



**“Keep Queens Clean” Pilot Project**  
featuring the  
***BigBelly*<sup>®</sup> Solar-Powered**  
**Trash Compactors**



**Anniversary Report**

**June 2006**

## EXECUTIVE SUMMARY

The Queens Clean Air Project (QCAP), an initiative of Clean Air Communities focused on improving air quality and energy efficiency in Queens, New York City, deployed 44 *BigBelly*<sup>1</sup> solar-powered trash compactors in 8 Business Improvement Districts (BIDs) between July and September 2005 for a pilot project called “Keep Queens Clean.” The BIDs are responsible for cleaning and maintenance in their districts and typically engage private service companies to perform this work. Over the last year, the compactors’ manufacturer, Seahorse Power Company, has worked with the BIDs to monitor the machines’ performance, and in spring 2006 conducted a survey and interviews with the BID executive directors, local business owners, and community residents to evaluate the pilot project.

After twelve months’ experience with machines on the street, the pilot project has demonstrated the reliability of the technology, customer satisfaction, and the premise that solar-powered trash compactors can significantly reduce collection frequency. In the one BID with scheduled private trash-hauling service, for instance, the *BigBelly* compactors are emptied once every three days, whereas the regular trash cans are emptied once or twice daily. The program demonstrates that in settings such as parks, in which workers come to empty containers whenever they are full, truck trips could be significantly reduced, with an equivalent reduction in polluting emissions and fuel consumption.

The key results of the pilot are:

- |    |   |
|----|---|
| 1. | The compactors reduced trash collection frequency by approximately 70 percent on average for BID workers.   |
| 2. | The compactors were operational for 13,396 machine days through June 15, 2006, with an up-time of 99.78 percent in 2006.  |
| 3. | BID directors reported high overall satisfaction with the program, submitting an average score of 4.5 out of 5 points in a survey on machine performance and customer satisfaction that covered topics including collection reduction, litter reduction, machine reliability, business district aesthetic improvement, public reaction and comments, and manufacturer customer service. |



<sup>1</sup> BigBelly® is a registered trademark of Seahorse Power Company. All rights reserved.

## **CASE STUDY**

### **A. Background and Methodology**

The Queens Clean Air Project (QCAP) is an initiative of Clean Air Communities (CAC) designed to achieve community-oriented air pollution reduction and energy efficiency goals in Queens. Launched in 2003, QCAP is a collaborative partnership of: Northeast States Center for a Clean Air Future (NESCCAF), CAC's parent organization; the New York Power Authority (NYPA); Office of the President, Borough of Queens; Natural Resources Defense Council (NRDC); and the New York Public Interest Research Group (NYPIRG). For more information, visit [www.cleanaircommunities.org](http://www.cleanaircommunities.org).

During an Earth Day celebration at Queens Borough Hall in April 2005, QCAP launched the "Keep Queens Clean" pilot project with the unveiling of the *BigBelly* solar-powered trash compactors – an innovative technology that could enhance the quality of life in the urban environment. The project would deploy 44 compactors in Business Improvement Districts (BIDs) throughout the borough to reduce litter on the street, promote awareness of renewable energy, and enhance environmental quality in the community.

Following the announcement, the Office of the Queens Borough President worked closely with QCAP to allocate the machines appropriately and to deploy them in eight interested BIDs between July and September 2005.<sup>2</sup> The BIDs engage private service companies to perform their maintenance and cleaning work – such as removing full bags of trash from litter cans, replacing new bag liners in the cans, sweeping up litter from sidewalks, removing stickers, and cleaning off graffiti. The BID workers were tasked with emptying the trash compactors along with the regular trash cans, and the New York City Department of Sanitation has cooperated in the pilot by collecting the full bags of trash removed from the compactors, just as it does with bags from other authorized trash cans in the BIDs.



*Earth Day 2005 unveiling announcement at Borough Hall. Pictured left to right: Lorna Harris, QCAP; Glenn Goldstein, QCAP; Evelyn Evans, NYPA; Kit Kennedy, NRDC; Borough President Helen Marshall; Jim Poss, Seahorse Power Co.*

### **Distribution of the *BigBelly* Units in Queens**

<b>BID Name</b>	<b>No. of Units</b>	<b>Date Delivered</b>
Downtown Flushing Transit Hub	10	7/19/05
Steinway Street	5	7/26/05
Jamaica Center	10	8/9/05
Queens Plaza/Court Square (Long Island City)	4	8/9/05
Sutphin Boulevard	3	8/9/05
165 <sup>th</sup> Street Mall	2	8/16/05
Myrtle Avenue	6	9/29/05
82 <sup>nd</sup> Street	4	9/29/05

<sup>2</sup> There are 44 *BigBelly* units in the eight participating Business Improvement Districts. Two additional units were delivered in May 2006 as part of the QCAP program: one to Queens Borough Hall (as a gift to the New York City Department of Citywide Administrative Services, which handles trash collection in front of Borough Hall); and one to the New York City Parks Department as a gift for Cunningham Park in Queens. Although early reports are consistent with the findings of this case study, these two machines were not included in the surveys since they have not been in service as long as the other units.

Since delivery of the units, the compactor manufacturer, Seahorse Power Company, has worked with the BIDs and their maintenance contractors to track the machines' performance. In the spring of 2006, Seahorse conducted a survey and interviews with the executive directors of each of the eight participating BIDs. Seahorse also interviewed business owners in each BID, the cleaning and maintenance contractors who empty the trash bags from the *BigBelly* machines, and residents of each community.

## **B. Key Results of the Pilot Project**

The tracking program was designed to assess several key performance criteria during the first year of the pilot, most notably: (1) system reliability, and (2) the machines' ability to reduce collection burden through automated compaction at the point of disposal.

***Reliability: The compactors were operational for 13,396 machine days from inception of the pilot through June 15, 2006, with an up-time of 99.78 percent in 2006.***

### **Machine Up-Time in Queens (as of June 15, 2006)**

**Cumulative operating time: 13,396 machine days**

<b>Month</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>AVERAGE</b>
<b>Up-Time</b>	98.94%	99.56%	99.87%	99.68%	99.93%	99.68%	<b>99.78%</b>

There were three phases to the pilot program: (1) Installation and customization, (2) winter energy testing, and (3) monitoring and statistical analysis. Below is a summary of each phase.

**Phase 1:** During the installation phase, the BIDs and Seahorse worked together to determine the most appropriate locations in each business district. The parties selected high-volume, high-profile, and high-visibility locations. The solar compactor units were placed and placement optimized during this phase.

**Phase 2:** During the winter months of November through January, Seahorse conducted an intensive study of the machines' performance in low light conditions. Seahorse worked with the BIDs to relocate certain units – in most cases a matter of only a few yards – so that the solar panels would receive the required sunlight to maintain battery charge during the winter months. Subsequently Seahorse has re-engineered the electrical board in the *BigBelly*, increasing unit efficiency by more than 80 percent. Units can operate efficiently year-round, in virtually any location.

**Phase 3:** Seahorse began systematically recording unit up-time beginning January 1, 2006, to document system reliability. The results are set forth in the table above.

**Collection reduction:** *BID directors and their maintenance supervisors reported that the compactors reduced trash collection frequency by approximately 70 percent or more for BID workers.* In Jamaica Center, for example, BID workers empty their 10 compactor units every three days on average, as compared to once or twice each day for their 85 regular trash cans. Atlantic Maintenance, which services 28 of the 44 machines in the pilot, reports a 70 percent reduction in collection requirements on average. This reduction in collection burden has three major effects:

(1) Time – BID workers need to empty the compactors less frequently than regular cans, which frees them to spend time on other cleaning tasks (such as sweeping litter from the sidewalks and cleaning off graffiti and gum). Maintenance supervisors stated that this is a major benefit of the new units.

(2) Volume – With an average 4:1 compaction ratio, the solar compactors significantly reduce the amount of sidewalk space taken up by bags of trash set out for collection by the Sanitation Department. Moreover, the compactors can hold the trash inside the unit during peak hours, which keeps piles of trash bags off busy street corners and makes it easier for pedestrian traffic. BID directors also commented on the aesthetic improvement.

(3) Litter – All eight BID directors and their maintenance contractors stated that the compactors help reduce litter by containing the trash and preventing overflow. More information appears in Appendices A and B.

**C. Reaction of Key Public Officials and Community Leaders**

**Public officials, BID directors, and community business leaders have expressed support for the “Keep Queens Clean” pilot project.** The Office of the Queens Borough President is one of the QCAP project partners, and Borough President Helen Marshall has been a strong supporter of the project as a way to promote clean energy, enhance business districts, and improve the quality of life in Queens.

Several City Council members have also expressed support for the pilot, and some were present when the units were first deployed in their districts. Key supporters include Councilman John C. Liu (D-Flushing), chair of the City Council’s Transportation Committee, and Councilman James Gennaro (D-Fresh Meadows), who chairs the Environmental Protection Committee and also serves on the Sanitation and Solid Waste Management Committee.



*Councilman James Gennaro and Melva Miller, Sutphin BID Executive Director, with three BID maintenance staff on delivery of their three solar compactors (August 9, 2005).*

Related comments appear in Appendices B, C, and D, which contain the BID director survey results, press releases, and news reports, respectively.

**D. Survey Results**

The project’s goals are to reduce the trash collection burden, reduce litter on the street, promote awareness of renewable energy, and enhance environmental quality in the community. In a survey conducted in spring 2006, covering nine topics including collection reduction, litter reduction, machine reliability, business district aesthetic improvement, public reaction and comments, manufacturer customer service level, and overall satisfaction with the pilot project, BID directors entered an average score of 4.5 out of 5 points. Full survey results are in Appendices A and B.

Some key results from the survey:

1. The <i>BigBelly</i> system has reduced bag collection frequency by 70 percent or more on average.
2. BID workers report having more time for sweeping and cleaning activities.
3. BID directors report that the compactors are containing the trash, thereby reducing litter and trash overflow.
4. As a result of compaction, there are fewer trash bags left on the sidewalk awaiting collection.



5. BID directors, business owners, and people in the community report that the compactors help improve the district by adding a clean, high-tech look.
6. People on the street offer compliments about how nice the <i>BigBelly</i> units look and appreciate BID efforts to help keep the community clean.
7. Use of the machines increased steadily in the first few weeks as people got used to the new look and feel; signage helps people understand that the units are for regular trash.
8. Workers report that the units are easy to use and save time.
9. Workers report that full bag weight is typically 30-40 pounds.
10. Vandalism and graffiti have not been major problems.
11. BIDs report greater utilization rates for the compactors when the old cans are removed, rather than left adjacent to the compactors (which led to some public confusion about whether the compactors were for regular trash)

**E. Conclusion**

After twelve months’ experience with machines on the street, the “Keep Queens Clean” pilot project has succeeded in meeting its primary goals. The project has also clearly shown that solar-powered trash compactors reduce the volume of trash and therefore can significantly reduce collection frequency, which in turn both reduces air pollution and saves fuel. In Jamaica Center, worker trash collection dropped from at least once a day for regular cans to once every three days for the *BigBelly* units, indicating that the BID’s private hauler could reduce truck collections from daily to every two or three days if all 85 trash cans were replaced by *BigBelly* compactors. Other BIDs maintained the same schedule of Sanitation Department collection to fully service both the traditional cans and the new units; in those areas, the trash cans fill up so frequently that BID workers must empty normal cans several times between truck trips, even though trucks make collections two or three times a day. Accordingly, the compactors in Queens do not reduce truck trips, but instead save BID workers time and reduce the number of full trash bags on the sidewalk awaiting collection.

The survey of BID directors indicates consensus that the project has improved the business districts: sidewalks are cleaner and have fewer trash bags awaiting collection; BID workers have to change trash bags less often, freeing up time for other cleaning tasks; and people in the neighborhoods have expressed their appreciation to the BIDs for their efforts to help beautify the community. The project has enhanced the quality of life in the urban environment of Queens.



[For the full version of this case study with appendices, visit [www.cleanaircommunities.org](http://www.cleanaircommunities.org)]

## SURVEY RESULTS SUMMARY

Average Score from All BID Respondents (rounded to nearest 0.5 point)

- |    |  |                    |   |   |                     |
|----|--|--------------------|---|---|---------------------|
| 1. | <b>Has the <i>BigBelly</i> system helped reduce trash collection frequency?</b><br>Not at all<br>1                           | Somewhat<br>3      | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">4.0</span> </div> | Very much<br>5  |                     |
| 2. | <b>Has the <i>BigBelly</i> system helped reduce litter?</b><br>Not at all<br>1   | Somewhat<br>3      | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">4.0</span> </div> | Very much<br>5  |                     |
| 3. | <b>Does the <i>BigBelly</i> system improve the business district by creating a cleaner look?</b><br>Not at all<br>1          | Somewhat<br>3      | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">4.5</span> </div> | Very much<br>5      |
| 4. | <b>How would you characterize public reaction and comments about the <i>BigBelly</i> system?</b><br>Negative<br>1            | Mixed<br>3         | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">4.5</span> </div> | Very positive<br>5  |
| 5. | <b>How would you rate the <i>BigBelly</i> system's ease of use?</b><br>Difficult to use<br>1                                 | Mixed<br>3         | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">5.0</span> </div> | Easy to use<br>5    |
| 6. | <b>How important to you is the fact that the <i>BigBelly</i> runs on renewable energy?</b><br>Not at all<br>1                | Somewhat<br>3      | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">4.5</span> </div> | Very important<br>5 |
| 7. | <b>Reliability: how many service problems with the machines have you experienced over the year?</b><br>Lots of problems<br>1 | Some problems<br>3 | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">5.0</span> </div> | No problems<br>5    |
| 8. | <b>How would you rate Seahorse Power Company's customer service and responsiveness?</b><br>Very poor<br>1                    | Average<br>3       | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">5.0</span> </div> | Excellent<br>5      |
| 9. | <b>Overall, are you pleased with the <i>BigBelly</i> system and the pilot program?</b><br>Not at all<br>1                    | Somewhat<br>3      | 4   | <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <span style="font-weight: bold; font-size: 1.2em;">5.0</span> </div> | Very pleased<br>5   |

**OVERALL AVERAGE SCORE:                      4.5**