Position Paper:
Encouraging the Development of Processing Infrastructure for New York City's Organics Waste Stream

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Executive Summary

There is scarcely any capacity for processing food wastes within a fifty-mile radius of New York City. If New York is to achieve its goal of diverting a significant portion of its organic waste stream from remote landfill disposal (as Local Laws 77 and 146 of 2013 envision), a significant amount of anaerobic digestion, composting, or other form of organics-processing capacity will need to be developed. The fact that almost no such facilities exist to serve the nation's largest source of municipal organic waste, while New York has the highest landfill costs in the country and transports its waste the longest distances, suggests that the barriers to developing such facilities are significant.

This paper makes a number of suggestions for attempting to overcome these imputed barriers. These recommendations—which might be followed either individually or in some combination—all pertain to three basic themes.

First, the order in which the components of the collection and processing system are introduced will affect the likelihood of achieving the economic and environmental benefits sought, as well as the amount of time that it will take to realize them. Processing infrastructure should precede collection operations. The organics streams that are the least costly to collect, and have the fewest non-organic contaminants, should be collected before streams that are costly to collect and have high contamination rates. Low-contaminant and high-contaminant streams should be collected and processed separately. Low-contaminant streams, whether collected by municipal or private forces, should be processed together.

Second, from a direct-cost perspective—if not from a public-benefits perspective—the economic benefits of organics-processing facilities are marginal. Public-sector assistance, in forms such as sites, supply commitments, and regulatory mandates, as well as in the form of grants, product purchase incentives, and other forms of monetary subsidy, may help overcome the financial barriers to facility development.

Third, inefficient collection and transport operations could marginalize the potentially significant environmental and economic benefits of diverting a portion of New York City's waste stream from long-distance transport and landfill disposal. Maximizing the efficiency of these operations will require attention to generator types and other logistical issues associated with volumes and contamination rates, to processing facility locations, and to the kinds of collection and transport equipment used. Distinctions should be made between generator and geographic characteristics with regard to the kind of collection program (containerized or rear-loader trucks, drop-off, or

mixed-waste) and the kind of processing facility (wet or dry anaerobic digestion, composting, or mechanical-biological treatment) used.

Three categories of suggestions for addressing these issues are outlined below:

- Strategic planning
- Financial levers
- Siting and logistics

But first, we will set the stage, define the issue, and characterize relevant experience elsewhere.

The Context

Managing the impressive volumes of municipal solid waste produced by New York's residents and businesses is a major challenge. The City's record in meeting this challenge has been mixed. In recent decades it has sometimes seemed that our efforts have been driven more by well-meaning but misplaced intentions than by a productive understanding of the underlying issues.

Doubtless it seemed a good idea, at the time, to separate the management of commercially generated waste from that produced by residents and non-profit institutions: a way of husbanding the municipal budget rather than of adding millions of truck miles to city streets because carters were forced to compete without the protections of rationally delineated franchise zones. Surely the advantages of plastic garbage bags—first used in New York—promised only benefits to civilization rather than a way to produce pop-up barricades that at once channel-and-repulse pedestrians and feed-and-breed rats. Raising the price charged commercial carters for access to the City's transfer stations and landfill was intended to capture fair-market value for a diminishing resource—not as a way to push most of the garbage trucks in the city into two neighborhoods in Brooklyn and the Bronx and to impel most of our commercial waste across our borders to other states. Setting mandatory-but-arbitrary percentages for diverting metal, glass, plastic, and paper from our waste stream in the absence of a plan for actually achieving those goals in an environmentally productive (never mind cost-effective) way was meant to accelerate the advance of recycling rather than to paint a bulls-eye for future budget-cutters. Closing the city's last-remaining landfill without figuring out what would happen next—or how much it would cost, or how far away our waste would have to go—must not have seemed a foolish idea.

Which brings us to where we are today.

The Issue

Ten years after our recycling budget was restored (although recycling rates are still below pre-cut levels),[1] a world-class processing station has been built on the Brooklyn waterfront.[*] But all the city's non-recycled residential and institutional waste leaves the city on vehicles (trucks or

[*] A state-of-the-art paper mill on Staten Island has been manufacturing paperboard from the City's residential mixed-paper stream since 1997. (http://webcache.googleusercontent.com/search?q=cache:rNMVhofmfGEJ:www.test.visy.com.au/pulpandpaper/%3Fid%3D143+&cd=4&hl=en&ct=clnk&gl=us, accessed 11-21-14)

railcars) that travel an average of 600 miles, round-trip, so that 90% of it can be placed in landfills,[†] at an average cost of $95 a ton, to release 700,000 metric tons of greenhouse gas emissions into the atmosphere each year.[2]

Over a third of this material is organic: the carbon-infused matter that remains after substances from once-living things are manufactured into products or prepared in kitchens and consumed. These materials, which are the major source of greenhouse gas emissions from landfills, can be composted to produce fertilizer and soil amendments or anaerobically digested to produce biogas and compost. Like many other cities throughout the world, New York now recognizes that separating this material from our refuse stream could be economically and environmentally beneficial. But again (as the experience outlined below suggests), some of our first steps toward achieving this end may have been more well-intentioned than strategic.

Thanks to Local Law 77 of 2013 (LL77), which set requirements for collecting source-separated organics (SSO) on a pilot basis from at least 400 hundred schools in all five boroughs and at least 100,000 households in at least four boroughs, municipal trucks are now collecting, at a significant cost in terms of dollars and miles, some 43 tons a day of material of varying quality from schools and residences.[3‡] Private carters are[§] voluntarily collecting another 170-or-so tons per day from restaurants and food stores.

But securing an adequate network of processing facilities for this material is another story. Residential waste from Staten Island's pilot program (one ton a day) is being composted in outdoor windrows on a portion of the leaf-and-yard-waste compost facility at the former Fresh Kills landfill.[4] Up to 12 tons of organics from schools and residences in the other boroughs are driven to compost facilities 70 miles away in eastern Long Island or 95 miles away in Dutchess County. In a pilot test up to 3 tons a day of organics from schools and greenmarkets were taken to a Waste Management pre-processing facility in Brooklyn, then transported by tanker truck to an anaerobic digester at the Newtown Creek Wastewater Treatment Plant.[5] But the majority of the source-separated organic material collected in New York City, food waste from stores and restaurants, was hauled a distance of 120 miles—one-way—to be delivered to a composting facility in Wilmington, DE. With the closure of that plant in October, a portion of the material that had been sent there is taken to two small compost facilities or to hog farms in New Jersey.[6**] The remainder of the SSO is either no longer collected (in the case of some of the formerly collected commercial waste) or is landfilled.

[†] The remaining 10% is trucked to a waste-to-energy incinerator in Newark.

[‡] As of October, 2014, more than 100,000 households in all five boroughs have been offered the opportunity to participate in this pilot and 750 schools in four boroughs have received separate organics collections. 43 tons per day is the average for October (Kathryn Garcia, commissioner, DSNY, personal communication, 11-13-14); 12 tons per day was the average for the last part of the first 6-month period that ended in June, per the report cited in footnote 3.)

[§] Or *were* collecting, prior to the closure of the Peninsula Compost Facility in Wilmington.

[**] Industry sources consider it unlikely that the Peninsula facility will re-open.

To date there have been several efforts to develop local processing capacity,[††] only one of which has thus far resulted in any physical manifestation: a 50-ton-per-day (tpd) in-vessel (enclosed) composting facility, which processes kitchen and cafeteria waste from the Rikers Island Correctional Facility.[7‡‡] It does not have the capacity to absorb any appreciable quantity of material from off-Island.[§§] Of greater potential significance, from a citywide perspective, are facilities built by the NYC Department of Environmental Protection for digesting sewage sludge at wastewater treatment plants (WWTPs). In an initial pilot study conducted between April 2013 and April 2014, SSO from the Department of Sanitation's (DSNY) school and greenmarket programs were pre-processed into a slurry that could be pumped into the digester at the Newtown Creek WWTP. Among the purposes of this study were determining what the contamination levels would be for material from these sources and what throughput could be expected for equipment of a given size. The Varick Avenue pre-processing facility is currently closed so that the pre-processing equipment can be scaled up to a capacity of 250 tons a day. It is expected to re-open, to receive SSO collected by private carters, in the 4th quarter of 2015.[8***]

Local Law 146 of 2013 gives the Sanitation Commissioner the authority to mandate source-separation of organics from designated categories of businesses, based on her assessment of available processing capacity within a hundred miles of New York City by July 1, 2015. Though the law was intended to foster the development of new processing capacity (in the recognized absence of any such facilities), it has not had any discernable effect thus far.[9] Given the fact that New York's large restaurants, hotels, food stores, caterers, food manufacturers, stadiums, and arenas generate upwards of an estimated 1,000 tons of food waste a day, it is unlikely that enough such capacity will be available within the next six months to serve more than a small fraction of the potential demand.

What can we do to increase the odds that our good intentions—to divert organics away from landfills and into beneficial-re-use facilities and thereby reduce costs and environmental

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[††] In 2012 DSNY issued a Request for Proposals for a facility within 80 miles of the city that would be capable of processing the organic content of up to 900 tons per day of refuse. Few proposals were received, none were found acceptable, and no formal action was ever taken. (See below.) The NYC Economic Development Corporation conducted analyses of a potential anaerobic digestion facility for the Hunts Point Produce Market in 2005 and 2010. Although this facility was deemed feasible, no steps were taken toward implementation. (NYC EDC, "Hunts Point Anaerobic Digestion Feasibility Study," 7-2010, http://www.nycedc.com/sites/default/files/filemanager/Projects/Hunts_Point_Peninsula/HuntsPointAnaerobicDigestionFeasibilityStudy.pdf, accessed 11-1-14; "Hunts Point Food Distribution Center: Organics Recovery Feasibility Study," 12-30-2005, http://www.nycedc.com/sites/default/files/filemanager/Projects/Hunts_Point_Peninsula/HPOrganicsRecoveryFeasibilityStudy.pdf, accessed 11-1-14.) The outdoor windrow compost facility at the former Fresh Kills landfill is not included here because it is designed to handle leaf and yard waste rather than food waste and because the food waste from the pilot collection program on Staten Island is being handled only on a temporary basis. A permanent facility could be developed there, with permission from the NYS Department of Environmental Conservation (DEC), provided it was an in-vessel plant.

[‡‡] The original plant, which opened in 1996, was upgraded and substantially replaced in 2010.

[§§] Theoretically it could be expanded (with permission from the NYS DEC). The logistical difficulties—and time delays—associated with trucking material into a prison complex may or may not outweigh the costs of trucking the material to a more-distant site. Since this facility was designed to accept only a very low-contaminant food stream, it could not be used for material such as that currently collected through the schools program.

[***] At some future time, the operator, Waste Management, expects to also accept residential organics at this facility.

impacts—are actually fulfilled? And while we're at it, can we help to fix some of the other inadvertently produced problems mentioned above?

Organics Processing Elsewhere

Other places have successfully developed organics processing capacity. In Europe, where the EU has banned the landfilling of organics—organics will be phased out of European landfills by 2025—hundreds of anaerobic digesters and compost facilities have been built over the past few decades.[10] Many of the plants built since 2000 are for anaerobic digestion (AD) rather than composting, since the economic and environmental return is better from the recovery of biogas than from compost alone. Although dozens of these anaerobic digestion plants are stand-alone facilities designed exclusively for urban (commercial, industrial, and residential) organics (primarily food waste),[11] the vast majority of the anaerobic digesters now in place are small-scale farm facilities that handle a mixture of manure and food waste. Another category of European facilities is "mechanical-biological treatment" (MBT) plants with anaerobic digestion or composting. These facilities are generally co-sited at landfills or incinerators to recover recyclables and process organics screened from incoming mixed refuse.[12] Together, all of these digesters and composters process about 30% of all the organic waste generated in EU countries.[13]

In the U.S., Massachusetts, Connecticut, and Vermont have taken steps to reduce the volume of organics disposed of in landfills. Massachusetts offers a useful example of a coherent state-wide strategy for stimulating the development of processing infrastructure in a cost-effective, low-risk way. It treats the industry as an eco-system that can be grown organically by focusing first on the generators whose food wastes are most susceptible to successful collection and processing, channeling this material to facilities in the easiest-to-develop locations, and providing sufficient regulatory and economic resources to allow a sustainable base capacity to become established. It expects that as this infrastructure grows it will attract—and be able to accommodate—a gradually increasing proportion of the state's overall organic-waste generation. That is, it prioritizes infrastructure rather than collection, on the theory that emerging capacity will draw increasing volumes of organic waste.[†††]

[†††] "[David] Cash [commissioner of the Massachusetts Department of Environmental Protection] says no residential food-waste ban is in the works, but there's little doubt the current commercial food-waste ban is putting the infrastructure in place should the state move in that direction later.
'Businesses need to know there will be a continual source of food waste coming before they're going to make an investment in building things like anaerobic digesters,' says Dana Gunders, staff scientist with Natural Resource Defense Fund [sic], and author of the group's 2012 report on food waste. 'This is enabling infrastructure to be built so a residential program down the road will have places to bring food.'" (Clare Leschin-Hoar, "Banning Food Waste: Companies in Massachusetts Get Ready to Compost," *Guardian*, 9-9-2014.)
To date, however, there is a geographic mismatch between the location of relatively small-scale, dispersed processing facilities and the metropolitan areas that are the major sources of food waste. Also, significantly more processing capacity will be required if all of the projected volumes of SSO are to be managed. For this reason, MA may need to increase the specified tonnage level from one ton per week to a higher figure, or to make the ban effective only when processing capacity is available within a "reasonable" distance, as CT and VT have done, or provide longer time periods for compliance by lower-volume generators, as VT has done. (Zoe Neale, "Implementation Realities of Organics Ban in Massachusetts," *BioCycle*, 4-2013, pp. 34ff)

The regulatory underpinning of Massachusetts's statewide plan is a 2013 law that amended the state's solid-waste-facility regulations to forbid the acceptance of certain organic wastes at any landfill or incinerator.[14] Facility development should be stimulated by the fact that the ban focusses only on those source-separated organics that can be collected most easily and efficiently, are least problematic to process, and offer the highest return in energy sales per unit of capacity. These materials are from food-related businesses that generate over one ton of organic waste per week—that is, businesses that are likely to already be segregating their organic waste or who could readily do so. These are also the sorts of generators who commonly stage their waste on loading docks in containers that could be picked up by automated or semi-automated collection trucks. This material is most susceptible to processing by anaerobic digesters, which have higher capital costs than composting facilities but offer a higher rate of return, offer higher throughput capacity on a smaller footprint, and present less potential for local nuisance.

In order to facilitate the siting of this type of waste-management facility—waste management facilities of any type are generally considered unwelcome neighbors—Massachusetts drew up an inventory of state-owned sites that might be suitable for the development of anaerobic digestion or compost facilities and made those sites available to potential developers.[15‡‡‡]

Since the capital costs of organics processing facilities are significant, while the combined operating revenues from energy and compost sales and tipping (disposal) fees provide only a relatively long-term return on investment, Massachusetts also offers a package of economic subsidies to plant developers. This includes construction grants of up to $1m per facility, low-interest loans, and electricity-sales incentives of 6.6 cents per kwh (through Renewable Energy Certificates worth up to $66 per MWh).[16]

Given the siting difficulties and economic hurdles facing the development of organics-processing capacity, it is not surprising that most of the facilities in Massachusetts that now accept commercial organic waste for processing are combination digesters in which food wastes are mixed with sewage sludge or manure at a sewage treatment plant or on a farm.

Vermont and Connecticut have similar landfill bans, but in recognition of the current insufficiency of processing infrastructure, these apply only to large producers who are within 20 miles of a certified organics facility. All of these bans are designed to be expanded over time to apply to more generators as processing capacity develops.

A number of U.S. cities, notably San Jose, CA and Portland, OR, have also taken steps to develop an organics-processing infrastructure to support organics-diversion programs. San Jose's AD facility, built in response to a 2012 request for proposals, processes only commercial/industrial waste collected pursuant to an exclusive city franchise.[17] San Francisco, Portland, and Seattle also offer source-separated organics collection from all or most households: most of this separately collected organic material is composted rather than digested. These compost facilities tend to be low-tech, large-footprint facilities located some distance from urban

‡‡‡ This has not obviated all issues with local opposition. "[L]ocal response to proposed projects over the last several years…has led to projects being discontinued." (Neale, op. cit.)

areas, where the waste can be managed in windrows or sausage bags rather than in more-controlled in-vessel facilities. In the relatively few cases where anaerobic digestion is used, most of the facilities are newly built, stand-alone digesters designed exclusively for urban (primarily industrial) organics, while a few facilities (the first of which is in Oakland, CA) are co-digesters at sewage treatment plants. (See Appendix.)

In all cases these facilities have received significant economic subsidies, including, at the federal level, American Recovery and Reinvestment Act (ARRA) grants,[§§§] Business Energy Investment Tax Credits (ITC), and New Market Tax Credits (NMTC), as well as state-level, sustainable-energy and economic development grants, low-interest loans, and energy-sales incentives through Renewable Energy Certificates in conjunction with Renewable Portfolio Standards. Sometimes publicly owned sites have been made available. Some facilities are also supported by Pay-As-You-Throw regulations, which incentivize generator compliance with voluntary or mandatory organics-diversion programs.

Most importantly, these facilities have depended on predictable supplies, premised on factors such as landfill bans, requirements for source-separated collection, and exclusive collection and processing franchises, which in turn support long-term tonnage commitments used to secure financing. The case of San Jose's combined AD and composting facility is instructive. To comply with a state mandate requiring source-separated recycling by businesses generating over four cubic yards of waste a week, the city issued simultaneous Requests for Proposal (RFPs) for exclusive rights to collect and pre-process commercial refuse, organics and recyclables and to process organics for a 15-year term.[18] These services shared the same start date so that the organics-processing facility would be open to accept the separately collected organics.[****] The project was financed through the state environmental authority, which issued bonds supported by a bank letter of credit based on the 15-year exclusive feedstock contract with the city and a power purchase agreement with the local utility.[19]

Seventeen Suggestions for New York

Maximizing benefits and minimizing costs requires a strategic plan for identifying sequential priorities. These are some suggestions toward such a plan, which are based on the experience of SSO programs elsewhere as well as New York's own experience to date:

I. Strategic Planning

1. Don't Put Collection Cart Before Processing Horse

Although it can be the most logistically complex and operationally costly portion of the organics-management system, collecting organics is in many ways the component that is most susceptible to municipal control. For publicly collected waste, it requires a budgetary commitment to

[§§§] Eligibility for this program closed at the end of 2011.

[****] Source-separation is on a "wet"/"dry" basis: organics comprise the wet stream, refuse and recyclables the dry stream. Generators have the option to either set out these materials in separate containers or to combine them in one container, with one of these streams in bags to keep it separate from the other.

provide trucks and labor and the political, legal, and/or regulatory support to secure some level of generator compliance. For privately collected material, it may require the use of regulatory authority to mandate that collection practices meet prescribed conditions. It may be difficult to predict participation rates, tonnage diversions, and contamination levels—and these factors may change over time—but we know in advance that a significant fraction of New York's waste consists of organic material that *could* be accessed for separate collection given an adequate commitment of financial and political resources. We can also predict, based on various logistical factors, which generator types in which geographic locations are likely to provide the greatest tonnage at the least collection costs and/or the material least likely to be contaminated with non-processible or low-Btu substances. And we know that this type of material requires the least degree of pre- and/or post-processing and offers the highest economic return with regard to energy recovery.

But until there is an adequate supply of reliable processing capacity—within a transport distance that makes economic and environmental sense—separate collection of organics can be counter-productive. This may be the current situation in New York City, since a significant proportion of this separately collected material is being landfilled. Not only are the costs and environmental impacts increased rather than decreased, due to the non-productive extra truck trips, but the quality of the material collected (if contamination rates are high)[††††] and the costs of collection (if participation and diversion rates are low) can *dis*courage private investment in processing capacity, rather than *en*courage it.[‡‡‡‡]

It would therefore be a more productive initial investment of City resources to incentivize *processing* capacity rather than to fund separate collection routes.

2. Pick Lowest-Hanging Fruit First to Maximize Odds of Success, Grow System Organically, Get Biggest Bang for Buck

In order to maximize benefits and minimize costs—and to encourage the gradual development of processing capacity that could accommodate additional DSNY collections and attract additional private collections—the lowest-hanging fruit should be picked first. Determining which generators should be targeted to offer the biggest bang for the buck should not be a difficult process. Material from relatively large-scale commercial and institutional kitchens and from food-related businesses will be available in larger quantities than material from residential generators. It is more likely to already be fairly well segregated from other waste streams,

[††††] Contamination rates in DSNY's residential collection program, for the first six months of the pilot program, were reported as 4.60% for Brooklyn and 17.60% for Manhattan (see citation in footnote 3). Residential contamination is currently estimated at less than 2% (Kathryn Garcia, commissioner, DSNY, personal communication, 11-13-14). Contamination rates in DSNY's school program are estimated at about 50% (personal communication, multiple primary sources).

[‡‡‡‡] Note that after dealing with contamination issues its initial pilot tests of DSNY-collected material at its Varick Avenue pre-processing facility, Waste Management determined that it would accept only commercial waste at the outset of its full-scale operations phase (which will begin in 2015). The Delaware Department of Natural Resources and Environmental Control cited problems due to refuse contamination as one of the issues that led to the closure of the Peninsula facility. (Amy Eddings, "Rotten Luck: NYC's Pilot Compost Program in Trouble, with Shutdown of Delaware Processor," WNYC, 12-1-14.)

because of the handling and contamination issues associated with mixing wet food waste and dry refuse and recyclables. It is also more likely to already be staged in containers that could be automatically tipped into or pulled onto collection trucks, or to be available in sufficient quantities to permit efficient manual collection. Therefore compliance with an organics-collection program is more likely to be achieved and collection is more likely to be cost-effective. It is also likely to be of a higher quality (less contamination with non-processibles, higher Btu content) than waste from elementary-school "kitchens"[§§§§] and cafeterias. This means that less pre-processing will be required before it is introduced into a composter or digester and that it will produce more energy (and/or more useable compost) per unit of processing capacity, impose smaller site requirements (with less potential for nuisance to the neighbors), and a higher and more-reliable rate of return.

At the opposite end of the spectrum, organics from multi-family buildings, which may have small apartments, relatively low levels of services, and do not have space on loading docks or elsewhere to allow containerized collection, are likely to offer the highest per-unit costs of collection, given the need for frequent pick-ups and the use of bags or bins set out at curbside for manual collection in a rear-loading compactor.

Present estimates suggest that there are a cumulative total of about 1,000 tons a day of the lowest-hanging fruit: kitchen waste accessible from large commercial and institutional generators.[*****]

3. Focus on Combining Public and Private Organics Streams, As Appropriate, Focusing on Private Stream First

Since the preponderance of "low-hanging fruit" on the generator end of the system will be in the commercial rather than the institutional waste stream, the lowest-hanging fruit on the processing side will rely on commercial-waste inputs.[†††††] Therefore the earliest opportunities for accessing processing capacity for DSNY waste are likely to be at facilities that primarily handle private-carter material.

[§§§§] Most food for schools is prepared in a central facility by the Department of Education's Office of School Food. Relatively little preparation is done at the individual schools.

[*****] 170 currently collected commercial and another 800 potential commercial; 14 tons per day of current DSNY containerized collections, and another 14 tons per day of organics in development complexes that could potentially be diverted to source-separated containers. NB: This 28-tpd estimate of potentially accessible DSNY containerized SSO does *not* include the potential for collection from centralized institutional kitchens that serve 260 million meals and snacks per year. (This estimate is based on confidential industry data and information from Ron Bergamini, president, Action Environmental Carting, and Pete McKeon, former chief of collections, DSNY. The overall number assumes that if sufficient processing infrastructure were available, about half of the city's commercial generation of food waste could be diverted.) Note that though a significant portion of the relatively accessible commercial organics is collected in bags or bins rather than in roll-on/roll-off or EZ-Pak (overhead dump) containers, the density of commercial collection routes, and the advantages associated with *not* mixing wet food waste with other commercial collections, still make separate collection of commercial organics by rear-load packers cost-effective.

[†††††] This is particularly the case now that the majority of the city's non-profit/non-governmental institutions, such as college and university cafeterias, rely on commercial food services that are required to use private carters.

While it will only be appropriate to combine DSNY-collected waste that is of similar quality to commercial waste (with regard to contamination rate and Btu content), it is reasonable to expect that a significant fraction of DSNY's potential collections could meet the general specifications associated with commercial material.[‡‡‡‡‡] Such DSNY material could be expected from large institutional and/or containerized generators[§§§§§] as well as from residential generators in areas with high compliance rates.

There are many reasons, apart from providing early access to processing capacity for DSNY-collected material and a reliable anchor stream of source-separated organics for the facility's investors,[******] why combining these streams would be a development to be welcomed. Coordinated facilities could involve more-rational planning with regard to siting (transportation access, adjacent land uses, etc.) and shared facilities could reduce overall miles traveled by private and DSNY trucks. Coordination might conceivably involve shared use of intermediate transport facilities, such as the DSNY's existing and proposed (and closed) Marine Transfer Stations (MTSs), and potential rail access opportunities. Since the MTS system's design is based on the assumption that private carters would use these facilities (an assumption that thus far shows little sign of being borne out) such use of integrated facilities might lead to other forms of productive integration—maybe, even, in the long-run, helping to blur if not obliterate the carelessly conceived historical dividing line between public and private routes which (in the absence of rationally designed franchise areas) adds millions of excess truck miles to city streets each year.

4. Take Maximal Advantage of Piggy-Back Opportunities With Existing Digesters

In the rest of the world, the rest of the country, and the rest of New York State, the great majority of existing facilities for processing organic wastes to recover energy and soil nutrients are digesters for sewage and manure. To the extent that these digesters have excess capacity—or could support expansion to accommodate organic municipal waste—they offer the advantages of being available soonest, at existing sites, with an existing economically viable base flow. For the wastewater facilities, the addition of municipal organics (since they contain more Btus per unit of mass than does sewage) offers the potential for more-cost-effective use of capacity, as well as the additional benefits due to tipping fees and increased energy recovery.

In New York City, co-digestion of pre-processed SSO slurry with sewage has already been successfully demonstrated at the Newtown Creek Wastewater Treatment Plant. When this expanded pre-processing facility at Varick Avenue is in operation, it will produce half of the 500 tpd that represents Newtown Creek's maximum projected capacity for accommodating organics. It may be possible to process another 500 tpd at a combination of several smaller New York City

[‡‡‡‡‡] Over time, as the DSNY's collection programs become more established and generators have become accustomed to satisfactory compliance with the necessary source-separation protocols, a greater proportion of DSNY-collected material is likely to meet these specifications.

[§§§§§] A non-institutional containerized generator might be a large housing complex with containers for source-separated organics staged on loading docks.

[******] Companies who also owned private collection services and/or transfer stations, and therefore already had streams of source-separated (or potentially source-separated) materials under their control, could be expected to be natural candidates to own/operate processing facilities.

facilities. This cumulative potential capacity of 1,000 tpd will not accommodate all of the SSO that could ultimately be expected from NYC public and private sources.

Additional capacity to meet this eventual demand might be found at some of the other WWTPs that are located in jurisdictions not-too-far distant from New York City, a number of which already have digesters.[20] Since the material to be introduced into such digesters would be a pumpable slurry, which is the sort of freight that is eminently suited to cost-effective, low-impact transport by barge, one or more of the WWTPs located along the Hudson, New York Harbor, or Long Island Sound could be particularly advantageous.[††††††] (Such economically and environmentally efficient transport options might also be used within the city, for example to transport organic slurry to Newtown Creek by barge, or to North River by barge or rail.)

Another potential opportunity to repurpose existing sewage-treatment infrastructure may be offered by a private facility planned for an unused sewage-drying facility adjacent to a WWTP in Trenton, NJ, 65 miles from New York City. The developer, Trenton Biogas LLC, plans to pre-process and anaerobically digest 100,000 tons per year of SSO to produce biogas, electricity, and compost.[21]

For the WWTPs within New York City, the most efficient means of transporting inbound material would be to drive it directly to the WWTP, rather than driving it to an intermediate facility for pre-processing and then making a second truck trip to the WWTP. While it may not be possible to accommodate such a use at the WWTPs, this possibility should be explored.[‡‡‡‡‡‡]

Whether or not on-site pre-processing is possible at a WWTP, intermediate transfer/pre-processing facilities will still make sense (in order to minimize the critical distance from the end of the collection route to the "first-dump" site) for any material not collected within a reasonable distance from the WWTP. To minimize this first-dump distance, as many such distributed facilities should be available as make economic sense given the economies of scale associated with this type of facility and for which appropriate sites with suitable transportation access can be found. Multiple smaller-scale facilities would reduce the impact of truck trips on any one locality. They would also offer the potential for multiple vendors to be involved, thus increasing competition and offering the City the negotiating leverage that is crucial for controlling the costs of long-term operations.

5. Don't Try to Squeeze a Camel Through a Trommel Screen: Match Facilities to Inputs

Despite good intentions and diligent efforts, the source-separated organic waste collected in response to Local Law 77 from school kitchens and cafeterias is reportedly too contaminated for anaerobic digestion at a WWTP using conventional pre-processing equipment. Barring changes at the generator level that it is hard to envision actually being implemented on a consistent, on-

[††††††] Rail tank cars—of which there will be an abundant low-cost supply as new regulations requiring double-liners for crude oil transport take effect—might also be used for hauling SSO slurry to the WWTPs located on rail lines near the city, although the lack of natural water-cooling (which barges could benefit from) may make this impractical. Such temperature concerns, however, would not affect the use of railcars (or barges) for transporting outgoing digestate, which could be taken to compost-curing facilities, fertilizer plants, or end-users elsewhere.

[‡‡‡‡‡‡] The Oakland WWTP is an example of a co-digestion facility that includes preprocessing equipment for SSO.

going basis, the level of pre-processing that would be required to make this material comparable to inputs from low-contaminant commercial, institutional, and residential streams would impose costs—and space requirements, and mitigation requirements—that may outweigh any benefits due to diverting this material from landfills.[§§§§§§]

As noted above, AD facilities are likely to offer a higher overall economic and environmental return than compost facilities, despite their higher capital cost, due to the value of the energy recovered, smaller footprint, and higher processing capacity. But compost facilities, which are considerably more land-intensive, require significantly longer processing time, and produce a lower-value product, may provide the best overall cost/benefit ratio when the overall costs of generator compliance, collection, and pre- and post-processing are considered. In the case of organics from NYC schools, for instance, or NYCHA facilities that have demonstrated significant compliance issues related to existing recycling programs, compost may be the best of the available options. Compost facilities may also be most appropriate for waste generators, such as single-family residences in low-density areas, who have a high proportion of yard waste.

Absent significant pre- and post-processing of the compost produced by such facilities to remove bits of plastic and other contaminants, which could be excessively expensive, non-standard markets may need to be found to accommodate it. Such markets could include utility and civil works projects. Since the City and State are major users of construction-grade fill, they might consider establishing procurement programs that could provide an adequate market outlet.

Because the overall cost/benefit ratio—including generator, collection, processing, and materials-recovery impacts—is likely to be greater for the low-contaminant SSO that is most practicable for AD, there would be good reason to sequence programs for high-quality SSO first and wait until they have been established before addressing more contaminated material. Sequencing program development in this order also allows the possibility that by the time the "high-hanging fruit" is picked the available processing capacity may be able to better-accommodate this more-contaminated material, thus reducing the amount of composting capacity that may eventually be required.

For some types of generators and waste streams—those that could be called the "*highest*-hanging fruit"—any form of source-separated organic program may not offer sufficient benefits to outweigh the economic and environmental costs associated with it. In such cases, it may make sense to economize on the front-end (generator and collection operations) by collecting the organics, as at present, in a single refuse truck, and spending the money on the back-end, by screening all the incoming material to separate out the organic components, and then treating this material by a relatively contaminant-tolerant compost or dry AD[*******] process to avoid

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[§§§§§§] Adequate pre-processing of this material *could* be accomplished, but the equipment necessary for doing so may cost an order of magnitude more than the equipment currently used. Depending on specific circumstances, this "super sorting" equipment might nonetheless be cost-effective, given the available collection and disposal alternatives.

[*******] AD facilities are of two basic types: wet and dry (or high-solids and low-solids). Co-digesters that handle sewage or manure are of the wet type, along with other organics-only digesters in which incoming material is ground up and water is added to make a pumpable slurry. Dry digesters, for relatively dry inbound material such as food and agricultural waste, do not require preliminary grinding or added water. These facilities therefore require

landfilling, while recovering whatever energy and material value is available. Such a Mechanical-Biological Treatment (MBT) facility would be the organic equivalent of what, for recyclables, is known as a "dirty murf" (MRF: Materials Recovery Facility).[†††††††]

6. Multiple Facilities: More is More

The fundamental building block of all waste-management planning is the concept of the waste-shed: the area from which waste material of a particular type would be drawn to be handled by a particular type of facility. Depending on the population density, land-use characteristics, and other geographic and transportation features associated with an area, on the type of material being considered, and on the type of facility, waste-sheds will be larger or smaller. But in every case the key criteria are the practicable economies of scale associated with a particular type of technology and the characteristics of the local transportation network (e.g., the presence or absence of "choke-points" that constrain transport flows between particular places, such as may be created by bridges, tunnels, and other types of geographic constrictions).

Within the limits thus defined, the more facilities there are—the smaller they are and the more decentralized—the better, since four important objectives are thus served. First, the distance between the end of the collection route and the first-dump site, which plays a critically important role in economic and environmental costs, is minimized. Second, the number of truck trips to any individual facility is reduced. Third, multiple facilities increase the potential for competition between service providers, which can play a major role in controlling system costs. Fourth, to the extent that the products associated with organics processing (energy in the form of biogas or biofuel, electricity, heat, compost) can be used locally ("closing the loop"), overall transport distances are reduced and benefits due to local economic development can be achieved.

Another reason to encourage the development of multiple facilities is that it is likely that New York City will also need multiple *types* of facilities to handle the various grades of source-separated organics that will come from its different types of generators and neighborhoods. Since there are also multiple companies offering various types of alternative AD and composting technologies, multiple facilities can also serve the purposes of technology testing and development, while balancing the associated risks across multiple installations. Multiple locations will also increase the City's resilience in enabling it to withstand storms and other disruptive events.

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smaller vessel capacity per unit of incoming material. Because the material in a dry digester is not pumped, dry digesters can tolerate higher levels of contamination than can wet digesters.

[†††††††] Such an MBT facility is implied by a current RFP ("Request for Proposals to Transport and Dispose of Containerized Waste from the Hamilton Avenue and Southwest Brooklyn Marine Transfer Stations," 10-27-14), which "encourage[s]" proposers to "consider, as an option, a system that includes separation and processing of organic waste or other reusable portions of the waste stream that may be recovered/processed for alternative uses prior to disposal of DSNY-managed Waste in the Authorized Disposal Site." (p. 4.) Since the RFP requires that the incoming material be accepted in containers at one of two designated Marine Transfer Stations, it would seem that the only logistically practicable location for such an MBT would be at the "Authorized Disposal Site" (i.e., landfill or waste-to-energy incinerator), as is commonly done in Europe.

Given the scale of New York City's generation of organic wastes—which far exceeds the economies of scale needed for any type of existing technology—not to mention the varying grades of recoverable organics produced by different types of generators, there is little likelihood that a single facility would adequately serve the city's needs. But rather than settling for the smallest number of facilities that could handle the city's SSO, there are sound reasons to maximize it.

7. Distinguish Between Centralized and Community-Based Opportunities

Local Law 77 required pilot collection programs from multiple types of generators—schools and single-family and multi-family residences. Preliminary results from this program, in terms of tonnages collected, participation rates, costs, and contamination levels, appear to be mixed.[22]

LL77 further requires the Sanitation Commissioner to make recommendations to the mayor and the City Council by October 1, 2015, based on the results thus far obtained, as to whether and how these various programs should be expanded. At this point it can safely be predicted that there will be significant differences between these programs in terms of the criteria that determine the cost-effectiveness of municipal collection with delivery to a centralized processing facility. Programs that provide sufficient tonnages of low-contaminant material to justify truck-based collection and central processing should be continued. Programs that do not allow cost-effective collection routes or centralized processing should be channeled to community-based composting facilities and local drop-off sites.

There are currently 237 backyard-style drop-off composting sites throughout the city at community gardens, community centers, schools, and apartment complexes.[23] Since these operations require virtually no truck-miles-traveled and offer the potential for local use of locally produced compost, these "closed-loop" sites should continue to be encouraged and their number expanded, as opportunities arise, to new locations, such as schools, where they could harness the enthusiasm of students and residents while promoting greater awareness of non-disposal waste-management options.

Strategic distinctions between sources that would be best managed through voluntary drop-off programs at community compost sites and sources that offer the potential for cost-effective centralized collection will maximize the potential for the greatest citywide diversion of SSO from landfills over the long term.

8. Encourage Rather Than Discourage Private Investment

The City's efforts thus far have not succeeded in attracting private investment in local organics-processing facilities.

The City's most ambitious and most recent step toward developing organics processing capacity was an RFP issued in 2012 that called for the development of a large-scale facility to process the organics extracted from mixed refuse. Dozens of prospective bidders attended the pre-proposal meeting. But the specifications called for were evidently so challenging that only a few proposals were received. The review of these proposals led to no tangible result.

Can this outcome be attributed to the way the RFP was structured?

It required a facility of up to 900 tons per day (328,500 tpy) to be built within the city limits or a radius of 80 miles.‡‡‡‡‡‡‡ To demonstrate that there were potentially available sites in the city, DSNY provided an inventory of potentially feasible sites that had been prepared by its consultants.[24] None of these sites turned out to be both feasible for a facility of this type and scale and available for purchase or lease by its owner. Nor were prospective bidders who scoured databases of all property in the city and held consultations with multiple brokers and owners of industrial properties able to identify any other privately held site in the city that would be operationally and economically feasible for a facility of this type on this scale. Though most of the thousands of acres of publicly owned land in the city are used for necessary facilities and for parks, there are among this inventory some that would meet the substantive criteria required for such a facility—provided that adequate political will were exercised to free it for such use. But only one such site was offered for consideration in the RFP. This exception, on Staten Island, was withdrawn after political objections were raised.

Much of the difficulty in finding a suitable site was due to the required throughput of the facility and the type of material it had to accept—the highest-hanging fruit: mixed refuse. This raised the bar very high for pre-processing and processing capability and dramatically lowered the bar for potential revenues other than tip fees (i.e., per-ton disposal costs to the City). Of the small number of proposals received, none (presumably) were able to provide a price that was competitive with current and projected landfilling costs.

It might be argued that there are advantages to being technology-neutral (not expressing a preference for a type of facility that the City judged to be economically or operationally superior for a particular type of waste). Conversely, the RFP may have suggested that the City was incapable of making a valid assessment of the likely overall economic and environmental impacts associated with management of a particular waste fraction from a particular waste-shed at a particular site by any particular type of successfully demonstrated process. It may have suggested that the City was unable to determine which component of the City's organics stream deserved to be addressed first, based on an assessment of environmental and economic returns. It failed to address issues associated with transport logistics and distances—issues of particular significance when it was likely (except with the least-proven and most-costly of the "emerging technologies") that a major proportion of the incoming waste-stream would need to be shipped away to a remote landfill. It neglected to consider other basic planning issues associated with siting (including those associated with potential sites within the city), such as transport access between waste generators and processing locations and the local impacts this transport would impose. And, implicitly, it suggested that the City was reluctant to focus on source-separated collection for any significant portion of its organic wastes.

Such an RFP might have a dampening effect on potential developer interest.

‡‡‡‡‡‡‡ The RFP called for two phases. In the pilot phase, the facility had to be at least 100 tpd and not more than 450. In the expanded phase, at the City's discretion, the facility had to be scaled up to 900 tpd.

II. Use Governmental Leverage to Provide Predictable (Financeable) Demand

9. Encourage the Development of Merchant Facilities With Commitments of DSNY Tonnage

Given that private carters have easier, less-expensive collection access to a higher volume of high-quality SSO than the City does, it is likely that the first facilities to come on-line in the metropolitan area will accommodate this material. Therefore the least-cost, lowest-risk strategy for accessing processing capacity for DSNY-collected material could be by encouraging and incentivizing private facilities willing to take waste from any suitable customer.

Despite the apparent demand for organics-processing capacity in the metropolitan area, the fact that a such a facility does not yet exist suggests that the economics of such a plant are making it difficult to compete with the price of landfill disposal.[§§§§§§§] But since the avoided cost of landfill disposal also includes public-sector externality benefits such as decreased greenhouse gas emissions and energy conservation, and because the costs of landfilling can be expected to continue to increase over time while organics processing costs are likely to increase at a lesser rate,[********] it may be in the interest of City and state government to lower the financial hurdles for getting projects built.

There are currently some modest New York State incentives in the form of NYSERDA's $2m grant program for anaerobic digestion facilities and the Green Bank, which helps developers to obtain loans at favorable interest rates.[25] But this level of incentives has not produced adequate results.

One of the most important incentives, because it is generally a prerequisite for bank financing, is a tonnage commitment. Although some logistical and institutional issues would need to be addressed before the DSNY itself could offer such tonnage commitments, the advantages of doing so would seem to warrant the attempt.

The logistical problems stem from the fact that the City does not currently handle (or at least there are no current collection routes that are known to handle) the kind of high-volume, containerized material that would be both relatively cost-effective to collect and be welcomed at a merchant facility handling high-quality SSO. There are, however, centralized sources that *should* be suitable for containerized collection in quantity. A likely place to begin identifying

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[§§§§§§§] The pre-processing facility that Waste Management is developing to deliver commercial food waste to the anaerobic digesters at City's Newtown Creek Wastewater Treatment Facility is projected to open in the 4th quarter of 2015. This hybrid facility—a privately owned front-end to handle commercial organics which will be linked to a publicly owned back-end—is likely to provide the first large-scale processing capacity for source-separated food-waste in the metropolitan area.

[********] Landfill prices fluctuate in response to economic cycles as do the costs of all commodities, but (as in the case of farmland and other finite resources) their general trend for many decades has been upward. Relative to landfilling, the cost increase over time of organics processing could be expected to be less because organics facilities should save energy through decreased transport distances while also recovering a higher proportion of saleable energy. There is also likely to be more organics-processing capacity over time, while the long-term supply of landfill space within a few hundred miles of the city will decrease.

such sources would be the *centralized* kitchens that provide "approximately 260 million meals and snacks per year in settings such as schools, senior centers, homeless shelters, child care centers, after-school programs, correctional facilities, and public hospitals."[26]††††††††

If and when these potential sources of high-quality SSO are accessed, their aggregate volume may not be enough to make a significant difference to the financing of more than a single potential merchant facility. And the value of this material to a prospective facility developer would be diminished by the fact that, if only a single facility were involved, the City would be required to undertake a competitive RFP process in order to "award" this material.

To address this issue, a program could be created (presumably with state legislative approval) through which the City could award tranches of this material for a specified period of say, at least seven years, to qualified developers who would use qualified technologies within a specified distance of the city. These tranches of material might well not be large enough to play a major role in the financing of any given developer's plant, but they might play an auxiliary role in helping a developer who had identified the majority of the tonnage needed from other (non-DSNY) sources to reach her final tonnage target.

Such a program—which might require that the majority of a given facility's tonnage come from sources other than the City's—could provide the kind of predictability that could encourage facility development. It could also provide a means for the City to spread its SSO among multiple potential vendors, which would minimize the risks to the City that would be associated with reliance on a single facility while avoiding the need to make a major financial commitment to a single facility.

10. Franchises Offer Another Option For Assuring Predictable Supplies of SSO

San Jose's experience demonstrates another way that the tonnage commitments required for financing processing facilities can be assured: through franchises that require SSO collection in designated zones.[27] The compost facilities serving San Francisco's SSO program, and Seattle's program, are also based on exclusive franchise zones. Los Angeles is currently engaged in an RFP process for franchise zones for commercial waste and residential waste from multi-family buildings with more than four units, which is expected to achieve a reliable supply of SSO (along with other recycling objectives).[28]

In New York City, the scope of franchises for collecting commercial-SSO-only might be expanded (perhaps at a later date) to also include collection of residential/institutional SSO within the given franchise area, should such material of comparable quality and adequate tonnage be available within that area and should it be beneficial to the City to assign such collection to a private entity. Whether the commercial-waste franchisee or the DSNY collected any such residential/institutional SSO within a given area, this material could be allowed, per the

†††††††† The typical public school cafeteria relies on food prepared in a centralized kitchen and transported to the individual schools in ready-to-serve form; the central kitchen is therefore the primary source of food-preparation waste; the cafeteria waste therefore tends to be commingled with packaging and serving materials.

condition of the delivery agreement entered into between the facility owner and the commercial-collection franchisee, to be delivered to the facility processing that area's commercial waste.

If this first, limited test of commercial waste franchising in specific areas of NYC for a specific purpose is successful, at some later point in time the collection franchise scope might also be expanded in another direction—to include commercial refuse and recyclables as well as SSO within a given area. Such a development might offer a variety of advantages.[29] For one thing, refuse franchisees could be required, as a condition of the franchise, to use the nearest transfer station (MTS or rail facility) designated by the DSNY—thus addressing the currently unmet goal of reducing the current concentration of waste transfer activity in just two areas of the city.‡‡‡‡‡‡‡‡ Other conditions might also be associated with such franchises, such as requirements for meeting certain specifications for truck noise, fuel use, or emissions, or for various other parameters related to collection. If these measures were successful, they might eventually be extended citywide. Such a development would dramatically reduce truck miles, ensure that private carters and DSNY trucks used the same distributed network of transfer stations, and facilitate shared access to recyclables- and organics-processing facilities sited to serve rationally planned public and private waste sheds.

As in the case of San Jose, the start of the franchise zones should be timed to coincide with the opening of organics-processing facilities. These parallel start dates should be scheduled a few years in advance so that the facilities could be planned, financed, permitted, and built in time to open by the time franchised collections begin.

11. Use Local Regulatory Authority to Provide Predictable Long-Term Access to SSO Supplies

Other cities and states (San Jose and Massachusetts, for example, as noted above) have found statewide source-separation regulations and landfill bans useful in providing financeable supplies of SSO. With no landfills of its own, New York City cannot produce a landfill ban. Since a relatively small proportion of its waste is landfilled in New York State, a state landfill ban might

‡‡‡‡‡‡‡‡ Note that a primary reason why it is unlikely that private carters will use municipal transfer stations in the absence of franchise requirements or other compelling regulatory authority is the anticipated cost differential between the operations of existing private transfer stations and those of DSNY's planned facilities. Whether or not these anticipated cost differentials will be offset by City subsidies or through increased fees to commercial generators, the use of municipal facilities for privately collected waste will impose public costs. Note also that it may not be desirable to shift waste to a municipal transfer station unless said facility produced the same public benefits as did the displaced transfer facility. In the case, for example, of a private "transfer" facility that accepted mixed waste but provided advanced processing to recover recyclables and/or organics from this incoming material, use of the private facility should not be replaced by a simple transfer operation with no pre-processing component. Likewise, in the case of a private transfer station that shifted material directly from trucks to railcars—avoiding the need for the costly intermediary handling associated with loading barges and unloading them at another location so that the material can be transferred to railcars for transport to the ultimate disposal facility—it could be inadvisable to shift its inbound waste to a marine transfer station. It could be similarly disadvantageous to shift material from a private transfer facility to a municipal transfer station that imposed significantly greater objectively measureable impacts on local populations due to the truck traffic associated with these deliveries. (These arguments would also pertain to currently proposed legislation, Int. 0495-2014, which fails to make such distinctions in its treatment of transfer station locations.)

not have a significant effect on stimulating the development of processing capacity. But the City does have regulatory control over commercial-waste collection operations. Local Law 146 gives the Sanitation Commissioner authority to require source separation of organics only for the volumes of material that could be processed within 100 miles of the city by 2015. Instead of allowing this significant loophole to stand (since generators and haulers may assume that the likelihood of significant capacity being built within the next few months is negligible), the law could be amended to ban the commingled collection of commercial organics from generators of a certain size, or with certain other characteristics, by a date certain. Provided that this date were several years in the future, to provide enough time to allow organics capacity to be developed on the strength of long-term (say 7-10 years) tonnage commitments acceptable to banks, commercial haulers would have the incentive to enter into such tonnage commitments and facility developers could have access to the capital they require.[§§§§§§§§]

12. Financial Incentives: Save-As-You-Throw

As we have learned over the past two decades with the separate collection of New York's recyclables, what happens at the generator level is critical to diversion rates, collection and processing costs, and marketability of end-products. As we have learned from the first six months of experience with the LL77 collection programs, participation, diversion, and contamination rates not only vary dramatically, participation rates (and hence diversion) can be quite low. New York's ability to increase participation and diversion over current (pilot-program) levels will determine whether or not the costs and adverse environmental impacts of collecting SSO on a citywide basis can be justified.

Enforcement has been used, with modest success, as a means of increasing compliance with the city's mandatory recycling program. Since the City has thus far not seen fit to mandate the easiest form of organics collection—leaves and grass-clippings, which would not impose significant hardships on generators, would require only outdoor windrow composting that could be conducted on City property as is already being done in a number of locations, and would produce clear net savings to the City of well over $10m per year in avoided long-distance transport and landfilling costs—it is not easy to imagine that it will be seen as politically palatable to mandate citywide (or neighborhood-specific or building-type-specific) source-separation of organics. Therefore gun-toting ticket-issuers are unlikely any time soon to ride to the rescue of an SSO program.

"Public-education and outreach" efforts have also been used, with modest success, to increase recycling compliance. This success is particularly modest in places, such as New York City Housing Authority buildings, where various factors such as the lack of convenient facilities and support services combine to produce a recycling rate that is virtually nil. Since putrescible food waste is the refuse fraction that produces the most odor, attracts the most rodents and insects, and is the least convenient to handle and store (particularly in small apartments, particularly in hot

[§§§§§§§§] The ability of carters to enter into long-term agreements with processing facilities is constrained by the fact that carters are limited to two-year contracts with their customers. (http://www.nyc.gov/html/bic/html/trade_waste/customer_info_contracts.shtml, accessed 11-21-14.) Franchise zones for SSO that had a longer contractual duration (say 7-10 years) could address this concern.

weather—and particularly if collection frequency is once a week or less), expensive "outreach" efforts such as TV and radio, subway and newspaper ads, mass direct mail, and full-time coordinators would seem an unlikely means to achieve cost-effective results.

What, then, to do?

Just as metering is the best way to cut water wastage, thousands of cities have found that Pay-As-You-Throw unit-pricing systems are a cost-effective way to reduce refuse generation and incentivize recycling.[30] Since the City's current DSNY budget is a billion-and-a-half dollars a year (a figure which is roughly equivalent to 15% of the City's residential property tax receipts, which go into the general fund that pays for Sanitation), since such a waste-disposal fee could be structured in a revenue-neutral way so that citizens' tax bills would be decreased by the amount raised through the unit-charges, and since there would be no charge for source-separated recyclables and organics, such a system could more-accurately be called "*Save*-As-You-Throw."[31] Instead of spending millions of City tax dollars trying to encourage generator participation through "outreach," let the Invisible Hand do the work.

13. Seek Regionalized Opportunities for Combining Economic Development and Organics Processing

The Empire State Economic Development Corporation accepts funding applications made by the Regional Economic Development Councils that represent each area of the state.[32] New York's five boroughs (five counties) are one such Regional Council. New York counties near New York City (e.g., the ones through which New York City's drinking water flows) offer potential sites for organics processing facilities that could be relatively easily accessed from New York City (including potential barge and rail access). Towns and cities with relatively high unemployment and relatively low income levels, which have brownfields and other disused industrial sites that might be suitable for organics processing, might welcome the jobs and tax revenues that such facilities could produce. They might also welcome the availability of cost-effective local processing capacity for their own organics waste. Applications from multi-region Economic Development Councils are encouraged by the Empire State Economic Development Administration.[33] Siting a regional SSO facility, say, on a barge- and/or rail-accessible brownfield, might be a win-win opportunity for New York City and another locality in New York State.

14. Monetize Public Benefits

The development of adequate SSO processing capacity within a convenient radius of NYC—provided that it is linked to economically and environmentally efficient collection systems—could have a wide range of benefits for the City and its residents, businesses, workers, and visitors. Relatively few of these benefits are currently reflected in any direct financial form available to potential operators of organics facilities.[*********] There are other programs that represent City, state, and federal priorities, for which significant sums are being or will be spent

[*********] As noted above, these current financial incentives include relatively modest NYSERDA capital grants, tax credits, potential access to low-interest loans, and the potential value of carbon trading programs.

in the coming decades, to which local SSO processing could make a contribution. Among these programs are the de Blasio's administration's Vision Zero campaign to reduce traffic fatalities; the State's "80 by 50" program (to reduce greenhouse gases by 80% from 1990 levels by 2050)[34]; the City and state's storm-hardening, resiliency, and climate-change adaptation programs; City, State, and federal programs to reduce asthma and other illnesses related to truck emissions; infrastructural spending programs for bridge and highway maintenance; energy conservation programs; and economic development programs focused on quality-of-life factors to attract visitors and businesses. These programs may represent opportunities for accessing funds that could be used to help obtain the public benefits that local SSO processing capacity could offer.

III. Siting and Logistics

15. City-Sponsored Facilities: Government-Owned Sites as an Option

If and when the City seeks to again issue an RFP to service its own collections—and perhaps commercial organics as well—at a facility that the City could either own or could acquire at fair-market value at the end of the initial contract term, a location within the City would be preferred. In this case it would be desirable to offer for this purpose a City-owned property that met the City's planning criteria for location and size. If necessary to meet its planning criteria, the City could attempt to obtain access for this purpose to property under state or federal control.

Private sites, obtained either through voluntary purchase or eminent domain, could also be an option. The only privately controlled sites known to be available within the city that could support a facility capable of managing a significant portion of the City's SSO would be available at a cost that is not likely to be supported by the economics of a privately owned facility. In the universe of publicly held land within New York City there are potentially suitable sites such as closed landfills, incinerators, and marine transfer stations, some of which would require state legislation or federal permission to use for such purposes, but which nonetheless might merit consideration.

Outside the boundaries of New York City there may be state-owned properties that would offer practicable transportation access from the city (such as land acquired in connection with highway projects, the New York City watershed, utility facilities, disused rail or marine facilities) that could be offered as potential sites for organics-processing facilities.

16. Use the Most Appropriate Collection Equipment and Keep SSO Streams of Varying Specifications Segregated

Plastic bags offer some advantages over other set-out alternatives—in certain situations. But whenever it is feasible—from a generator perspective, a collection perspective, and a routing perspective—automated (roll-on/roll-off; EZ-Pak front-end lifters, side-lifting extension-arms) or semi-automated collection (hoist-assisted bin-dumping into rear-loaders) could save money and prevent worker injuries.[35] Containers are particularly useful for collecting source-separated organics, since they can prevent rodent access, minimize leaks and odors, and make collection of this heavy, highly putrescible material less onerous for workers. To the extent that using

containers minimizes the number of plastic or compostable plastic or paper bags that are used to handle the waste, processing problems due to contaminants are reduced.

Since there will be differences in the contamination rates and Btu content associated with SSO from different types of generators, streams that could be directed to a high-quality AD facility should not be contaminated with streams that would require intensive pre-processing and/or low-value composting. SSO from high-compliance residential generators, for example, should not be collected in the same rear-loader as highly contaminated SSO from school cafeterias.

17. Use the Most Appropriate Transport Equipment

Small-scale, decentralized facilities[†††††††††] are likely to be desirable in certain locations—even, potentially, in high-density locations such as the rapidly developing Far West Side of Manhattan—since they would keep transport distances to an absolute minimum, and therefore the costs and impacts associated with truck miles.

But it is likely that the network will also require larger-scale facilities, at least some of which are likely to be sited outside the five boroughs. These will necessitate longer transport trips. Trucks are the least-efficient means of hauling bulk freight such as inbound SSO or SSO slurry or outbound compost or digestate. Barges and railcars are eminently suited to transporting these types of materials at relatively low cost and with relatively few adverse impacts.

The City's network of existing, planned, and closed MTSs may offer opportunities for aggregating and transferring SSO to barge-accessible processing sites along the Hudson, New York Harbor, or Long Island Sound. Other industrially zoned sites along the City's waterfront could also be suitable for such use. Every borough of the City also has potential access to rail freight lines. SSO could be handled in containers, as SSO mixed with non-organic refuse currently is in the Bronx, Brooklyn, and Staten Island. Covered gondola cars could also provide less-expensive rail transport than would flatcars carrying containers. For liquefied SSO, tank cars would offer the best rail solution (provided issues associated with temperature control could be managed); tanks could also be used to haul digestate to remote end-users such as compost facilities, fertilizer manufacturers, or farms. Covered hopper cars might provide the best solution for transporting compost product to distant markets.

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[1] Peak before 2002 budget cuts, 20.1%. Rate for FY 2014: 15.1%: http://www.nyc.gov/html/dsny/downloads/pdf/pubinfo/pr_pdfs/DSNY_LL77_DiversionReport_June2014.pdf,

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[†††††††††] Micro anaerobic digestion facilities are the subject of a number of current research initiatives (e.g., the EU's "Organic waste management by a small-scale Innovative automated system of anaerobic digestion (ORION)," http://www.dommrc.com/project-orion.html, accessed 11-29-14). Facilities that fit into one or more standard shipping containers, for example, have been acquired for use in military situations. (E.g., Ben Messenger, "Micro Anaerobic Digestion Biogas Unit Wins U.S. Defense Award," *Waste Management World*, 9-4-13, http://www.waste-management-world.com/articles/2013/09/micro-anaerobic-digestion-biogas-unit-wins-u-s-defense-award.html)

accessed 10-28-14; http://www.nyc.gov/html/nycwasteless/downloads/pdf/DSNY-reports/Annual_by_Boro_District_FY14.pdf, accessed 10-27-14.

[2] Citizens Budget Commission, "Taxes In, Garbage Out," May 2012, p. i, http://www.cbcny.org/sites/default/files/REPORT_SolidWaste_053312012.pdf, accessed 10-28-14.

[3] http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=1450676&GUID=7743FA15-9A38-4854-8877-31C725522D90&Options=&Search=, accessed 10-28-14; 8.1tpd of school waste and 3.6 tpd of residential waste for the latest months. (The latest months are used for an average tpd, rather than the entire period, since the program has grown in size since its beginning.) DSNY, "Local Law 77 of 2013 Organics Collection Pilot Program Report, through March 2014, " 6-14, http://www.nyc.gov/html/dsny/downloads/pdf/pubinfo/pr_pdfs/DSNY_LL77_DiversionReport_June2014.pdf, accessed 10-28-14.

[4] 8.5 tons a week are collected on SI. This figure is divided by 7 (though collection is done on a weekly basis) in order to be consistent with other daily figures. http://www.nyc.gov/html/dsny/downloads/pdf/pubinfo/pr_pdfs/DSNY_LL77_DiversionReport_June2014.pdf, p. 14, accessed 10-28-14.

[5] Anthony Fiore, director, Office of Energy, NYC DEP, personal communication, 10-29-14.

[6] Dan Leif, "Delaware Compost Facility Closed Over Odors," *Resource Recycling*, 10-30-14, http://resource-recycling.com/node/5391, accessed 10-30-14. Information on current disposal locations: personal communication with multiple industry sources.

[7] http://www.nyc.gov/html/nycwasteless/html/compost/operations_rikers.shtml, accessed 10-1-14.

[8] Fiore, 10-29-14.

[9] The Council of the City of New York, Report of the Infrastructure Division, 11-22-2013. The co-digestion plans at the Newtown Creek WWTP cannot be credited to LL146 since the pilot program, which had been in planning for some time, began in April, 2013.

[10] http://ec.europa.eu/environment/waste/compost/developments.htm

[11] E.g., "London, England, United Kingdom: Almost 50 AD Plants Treating Food Waste," *BioCycle*, April, 2013, p. 17.

[12] Martin Steiner, "MBT in Europe," 7-1-2007, *Waste Management World*, http://www.waste-management-world.com/articles/print/volume-8/issue-4/features/mbt-in-europe.html, accessed 11-10-14.

[13] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52008DC0811&from=EN, accessed 10-28-14.

[14] 310 CMR 19.000

[15] http://www.mass.gov/eea/pr-2014/food-waste-disposal.html, accessed 10-27-14.

[16] Massachusetts Clean Energy Center, "Commonwealth Organics-to-Energy: Grants for Construction Projects and Pilot Projects", Sept. 30, 2013; http://www.mass.gov/eea/pr-2014/food-waste-disposal.html, accessed 10-20-14; http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/retail-electric-supplier-compliance/alternative-compliance-payment-rates.html, accessed 10-27-14.

[17] Nora Goldstein, "High-Solids Anaerobic Digestion + Composting in San Jose," *BioCycle*, Mar/Apr 2014, pp. 42-7.

[18] Nora Goldstein, *BioCycle*, May, 2011, http://www.biocycle.net/2011/05/17/new-frontier-for-commercial-waste-in-san-jose/

[19] Goldstein, 2014.

[20] https://www.americanbiogascouncil.org/biogas_maps.asp, accessed 11-3-14.

[21] E.g., Brendan McGrath, "Trenton Biogas receives DEP approval to turn sludge plant into food waste recycling facility," *Times of Trenton*, 9-2-14, http://www.nj.com/mercer/index.ssf/2014/09/trenton_biogas_receives_dep_approval_to_turn_sludge_plant_into_food_waste_recycling_facility.html.

[22] NYC DSNY, "Local Law 77 of 2013 Organics Collection Pilot Program Program Report, through March 2014," http://www.nyc.gov/html/nycwasteless/downloads/pdf/DSNY-reports/DSNY_LL77_DiversionReport_June2014_secure.pdf, accessed 11-3-14. Personal communications with Bridgette Anderson, director, Recycling Unit, DSNY; Robert Lange, Recycling Unit, DSNY; Pete McKeon, former chief of collection, DSNY.

[23] Local Law 77 Report, p. 6.

[24] Alternative Resources, Inc., "New York City Evaluation of New and Emerging Waste Management and Recycling Technologies, Phase 3: Demonstration Project Siting Study and Preliminary Investigation," March 2012.
[25] http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2828-Renewable-Portfolio-Stand-Customer-Sited-Tier-Anaerobic-Digester-Gas-to-Electricity.aspx; http://greenbank.ny.gov/Approach/Product-Offerings.aspx; accessed 11-3-14.
[26] NYC Office of the Mayor, "New York City Food Policy: 2013 Food Metrics Report," p. 8, http://www.nyc.gov/html/nycfood/downloads/pdf/ll52-food-metrics-report-2013.pdf, accessed 11-3-14. See also New York City Food Policy Center at Hunter College, "The Public Plate in New York City: a Guide to Institutional Meals," 2014, http://nycfoodpolicy.org/publications/research/, accessed 11-3-14.
[27] Goldstein, op. cit., 2011, 2014.
[28] E.g., Rick Orlov, "15 Firms Seek Los Angeles Trash Franchise" *Los Angeles Daily News,* 10-30-14, http://www.dailynews.com/government-and-politics/20141030/15-firms-seek-los-angeles-trash-franchises; Emily Alpert Reyes, "L.A. Poised to OK Sweeping Overhaul of Trash Collection," *LA Times,* 3-31-14, http://articles.latimes.com/2014/mar/31/local/la-me-zero-waste-20140401; City of Los Angeles, "Final Implementation Plan for Exclusive Commercial and Multifamily Franchise Hauling System," 4-2013; "Solid Waste Franchise Assessment," 1-23-12, http://www.lacitysan.org/solid_resources/pdfs/2012/city-of-la-sw-fran-assmt-final-report.pdf, accessed 11-9-14.
[29] Alliance for a Greater New York (ALIGN), *Transform Don't Trash NYC,* 9-2013, http://www.alignny.org/wp-content/uploads/2013/10/TransformDontTrashNYCReport_FINAL_Lo.pdf, accessed 11-9-14.
[30] Citizens' Budget Commission, op. cit.
[31] http://council.nyc.gov/downloads/pdf/budget/2015/15/eb/sanitation.pdf; http://www.cbcny.org/sites/default/files/Interactive/2013_Conference/REPORT_PropertyTaxes_12062013.pdf; http://www.nyc.gov/html/omb/downloads/pdf/sum5_14.pdf; accessed 11-4-14.
[32] http://esd.ny.gov/BusinessPrograms/EDF.html, accessed 11-4-14.
[33] http://regionalcouncils.ny.gov/assets/documents/REDC_2014_Guidebook.pdf, p. 37, accessed 11-4-14.
[34] http://www.dec.ny.gov/energy/44992.html, accessed 11-3-14.
[35] E.g., Citizens Budget Commission, "12 Things New Yorkers Should Know About Their Garbage," May, 2014.

Major Organics Processing Facilities Serving Selected Cities

City	State	Organics Policies	Facility	Start Date*	Process	Type#	Food Waste Capacity tpd **	Co-processing with: Yard Waste, Manure, FOG ##, Sewage Sludge
Los Angeles	CA	State, City	Kroger Recovery System (4)	2013	AD	LS	165	None
	CA	State, City	American Organics (1)	2014	AD	LS	?	Yard Waste
	CA	State, City	VVWRA Omnivore WWTF (2)	2014	AD	LS	4	Sewage Sludge
Sacramento	CA	State	Sacramento BioDigester Facility (3)	2013	AD	HS	110	None
San Francisco	CA	State, City	East Bay Municipal Utility District (EBMUD)(8)	2002	AD	LS	600	Sewage Sludge, FOG
	CA	State, City	Grover (8)	2010	Compost	Windrow	600	Yard Waste
	CA	State, City	Jepson Prairie (25)	2005	Compost	Multiple	600	Yard Waste
San Jose	CA	State, City	Z-Best Compost Facility (13)	2001	Compost	In-vessel	600	Yard Waste
	CA	State	ZWEDC Anaerobic Digester (14)	2014	AD	HS	740	FOG
Vancouver	CAN	Region	Fraser Richmond Soil and Fibre (15)	1993	Compost	CASP	550	Yard Waste
	CAN	Region	Richmond Energy Garden (15)	2012	AD	HS	110	None
Orlando	FL	None	C. F. Energy Garden at RCID WWTF (16)	2012	AD	LS	350	Sewage Sludge
Chicago	IL	None	Calumet Water Reclamation Plant WWTF (22)	Dev	AD	LS	300	Sewage Sludge, FOG
Boston	MA	State	CRMC Dartmouth Bioenergy Facility (10)	Dev	AD	?	110	FOG
	MA	State	Deer Island WWTF (6)	Pilot	AD	LS	500	Sewage Sludge (pilot)
	MA	State	WeCare Environmental (14)	?	Compost	In-vessel	100	Yard Waste, Manure?
New York City	NY	City (pilot)	Long Island Compost Facility (2)	?	Compost	Windrow	330	Yard Waste
	NY	City (pilot)	McEnroe Farm (18)	1987	Compost	Windrow	55	Manure
	NY	City (pilot)	Newtown Creek WWTF (19)	2015	AD	LS	250	Sewage Sludge
Rochester	NY	None	Synergy Biogas (Synergy Dairy) (23)	2012	AD	LS	150	Manure
Cleveland	OH	None	Collinwood BioEnergy (5)	2012	AD	?	200	Sewage Sludge, FOG
Portland	OR	Region, City	Columbia Biogas (6)	Dev	AD	?	410	FOG
	OR	Region, City	JC Biomethane (9)	2013	AD	LS	100	FOG
	OR	Region, City	Nature's Needs (20)	2011	Compost	Windrow	7	Yard Waste
	OR	Region, City	Pacific Region Compost (17)	2010	Compost	Windrow	50	Yard Waste
Seattle	WA	City	Cedar Grove Composting (12)	2003	Compost	Windrow	180	Yard Waste
	WA	City	Greenblenz (21)	2014	Compost	?	110	Yard Waste
	WA	City	Ovnell Farm (7)	2010	Compost	Windrow	550	Yard Waste, Manure

* Food waste start date, facilities may predate food waste feedstock

** Planned (not necessarily installed) food waste capacity, does not include capacity for other feedstocks.

*** Food waste gallon to ton conversion: 266 gallons/ton, see: http://www.state.nj.us/dep/dshw/resource/tonnage/

LS=Low Solids (dry); HS=High Solids (wet)

Fats, Oils and Grease

Notes for Major Organics Processing Facilities Serving Selected Cities

(1) Owner: Athens Recovery, http://www.losangelesregister.com/articles/food-602193-waste-pilot.html; Los Angeles commercial food waste policy: http://www.lacitysan.org/solid_resources/recycling/services/food.htm

(2) Owner: Victor Valley Water Reclamation Authority and Anaergia Inc.; http://vvwra.com/index.aspx?page=4: http://www.vvdailypress.com/article/20140926/NEWS/140929845/12982/NEWS?template=printart

(3) Owner: CleanWorld; http://biomassmagazine.com/articles/10841/balancing-digester-diets;municipal pilot residential food waste program: http://portal.cityofsacramento.org/City-Manager/Media-Releases/Elmhurst-Food-to-Fuel

(4) Owner: Kroger Supermarkets; http://sustainability.kroger.com/energy.html; http://www.biocycle.net/2013/06/19/grocery-chain-unveils-on-site-digester/; http://www.greenbiz.com/news/2013/08/09/kroger-fuels-warehouse-food-waste

(5) Owner: Quasar; http://blog.brewer-garrett.com/index.php/2014/05/anaerobic-digestion-a-renewable-energy-in-cleveland/

(6) Owner: Mass. Water Resource Authority; http://www.biocycle.net/2014/10/20/assessing-organics-processing-capacity-in-massachusetts/; http://www.bizjournals.com/boston/print-edition/2013/06/14/recycling-of-food-waste-could-fuel-a.html?page=all;

(7) Owner: PacifiClean Environmental & Ovnell Farm, Ovnell Farm to process 65,000 tpy from Seattle contract; http://www.greenblenz.com/; http://www.dailyrecordnews.com/news/compost-processor-pacificlean-to-operate-in-grant-county/article_dc35afea-014e-11e4-88cb-0019bb2963f4.html

(8) Owner: EBMUD, at term capacity, current is 200 tpd, Environmental Impact Report Main Wastewater Treatment Plant Land Use Master Plan, 2011: MWWTP_Land_Use_Master_Plan_DEIR.pdf

(19) Owner: JC Biomethane, http://energytrust.org/library/case-studies/CS-Willamette-Valley-Biomethan.pdf

(10) Owner: CommonWealth Resource Mgmt. Corp.; http://crmcx.com/whats-new/; 30,000 gallons/day / 266= 112 tons

(11) http://www.zankerrecycling.com/content/z-best-composting-services

(12)http://www.heraldnet.com/article/20120504/NEWS01/705049879; http://seattletimes.com/html/localnews/2015977789_compost22m.html;

(13) Owner Z-Best: Zanker Road Resource Mgmt. LTD; Owner ZWEDC: Zero Waste Energy Development Co.; 90,000 tpy is Phase 1. Projected full build-out is 270,000tpy. Nora Goldstein, "High-Solids Anaerobic Digestion + Composting in San Jose," BioCycle, Mar/Apr 2014, pp. 42-7; http://www.zankerrecycling.com/content/z-best-composting-services

(14) Owner: WeCare Environmental; http://www.mass.gov/eea/docs/dep/recycle/reduce/06-thru-l/fdcomlst.pdf

(15) Owner of both colocated facilities: Harvest Power; http://findacomposter.com/listing/fraser-richmond-soil-fibre.html

(16) Owner: Harvest Power; http://articles.orlandosentinel.com/2014-02-20/news/os-restaurant-scraps-to-energy-20140220_1_food-waste-walt-disney-world-scraps

(17) Owner: Republic Services

(18) Owner: McEnroe Farm

(19) Owner: NYC DEP

(20) Owner: Recology

(21) Owner: Lenz Enterprises; http://www.dailyrecordnews.com/free/news/seattle-oks-compost-agreement/article_84f90382-9b22-11e2-8f2d-0019bb2963f4.html?mode=jqm;

(22) Owner: Metropolitan Water Reclamation District of Greater Chicago; 2 facilities will be retrofitted to handle a total of 300 tpd, including Calumet; http://www.anaergia.com/news/mwrd-greater-chicago-selects-anaergia-design-new-organic-waste-processing-facility;
https://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/News&Media/Newsroom/Media/Press_Releases/2014/14_0929_Anaergia_presser.pdf

(23) Owner: CH4 Biogas; 40,000 gallons/day / 266 = 150 tons*** ; http://www.nyserda.ny.gov/About/Newsroom/2012-Announcements/2012-05-01-NY-Largest-On-Farm-Biogas-Power-Project-Generates-Renewable-Energy-for-Nearly-1000-Homes.aspx

(24) Owner: Long Island Compost Corp.; http://licompost.com/index-2.html

(25) Owner Grover and Jepson Prarie: Recology; Jepson Prarie uses windrow, in-vessel and static pile strategies,
http://www.calrecycle.ca.gov/Actions/Documents%5C20%5C20132013%5C881%5CJPO%20Staff%20Report%206-26-13.pdf

APPENDIX II:
Selected Source-Separated Organics Policies in U.S. Cities and States

Landfill Bans for Commercial Food Waste

- **2012, San Jose, CA**
- **Portland Metro, OR (region)**
- **2013, Massachusetts:** Massachusetts DEP Solid Waste Management General Requirements Procedures and Permits, Waste Bans. Ban on commercial organic material begins Oct. 1, 2014 (310 CMR 19.017).[1]
- **2011, Connecticut:** "An Act Concerning The Recycling Of Organic Materials By Certain Food Wholesalers, Manufacturers, Supermarkets And Conference Centers"; Effective six months after two or more organics processing facilities with capacity to process material from all qualifying commercial sources (more than 104 tpy) are operational. Qualifying commercial sources within 20 miles of a certified processing facility must recycle their food waste. (Public Act 11-217).[2]
- **2014, Vermont:** Legislation. "An Act Relating to Establishing Universal Recycling of Solid Waste;" "Food scrap generators of 104 tons/year (2 tons/week) must divert material to any certified facility within 20 miles." Generators of 52 tpy (2015), 26 tpy (2016), 18 tpy (2017) must divert to certified facility within 20 miles. Total food scraps ban in 2020.[3]
- **2014, California:** Beginning in 2016 all businesses producing 8 cubic yards [approximately 2 tons] of organic waste per week (including multifamily buildings of 5 or more units) must receive source-separated organics collection. In 2017, all businesses producing 4 cy or more of organic waste; in 2019 all businesses producing 4 cy or more of commercial solid waste (CSW); in 2020 if organics disposal has not been reduced by 50% from 2014 levels, businesses producing 2 cy of CSW must source-separate organics for collection (if it is determined that this will be effective) (AB 1826 (Chesbro)).[4]
- **2014, Rhode Island: "**An Act Relating To Health And Safety—Food Residuals Recycling" requires that in 2016 "covered entities" (businesses and institutions but not residential buildings) producing more than 104 tons per year of organic waste, and located within less than 15 miles of a certified processing facility, separate organic waste for collection. Entities can apply for an exemption if solid-waste tipping fees for "Rhode Island resource recovery corporation for non-contract commercial sector waste" are less than fees charged by the organics processing facility within 15 miles (2014 -- H 7033 SUBSTITUTE A).[5]

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[1] http://www.lawlib.state.ma.us/source/mass/cmr/cmrtext/310CMR19.pdf

[2] http://www.cga.ct.gov/2011/ACT/PA/2011PA-00217-R00SB-01116-PA.htm; see also: http://biomassmagazine.com/articles/9153/vermont-now-connecticut-models-for-diverting-organics

[3] http://www.anr.state.vt.us/dec/wastediv/solid/act148.htm; http://www.anr.state.vt.us/dec/wastediv/solid/documents/UR_Timeline_Summary.pdfhttp://www.leg.state.vt.us/docs/2012/Acts/ACT148.pdf

[4] leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1826

[5] http://webserver.rilin.state.ri.us/PublicLaws/law14/law14184.htm

Organics Processing Infrastructure Incentives:

- **California:** "Renewable Bioenergy Projects"; Requires the California Energy Commission to direct electricity companies to procure a minimum of 250 megawatts of renewable energy from small biogas and biomass technologies by June 1, 2013 (AB 1122 (Rubio)).
- **USDA - Biorefinery Assistance Program:** Federal loan program ($181 million available in FY2014) to promote development of renewable energy (anaerobic digestion eligible). Program provides loans of up to $250 million or 80% of project cost to be paid over 20 years or the life of the project.[6]

Mandatory Source Separation of Organics:

- **2009, San Francisco (residential and commercial):** SEC 19: San Francisco Environment Code: Chap. 19 (2011): Mandatory Recycling and Composting" Sec 02 requires all a multifamily buildings to separate compostables unless they can prove inadequate storage space and no other solution can be found (sec 1910). Enforcement includes fines. (2011)[7]
- **2011, Metro Portland (residential 2012)**
- **2009, Seattle, WA (residential)**

Exclusive Franchise System Incorporating Organics Collection:

- **Portland, OR**
- **San Francisco, CA (residential and commercial)**
- **2012, San Jose, CA (commercial only)**
- **Seattle, WA**

[6] http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US57F&re=1&ee=1

[7] http://www.ilsr.org/rule/food-scrap-ban/san-francisco/