Street Sweeping Pilot Study Update: August 2010

Background

The City of San Diego's Storm Water Department is committed to protecting water quality and preserving natural resources in San Diego. Clean water regulations enacted by the EPA and the California State Water Resources Control Board require municipalities to implement projects that address local water quality issues. In San Diego, over two dozen water body segments are considered impaired.

In 2008, the Department implemented a Street Sweeping Pilot Study to determine if enhanced sweeping is a cost effective solution for reducing pollution and meeting existing and regulatory requirements mandated by the State. The goals of the project are to determine if different sweeping frequencies help reduce pollution, specifically debris and fine metal particles, in both residential and commercial areas, and if newly acquired vacuum-assisted sweepers are more efficient or cost effective than conventional sweepers. Three pilot areas communities were chosen for this study: Mid-City, which impacts Chollas Creek and San Diego Bay; Clairemont, which drains to Tecolote Creek and Mission Bay; and La Jolla Shores, which drains to two marine Areas of Special Biological Significance (ASBS). These locations were chosen because the roads in these areas contain high concentrations of fine metal particles, which can significantly impair water quality.

Research has shown that because fine particulates, such as brake dust, tend to collect in gutters, street sweeping is more effective when the sweepers can reach the gutters. Therefore, streets contained within the study areas were posted with "no parking" signs for the duration of the study. Since a focus of the study was to identify the impacts of enhanced sweeping, the sweeping frequencies in all three areas were increased at different rates.

The Storm Water Department has been working in conjunction with other City entities to plan, implement, and eventually assess this pilot study. In addition, several professional consultants and local non-profit organizations, such as San Diego Coastkeeper and Urban Corps are assisting with various outreach and education aspects of the pilot study.

The two-year study began in April 2008 and is near completion. Two wet seasons and two dry seasons were included to increase the validity of the data. The first phase included dry weather debris analysis to determine the most effective/efficient sweeper technology and sweeping frequency. The second phase included a wet weather analysis to determine if enhanced sweeping produced any beneficial impacts to water quality. Equipment tested against the City's currently owned Johnson 4000 mechanical sweeper were a Schwartz A7000 regenerative sweeper and an Elgin Whirlwind vacuum sweeper.

Pilot Study Phases

The pilot study was intended to significantly reduce the amount of trash, debris, and other harmful pollutants, such as metals, entering local waters after washing down from the City's roadways.

- **Phase I began on April 1, 2008** and included the Chollas Creek Watershed communities of Greater North Park, Normal Heights, Kensington-Talmadge, City Heights, Logan Heights, and Memorial.
- **Phase II began in May 2008** and included the Clairemont Mesa, Kearny Mesa, and Linda Vista communities surrounding the Mission Bay watershed.
- **Phase III began in October 2008** and included the La Jolla, University, Torrey Pines, and Torrey Hills communities draining into the La Jolla Shores watershed.

Each phase of the pilot study included increased sweeping of routes in both commercial and residential areas. In addition, the City employed new vacuum assisted sweepers as part of the pilot effort. During the first year, the sweeping frequency in Mid-City was increased from an average of one full sweep (both sides of the street) per month, to two full sweeps per week. During the second year, the frequency was reduced to one full sweep per week for comparison. In both the Clairemont and La Jolla Shores communities, previously non-posted routes that were swept once every other month were increased to two full sweeps per month.

Results to Date - Science

Although the City is still analyzing data in order to make recommendations, preliminary results indicate that street sweeping has a positive impact on water quality by providing an effective means of reducing pollutant concentrations in storm water runoff. Comparisons indicate that the vacuum sweeper is more effective in reducing pollution than the mechanical sweeper on flat, even street surfaces, while the mechanical sweeper performs equally well on uneven, hilly streets. In addition, the data indicates that conducting aggressive sweeping using the vacuum sweeper is more cost effective than sweeping at the same frequency with the mechanical sweeper. A summary of the data collected is provided below.

All debris collected from each pilot area was weighed prior to being isolated in individualized collection bins for sampling. A debris analysis was subsequently conducted and a synopsis of the dry weather results is presented in the following table.

Summary of Dry Weather Data Collection, by Study Area

Study Area	Total Debris Swept (lbs)	Total Broom Miles Swept	Copper (lbs)	Lead (lbs)	Zinc (lbs)
Chollas Creek	201,520	3,049	9.0	8.5	40.5
La Jolla Shores	390,300	4,769	17.2	4.7	43.5
Clairemont	170,740	1,734	7.3	3.1	41.6
Pilot Study Total	762,560	9,552	33.6	20.2	133.8

The sweeper comparison portion of the Study was implemented by sweeping pilot areas with three sweeper types for a set period of time at the same frequency using the same analysis protocol. In Mid-City, the comparative machine analysis was performed by operating each the Johnson mechanical, the Elgin vacuum and the Schwartz regenerative air, for a minimum of three consecutive weeks for approximately 12 months. In Clairemont, a similar analysis was conducted for all three machines. In the La Jolla Shores community, only the Johnson and Schwartz sweepers were compared.

Finally, to determine the beneficial impacts of enhanced sweeping on water quality, a wet weather comparative analysis was conducted in Mid-City. Samples were taken during three storm events from a single road, half of which had been swept with a Johnson mechanical and the other half with the Elgin vacuum for three weeks prior to the rain event. The samples were collected to prevent co-mingling of runoff from the segments swept by the two machines, and control samples were taken from an adjacent non-swept street. Samples were analyzed for sediment, metals and pesticides.

Since the Study began, the City has swept the equivalent of over 9,500 miles of streets, has collected over 381 tons of trash and debris, and a significant amount of heavy metals have been removed from City streets.

Results to Date - Public Feedback

The Department initially promoted the study with media, information sheets and website updates. While responses were generally positive, many of the more complex scientific details were not easily understood. Also, new route timeframes, new parking restrictions, and the amount of signage installed, caused concern for many citizens. In response, the City conducted a public survey of the residents and businesses that have been impacted by the Pilot Study.
The surveys were designed to obtain critical feedback from the public living in the commercial and residential areas impacted by the street sweeping project. The surveys investigated the public's perception of the existing street sweeping program as well as gauged potential reactions to various program elements. The surveys included business owners and residents from the pilot areas of La Jolla, Mid-City, and Clairemont.

Business Feedback

- 85 percent of businesses felt that the current level of street sweeping in the area around their business was "just right" and not one reported that the street was swept "too often."
- 93 percent of businesses believe that street sweeping was a good use of public money (either strongly or somewhat agreed).
- 78 percent of businesses rated storm water pollution as a "very" or "extremely" important issue.
- Businesses perceived that street sweeping was important for addressing a variety of issues from litter to water quality. Business' ratings of the importance of street sweeping were higher than 8 on a scale from zero to ten (10 = extremely important).

Residential Feedback

- 78 percent of respondents agreed that street sweeping was a good use of public money.
- 80 percent believed that storm water was a very or extremely important issue.
- 70 percent of respondents said they did not face any difficulties because of street sweeping.
- 63 percent of respondents believed that their street was swept, "just the right number of times."
- Mid-City respondents believed street sweeping was most important for removing litter, whereas La Jolla and Clairemont respondents believed street sweeping was most important for improving water quality
- People who reported that someone in their household needed to move a vehicle for the street sweeper were significantly more likely to report that street sweeping occurred "too often."
- Over 60 percent of respondents believed that the street sweeper should visit their street only one time per week or every couple of weeks.

Opportunities for Street Sweeping Program Improvements

The City is currently evaluating the scientific results, community feedback, and financial data from the pilot study to apply a triple-bottom-line analysis (environmental, social and economic factors) with the goal of identifying cost-effective opportunities to improve its street sweeping program. Based on this evaluation, several initial actions have been implemented. Near-term opportunities and potential long-term modifications are currently being developed and will be reported in Fall 2010.

Initial Actions

At the completion of the pilot study, the Storm Water Department discontinued aggressive street sweeping in the Clairemont pilot study area, effective June 4, 2010. Street sweeping along this route resumed its previously un-posted schedule of one sweep every other month. Parking enforcement ceased and the City removed the no parking signs.

Based on the data gathered to date, street sweeping was highly effective at removing pollutants and debris from City streets in this pilot area over the course of the two-year study. However, upon evaluating other locations that need street sweeping, other areas in San Diego were determined to be of a higher priority with regard to water quality protection. Therefore, the City will be reallocating resources to address those higher priority areas.

Near Term Opportunities

Through its analysis of the pilot study and community feedback survey, the City has identified the following near-term, cost-neutral opportunities for improving its street sweeping program:

- Maximize pollutant removal by utilizing the City's three vacuum sweepers on flat routes. The results of the pilot study clearly show that the vacuum sweeper is more effective than the mechanical sweeper at removing debris and fine particulates (including metals) along flat routes with good road surface conditions and well-defined curb and gutter. This sweeping modification will allow the City to benefit from improved water quality without impacting existing budgets and resources.

- Engage communities in advance of implementing posted sweeping.
  The results of the feedback survey indicate very clearly that the majority of resident and nearly all business owners feel that street sweeping is beneficial and a good use of public funds. The Department has been tracking citizen and community requests for increased street sweeping, and is already incorporating a request recommendation into the logistics of the planning stages.

These opportunities will allow the City to benefit from improved water quality without impacting existing budget and/or resources.

Potential Long Term Modifications

Long-term, programmatic modifications to the City's street sweeping program will impact future fiscal year budgets and/or resources. Therefore, the City will be comparing the cost-effectiveness of these potential modifications with other BMPs in order to make more comprehensive and balanced decisions toward meeting our water quality objectives by FY2013.
Potential Long-term modifications may include:

- Transitioning the City's fleet of sweepers to a more equitable mix of vacuum and mechanical sweepers (50% vacuum, 50% mechanical).
- Identifying residential areas interested or requesting enhanced (e.g., once a week) sweeping.
- Identifying commercial and industrial routes for aggressive (e.g., twice a week) sweeping.
- Sweeping center medians along high-traffic roadways.

Effort Part of Larger Water Quality Improvements Strategy

The pilot study is part of ongoing effort to reduce water pollution and maintain the City's compliance with water quality regulations. The program was developed as a component of the City's **Strategic Plan for Watershed Activity Implementation** completed in November 2008. The plan outlines a process to identify activities that can be implemented to meet multiple storm water regulations in an integrated and efficient manner. A full copy of the plan can be found at Program Reports.