



sanitation

JOHN J. DOHERTY

Commissioner

125 Worth Street, Room 714

New York, New York 10013

Tel: (646) 885-4974

January 31, 2007

Honorable Michael Bloomberg
Mayor, City of New York
City Hall
New York, New York 10007

Honorable Christine Quinn
Speaker, New York City Council
City Hall
New York, New York 10007

Honorable William C. Thompson, Jr.
One Centre Street – Municipal Building
Room 530
New York, New York 10007

Re: Local Law 38 of 2005, First Annual Report

Dear Mayor Bloomberg, Speaker Quinn, and Comptroller Thompson:

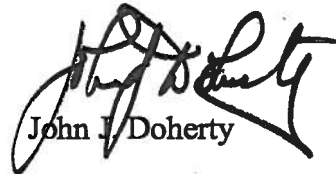
Pursuant to the New York City Administrative Code, I am pleased to submit to you the first annual report required by Local Law 38 of 2005.

Local Law 38 of 2005 added sections 24-163.1 and 24-163.2 to the New York City Administrative Code. Section 24-163.1 requires all City agencies to meet emissions and fuel economy standards for newly purchased light- and medium-duty vehicles. Section 24-163.2 provides that the Commissioner of Sanitation shall: (1) implement a program for testing the mechanical reliability and operational feasibility of alternative fuel street sweeping vehicles, and (2) collect and analyze data to further develop its initiatives for, and assess the feasibility of, incorporating new alternative fuel sanitation vehicles and technology into its fleet.

Section 24-163.2 also requires the Commissioner of Sanitation to report annually to the Mayor, Speaker of the City Council and Comptroller on the Department's alternative fuel street sweeping vehicle pilot project, and all other testing, analyses and assessments regarding its alternative fuel initiatives. The enclosed report is the first annual report on the Department of Sanitation's alternative fuel programs, including the street sweeper pilot program.

The Department of Sanitation is committed to the use of alternative fuels. As the enclosed report indicates, the Department currently has approximately 800 vehicles that operate on various alternative fuels, and will continue to expand its current fleet of alternative fuel vehicles while pursuing research and development of new technologies.

Sincerely,



John J. Doherty

c: Edward Skyler, Deputy Mayor
City Hall

Haeda Mihaltses, Director
Office of Intergovernmental Affairs, City Hall

Encl.



The City of New York Department of Sanitation



**Report to the Mayor, Speaker of the City Council and Comptroller
on the use of Alternative Fuel Street Sweepers and Sanitation Vehicles
Pursuant to Local Law 38 of 2005**



John J. Doherty, Commissioner
January 2007

I. Introduction

In addition to keeping the streets of New York City clean, the Department of Sanitation (DSNY) uses certain state-of-the-art technology and alternative fuels for its vehicle fleet to minimize air pollutant emissions. Currently, all of the Department's light, medium and heavy-duty diesel vehicles utilize the industry's latest computer-controlled and regulated clean-diesel engines for their respective engine model years. The Department also implemented the use of ultra-low sulfur diesel fuel (ULSD) in its entire fleet over two years in advance of regulatory mandates.¹ The use of ULSD in turn allows for DSNY's expanding use of various advanced emission-control retrofit technologies, such as diesel particulate filters and diesel oxidation catalysts (high sulfur diesel fuel harms these devices). With the use of these new technologies, diesel emissions differ only slightly from those of compressed natural gas (CNG)-fueled heavy duty vehicles, with nitrogen oxides emissions from CNG-fueled vehicles still somewhat lower than from diesel vehicles.² Meanwhile, with the new national standards for ULSD fuel, federal standards for new on-road heavy duty diesel engines taking effect with the 2007 model year will result in a reduction in particulate and nitrogen oxides pollution by over 98%, as compared with pre-1988 engines.³

DSNY currently has about 800 vehicles that operate on alternative fuels, and most of its future light-duty vehicle purchases will be advanced hybrid vehicles. DSNY is the first and only city agency to use E85 ethanol fuel – a mixture of 85% ethanol and 15% gasoline – in its fleet. Currently, there are six E85 fueling facilities in operation citywide, and over 500 DSNY vehicles run on E85.

Local Law 38 of 2005 provides that, beginning no later than March 1, 2006, DSNY shall implement a program for testing the mechanical reliability and operational feasibility of alternative fuel street sweeping vehicles. This law provides for a pilot project where alternative fuel street sweeping vehicles are used exclusively in at least four sanitation districts, with at least one district in an area where high rates of asthma are found among residents. In addition, Local

¹ The federal mandate for using on-road ULSD took effect in September 2006.

² See Ayala, *et al.*, *CNG and Diesel Transit Bus Emissions in Review* (August 2003); Ayala, *et al.*, *Diesel and CNG Heavy-Duty Transit Bus Emissions over Multiple Driving Schedules: Regulated Pollutants and Project Overview* (Society of Automotive Engineers, 2002).

³ Nitrogen Oxides levels are capped at 0.2 grams per brake horsepower-hour (g/bhp-hr), and particulate matter is capped at 0.1 g/bhp-hr. 66 Fed. Reg 5001, 5005 (Jan 18, 2001).

Law 38 requires that DSNY assess the feasibility of incorporating new alternative fuel sanitation vehicles and technology into its fleet.⁴

Under Local Law 38, alternative fuels include natural gas, liquefied petroleum gas, hydrogen, electricity, and any other fuel which is at least eighty-five percent, singly or in combination, methanol, ethanol, any other alcohol or ether.⁵ DSNY is currently utilizing CNG as an alternative fuel for its street sweepers and sanitation vehicles. CNG-fueled heavy-duty vehicles emit significantly less particulate matter and nitrous oxides than pre-2007 model year diesel-fueled vehicles without retrofit technology, and make less noise.⁶ However, it has also been noted that CNG-fueled vehicles have lower fuel efficiency and emit more methane and carbon monoxide than conventional diesel vehicles,⁷ and the costs of CNG-fueled vehicles and CNG fueling station infrastructure are relatively high.

Local Law 38 requires the Commissioner of Sanitation to report to the Mayor, the Comptroller and the Speaker of the Council on DSNY's alternative fuel street sweeping vehicle pilot project, and all testing, analyses and assessments of the alternative fuel street sweepers and sanitation vehicles. To fulfill this mandate, this report includes:

- The number of alternative fuel street sweeping vehicles included in the pilot project;
- The districts in which alternative fuel street sweeping vehicles are located and the type of alternative fuel used by such vehicles;
- The total number of alternative fuel sanitation vehicles owned or operated by DSNY, separated according to vehicle model and type of alternative fuel used;
- A description of all testing, analyses and assessments done on DSNY's alternative fuel street sweepers and sanitation vehicles;
- Conclusions based upon such testing, analyses and assessments;
- Information regarding efforts made by DSNY to further develop initiatives for further incorporating alternative fuel sanitation vehicles into its fleet; and
- Information regarding the feasibility of incorporating alternative fuel sanitation vehicles into the DSNY fleet.

⁴ NYC Administrative Code § 24-163.2(c)(1), (2).

⁵ NYC Administrative Code § 24-163.1(a)(1). Other types of fuels, such as biodiesel, do not qualify as alternative fuels.

⁶ INFORM, Inc., *Greening Garbage Trucks: New Technologies for Cleaner Air* (2003).

⁷ DSNY Commercial Waste Management Study, Vol. VI, at ES-5, 23 (March 2004); Ayala, *et al.*, *Diesel and CNG Heavy-Duty Transit Bus Emissions over Multiple Driving Schedules* (indicating CNG buses emit more carbon monoxide than retrofitted diesel buses).

II. Street Sweepers

This section reports on the number of alternative fuel street sweeping vehicles included in the pilot project; the districts where alternative fuel street sweeping vehicles are located and the type of alternative fuel used by such vehicles; and a description of all testing, analyses and assessments done on DSNY's alternative fuel street sweepers.

DSNY currently owns nineteen (19) alternative fuel street sweepers, all of which use CNG (see Figure 1), and all of which operate in the following four sanitation districts: Brooklyn North 4; Queens West 2; Queens West 4; and Queens West 5. Ten (10) of DSNY's 19 CNG street sweepers are being carefully monitored and studied, because they represent the latest CNG sweeper technology (see Figure 2). The ten pilot study street sweepers have been allocated as follows: four street sweepers in Brooklyn North 4; and two street sweepers each in Queens West 2; Queens West 4; and Queens West 5 (see Figure 3). Of the four sanitation districts selected for the pilot study, Brooklyn North 4 was determined to have high asthma rates among residents.

Figure 1: Total DSNY alternative fuel street sweepers

Vehicle	VIN #	Vehicle Type	Alternative Fuel
20CNG-401	1J9VM4L961C172002	Street Sweeper	CNG
20CNG-402	1J9VM4L981C172003	Street Sweeper	CNG
20CNG-403	1J9VM4L9X1C172004	Street Sweeper	CNG
20CNG-404	1J9VM4L911C172005	Street Sweeper	CNG
20CNG-501	MJ9VM4L903C172001	Street Sweeper	CNG
20CNG-502	1J9VM4L323C172002	Street Sweeper	CNG
20CNG-503	1J9VM4L943C172003	Street Sweeper	CNG
20CNG-504	1J9VM4L963C172004	Street Sweeper	CNG
20CNG-505	1J9VM4L983C172005	Street Sweeper	CNG
20CNG-601	1J9VM4L956C172001	Street Sweeper	CNG
20CNG-602	1J9VM4L976C172002	Street Sweeper	CNG
20CNG-603	1J9VM4L996C172003	Street Sweeper	CNG
20CNG-604	1J9VM4L906C172004	Street Sweeper	CNG
20CNG-605	1J9VN4L926C172005	Street Sweeper	CNG
20CNG-606	1J9VM4L946C172006	Street Sweeper	CNG
20CNG-607	1J9VM4L966C172007	Street Sweeper	CNG
20CNG-608	1J9VM4L986C172008	Street Sweeper	CNG
20CNG-609	1J9VM4L9X6C172009	Street Sweeper	CNG
20CNG-610	1J9VM4L966C172010	Street Sweeper	CNG

Figure 2: DSNY Alternative Fuel Street Sweepers Used in Pilot Study

Vehicle	VIN #	Fuel	Make / Model
20CNG-601	1J9VM4L956C172001	CNG	Johnston 4000
20CNG-602	1J9VM4L976C172002	CNG	Johnston 4000
20CNG-603	1J9VM4L996C172003	CNG	Johnston 4000
20CNG-604	1J9VM4L906C172004	CNG	Johnston 4000
20CNG-605	1J9VN4L926C172005	CNG	Johnston 4000

20CNG-606	1J9VM4L946CI72006	CNG	Johnston 4000
20CNG-607	1J9VM4L966C172007	CNG	Johnston 4000
20CNG-608	1J9VM4L986CI72008	CNG	Johnston 4000
20CNG-609	1J9VM4L9X6CI72009	CNG	Johnston 4000
20CNG-610	1J9VM4L966C172010	CNG	Johnston 4000

Figure 3: Pilot Study Sanitation Districts & Vehicles

District	Vehicles
Brooklyn North 4	20CNG-601; 20CNG-602; 20CNG-605; 20CNG-609
Queens West 2	20CNG-607; 20CNG-608
Queens West 4	20CNG-604; 20CNG-606
Queens West 5	20CNG-603; 20CNG-610

DSNY’s alternative fuel street sweepers were tested for fuel economy, refueling times, low-fuel operability, and reliability. Average fuel economy was 2.434 miles per gallon-equivalent, with the most efficient pilot study sweeper operating at 3.16 miles per gallon-equivalent and the least efficient vehicle running at 1.65 miles per gallon-equivalent (see Figure 4).

Figure 4: Fuel Economy of Alternative Fuel Street Sweepers Used in Pilot Study

Vehicle	Fuel Economy (miles/gallon-equivalent)	Avg.	Fuel
20CNG-601	1.94	2.434	CNG
20CNG-602	1.78		
20CNG-603	2.72		
20CNG-604	3.16		
20CNG-605	3.01		
20CNG-606	2.25		
20CNG-607	2.37		
20CNG-608	2.50		
20CNG-609	1.65		
20CNG-610	2.96		

DSNY’s alternative fuel street sweepers were tested for fueling time. The sweepers were filled with between 3.8 and 18.1 gasoline gallons equivalent, with fueling times ranging from between two minutes and thirty-five seconds to nine minutes and fifty-five seconds (see Figure 5).

Figure 5: Refueling Times ⁸

Date	Vehicle	Miles	Hours	Tank PSI	Tank PSI	Fuel	Fill
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⁸ Testing conducted at Keyspan Energy’s Greenpoint CNG fueling facility, which dispenses at 3,600 pounds per square inch (PSI).

				Pre-fill	Post-fill	(GGE) ⁹	Time
10/31/06	20CNG-603	N/A	N/A	3000	3600	3.803	2:35
	20CNG-606	N/A	N/A	2000	3425	9.154	7:15
	20CNG-608	N/A	N/A	1800	3800	12.764	9:55
11/06/06	20CNG-601	958	231	1900	3600	11.225	3:45
	20CNG-603	486	77	1150	3325	18.059	4:48
	20CNG-607	1428	194	1225	3550	17.407	3:47
	20CNG-608	533	93.3	1800	3650	11.087	3:00
	20CNG-610	1221	196	900	3150	18.13	3:48

One sweeper was given a Low Fuel Operability Test, which evaluates the vehicle's drivability under certain low-fuel pressure conditions. The sweeper's fuel system was isolated to one CNG fuel tank, and the vehicle was then driven on the one fuel tank. As the fuel pressure dropped in the one tank, the sweeper's drivability was documented at certain fuel pressures. No power loss was experienced above 1,000 PSI. At 700 PSI, there was a slight loss of power. At 450 PSI, the engine surged during full throttle in low gear. And at 125 PSI, the vehicle experienced a loss of power, the low fuel lamp turned on, and the malfunction indicator lamp turned on.

Finally, the sweepers were evaluated for reliability. Their days in service were tracked and compared to their "down" incidents (i.e., incidents of required maintenance). Each sweeper was in service for between 55 and 117 days; the overall average was about 101 days of service. The sweepers each experienced at least one down incident, with a high of five incidents and an average of 2.4 incidents. The sweepers' down incidents amounted to between one and 21 days out of service, with a total of 96 days out of service and an average of 9.6 days out of service per vehicle. The percent of time spent down ranged from 0.85% to 20.19%, with an average of about 9% (see Figure 6). In 2007, DSNY intends to compare the CNG sweepers' performance with the performance of conventional diesel sweepers.

Figure 6: Reliability Statistics By District

Brooklyn North 4		# Days In-Service	# of Down Incidents	# of Down Days	% of Down time
20CNG-601	1J9VM4L956C172001	114	2	21	18.42%
20CNG-602	1J9VM4L976CI72002	79	1	3	3.80%
20CNG-605	1J9VN4L926C172005	104	2	21	20.19%
20CNG-609	1J9VM4L9X6CI72009	113	2	3	2.65%

⁹ GGE: Gasoline Gallons Equivalent.

Queens West 2		# Days In-Service	# of Down Incidents	# of Down Days	% of Down time
20CNG-607	1J9VM4L966C172007	114	4	17	14.91%
20CNG-608	1J9VM4L986C172008	93	3	8	8.60%

Queens West 4		# Days In-Service	# of Down Incidents	# of Down Days	% of Down time
20CNG-604	1J9VM4L906C172004	55	2	2	3.64%
20CNG-606	1J9VM4L946C172006	111	5	12	10.81%

Queens West 5		# Days In-Service	# of Down Incidents	# of Down Days	% of Down time
20CNG-603	1J9VM4L996C172003	117	1	1	0.85%
20CNG-610	1J9VM4L966C172010	114	2	8	7.02%

III. Sanitation Vehicles

DSNY currently owns 26 dedicated CNG sanitation collection trucks (see Figure 7). This is an older fleet (2001-2003 vintage) that has been problematic. CNG-fueled trucks are longer than conventional sanitation vehicles, preventing them from accessing narrower streets because of their wider turning radius.¹⁰ A new generation of acceptable class-8 CNG collection vehicles is currently not available, even though DSNY has made a strong industry-wide outreach for new CNG trucks.

Under a federal consent order, DSNY has built a fully-operational, heavy-duty vehicle CNG fueling station in Woodside, Queens, at a cost of approximately \$2,950,000.¹¹ This station will provide better fueling times and increase efficiency of the CNG vehicle fleet.

Figure 7: DSNY's CNG Sanitation Trucks¹²

Vehicle	VIN #	Vehicle Type	Make / Model	Fuel
25CNG-301	1M2AC12CX1M005222	Collection truck	Mack LE 613	CNG
25CNG-302	1M2AC12C51M005225	Collection truck	Mack LE 613	CNG
25CNG-303	1M2AC12C31M005224	Collection truck	Mack LE 613	CNG
25CNG-304	1M2AC12C51M005225	Collection truck	Mack LE 613	CNG
25CNG-305	1M2AC12C71M005226	Collection truck	Mack LE 613	CNG
25CNG-306	1M2AC12C91M005227	Collection truck	Mack LE 613	CNG
25CNG-307	1M2AC12C01M005228	Collection truck	Mack LE 613	CNG

¹⁰ Testimony of DSNY Assistant Commissioner Rocco DiRico to City Council Committee on Environmental Protection (September 23, 2004).

¹¹ This project was undertaken as part of a settlement of a lawsuit brought against the City and the New York City Department of Sanitation by the United States for violations of the Clean Air Act. *United States v. City of New York*, 99 Civ. 2207 (LAK) (S.D.N.Y.).

¹² Vehicles 25CNG-301, -302, -303, -304, -305, -306, -307, -308, and -309 were purchased as part of a settlement of a lawsuit brought against the City and the New York City Department of Sanitation by the United States for violations of the Clean Air Act. *United States v. City of New York*, 99 Civ. 2207 (LAK) (S.D.N.Y.).

25CNG-308	1M2AC12C21M005229	Collection truck	Mack LE 613	CNG
25CNG-309	1M2AC12C91M005230	Collection truck	Mack LE 613	CNG
25CNG-310	1M2AC12C01M005231	Collection truck	Mack LE 613	CNG
25CNG-401	1M2AC07C03M008004	Collection truck	Mack LE 613	CNG
25CNG-402	1M2AC12C23M008005	Collection truck	Mack LE 613	CNG
25CNG-403	1M2AC12C43M008006	Collection truck	Mack LE 613	CNG
25CNG-404	1M2AC12C63M008007	Collection truck	Mack LE 613	CNG
25CNG-405	1M2AC12C83M008008	Collection truck	Mack LE 613	CNG
25CNG-406	1M2AC12CX3M008009	Collection truck	Mack LE 613	CNG
25CNG-407	1M2AC12C63M008010	Collection truck	Mack LE 613	CNG
25CNG-408	1M2AC12C03M008011	Collection truck	Mack LE 613	CNG
25CNG-409	1M2AC12CX3M008002	Collection truck	Mack LE 613	CNG
25CNG-410	1M2AC12C13M008013	Collection truck	Mack LE 613	CNG
25CNG-411	1M2AC12C33M008014	Collection truck	Mack LE 613	CNG
25CNG-412	1M2AC12C53M008015	Collection truck	Mack LE 613	CNG
25CNG-413	1M2AC12C73M008016	Collection truck	Mack LE 613	CNG
25CNG-414	1M2AC12C93M008017	Collection truck	Mack LE 613	CNG
25CNG-415	1M2AC12C93M008017	Collection truck	Mack LE 613	CNG
25CNG-416	1M2AC12C23M008019	Collection truck	Mack LE 613	CNG

DSNY is further developing its clean air efforts by implementing a biodiesel pilot on a small portion of the fleet and participating in a national Hybrid Truck Working Group¹³ to accelerate the commercial availability of hybrid-electric and hybrid-hydraulic sanitation vehicles. The working group expects to issue a request for proposals for test vehicles in the first quarter of 2007. DSNY intends to conduct further studies on the economic and operational feasibility of incorporating more alternative fuel sanitation vehicles into its fleet.

IV. Conclusions

It is too early to tell whether CNG or other alternative fuel street sweepers and sanitation vehicles can meet the reliability standards necessary for efficient operations. DSNY will continue to study its current fleet of alternative fuel sweepers and sanitation vehicles, while participating in research and development of new technologies.

¹³ See <http://www.weststart.org/programs/htuf/?p=programs>.