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**FOOD WASTE DIVERSION IN FOOD SERVICE ENTERPRISES: AN ANALYSIS  
OF ORGANICS DIVERSION PLANS IN AUSTIN, TEXAS**

**APPROVED BY  
SUPERVISING COMMITTEE:**

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Erin Lentz, Supervisor

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Raj Patel,

DEDICATION

To Joss and Lev

**FOOD WASTE DIVERSION IN FOOD SERVICE ENTERPRISES: AN ANALYSIS  
OF ORGANICS DIVERSION PLANS IN AUSTIN, TEXAS**

**by**

**Jason Todd Umlas**

**Report**

Presented to the Faculty of the Graduate School of

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## **Abstract**

### **FOOD WASTE DIVERSION IN FOOD SERVICE ENTERPRISES: AN ANALYSIS OF ORGANICS DIVERSION PLANS IN AUSTIN, TEXAS**

Jason Todd Umlas, MPAff,  
The University of Texas at Austin, 2018  
School of Public Health, 2018

Supervisor: Erin Lentz      Co-Supervisor: Alexandra van den Berg

As a major component of municipal landfills, food waste produces greenhouse gases which contribute to climate change; food waste is the largest component of Austin's municipal waste. Food waste diversion can impact a range of public health concerns including food insecurity and climate change mitigation. Reducing food waste is a critical goal under Austin's Universal Recycling Ordinance (URO), which requires all food service enterprises to implement a food waste diversion plan and file an annual Organics Diversion Plan (ODP). The purpose of this study was to identify trends in the diversion efforts of businesses of different sectors and sizes and to develop baseline adoption rates for each strategy by sector by analyzing the ODPs filed in 2017 and 2018. A second purpose was to study the real-world implementation of organics diversion strategies among Austin's food service enterprises using a interviews with business operators. The study utilized mixed methods, including statistical methods such as the chi-square test, z-test and two-sample test of proportions to analyze the ODP data sets, and qualitative, semi-structured interviews with business managers and owners to better understand ODP implementation. The study confirmed that larger businesses were more likely to adopt organics diversion strategies than

smaller businesses. The study also found a statistical increase in the adoption of waste prevention and recovery strategies among businesses that filed ODP information with the city of Austin for both 2017 and 2018. The interviews revealed that businesses were using novel service providers such as diversion management companies to meet the diversion requirements. These emerging business opportunities have the potential to benefit economically-insecure communities. Quantitative research was limited by a small sample size, an incomplete data set and a lack of granular data; future surveys should collect more detailed information for further statistical analyses. The results of this study can inform future research and help improve outreach efforts to encourage organics diversion among Austin's food service enterprises.

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## **BACKGROUND**

### **Introduction**

Reducing food waste has several potential positive outcomes for human health and economic security, ranging from climate change mitigation to increasing food security among the most vulnerable members of society. Organic waste (the majority of which is food waste), is the single largest component of municipal solid waste,<sup>1</sup> thus reducing its volume will have an economic and logistical impact on the municipal agencies tasked with hauling and waste management. It is estimated that 33% of all food produced worldwide for human consumption ends up as food waste,<sup>2</sup> while in the United States the total amount of may be as high as 40%.<sup>3</sup> This adds up to an aggregate total of food waste comprising 160 billion pounds with a value of \$218 billion dollars annually,<sup>4</sup> with 95% of this waste ending up in landfills or being incinerated.<sup>5</sup>

Based on a 2017 report by the National Resources Defense Council, the average urban resident generates 3.5 pounds of food waste weekly, of which 2.5 pounds is edible food.<sup>6</sup> Using these figures as the basis for projections based on total municipal population, the City of Austin produces 86,500 tons of total food waste annually of which 61,750 tons is edible food. In 2015, Austin Resource Recovery, Austin's municipal solid waste agency, conducted a waste characterization study of residential collection.<sup>7</sup> The study found that an estimated 46% of trash consisted of divertible organic material and that the single largest component was food waste at 25.8% of total volume. The total estimated volume of food

waste in Austin was measured at 57,276 tons annually.<sup>8</sup> The report recommended prioritizing the reduction and diversion of food waste as an immediate goal for the City of Austin.

Restaurants are the single largest generators of food waste in any commercial sector and even surpass the volume of residential food waste in some US cities.<sup>9</sup> According to a 2014 study of commercial food waste, on a national level, only around 16% of food waste generated in food service facilities is recovered and 70% of what is recovered is used cooking oil.<sup>10</sup> While the NRDC has developed patterns of food waste generation by industry sector, there has been no research focused on comprehensive organics diversion strategies across sectors. This research hopes to establish a benchmark of current organics diversion practices within specific industry sectors for Austin's food service enterprises.

The Environmental Protection Agency recommends a hierarchy of five alternatives to traditional waste management practices: source reduction, feeding hungry people, feeding hungry animals, industrial uses and composting.<sup>11</sup> Source reduction involves management interventions to improve efficiency such as implementing a waste prevention plan. Source reduction is focused on reducing the generation of food waste while the remaining four strategies present a hierarchy of potential destinations for food waste other than a landfill. Edible food that still meets local health department guidelines for food safety can be donated to food banks and last-mile rescue organizations. Food that is no longer suitable for humans, as well as waste byproducts from food processing can be used as animal feed. Food waste that is not suitable for either of these diversion strategies and specific waste streams such as used cooking oil and grease can be recovered and used for energy-generating processes or other industrial uses. Finally, any food waste remaining in the steam can be used to produce

compost. Despite the existence of these guidelines, the vast majority of food waste generated by food service facilities still ends up being incinerated or dumped in landfills.<sup>12</sup>

The current prevalence of food waste in the Municipal waste management system is driven by systemic forces such as industrialization, urbanization and globalization which have expanded the variety of food choices while further disconnecting the consumer from their food's origin and mode of production.<sup>13</sup> The generation of food waste has also been correlated to economic growth;<sup>14</sup> as one of America's fastest growing cities, Austin faces numerous environmental challenges related to rapid population growth. Austin's zero waste initiative dates to 2001 and grew out of a combination of local stakeholder pressures and lobbying efforts from environmental groups such as Texas Campaign for the Environment.<sup>15</sup> Austin made an official commitment to becoming a zero-waste city in 2009 and adopted the initial version of the Universal Recycling Ordinance in 2010.

In 2011, the City of Austin's Solid Waste Services changed its name to Austin Resource Recovery (ARR) to reflect a shift in paradigms, from an agency that disposes of trash to an agency that manages the valuable resources which end up in the waste stream.<sup>16</sup> The current amended version of the URO was adopted by City Council in 2013 and included a multi-year roll-out of additional recycling and diversion requirements. Through its business outreach division, ARR provides free consulting and guidance to businesses that are affected by the URO. This includes on-site assessments of a business's operations and diversion potential and providing businesses with educational material that highlight the financial and operational benefits of waste diversion efforts.<sup>17</sup> ARR also offers a rebate of up

to \$1800 towards the cost of training, capital improvements, equipment, service fees and signage related to diversion efforts.<sup>18</sup>

The City of Austin has committed itself to broad range of waste reduction strategies in an effort to meet a goal of 100% diversion by 2040. The citywide URO mandates minimum requirements for recycling and organics diversion in three categories: multi-family residential properties, non-residential commercial properties, and food service enterprises.<sup>19</sup> A Food Service Enterprise (FSE) is defined as an ‘establishment that serves non-prepackaged food and is required to hold a food permit such as a food or beverage distributor, processor, preparation facility, retailer, or service.’<sup>20</sup> The URO requires any organization with a food permit from the City of Austin (including not-for-profit organizations and schools not affiliated with AISD) to implement an organics diversion program. Most of the organizations affected by this ordinance are businesses, which is why they have been selected as the focus of this study. The ordinance went into effect for large facilities (greater than 10,000 square feet) on October 1st, 2016 and for medium facilities (greater than 5,000 square feet) on October 1st, 2017. All remaining businesses will be required to comply by October 1st, 2018.

The minimum requirements for these establishments consists of the following:

1. Submission of an online Organics Diversion Plan (due by Feb. 1 each year)
2. Reduce or divert organic material generated onsite, on a weekly basis
3. Post informational signs in both English and Spanish, or in English and one additional language

4. Educate employees about the organics diversion program annually and within 30 days of hire
5. Place exterior organics collection receptacles within 25-feet of landfill trash containers

## **LITERATURE REVIEW**

### **Relationship Between Business Size and Adoption of Green Practices**

Past research establishes a theoretical framework for understanding the relationship between business size and the implementation of environmentally sustainable practices. Large businesses are more likely to implement environmentally-friendly practices than smaller business for operational reasons such as increased economies of scale and a greater potential to maximize the financial benefits of green practices.<sup>21</sup> Large companies are more aware of the potential economic benefits of sustainable practices than smaller companies; larger companies are also more publicly visible (and produce a greater volume of total waste), and thus more likely to be aware of the environmental concerns of local stakeholders.<sup>22</sup> However, the greatest motivator for large businesses to adopt environmentally-friendly policies was identified as the implementation of permit-based regulation.<sup>23</sup>

Research into small and medium business adoption of environmentally-friendly initiatives has highlighted the role of individual manager/owner values as leading motivators for program adoption.<sup>24</sup> Particularly visible ‘exemplars’ (small business operators who have



proactively adopted environmentally practices out of personal motives) highlight best practices and set an example for other business operators to follow. It is hypothesized that small businesses are most likely to adopt new practices that have already been implemented by a visible peer,<sup>25</sup> and thus adoption of environmental programs can be increased through encouraging publicity of these exemplars as well as promoting inter-industry networking opportunities.

Other research has focused on the operational differences that make small businesses less likely to adopt environmentally-friendly policies than larger businesses. Larger businesses have greater resources available to devote to environmental efforts than small businesses and are better able to absorb the initial costs of program implementation.<sup>26</sup> A 2006 study hypothesized that government-instituted policies and industry-group led efforts would have the greatest positive impact on increasing program adoption amongst small businesses, as small businesses look to larger organizations to set frameworks for their social responsibilities.<sup>27</sup>

While small businesses may be less likely to proactively adopt environmental policies, other researchers have argued that small businesses are actually more responsive to stakeholder pressures to adopt these policies.<sup>28</sup> Small business owners have a greater propensity towards innovation and can make decisions in a more simplified manner than large corporations, while resource scarcity means that small businesses are less likely to push back against government initiatives through legal or lobbying efforts.<sup>29</sup> Small businesses are also more closely tied into their local communities and thus are more subject to pressure

from a local customer base. Ultimately, small businesses were theorized to be more responsive to regulatory pressures from government policies than their larger counterparts.<sup>30</sup>

### **Research on Food Waste Generation and Business Sector**

Another strain of research focuses specifically of the ramification of environmental policies on the food service sector. A 2014 study on green practices in the restaurant industry found that the proactive adoption of green practices was associated with increased firm competitiveness and performance.<sup>31</sup> Promoting an understanding of the potential competitive advantages of environmentally-sound practices would thus encourage more small businesses to undertake such initiatives. Further analysis of green practices within the food supply chain highlights the potential for food service enterprises to conform to green practices while food waste continues higher up the supply chain.<sup>32</sup> In other words, while restaurants and grocers may make a visible effort to manage their food waste streams through environmentally-friendly methods, overall industry standards for product perfection (particularly in produce) drives an increase in food waste at the producer and distributor levels.<sup>33</sup>

A 2017 study examining food waste management practices in the UK grocery sector found that although most grocery managers recognized food waste as a problem, it was not seen as a critical issue.<sup>34</sup> Grocers commonly used price reductions to quickly move perishable items before they spoiled and utilized recovery strategies such as waste collection for energy production. However, other diversion strategies such as food donation for human consumption were utilized largely on an ad-hoc basis and at the discretion of an individual store's management. The study found that rigid corporate policies and the limited control

that an individual store had over suppliers are the major barriers towards expanding food waste management practices.

A 2015 study of 45 hotels/restaurants in Abu Dhabi linked food waste output with serving style, time of service and accuracy of guest count/forecasting. while the greatest generator of food waste was identified as buffet-style service.<sup>35</sup> This was compounded by inaccurate guest counts, which resulted in overproduction by kitchen staff in anticipation for larger sales volumes. Suggested interventions for decreasing waste in this sector included switching over to a la carte service rather than buffet-style service and increasing communication between the front desk and kitchen management.

A 2016 case study of a hotel restaurant in Malaysia also identified buffet-style service as the leading generator of food waste; 94% of this waste was considered avoidable.<sup>36</sup> This study also utilized material flow analysis to qualify the largest components of food waste as fruits, vegetables and cereals. A 2015 study on food waste generation in campus dining halls also found fruits, vegetable and cereals to be the most heavily wasted items.<sup>37</sup> The study found edible plate waste to be the largest component of food waste by volume and highlighted the value of not having trays and using smaller plates as means to reduce food waste.

Further research into food waste generation in restaurants identified low cost items as the most likely to be wasted, particularly in fine-dining settings where the presentation of food items takes priority over food handling practices.<sup>38</sup> Fine dining establishments were also more likely to lose food to spoilage due to the uncertainty of production pars (the amount of food prepared in anticipation of an expected sales volume) associated with seasonal and

rotating menu items. Other research however indicates that restaurants can reduce their food waste output by serving local, fresh and seasonal items while limiting the total number of menu items and daily specials.<sup>39</sup>

In sum, there is considerable research on the relationship between the adoption of green practices and business size, as well as the factors which may hinder or drive the adoption of these practices. There is however a lack of literature on the adoption of green practices among the food service sector or on organics diversion as a specific business strategy. Studies specific to the food service sector have identified drivers of food waste within specific business types such as restaurants and hotels. This literature is primarily focused on quantifying specific waste generating processes, but does not directly address specific diversion strategies to manage this waste.

## **AIMS AND OBJECTIVES**

The two objectives for this study included:

1. To determine the patterns of waste diversion strategy adoption among different types of Food Service enterprises, among different sized businesses, and between different years to establish the current patterns of business behavior
2. To document the specific methods that businesses have adopted to meet the requirements of the URO as well as the challenges and opportunities the URO has created for these businesses.

The first objective was accomplished through statistical analyses of select data from the Organics Diversion Plans (ODPs) by identifying adoption patterns among waste diversion strategies. These analyses, including descriptive statistics, chi-square tests, two sample tests of proportions, z-tests for comparing means, aimed to answer the following research questions:

1. What are the current adoption rates for each organics diversion strategy for each food service enterprise sector
2. Do different sized businesses have significantly different patterns of waste diversion strategy adoption?
3. Have adoption patterns changed significantly between the first and second year of program implementation?

This second objective was accomplished by examining the qualitative aspects of waste diversion strategy adoption through interviews of seventeen Austin Food Service Enterprises. The interviews followed a semi-structured format and were conducted with the management representative who filed the ODP with the city.

The goal of the case studies was to move beyond binary data and present a snapshot of an ODP in action. Specifically, this section focused on two research questions:

1. What specific methods (internal programs, contracted services, etc.) are businesses using to meet the diversion requirements?
2. What are the perceived major obstacles to implementing waste diversion systems?

## **PUBLIC HEALTH SIGNIFICANCE**

Food waste is an underutilized resource; edible food waste can be redistributed to food insecure individuals while food waste that is not suitable for human consumption can be converted into animal feed, compost and industrial products.<sup>41</sup>

### **Food Insecurity**

The topline priority for food recovery efforts is to divert wasted, ready-to-eat food to hungry people. Much of currently donated food comes from grocery stores, bakeries, catering companies, and cafeterias,<sup>42</sup> and is distributed through community organizations to food insecure individuals. In the United States an estimated 12 billion pounds of fresh fruit and vegetables are wasted in grocery stores annually to ‘shrinkage’, the loss of product due to spoilage.<sup>43</sup> Improving systems for the recovery and distribution of food waste that is suitable for human consumption has the potential to increase food security among the estimated 41 million Americans who are food insecure.<sup>44</sup> It is estimated that a reduction in food waste of 30% would generate enough food to feed 47 million people annually, thus there is potential for creating positive health benefits.<sup>45</sup> The potential for food recovery efforts to generate sufficient volumes of food for economic viability is limited by the scale of recovery efforts and the proximity/density of donors to optimize route efficiency.<sup>46</sup> Based on efforts to model the potential for recovery to address hunger, every \$1 spent on recovery efforts yields \$5.71

worth of food. Thus, this finding highlights the value of food donations as a better alternative to direct food purchases.<sup>47</sup>

While there is literature which supports the potential of food recovery efforts to yield a sufficient *quantity* of recovered food, there remain significant questions as to the *quality* of this food. Donated food items may not be ‘healthy’ or ‘wholesome’ from a public health standpoint; research has indicated that food donations consist of large quantities of bread and other baked goods.<sup>48</sup> A diet consisting of solely donated food items is unlikely to meet the recommended guidelines for proper nutrition.<sup>49</sup> Increased donations of ‘unhealthy’ food items may temporarily alleviate hunger but ultimately contribute to higher morbidity rates for negative diet-related health outcomes such as obesity.

There is also a body of research that focuses on the potential risks of depending on food donations as a potential cure for food insecurity. While food recovery networks may offer short-term alleviation of hunger, they do not address the systemic forces which drive food insecurity and thus cannot ultimately address the underlying issue of poverty.<sup>50</sup> Furthermore, the dismantling of state welfare systems under neoliberal capitalism have essentially outsourced a function of state to not-for-profit agencies which rely on donations and volunteers.<sup>51</sup> In the former paradigm, food can be considered a right. If a citizen does not have adequate access to wholesome food, then the state steps in to fill the void. Under the current paradigm, food donations are seen as an act of charity rather than fulfilling an obligation. While not-for-profit food recovery organizations certainly aim to serve the needs of their clients, they may inadvertently reinforce the notion that poverty is caused by personal

failures or emergencies rather than being the inevitable result of our current economic system.<sup>52</sup>

### **Climate Change Mitigation**

Food waste that ends up decaying in landfills or is incinerated contributes to global climate change through the production of greenhouse gases.<sup>53</sup> Methane is the primary gas produced by food decay in landfills and is 20 times more damaging to the atmosphere than carbon emissions.<sup>54</sup> Food waste is one of the primary components of landfill and is thus a major contributor to the total outgassing associated with landfills. Cities have a unique role in climate change mitigation; while cities account for as much as 80% of global greenhouse gas emissions, they may not see a direct benefit from local environmental efforts.<sup>55</sup> However, city governments often are the first to implement local environmental policies due to their direct control of local infrastructure such as building codes, land use and waste management.<sup>56</sup>

### **Improved Soil Quality While Reducing the Use of Chemical Fertilizers**

Compost generated from food waste is a valuable resource which can improve soil quality and increase agricultural productivity by returning valuable nutrients into the system.<sup>57</sup> Using compost as a fertilizer for agricultural production reduces the need for chemical fertilizers created from petroleum products. Chemical fertilizer usage is associated with environmental degradation such as groundwater contamination and algal blooms caused by agricultural runoff.<sup>58</sup> Exposure to chemical fertilizers also has negative health impacts for



human beings and can contribute to skin irritation, and kidney problems.<sup>59</sup> Replacing chemical fertilizers with compost reduces these risks. It is important to note that the composting process itself does pose its own risks including the generation of generation of bioaerosol emissions such as airborne bacteria.<sup>60</sup>

### **Creation of Economic Opportunity in the Pursuit of Equity**

Food waste which is not suitable for human consumption still has economic value and can be used for a range of commercial purposes including energy generation, animal feed, plastics and industrial chemical production.<sup>61</sup> The movement for food justice has highlighted a cooperative, community-based approach to handling issues of sustainability within the food system and recent efforts in minority communities have taken a similar approach to waste management. Helping communities develop models for small or cooperatively-owned businesses based around recovered food waste can help build wealth and increase living standards.<sup>62</sup> New small business models are evolving to provide commercial waste diversion services as well as novel uses of food waste to create economic value. This study highlights emerging business opportunities which can benefit economically-insecure communities.

### **Potential Conflicting Interests Among Stakeholders**

There are a several different municipal agencies and stakeholder groups which are involved in organics diversion policy in Austin in addition to ARR such as the Offices of Sustainability and Public Health and various policy boards and working groups. Each group has different goals, many of which have hard-to-quantify outcomes. Waste diversion is the

most easily measured in terms of outcomes; the amount of waste kept out of landfills can be quantified and assessed. Ostensibly, one of the primary purposes of diverting food waste is to reduce the volume of greenhouse gases. However, the EPA hierarchy places food diversion for consumption by animals above composting and landfills, yet this diversion method has been shown to generate more greenhouse gases than either of the disposal methods below it in one Taiwanese study.<sup>63</sup> A policy initiative that focuses on one goal without a consideration of other priorities risks unintended negative consequences. In addition, particular diversion strategies may compete with each other.<sup>64</sup> A potential strategy for mitigating potential conflicts involves developing diversion strategies with co-benefits across multiple policy areas.<sup>65</sup> In this manner, an organics diversion approach should take into consideration the optimization of other policy goals such as food insecurity and greenhouse gas reduction.

### **Incremental Change vs. Systemic Change**

On the whole, current organics diversion efforts largely seek to incrementally increase efficiency and manage the surplus production of a capitalist system; they fail to address systemic issue or offer radical change from the status quo.<sup>66</sup> This is not to say that they are without value: they serve to drive public attention towards important issues and can be the first steps towards more systemic changes.<sup>67</sup> These diversion strategies may treat some of the symptoms of the problem, but they cannot effect real change. Certain literature would categorize these strategies as “weak” sustainability as they rely on technological or managerial innovations to improve efficiency without questioning the underlying business model.<sup>67</sup> These initiatives offer immediate benefits for companies that implement them:

increased profits through improved efficiency or by commodifying a waste stream into a source of revenue.<sup>68</sup> While these policies make sense from the standpoint of a business operator and have the outward appearance of being environmentally-conscious, may amount to little more than ‘greenwashing’ (or in the case of food donations, ‘charity-washing’).<sup>69</sup>

## **METHODS**

The purpose of this study was to document the specific organic waste diversion strategies that are currently in use by Austin’s food service enterprises. To answer the first question, “What strategies are businesses using to meet URO requirements”, this study leveraged data collected by Austin Resource Recovery. The Organics Diversion Plan consists of a series of yes/no questions regarding waste diversion practices answered by each permitted food service enterprise in Austin, TX. These questions are mutually exclusive and a business may answer ‘yes’ to multiple diversion strategies. OPDs are submitted to Austin Resource Recovery by February 1st of each year via a web-based form. Businesses that fail to respond by the due date are contacted regularly until they comply; failure to file an ODP can potentially lead to legal ramifications but thus far this has not occurred. The data set consists of the responses to these questions along with the name of each business, its permit type, and business type. This study examined the responses of seven different business categories (Grocery, Commercial Kitchen/Catering/School, Hospitality/Hotel, Manufacturing/Warehouse/Distributor, Restaurant, Cafeteria/Buffer, Assisted Living/Child

Care) to the five questions which correspond with the five waste reduction strategies recommended by the EPA:

1. Source Reduction: Does your business have a waste reduction plan? Y/N
2. Food Donation for People: Does your business donate food for human consumption? Y/N
3. Food Donation for Animals: Does your business donate food for animal consumption? Y/N
4. Food Recovery for Industry: Does your company have a documented food recovery and reuse program? Y/N
5. Composting: Does your business have onsite or commercial compost collection? Y/N

### **Data Collection and Measures**

The quantitative data for the 2017 and 2018 ODP submissions were obtained through a public information request via the City of Austin website and provided by ARR in the form of excel documents. These spreadsheets contained the tabulated results of ARR's online submission form. Data collection for the case study portion of this study was conducted through a semi-structured interview format where participants were asked a series of five yes/no questions with the opportunity for an open response to clarify their reasons for their previous answer. A final open question allowed participants to share any general thoughts about organics diversion or the URO. Interviews were conducted over the phone and ranged from approximately 5 minutes to 60 minutes in length. Businesses were selected randomly

within each category and were initially contacted via a request letter. If no response was received, an attempt was made to contact the staff member over the phone. If the selected business failed to respond or was unwilling to participate, another business was selected.

## **Recruitment**

Case study participants were selected from businesses that had filed a 2018 ODP. Potential participants were initially contacted via email at the address of record for the person responsible for filing the ODP. If an individual did not respond within a week, an attempt was made to contact them with a phone call. No potential participants outright refused to participate, but three individuals who initially agreed to participate failed to respond to further inquiries. A total of seventeen interviews were conducted during this study. The overall response rate to recruitment efforts was approximately 30% with restaurants being the least willing to participate.

## **Organics Diversion Plan Data, 2017**

The 2017 data set contains 236 relevant ODPs from large food service enterprises (kitchen over 10,000 square feet), the first segment of businesses affected by the URO. This data set is theoretically inclusive of every permitted Austin food service enterprise business in this size category.

## **Organics Diversion Plan Data, 2018**

The 2018 data set contains 576 relevant ODPs from large and medium sized food service enterprises (kitchen over 5,000 square feet). The total population for the 2018 data set is approximately 800 businesses but only around 70% of businesses had filed their ODP at the cut-off date for this study. When complete, this data set is theoretically inclusive of every permitted Austin food service enterprise business in this size category. Most organizations included in the population are for-profit business

## **Statistical Analysis**

### Specific Objective 1:

Statistical analyses were conducted on STATA IC 13 statistical software. Mean adoption rates were determined for each one of the 5 diversion strategies for the entire population and by business category per year for 2018, (2017 and 2018). The 158 businesses which filed plans both years were compared using a two-sample test of proportions for statistically significant change in their diversion strategies between the two periods. The 2018 data set was divided into large (businesses that filed in 2017) and small businesses (businesses that only filed in 2018 and under 10,000 square feet) and the z-test for comparing difference of means was used to assess any significant changes between diversion strategies in a given sector based on business size. The Chi-Square Test of independence was utilized to check for correlation between industry sector and strategy adoption with a .05 significance level.

### Specific Objective 2:

To answer the second question: “What challenges and opportunities do businesses face with the URO,” this study utilized a case study approach. The case studies consisted of a brief interview with the member of management responsible for filing the ODP (owner, manager, kitchen manager or chef) from 17 food service enterprises. The interview consisted of questions which addressed the five diversion strategies covered in the URO, the perceived obstacles to implementing these five strategies, and an opportunity to present an overall response to the effect of the URO on business operations. Responses were tabulated across all participants to identify reoccurring themes. Participants in the case studies were kept anonymous to protect the identity of the businesses involved.

Interviews were conducted over the phone, recorded electronically and followed the format detailed in Appendix A. The five yes/no questions were taken directly from the ODP but were expanded to allow the participant to qualify their answer. The sixth, open-ended question was designed to give participants to share any feelings, issues, or insight into the URO and its impact on their business operations.

### **Human Subjects, Animal Subjects, or Safety Considerations**

The project, IRB submission number HSC-SPH-18-0040, was determined to qualify for exempt status from IRB according to 45 CFR 46.101(b) as Category #2: Research

involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

- a.) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; AND,
- b.) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

## **RESULTS**

### **Objective One: Statistical Analyses**

The results of the statistical analyses of the ODP data sets as well as the key findings of the case studies are presented below. The study determined the baseline diversion strategies for seven business sectors: Grocery, Commercial Kitchen/Catering/School, Hospitality/Hotel, Manufacturing/Warehouse/Distributor, Restaurant, Cafeteria/Buffer, and Assisted Living/Child Care.

### **Establishing a Baseline for Diversion Strategy Adoption**

The results of the 2018 ODP submissions were tabulated as of March 1<sup>st</sup>, 2018. Although the plans were officially due as of February 1<sup>st</sup>, the data set was approximately 72% complete at the time the study was conducted, with 576 plans filed out of an expected pool of around 800 businesses and contained 318 businesses in the sectors which are the focus of this study. A Chi-square test of independence with a .05 significance level was



used to confirm a correlative relationship between each business sector and the adoption rate of each diversion strategy. This included 31 plans from the Assisted Living/Child Care sector, 14 plans from the Cafeteria/Buffer category, 21 plans the Commercial Kitchen/Catering/School sector, 81 plans from the Grocery sector, 32 plans from the Hospitality/Hotel sector and 139 plans from the Restaurant sector.

### **Diversion Strategy Adoption by Business Sector**

The mean adoption rate for each diversion strategy for the 2018 ODP submissions are presented below:

#### **Waste Prevention**

Waste prevention was the most widely adopted organics diversion strategy across all sectors. The Cafeteria/Buffer Sector had the highest adoption rate at 92.9% while the Manufacturing/Warehouse/Distributor sector had the lowest at 68.1%.

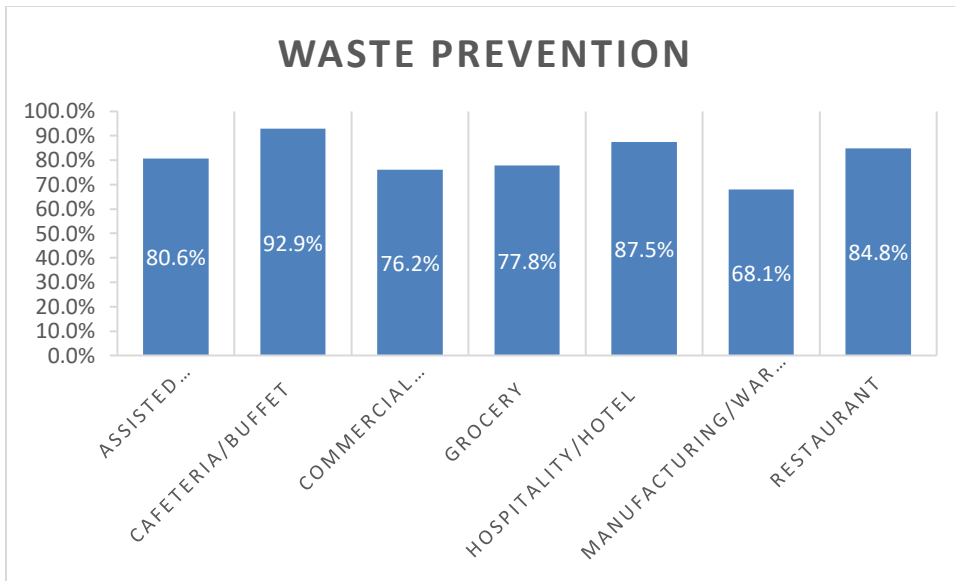


Figure 1: Mean adoption rate for waste prevention strategies for seven food service sectors (n=576), Austin, TX  
2018

### Donations for People

The strategy of donating food for human consumption was implemented primarily by the Grocery sector, which had the highest strategy adoption rate at 79%. The Manufacturing/Warehouse/Distributor sector came in second with a rate of 46.8%. Donation rates from other sectors were lower, with the Cafeteria/Buffer sector coming in lowest at 7.1%.

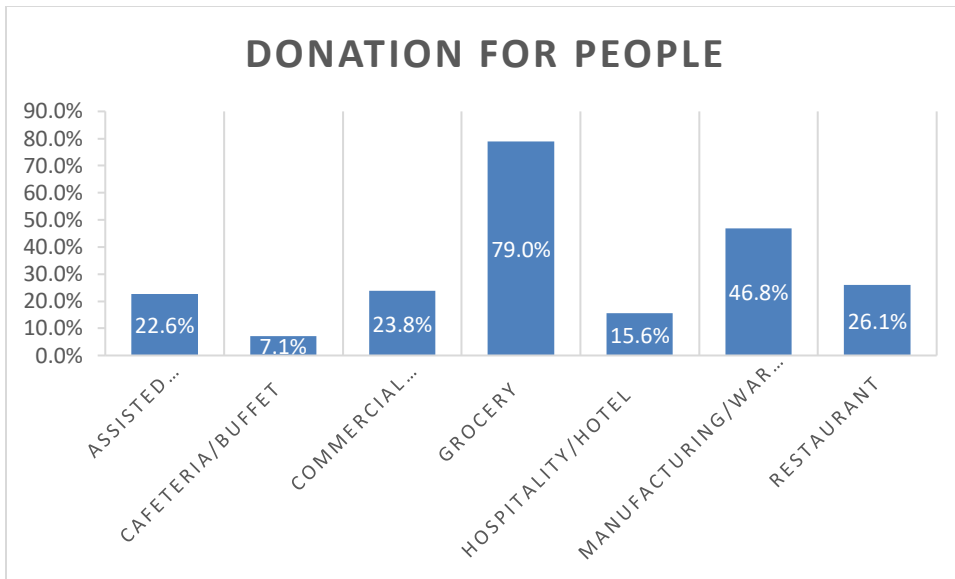


Figure 2: Mean adoption rate for food donations for consumption by humans (n=576), for seven food service sectors, Austin, TX 2018

### Donations for Animals

Food donations for consumption for animals was limited almost exclusively to the Grocery sector, with a mean adoption rate of 56.8%. The Cafeteria/Bufferet and Commercial Kitchen/Catering/School sectors report no donations of this type.

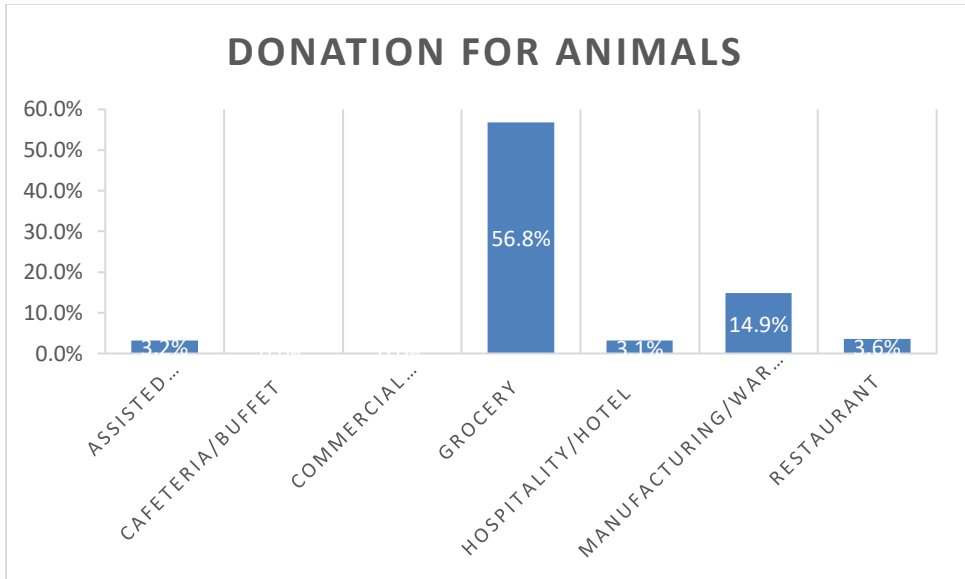


Figure 3: Mean adoption rate for food donations for consumption by animals (n=576), for seven food service sectors, Austin, TX 2018

### Recovery for Industrial Use

Recovery of food waste for industrial uses was widely reported in all sectors, but the Grocery sector stands as the highest adopter with an adoption rate of 84%. The Cafeteria/Bufferet sector reported the lowest adoption rate of 35.7%

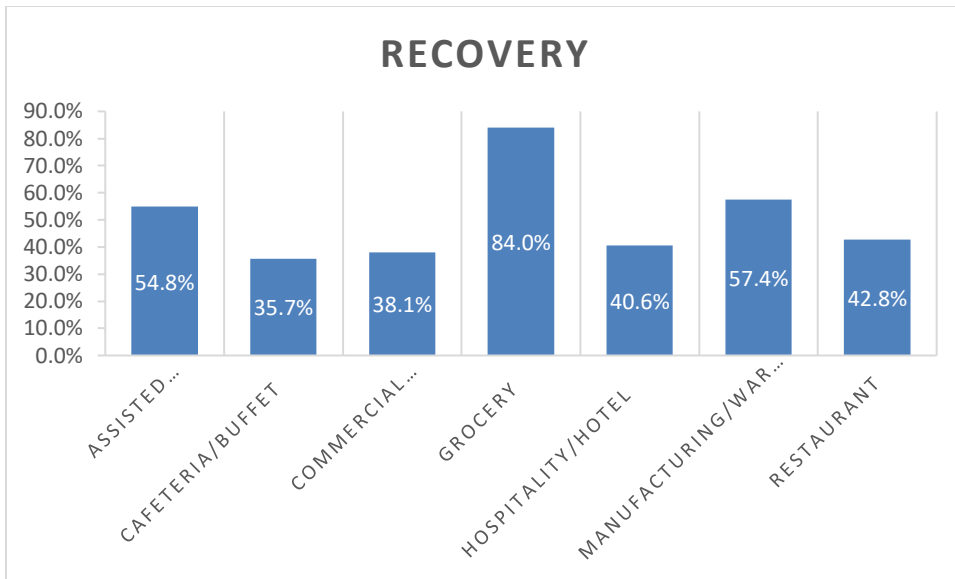


Figure 4: Mean adoption rate for waste recovery strategies for seven food service sectors (n=576), Austin, TX  
2018

### Composting

Composting programs were widely utilized across all seven sectors, with the Cafeteria/Buffer leading the way with a 78.6% adoption rate. The Grocery sector followed close behind with an adoption rate of 75.3%. The Manufacturing/Warehouse/Distributor sector had the lowest adoption rate for this strategy at 31.9%.

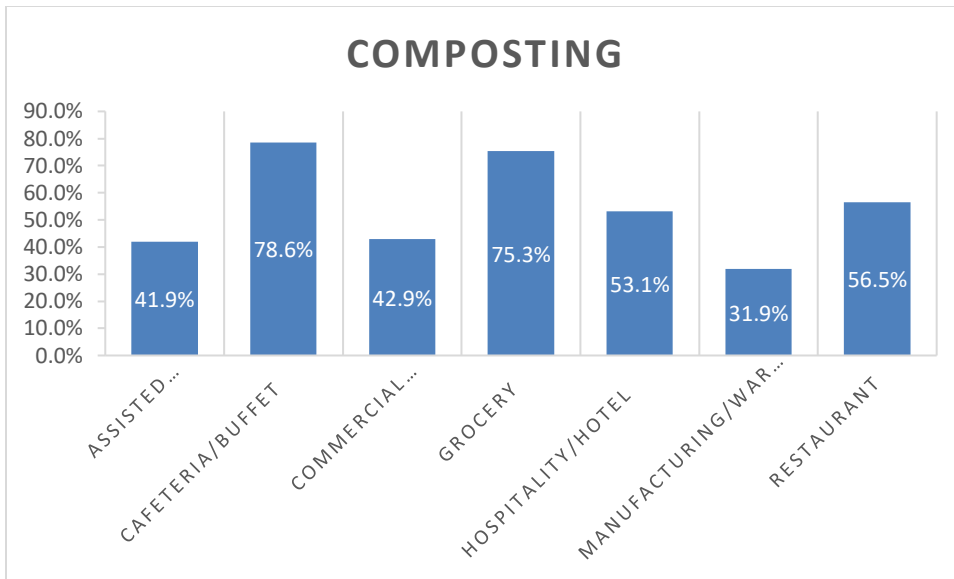


Figure 5: Mean adoption rate for composting for seven food service sectors (n=576), Austin, TX 2018

An analysis of organics diversion strategy adoption by sector reveals that *prevention* was the most widely utilized strategy across all sectors while *other donations for consumption by people and animals* were highly localized in the grocery sector. *Recovery* and *composting* were also widely adopted across all sectors. Overall, the Grocery sector had the widest range of diversion strategy adoptions of any sector.

### Strategy Adoption and Changes Between Years

Mean adoption rates were calculated for the 158 businesses who filed both 2017 and 2018 ODPs. A two-sample test of proportions with a .05 significance level was used to test for statistically significant changes between the two periods. Food service enterprises who filed ODPs in both periods experienced a statistically significant increase in the

implementation of waste prevention and waste recovery programs.

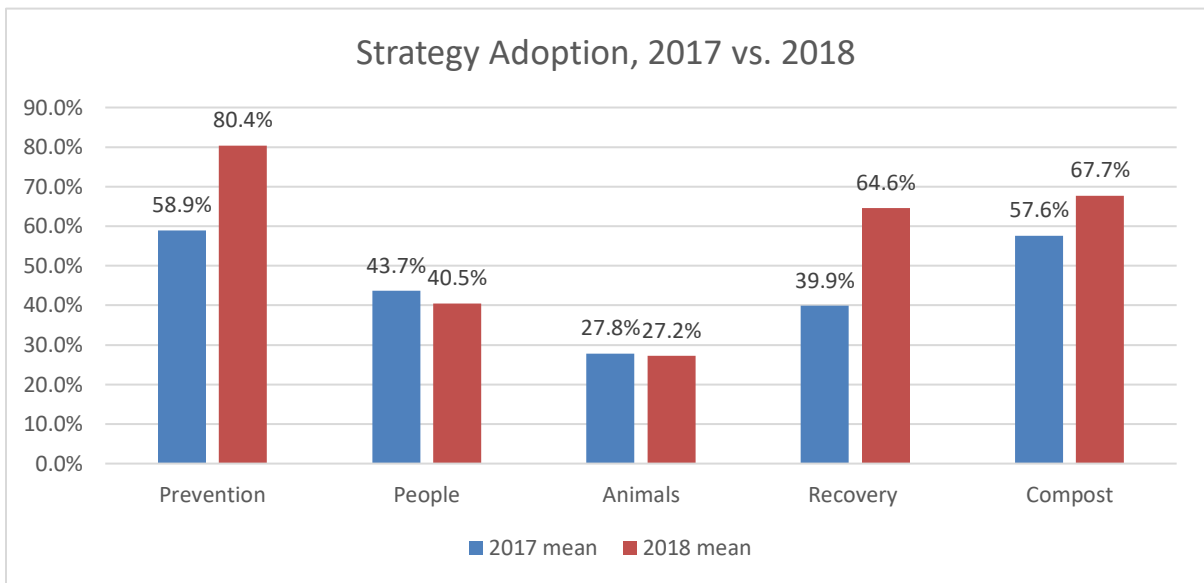


Figure 6: Comparison of mean adoption rates for each diversion strategy for 156 large food service enterprises which ODPs in 2017 and 2018.

### **Difference in Strategy Adoption Between Large and Medium Businesses**

The 2018 ODP data set was divided into two populations (above 10,000 square feet and between 10,000 to 5,000 square feet) based on business size (based on the ODP criteria and validated against self-reported square footage) and the mean adoption rate for each strategy was determined. This created a population of 156 large business and 404 medium businesses. The z-test for two means was then used to check for statistically significant differences between the two groups. Large businesses showed a higher rate of organics diversion efforts across all categories, with statistically significant differences at a .05 significance level across all strategies except for prevention.

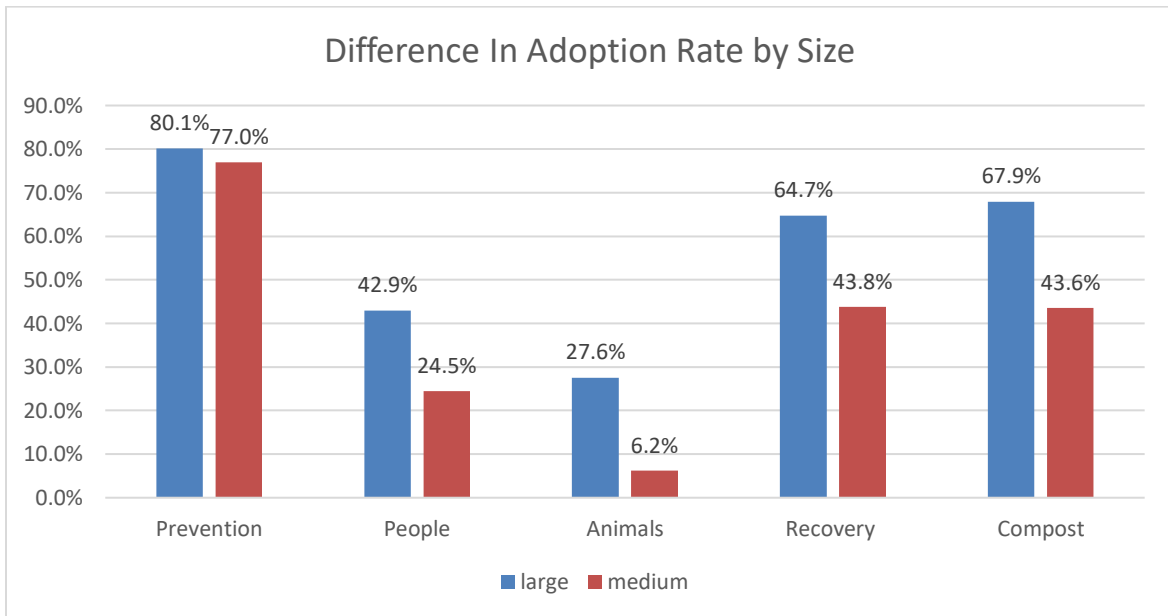


Figure 7: Comparison of mean adoption rates for each diversion strategy between 404 large and 156 medium business which filled 2018 ODPs

## Objective 2: Case Studies

### Diversion Strategy Adoption

Two case studies were done for each of the 7 business categories used in the data set (Grocery, Commercial Kitchen/Catering/School, Hospitality/Hotel, Manufacturing/Warehouse/Distributor, Restaurant, Cafeteria/Buffer, Assisted Living/Child Care). ODP filers self-selected their business category from a list of choices provided by ARR which reflected the customer-facing function of the business. It is important to note that AISD public schools are not required to file ODPs and thus do not contribute to the Commercial Kitchen/Catering/School category. While some of these categories are useful for



the purpose of studying organics diversion (such as the Grocery and Restaurant sectors), others aggregate businesses which have significantly different waste generation profiles. For instance, the Manufacturing/Warehouse/Distributor contains both businesses that supply fresh, perishable items such as produce (which have a large potential for generating food waste) and businesses that distribute frozen items (and produce virtually no organic waste). Case study participants were initially selected randomly, while additional case studies were selected for the Manufacturing/Warehouse/Distributor and Restaurant sectors to capture the diversity of business practices in these sectors. Additional cases studies were done for the restaurant and manufacturing/warehouse/distributor categories to capture the wider range of operations present within these sectors. For example, food waste generated by a sushi restaurant will vary tremendously from a vegan restaurant, thus the two establishments may opt for different diversion strategies. Of the 17 interviews, prevention was the most widely adopted diversion method with 16 participants utilizing this method. Donations for consumption of people was utilized by 7 participants and donations for animals by 3 participants. Recovery was used by 6 participants while composting was used by 14.

Table 1: Interview participants by business sector and number of strategies adopted

	# of Participants	Prevention	People	Animals	Recovery	Compost
Assisted Living/Child Care	2	2	1	0	0	2
Cafeteria/Buffer	2	2	0	0	1	2
Commercial Kitchen/Catering/School	2	2	1	0	1	2
Grocery	2	2	2	2	0	2
Hospitality/Hotel	2	2	1	0	1	1
Manufacturing/Warehouse/Distributor	3	2	2	1	0	2
Restaurant	4	4	1	0	3	3
<b>Total</b>	17	16	8	3	6	14

### Case Study Emerging Themes

The most frequently mentioned responses to the open response questions are tabulated below. Most of the businesses surveyed reported *no changes* in their business practices due to the implementation of Austin’s organics diversion requirements; the few that did reported adding compost collection services. Most businesses also experienced no perceived challenges in meeting the ODP requirements, although several mentioned difficulties in completing the online application. Several businesses also reported internal challenges in training employees on proper waste sorting techniques for compost collection.

The primary reason given for not adopting a particular diversion strategy was that it was not applicable for the business as the strategy did not fit with the business’s waste profile. For instance, donations for animals consisted primarily of produce items and came primarily from business that handled large volumes of produce. Several participants expressed interest in expanding their diversion efforts but felt that it would be difficult to implement due to space or staffing issues. The primary reasons given for adopting a particular strategy were ‘doing the right thing’ and the financial benefit received by the

business from waste prevention strategies. One participant mentioned that ARR's educational initiatives has help him learn how to operate more efficiently and thus be more profitable.

### **Use of Novel Services**

In addition to standard compost collection through traditional solid waste haulers, interview participants cited using two novel contract services to meet the organics diversion requirement. Two larger organizations used a service which managed multiple different diversion strategies (through subcontractors), providing a one-stop-solution for organics diversion methods. This service provided the businesses with a consolidated summary of their diversion efforts across multiple strategies and received its service fees out of the federal tax benefit for waste diversion. Several smaller businesses also contracted out their compost collection, but used boutique composting services that targeted at local, sustainability-inclined customers with specific waste profiles. These services often utilized the compost produced for their own organic farming efforts.

Table 2: Case study themes and key quotes with responses to specific questions

Changes to Business Practices (all participants)	
No change	14
Change	3
<p><i>“The Organics Diversion Plan paperwork did not alter the way we handle our organics. We are already doing those things”</i></p> <p><i>“We added compost service...that’s the only change.”</i></p>	
Challenges Reported:	
No challenges reported	12
Difficulty in training staff to separate compost	3
Difficulty in filing ODP online	2
Difficulty with regulations	1
<p><i>“I feel like it’s difficult to meet the diversion rate requirements.”</i></p> <p><i>“The paperwork was a bit lengthy”</i></p> <p><i>“We had to reprint all our signage”</i></p>	
Motivations for Diversion:	
"doing the right thing"	5
financial benefit	3
<p><i>“...efficiency really makes sense, (it’s) good for the environment”</i></p> <p><i>“Every business should already be doing this.”</i></p>	
Reasons for not adopting a strategy (all participants)	
Not applicable due to waste profile	14
Difficult to implement	3
<p><i>“The only real way to make people divert their trash is if garbage is more is expensive”</i></p> <p><i>“We don’t really have a lot of food waste...anything that’s left over we give to the staff and they finish it off. Does that count as a donation?”</i></p>	

Novel Practices	
Contracted outside management solution	2
Contracted boutique organics hauler	2

## DISCUSSION

Although the data obtained from the ODPs was neither complete nor particularly granular, basic patterns emerged which allow for preliminary answers to the study’s research questions. The study determined adoption rates for each diversion strategy based on a sample of the total population and documented statistically significant differences in adoption rates between large and medium businesses. The analysis of businesses that filed ODPs in both 2017 and 2018 found significant increases in two adoption strategies. The case study process found limited reports of difficulty meeting diversion requirements or implementing diversion strategies, but did uncover the novel use of some organics diversion service providers that warrants further study.

### **Diversion Profiles by Business Sector**

This study confirmed a significant correlation between business sector and the pattern of organics diversion strategies adopted. Logically, different kinds of businesses will have differing waste outputs and thus will adopt the strategies that best correspond to the type and volume of waste being produced. Due to the small sample size in most business sectors, further statistical analysis using two sample tests of proportion or z-tests would not yield viable results. The 2019 ODP data set will include all permitted Austin food service

enterprises will contain a larger sample size that may be suitable for more detailed statistical analyses.

Understanding the potential utility of each diversion strategy for a given business sector can help create best practices such as developing a relationship with last-mile food rescue organizations and inform policy efforts to maximize the potential of organics diversion efforts. Though basic, the diversion rates for each sector can be compared to national averages such as those used in the compilation of NRDC's report: *Modeling the Potential to Increase Food Rescue*.<sup>70</sup> Comparing Austin against the report indicates areas where Austin is falling short. In particular, data suggests that there is the potential for additional food recovery in the grocery, institutional dining and small retail sectors.<sup>71</sup> This current picture of Austin's organics diversion implementation will aid recovery efforts by highlighting areas that have a high potential for increasing their diversion streams.

### **Prevention Strategy**

It is not surprising that prevention is the most highly adopted strategy across all sectors as it has the most direct effect on a business's bottom-line; waste prevention is a fundamental principal of kitchen management and practiced throughout the majority of the food service industry.<sup>72</sup> These practices may include portion control, inventory management systems and utilizing kitchen scraps for other recipes. Prevention strategies help businesses maximize the value of their inputs, which is applicable to all business sectors

### **Donations for Human Consumption Strategy**

Donations for people came primarily from the grocery sector and from distributors who handled perishable items such as produce. Donations for people are primarily perishable items that are nearing the end of their shelf-lives. The majority of food donations for people come from donors with large volumes of edible food, which can include institutional food service providers.

### **Donations for Animals Strategy**

Diversion for animal consumption was reported by both participants from the grocery sector as well as one from the manufacturing sector; all three businesses donated spoiled produce to local farmers for use as hog feed. It is likely that further adoption of this strategy will be limited to these sectors as most other businesses do not produce a suitable volume of waste for this diversion strategy. However, Austin area grocery stores that are not already participating in donation for animals can be targeted.

### **Recovery Strategy**

Recovery for industrial uses was limited strictly to used cooking oil and this occurred only in businesses that used industrial deep fryers. Of the five diversion strategies being studied, prevention and recovery have the most direct impact on improving a business's bottom line. Recovery strategies turn waste outputs into additional revenue streams. It is logical that businesses would embrace the strategies that have the most positive financial impact on their operations while resisting strategies that would increase their operating costs.

## **Composting Strategy**

Composting is also widely adopted as most food service enterprises already pay private haulers to remove their solid waste.<sup>73</sup> While the cost of compost collection may be slightly higher than mixed waste collection in some areas, it is relatively easy and inexpensive to have compost collected by a commercial hauler. The challenge of this strategy is in the time and labor required to sort out organic waste from the non-compostable waste. Composting requires a significant volume of appropriate waste to be feasible, which makes it suitable for only certain business types.

## **Business Size**

The literature on the relationship between business size and green practices suggests that larger businesses are more likely to adopt a given organics diversion strategy than smaller businesses. The statistical analyses performed on business size in the 2018 ODP data set supports this hypothesis. Additionally, the identification of ‘exemplar’ small business owners through the case study process is consistent with past research efforts.

The statistical analyses performed in this study confirms the earlier research claim that large businesses are more likely to adopt environmental policies than smaller businesses.<sup>74</sup> Large businesses may be better able to utilize certain diversion strategies due to economies of scale.<sup>75</sup> Case study interviews also support the claim that some smaller businesses might be more driven to adopt environmentally friendly practices due to the motivations of individual managers.<sup>76</sup> Small businesses may be more driven by the ideals of individuals than their larger counterparts, and thus more willing to participate in food recovery efforts. They may



also be less restrained by corporate policies which limit donations.<sup>77</sup> Prevention strategies have the highest financial impact of any strategy and are a standard operating procedure in the food service industry; thus, it makes sense that most businesses would have one in place regardless of size.

The significant drop in adoption rates between large and medium businesses for the remaining four strategies may be a function of economies of scale. All four require a waste output that meets specific parameters for that diversion method. Larger businesses have greater waste outputs, thereby increasing the potential utility of a given strategy. In addition, utilization of most of these strategies requires the involvement of an outside party (recovery organizations for feeding people, compost haulers for compost, etc.) Without a large enough volume of divertible material, it may not make sense for these parties to service a business. Strategies that aggregate waste from multiple businesses such as reverse logistics (having suppliers pick up food waste and aggregate it while running their existing delivery routes)<sup>78</sup> may help alleviate this barrier to entry, and offer a solution that is cost-effective for smaller waste-generators.

### **Impact of Diversion Requirements on Business Operations**

This study found a statistically significant increase in the adoption rate of two of the five strategies (i.e. waste prevention and recovery strategies) among the 158 businesses that filed ODPs in both 2017 and 2018. While the case study interviews only captured three mentions of changes in business practices due to the URO, it is clear from the data that a significant number of businesses have reported changing their organics diversion practices

since the implementation of the URO. It is important to note that since this is self-reported information with no quantitative measurement of diversion volume, it is impossible to tie these changes to tangible outcomes.

While most businesses already met the minimum diversion requirements at the time they fell under the URO's jurisdiction, there was a significant increase in the adoption of prevention and recovery strategies by the second year. While it is unclear how much additional food waste was prevented or diverted by the implementation of these strategies, it is safe to conclude that the URO has increased awareness about and participation in recovery efforts. This sentiment was also verified by the case studies, as several participants cited ARR and the URO as having increased their awareness about organics diversion and what they could do to improve their diversion rate.

### **Improving Public Health**

Austin's organics diversion requirements for food service enterprises have largely codified the industry status quo as the minimum threshold for compliance. Further policy initiatives will be needed to increase the rate of adoption of desired strategies. Thus far, the diversion strategies implemented have the greatest financial benefit to the organization but more limited benefits to specific public aims.

Austin has prioritized food recovery for human consumption; further research should focus specifically on means of increasing this diversion strategy. Combined with national data on recovery potential, this dataset can help identify businesses that have a large potential for donating food for people but are not already doing so. To be effective, future waste

diversion efforts will need to be tailored to the reality of specific business practices. If the goal is to maximize the output of a particular diversion effort, then it makes sense to direct efforts towards ‘low-hanging fruit’. Specifically, efforts to recover large volumes of healthy food such as fresh produce should target businesses that handle large volumes of produce rather than broad initiatives across all businesses in the current business categories.

Future research efforts should be focused on measuring the actual outcomes of diversion efforts to quantify progress towards specific goals. This will involve measuring the actual organics diversion volume of a business over time. Ideally, granular data about the diversion volumes of specific strategies will allow for a better understanding of how to tailor strategies that match the needs of a particular business. Next steps for ARR should include further research to quantify the outputs of food waste in sectors which have been identified in the literature as the highest waste producers such as institutional dining.

### **Recategorize 2019 ODP Data Set by Service Type**

The current business sectors used in the ODP do not reflect the different types of food service that are performed by the establishments within each sector. For example, one hotel may have a several full-service restaurants and a catering program while another may only offer a breakfast buffet consisting of pre-made items. Businesses in different sectors may have identical food service programs. Hospitals, schools and corporate campuses all fall into the category of institutional dining but are treated as separate sectors for the purposes of the ODP. Furthermore, there were additional ODP sectors (Other, Entertainment, Pub/Bar) that

are nebulous and would be more useful if they were dissected or reassigned. For example, Alamo Drafthouse is categorized as entertainment yet has restaurant-style food service and a full commercial kitchen; other movie theaters however only serve popcorn, beverages and candy.

While there are reasons for maintaining the current business sectors for certain analytical purposes, a separate layer of categorization which groups businesses by service type will be more useful for understanding diversion profiles. Current literature on food recovery focuses on categories such as institutional dining and small retail; identifying which Austin businesses fall into those categories will help align local initiatives with national best practices and research standards.

### **Criteria for Recategorization**

The primary criteria for the suggested categories is the style and volume of service. The pre-existing categorizes often aggregate businesses that do not share similar business practices or waste outputs (manufacturers have an entirely different business model/waste profile than distributors or warehouses). Some of the pre-existing categories have been disaggregated while others have been reassigned or removed completely. Categories such as other and entertainment currently serve as a catch-all and don't reflect the behaviors and functions of those businesses as it related to food service. ARR should collect additional data about actual food service practices and categorize Austin's food service enterprises based on service style.

## **Data Collection for Recategorization**

Properly categorizing Austin's food service enterprises requires additional information from businesses which is not currently covered in the ODP questionnaire. The addition of the following four questions will provide the data necessary to properly classify businesses based on their service style:

1. Does your business provide catering or event services?
2. Does your business utilize buffet or cafeteria-style food service?
3. Does your business have a full-service kitchen?
4. Does your business offer an a la carte menu?

## **Suggested Business Categorizations**

Institutional food service businesses produce a large volume of food in advance based on a predetermined production par (estimated guest count plus 10-15% buffer on average). Service is generally done in a buffet or cafeteria style. The regular overproduction of edible food makes this sector an excellent target for food recovery efforts. Large food retail businesses handle a large volume of food and often have an overstock of food that is reaching the end of its shelf-life, making them another excellent target for diversion efforts. Small food retail stores often have pre-packaged food items that are removed from sale before they have reached the end of their shelf-life due to internal policies (for example, the sandwiches and fruit cups at 7-11). Because these items are relatively healthy and already individually packaged, they are ideal for food recovery. Manufacturing is a discrete category of businesses and thus should be by itself. The restaurant category has been expanded to all

business that have full-service kitchens and offer a la carte menus. Small food service captures businesses that do not have full-service kitchens and offer a small menu of food items which are generally prepared in advance and may be pre-packaged.

### **Additional Data Collection for 2019 ODP**

More information is need on specific business characteristics in in order to develop a better understanding of the factors that influence a businesses' organics diversion patterns. In addition to the above-mentioned questions about service style, new questions should be added to the 2019 ODP to collect business demographics. These questions should capture the number of employees at a given location, the annual volume of food sales at a given location, the total number of locations and the ownership structure of the business. This information will help correlate the literature on green practices in businesses to the specifics of Austin's urban environment.

Table 3: Suggested categories for future ODP submissions

<b>Institutional Food Service:</b>
Cafeteria/Buffer
Assisted Living/Child Care
School
Catering
Hotels with catering/event facilities
Commercial Kitchen
Entertainment with catering/event facilities (TopGolf, Main Event, etc.)
Hospitals
<b>Large Food Retail:</b>
Grocery
Warehouse/Distributor
<b>Small Food Retail:</b>
Convenience Store
<b>Manufacturing</b>
<b>Restaurant:</b>
Entertainment w/full service dining
Hotels with full service restaurants and/or room service
Entertainment with full service restaurants (Alamo Drafthouse)
Bars/Pubs with full service kitchens
Quick Service/Fast Food
Coffee/Beverage Shop with full service restaurants
<b>Small Food Service:</b>
Mobile Vendor/Food Truck
Bars/Pubs without full service kitchens
Coffee/Beverage Shop without full service kitchens
Entertainment without full service kitchens (most movie theaters, small snack bars)

## **Identifying Best Practices**

The results of this study can serve as a basis for establishing best practice guidelines tailored towards specific industry sectors so that they can realistically maximize their organics diversion potential. Once specific practice identified by this study is using a contract service provider to manage multiple diversion strategies. Not all strategies are appropriate for any given business; the City of Austin should provide guidance as to which strategies make the most sense and best conform with public health and other goals. It is important to note that different city agencies will have varying goals: Austin Resource Recovery is focused on achieving the maximum overall organics diversion rate while the Offices of Sustainability and Public Health are interested in increasing the rate of food donations for hungry people. These agencies should work together to achieve the widest range of co-benefits from any further policy initiative aimed at recovering food waste. Specifically, these agencies should identify the largest potential sources of recoverable, edible and ideally ‘wholesome’ foods and focus efforts on diverting this food to needy people.

## **Emerging Opportunities**

The City of Austin should also take note of the emerging business sector of organics diversion service providers. These start-ups will help fill a niche created by the URO by assisting business meet the diversion requirements. Furthermore, Austin can encourage the creation of minority-owned businesses in this space through grants and other financial incentives and model. Recent news coverage has highlighted the success of minority-owned



composting and biogas businesses in other cities,<sup>79</sup> and this burgeoning sector may be a potential opportunity for the economic empowerment of vulnerable populations. Policies that encourage direct relationships between food producers and recovery organizations can also offer co-benefits to local farmers while driving an increase in the donation of healthy foods. A recent bill passed in the state of West Virginia provides a tax credit to farmers who donate their excess produce to food recovery organizations.<sup>80</sup> The City of Austin should explore similar initiatives as they have the potential to improve to benefit a wide range of stakeholders.

### **Themes: Environmental and Social Responsibility**

A small subset of case study participants (3) were proactively motivated to engage in environmentally-friendly practices. All three implemented three or more diversion strategies prior to the implementation of the URO which included donations of edible food for human consumption. Participants cited ‘doing the right thing’ and ‘a commitment to sustainability’ as the primary drivers of organics diversion programs and voiced support for the URO. These businesses fall into the literature’s classification as ‘exemplars’; their example may help inform and motivate peers to also adopt similar practices. Future public efforts to increase donation should identify these exemplary businesses and use their example as a focus of educational efforts designed to increase organics diversion with that business sector.

## **Themes: Sound Business Practice**

Business operators are driven to increase their bottom-line by maximizing efficiency. The literature has demonstrated the financial and competitive advantages of adopting environmentally-friendly practices. Case study interviews contained five mentions of the benefits of organics diversion for operational efficiency. There is an obvious incentive to adopt diversion strategies that have a financial benefit to their organization, particularly waste prevention and waste recovery for industrial purposes. Several participants in this category felt that the URO (along with the guidance they received from ARR) helped them improve their business operation's efficiency by decreasing the amount of food waste produced. Public efforts to promote the adoption of organics diversion should highlight the potential financial and operational upsides to these strategies as most businesses would be receptive to strategies with a tangible benefit to the organization.

## **Limitations and Strengths of Study**

This study was limited by small sample size and the limitations of the data sets. It was also limited by the aggregation of business sectors into categories that combined a wide range of service styles. While this study found statistically significant relationships, there remains the possibility that these relationships are artifacts of an incomplete data set. Although the deadline for ODP submission was on February 1<sup>st</sup>, 2018, the data set was only about 70% complete as of March 1<sup>st</sup>, 2018, when the analysis commenced. Future research should include a complete pool of ODP responses and should also include a more granular statistical approach as well as correlate these diversion strategies to actual measurable

outcomes in terms of reduction of food waste. Finally, as the 2018 ODP data set is limited to businesses with kitchens over 5,000 square feet it likely does not capture the complete picture of current organics recovery.

## **Recommendations**

While this baseline data serves as a valuable entry point for future research into food rescue and achieving zero waste goals, the limited nature of the current data set prevents deeper analysis through more advanced statistical means. The current ODP questionnaire only collects top-level, binary data about business' diversion practices and contains limited data about specific business characteristics (essentially self-reported kitchen size and permit type). Collecting additional information about the businesses themselves such as number of employees, gross annual sales volume and ownership structure would allow for a deeper level of analysis through linear regression to uncover other correlating factors. Furthermore, quantitative data on actual diversion outputs will need to be collected to measure the outcomes of Austin's organics diversion efforts.

ARR should recategorize 2019 ODP data set by service type and add more detailed questions to collect more granular data for future statistical analyses. This will help bring future data into better alignment with current research literature and best practices. ARR should also study the novel businesses which were highlighted in the case study process, as this may both help other businesses adopt more green practices and identify opportunities for the creation of equity. Finally, ARR should use the themes of environmental/social responsibility and sound business practice, as well as the example of 'exemplar' small

businesses to promote the adoption of organics diversion practices. This can be best done by utilizing networking opportunities for exemplary businesses to share their practices with their peers. Austin already has a robust network of citizen advocacy groups that work in conjunction with city agencies, but the city can play a more active role by putting an official seal of approval on radical or novel business practices that embrace “strong” sustainability.

## **CONCLUSION**

While the analysis faced several data-based limitations, findings on the adoption of organics diversion strategies by Austin’s food service enterprises follows several of the theorized patterns described in the literature. First, large businesses had a higher rate of adoption of diversion practices than smaller businesses, consistent with literature that found that larger businesses are more likely to adopt green practices than smaller ones. Second, certain small businesses demonstrated attributes of a green ‘exemplar’, consistent with literature on which suggests that certain small businesses will proactively adopt green practices due to the personal beliefs of a manager or owner. City can support further adoption by (1) promoting the themes of economic benefit and social duty to encourage businesses to expand their diversion programs, (2) highlighting ‘exemplar’ businesses to spread the exchange of green practices among peers, and (3) creating further networking opportunities to facilitate the discussion of organics diversion within specific industry groups

Yet, the current diversion approaches are forms of “weak” sustainability policy and will likely have limited impacts on key City objectives. Ultimately, the City of Austin must advocate for “strong” sustainability for longer-term solutions to the problems of climate

change mitigation, food insecurity and economic justice. Policies that encourage the production and consumption of locally produced food can also create opportunities for economic growth, and thus potentially reap multiple co-benefits for a range of stakeholders. The various city agencies involved in organics waste diversion should look at this model for reclaiming food waste while creating economic opportunities.

## **APPENDICES**

### Appendix A: Interview Request Letter

[Salutation]. My name is Jason Umlas, and I'm a graduate student at the University of Texas School of Public Health and the LBJ School of Public Affairs. I am collecting data about the effects of the Universal Recycling Ordinance on Food Service Enterprises in Austin to be used in my thesis project. I will be conducting interviews with businesses in an attempt to document the specific food waste diversion strategies utilized by these businesses, as well as the general impact of the URO on business operations. If you choose to participate, you may opt to have your identity kept confidential. The results of this study will help inform future policy decisions for the City of Austin. The interview should take approximately 15-30 minutes to complete.

If you have any questions or concerns, you may contact me by phone at (512) 303-6262 or by email at Jason.T.Umlas@uth.tmc.edu. You may also contact the University of Texas Health Science Center Committee for the Protection of Human Subjects (713) 500-3985. Do you agree to participate in the interview?

- Yes
- No

## Appendix B: Interview Questions

1. Prevention: Does your business have a waste reduction plan? Y/N
  - If yes, what methods does your business utilize, including outside contract services? What challenges or obstacles have you encountered in implementing this strategy?
  - If no, are there specific reasons why your business has not utilized this strategy?
2. Food Donation for People: Does your business donate food for human consumption? Y/N
  - If yes, what methods does your business utilize, including outside contract services? What challenges or obstacles have you encountered in implementing this strategy?
  - If no, are there specific reasons why your business has not utilized this strategy?
3. Food Donation for Animals: Does your business donate food for animal consumption? Y/N
  - If yes, what methods does your business utilize, including outside contract services? What challenges or obstacles have you encountered in implementing this strategy?
  - If no, are there specific reasons why your business has not utilized this strategy?

4. Food Recovery for Industry: Does your company have a documented food recovery and reuse program? Y/N
  - If yes, what methods does your business utilize, including outside contract services? What challenges or obstacles have you encountered in implementing this strategy?
  - If no, are there specific reasons why your business has not utilized this strategy?
5. Composting: Does your business have onsite or commercial compost collection? Y/N
  - If yes, what methods does your business utilize, including outside contract services? What challenges or obstacles have you encountered in implementing this strategy?
  - If no, are there specific reasons why your business has not utilized this strategy?
6. Overall Effects: Do you have any other general feedback you would like to offer regarding the effect of the organics diversion requirements on your business's operations?



Appendix C: ODP submission form

ORGANICS DIVERSION PLAN

Business Information Business Name:\*

Business Address:\*

Food Permit Number:\*

ADD Permitted Square Footage:\*

Property ID #:

Contact Name:\*

Contact Title:\*

Contact Phone Number:\*

Contact Email:\*

Type of Business:\*

Additional Business Information

Are you located in the Downtown Trash and Recycling District? YES NO

Does your property have trash and recycling carts with the City logo? YES NO

Definitions and Information Organic Material - Generally includes: Meats, fats and dairy Vegetables, fruits, grains Paper towels (including bathroom) and paper napkins Food soiled paper, cardboard or waxboard (e.g. pizza boxes, paper cups, paper food containers, coffee filters, tea bags) Landscape trimmings and floral décor

Organics Diversion - Organic material recovered, collected or diverted from solid waste stream. Please visit [austintexas.gov/bizorganics](http://austintexas.gov/bizorganics) for more information.

URO Organics Diversion Program Minimum Requirements Food Service Enterprises must prevent organic material from going to the landfill, post informational signs and educate employees on the program. Austin Resource Recovery reserves the right to request supporting documentation.

Does your business prevent or remove organic materials from going to the landfill or incinerator on a weekly basis? \* Yes No

Are informational signs posted to help employees use the organics program? This includes: - Labelling collection containers or spaces (e.g. donation shelves, inventory labels, compost bins) - Indicating materials accepted using graphics and text in English and Spanish (or other appropriate language) \* Yes No

Does your business educate employees and tenants about organics program? \* Yes No

Education must: Describe organics program Use English and Spanish (or other appropriate language) Be provided annually and within 30 days of move-in or hiring

## ORGANICS DIVERSION PLAN

URO Organics Diversion Options Organics diversion programs should include a combination of the options outlined below. For questions, visit [austintexas.gov/bizorganics](http://austintexas.gov/bizorganics) or call 512-974-9727.

1. Food Waste Prevention: Identifying discard streams and deliberately implementing processes to reduce waste. Does your business implement any of the following?\* Yes No

2. Food Recovery: Implementing a system to capture food that is normally discarded and use it towards a higher and better use. Does your business implement any of the following?\* Yes No

3. Food Donation for People: Does your business donate food for human consumption?\* Yes No

Note: Keep documentation. Food donations may be tax deductible. Businesses and individuals donating food in good faith are protected by the Bill Emerson Good Samaritan Food Act Understand regulations and requirements for donating food

4. Food Donation for Animals: Does your business donate food for animal consumption?\* Yes No

5. Packaging and Purchasing: Does your business implement any of the following?\* Yes No

Bulk purchasing Reusable shipping containers Replace single-use items with reusable items Incentivize customers to bring personal, reusable take-out containers (e.g. personal mug, plastic container) Replace Styrofoam with recyclable or compostable products

6. Composting: Does your business have onsite or commercial compost collection?\* Yes No

7. Yellow Grease Collection: Does your business divert yellow grease (fryer oil) from the landfill? Contact your hauler to determine what happens with your yellow grease.\* Yes No

Additional Notes (Optional) This section can be used to offer additional information about your business. Please note that if you have questions or concerns that need immediate

attention, you should call Austin Resource Recovery at 512-974-9727 or email at CommercialRecycling@AustinTexas.gov.

Please enter additional information or comments:

Summary Total number of Organics Options reported:

Your business does not meet the URO Organics Diversion minimum requirements. Please call or email for assistance: 512-974-9727 or

CommercialRecycling@AustinTexas.gov.

Signature of Person Completing Form Name\*

Phone Number\*

Please contact me about city-sponsored recycling, training or educational materials. Yes No

Certification\*

I certify that this information is accurate and valid to the best of my knowledge

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