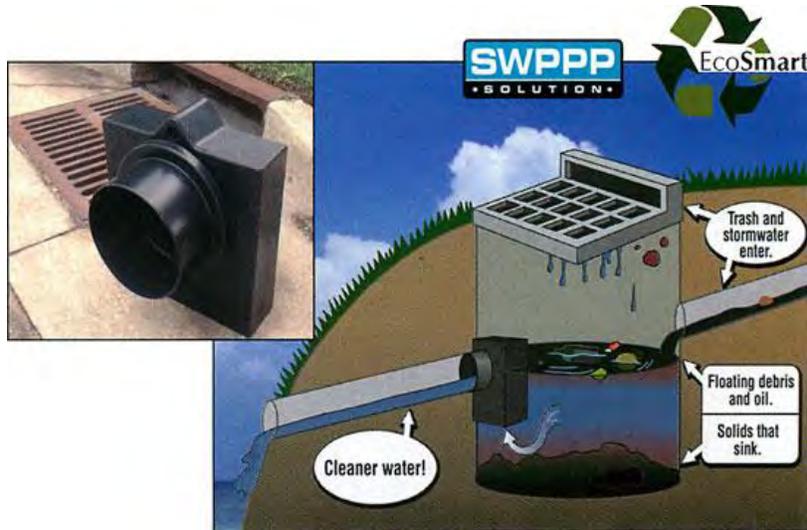


Figure 4-3: Hood
Photo Credit: Ultra-Oil & Debris Blocker®

2. Combination Jet-Vacuum Trucks

A combination jet-vacuum truck (jet-vac truck) (See Figure 4-4) is equipped with a high pressure water jet, water storage tank, water pump, vacuum, hydraulic boom, and debris tank. Because of its high suction power, it removes suspended solids and some can remove heavy debris such as bricks and rocks deposited in the basin. DSS currently has two vacuum truck primarily used to clean sewers.



Figure 4-4: Combination Vacuum Truck
Photo Credit: Vac-Con

3. Catch Basin Lid Magnetic Lifting Device

Catch basin lids are made of cast iron and weigh approximately 100 lbs. A magnetic lifting device can quickly lift and remove a catch basin lid minimizing strain on the body. This magnetic lifter is collapsible and can be stored and transported with relative ease. A similar device exists for removing grates on grate style catch basins. While this device does not directly clean the catch basin, it assists in the overall catch basin cleaning operation by preventing injuries at work thereby minimizing lost production time.



Figure 4-5: Catch Basin Lid Magnetic Lifter
Photo Credit: Allegro

4. Catch Basin Mobile Tracking Application – Database Management Tool

A catch basin mobile tracking application can be developed as a map-centric tool for optimization of the program similar to the successful fire hydrant tracking application developed by DC Water. This application will feature a variety of information such as physical characteristics of the asset (single, double, etc), location, maintenance record, repair record, and additional work needed. This application could also create work orders for each catch basin. Utilizing this application would reduce vast amounts of paperwork and map markings while improving the ability to track the progress of inspection, cleaning, and repairs. Such an application can be designed to allow the crews to report new or removed catch basins and any follow up repair work needed. This alternative will provide DSS the ability to use GPS and a map viewer with basic navigation tools to select a catch basin, input information about the cleaning operation, and synchronize the data collected in the field with DC Water servers. This

application could enable the operations group to track the status of the inventory. Fundamental to the success of this application is having an accurate inventory. For a sample interface of this application see Appendix J.

5. Public Outreach Program

Educating the public on the effects of debris, silts, and sediments to water quality can be beneficial in reducing solids and floatables. This plan can be achieved by instituting a public outreach program. The Office of External Affairs at DC Water has a wide range of community outreach services. Among the programs related to water quality are the following:

- Environmental Education – A program which educates students from grades K to 8 about the District’s water supply and significant environmental issues impacting our water resources.
- Speakers Bureau – A program which allows members of the community to request an expert from DC Water to provide a short presentation about infrastructure projects and various programs that serve its customers, improve the community, and protect the environment
- DDOE Anti-Littering Education and Outreach Efforts – DDOE is responsible for coordinating efforts to comply with the total maximum daily load (TMDL) for trash for the Anacostia River. One of the major contributors to trash in the Anacostia is the District’s sewer system. Keeping litter off the streets is essential to reducing catch basin clogging and street flooding. DDOE recently issued a grant to the Alice Ferguson Foundation (AFF) to conduct an intensive education and outreach campaign focused on preventing littering in the Anacostia watershed. Coordinating with that program may be an effective means of reducing litter from getting into catch basins.
- DPW Solid Waste Enforcement and Education Program (SWEEP) – DPW SWEEP program conducts anti-littering education in schools throughout the District. Working with SWEEP to take a “watershed approach” with their education and outreach efforts may help reduce addition litter from getting into catch basins.
- Anti-Littering Enforcement – Both the DC Metropolitan Police Department (MPD) and SWEEP operate litter enforcement programs. The MPD program began as a pilot in Ward 4 in 2011, and was recently expanded to parts of Wards 7 and 8 in 2012. DPW SWEEP has been conducting litter enforcement for several years. Using catch basin

clog reporting and cleaning results to inform MPD and SWEEP may be mutually beneficial to both programs, and reduce catch basin maintenance overall in the long term.

6. Coordinate with DPW Street Sweeping Program Schedule

One problem occasionally encountered when cleaning and inspecting catch basins is cars parked along the street which can block access to the inlet or catch basin lid. In densely-populated neighborhoods, parking restrictions are posted to facilitate street sweeping. Street cleaning in the District already enforces parking restriction and is conducted as often as once a week in densely-populated neighborhoods with high volumes of pedestrian traffic. In residential neighborhoods with no parking restrictions, street sweeping is performed twice a month. To avoid being towed, vehicle owners move their cars in accordance with the parking restrictions. Coordination between DDOE, DC Water, and DPW Street Sweeping Program schedules and routes could facilitate access to the inlets on the same day the street sweepers operate.

7. Development of Written Standard Operating Procedure (SOP)

Developing a written standard operating procedure (SOP) could improve the program. Observations of the field crews show consistent practices among cleaning crews, but a written SOP will document the standardized procedures, responsibilities, and ensures repetitive tasks such as catch basin cleaning will be consistent. It will also help with training of new staff. This will help minimize oversights and document the cleaning standards. Once developed, this should be incorporated into a training program.

8. Training Program for Cleaning Crews

Training is an effective means of enhancing productivity, competency, quality of work, and also increases worker awareness. Development of a training program will help the crews understand their work responsibilities in relation to water quality. A training program for new employees will help them understand what is expected of them. Experienced employees will also benefit from this as it will provide them a refresher of the standards and an opportunity to suggest new practices that could become standard practice.

4.2 EVALUATION OF ALTERNATIVES

Careful evaluation of alternatives is needed to select the best alternatives to achieve the permit goals. A summary of the evaluation of each alternative is shown below. Also, Table 4-1 below

shows detailed benefits and drawbacks of each alternative.

1. **Retrofit Products:** While retrofit products have the ability to trap debris and sediments, installation and implementation of this alternative would leave more debris and trash on the street. This alternative is eliminated from further evaluation.
2. **Combination Jet-Vacuum Truck:** Jet-vacuum combination truck is widely used by all the municipalities that were surveyed. While this type of fleet addition involves a sizeable investment, further analysis and evaluation is required to determine its cost benefit.
3. **Magnetic Lid Lifter:** A magnetic lid lifter is a tool that will make opening of catch basin lids much easier and could accelerate routine catch basin cleaning operations, or reduce the number of crew accidents. Its addition to the pool of equipment that the crew uses on a daily basis may be low-cost approach that could lead to operational improvements. Further evaluation is required to determine its benefits.
4. **Catch Basin Mobile Application:** Development of this application is under consideration as part of the operational improvements at DC Water.
5. **Public Outreach Program:** Numerous public outreach programs have been implemented by DC Water, DDOE, DPW, and MDP. These programs have been actively promoting environmental awareness in the District and should continue to provide water quality awareness.
6. **Coordination with DPW Street Sweeping Program:** As stated in the previous section, coordinating with this program will help alleviate the challenges with cars parked near catch basin access. This would be coupled with the catch basin mobile application.
7. **SOP Development:** This program is currently underway at DC Water.
8. **Training Program:** Once SOP is developed, training program(s) will be scheduled for SOP implementation

Table 4-1: Evaluation of Alternatives

Alternative	Benefits	Drawbacks	Tasks that Require Funding
Retrofit Product: Insert Filter / Barrier	<ul style="list-style-type: none"> Traps debris, silts & sediments Absorbs hydrocarbon Relatively easy to install (no excavation required) Installation can be phased over a period of time 	<ul style="list-style-type: none"> Becomes difficult to clean; might have to do manual cleaning Clogs easily depending on type of debris Restricts water flow and leads to more frequent flooding Causes debris deposits on streets Removal of blockages during flood is difficult and unsafe Requires interagency consensus Obstructs clamshell operation 	<ul style="list-style-type: none"> More frequent catch basin cleaning Purchase of material Installation of material Maintenance of material
Retrofit Product: Outlet Screen Insert	<ul style="list-style-type: none"> Traps debris Not obtrusive to clamshell operation Relatively easy to install (no excavation required) Installation can be phased over a period of time 	<ul style="list-style-type: none"> Clogs easily depending on type of debris Restricts water flow and leads to more frequent flooding Does not remove silt, sediment, suspended solids, or hydrocarbon Removal of blockages during flood is difficult and unsafe 	<ul style="list-style-type: none"> More frequent catch basin cleaning Purchase of material Installation of material Maintenance of material
Retrofit Product: Snout / Hood	<ul style="list-style-type: none"> Prevents debris, silt, and sediments from entering the system Allows suspended solids to settle Relatively easy to install (no excavation required) Installation can be phased over a period of time 	<ul style="list-style-type: none"> Does not remove sediments and silts Can obstruct clamshell operation Removal of blockages during flood is difficult and unsafe 	<ul style="list-style-type: none"> More frequent catch basin cleaning Purchase of material Installation of material Maintenance of material
Combination Jet-Vacuum Truck	<ul style="list-style-type: none"> Removes suspended solids, silts, and sediment Operation of equipment is relatively easy Staff familiarity 	<ul style="list-style-type: none"> High initial cost High Maintenance cost May require removal of large debris prior its operation Depending on catch basin type and configuration, may be very difficult to thoroughly clean entire catch basin, especially corners and walls far from manhole lid 	<ul style="list-style-type: none"> Purchase of truck Additional crews Maintenance of truck
Magnetic Catch Basin Lid Lifter	<ul style="list-style-type: none"> Reduces the strain on back and body Safely removes and lifts catch basin lids Relatively inexpensive 	<ul style="list-style-type: none"> Need storage with lock on truck More expensive than typical equipment for opening manhole lids 	<ul style="list-style-type: none"> Purchase of equipment Installation of storage with lock on trucks
Catch Basin Mobile Application – Data Management Tool	<ul style="list-style-type: none"> Provides better management of resources Ability to track maintenance work with a street map interface Provides interface with Maximo & GIS Provides operational efficiency Asset management tool to track 24,000+ assets 	<ul style="list-style-type: none"> Needs an accurate inventory 	<ul style="list-style-type: none"> Development of application Purchase of equipment where application will be installed Labor for installation of equipment Training of crews Possible GIS license(s) Inventory updates
Public Outreach Program	<ul style="list-style-type: none"> Educates the public May help reduce debris 	<ul style="list-style-type: none"> Requires funding 	<ul style="list-style-type: none"> Development of info material Distribution of material Public Workshops (if needed)
Coordinate with DPW Street Sweeping Schedule	<ul style="list-style-type: none"> Improves inaccessibility of catch basins Improves cleaning frequency of catch basins in densely populated areas 	<ul style="list-style-type: none"> Requires significant agency coordination and consensus 	<ul style="list-style-type: none"> Liaison time between DC Water, DPW, and DDOE
SOP Development	<ul style="list-style-type: none"> Documents work process Improves training of new employees 	<ul style="list-style-type: none"> Takes time away from operation during development 	<ul style="list-style-type: none"> Staff time to write the SOP
Training	<ul style="list-style-type: none"> Increases water quality awareness Increases work consistency Increases staff competency Increases staff efficiency 	<ul style="list-style-type: none"> Takes time away from operation during training events 	<ul style="list-style-type: none"> Preparation of training material Crew is taken from regular operation Trainer

5.0 RECOMMENDATIONS

Per the MS4 permit issued by EPA, the District as permittee is required to provide an optimal plan for catch basin cleaning, inspection, and repair. Based on the benchmarking survey results, DC Water's current catch basin cleaning, inspection, and repair program is comparable to the best management practices employed by a number of municipalities throughout the United States. To comply with the permit requirement to develop an optimal plan, DC Water proposes the following

1. Development of Catch Basin Mobile Tracking Application

Current industry asset management practices need a catch basin inventory of over 25,000 assets be tracked in a data management tool. This tool can be linked directly to field operations through handheld tablets and/or computers installed in cleaning trucks. The development of a mobile tracking application would enable DSS to maintain accurate records on cleaning operations. Building an accurate inventory is integral in the development of this application. DC Water proposes to develop the inventory, GPS locating of catch basin, and upload the maintenance history for each catch basin in the first two years following plan approval. To maintain an up-to-date inventory, proper coordination between the agencies and design engineers is needed to record newly constructed catch basins. This requires an interagency process for submittal of as-builts in a timely manner.

2. Coordination with DPW Street Sweeping Program

As discussed in Section 1, a challenge in the cleaning and inspection operation is access to each catch basin. During the street sweeping operations, parking restrictions are enforced. Coordinating this program would help overcome the issue of restricted catch basin access issue. Street sweeping schedule and routes are needed to allow the foreman to schedule the catch basin cleaning activity accordingly. As the current catch basin program evolves, coordination meetings with DPW and DDOE will be required

3. Pilot Study for Vacuum Truck(s)

The addition of vacuum trucks may assist in attaining better catch basin cleaning by removing more of the sediments and suspended solids. Before making a sizeable investment in vacuum trucks, the District should conduct a comparative pilot study examining the efficiency of clamshell bucket trucks vs. vacuum trucks at removing

sediment and debris. The pilot will also evaluate other factors such as the ability of vacuum trucks to negotiate tight urban streets, the ability of vacuum trucks to remove large and heavy debris without clogging, and other operational restraints. Areas selected for this pilot study would be representative of the varied neighborhoods in the District. The study will be conducted over several city blocks, with each side of the street to be cleaned alternately by a vacuum truck and a clamshell truck. Among the data to be collected and compared between the two trucks will include:

- Crew production rate
- Amount of silt, sediment and debris collected
- Overall cost
- Visual assessment of catch basin cleanliness achieved
- Truck storage requirements
- Operations challenges

This data will be used for cost benefit analysis of the two cleaning truck options. In addition, sampling of collected sediments may be conducted to document the type of pollutants present. Also, magnetic lid lifter will be included in the pilot study to determine its operational benefits. It is proposed that funding of this pilot study be shared by DDOE and DC Water. Detailed scope for this pilot study will be developed within the first year of the approval of the proposed optimization plan.

4. Development of a Written Standard Operating Procedure

In order to have consistent documentation, a standard operating procedure (SOP) for the cleaning crew would be developed. The SOP would help crews understand the policies, guidelines, field documentation requirements, cleaning procedural steps, etc. Once developed, the SOP would be reviewed and updated annually to ensure that improvements to the program are documented. In addition to cleaning SOP, an as-built submittal SOP will be developed to ensure timely submittal of as-builts and GIS updates..

5. Development of a Training Program

To implement the SOP, a training program would be initiated to provide consistency to the cleaning program across crews. All crew members would be required to complete the training program.

Once approved, we anticipate that the proposed optimization plan would be operational in five years. A timeframe for the proposed optimization plan is shown on Table 5-1. Prior to the execution of the plan, DC Water would strive to integrate practices that prove to cost effectively improve catch basin performance as a means of improving water quality.

Table 5-1: Optimization Plan Implementation Timeframe

Year	Action
Year 1	<ul style="list-style-type: none"> • Develop catch basin mobile application • Develop processes for timely submittal and updating of GIS to reflect as-built conditions. • Develop scope and determine funding for vacuum truck pilot study • Conduct training program on SOP • Coordinate with DPW Street Sweeping Program
Year 2	<ul style="list-style-type: none"> • Locate catch basins using GPS technology (two years) • Update and populate GIS maps • Conduct pilot study and prepare report
Year 3	<ul style="list-style-type: none"> • Locate catch basins using GPS technology (two years) • Continue to develop and populate GIS maps • Test catch basin mobile application • Conduct training program/refresher on SOP
Year 4	<ul style="list-style-type: none"> • Revised SOP to include catch basin mobile application • Develop Training Program • Obtain computers needed for catch basin application
Year 5	<ul style="list-style-type: none"> • Conduct training program on catch basin mobile application • Conduct training program on SOP

