

GREEN SOLUTIONS

ENVIRONMENTAL CONSULTING



2013 King County UTC Cart Contamination Project

Phase 2 Final Report

Prepared for:

Republic Services

Prepared by:

Green Solutions

PO Box 680, South Prairie, WA, 98385

360-897-9533

rick@green-solutions.biz

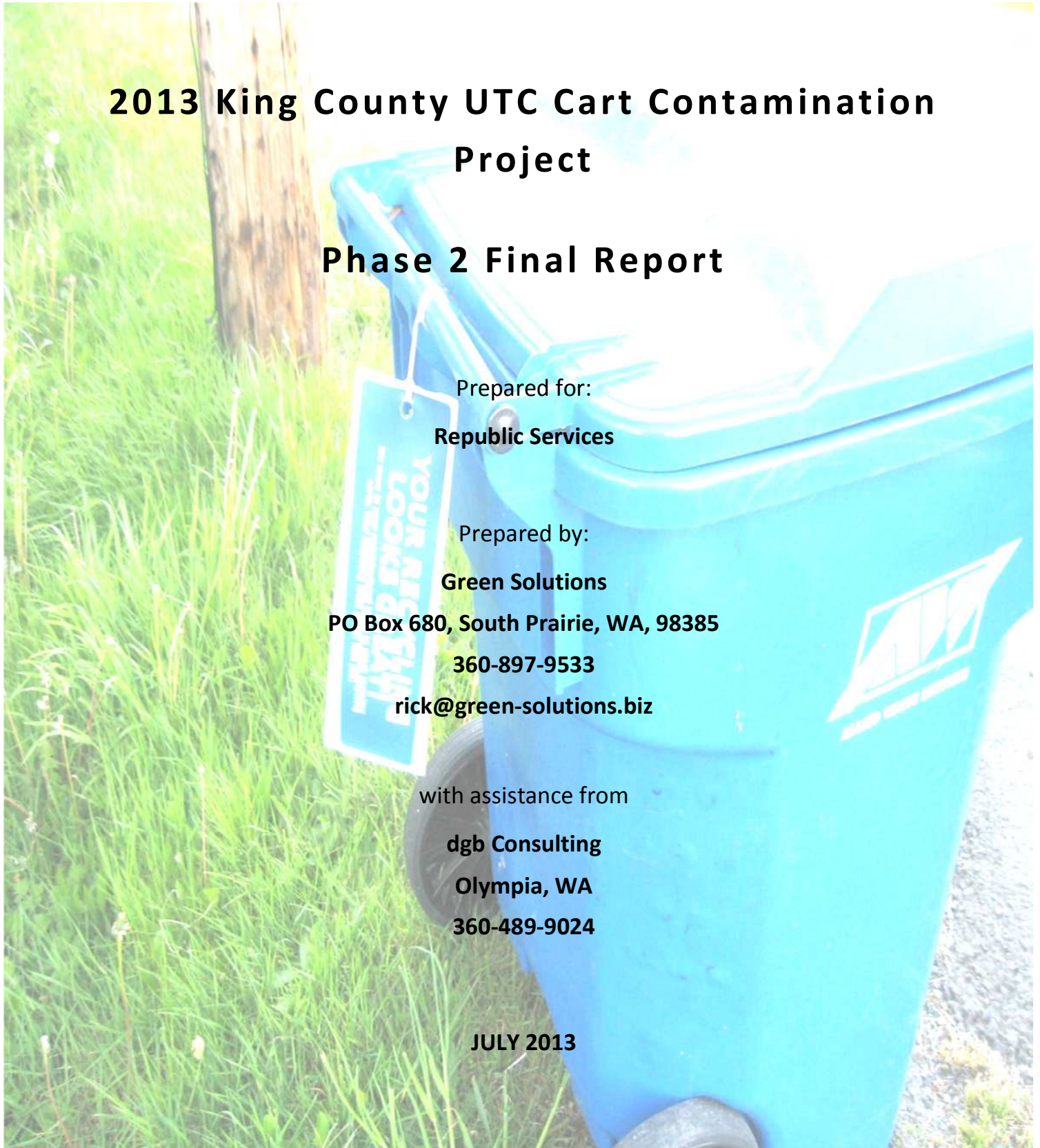
with assistance from

dgb Consulting

Olympia, WA

360-489-9024

JULY 2013



Contents

Summary	1
Introduction	3
Project Approach	3
Customer Interactions	6
Results	7
Results for the Numbers of Good and Bad Carts	7
Results for the Estimated Amounts of Contaminants	13
Comparison of Results to Phase 1	12
Conclusions	13
Next Steps	15

Attachments

Attachment A, Data Collection Forms
Attachment B, Maps of Routes used for Tagging Project
Attachment C, Tags Used for Phase 2
Attachment D, Abbreviations for Contamination found in Carts

Tables

Table 1, Numbers of Carts Inspected and Tagged	7
Table 2, Setout and Contamination Rates (Percent)	8
Table 3, Setout and Contamination Rates for the Tagged Garbage Carts	9
Table 4, Setout and Contamination Rates for the Tagged Recycling Carts	9
Table 5, Setout and Contamination Rates for the Tagged Organics Carts	9
Table 6, Estimated Amounts of Recyclables and Organics Observed in the Garbage Carts	11
Table 7, Estimated Amount of Contamination Observed in the Recycling Carts	11
Table 8, Estimated Amount of Contamination Observed in the Organics Carts	12
Table 9, Cost Estimate for Future Tagging Project using Employees	16

Figures

Figure 1, Percentage of Setouts with Contamination	10
--	----

King County UTC Cart Contamination Project 2013, Phase 2, Final Report

Summary

The King County UTC Cart Contamination Project was conducted under the Revenue-Sharing Agreement (RSA) between Republic Services and King County, Washington. This project was conducted by Green Solutions (Rick Hlavka), who was assisted by dgb Consulting (David Baker).

This project was conducted in two phases in order to allow refinements in the approach to be tested in the field. This report discusses the results of Phase 2 of this project. Both phases involved tagging recycling, yard waste and garbage carts in unincorporated King County. Phase 1 was conducted in the Petrovitsky area south of Renton and Phase 2 was conducted farther north, closer to Renton but still in unincorporated King County, using a somewhat different approach. These areas were chosen based on the results of previous tests showing significant differences in diversion rates and contamination.

This project involved inspecting and tagging garbage, recycling and organics carts for 500 households. An “oops” tag was attached to the recycling and organics carts to indicate if the wrong materials had been placed in those carts, and an “oops” tag was attached to the garbage cart if recyclables and compostables were observed in those carts. If the recycling and organics carts were observed to be free of contamination, then a tag was attached to the cart that said “your recycling looks great” or “your yard waste looks great.” The amount of contamination in the recycling and organics carts, and the amount of recyclables and organics in the garbage carts, was estimated and this data was recorded and then entered into a spreadsheet later along with the other data collected in the field. The carts were inspected twice, both before and after tagging, to demonstrate the amount of improvement resulting from tagging.

The data collected in this phase 2 of this project shows that the number of garbage carts containing recyclable and compostable materials decreased by 22%. The number of contaminated recycling carts dropped from 31% on the first visit to 22%. The amount of improvement for the yard waste carts was less, but there was less room for improvement for those carts since so many of the carts were clean to begin. The number of yard waste carts with contamination decreased by almost one-half, dropping from 8.7% to 4.8%.

The process used in this study for estimating the weights of contaminants observed in the carts is not as accurate as other studies that involve sorting and weighing, but the weight estimates still provide an indication of the relative amounts of the materials observed. Based on these estimates, there appears to have been a significant reduction in the total amounts of

contaminants observed in the recycling and organics carts, and a reduction in the amount of recyclables and organics observed in the garbage carts. During the course of the tagging project, the amount of contamination dropped by 71% in the yard waste carts, 44% in the garbage carts and 43% in the recycling carts.

Other results can be gathered from the data and anecdotal evidence collected for this project. The most significant of these conclusions and observations include:

- The contents of almost all of the yard waste carts were very clean. A few carts were very contaminated, which appeared to be due to the cart being used for garbage.
- About three-quarters of the tagged garbage carts initially contained food waste, but this dropped to slightly more than half (51%) after tagging. Food waste was often observed in the garbage carts of households that were also placing food waste in their yard waste carts, indicating that even the people participating in the food waste program are not diverting 100% of their food waste.
- A small number of the recycling and yard waste cans and carts need to be more clearly identified with labels to make sure those are collected by the right truck.
- Most customers are okay with cart inspections, with only a small percentage (less than 1%) raising any objection to this approach. Many more customers than that were appreciative of the feedback.
- There appears to be significant confusion about the recyclability of plastic bags. There were several times where a customer was observed to have placed both “bags of bags” (which are acceptable) and loose plastic bags (which are not) in their recycling carts.
- Milk cartons and similar items were often observed in the garbage carts of households that appeared to be avid recyclers, indicating confusion about the recyclability of this material.
- Public outreach for recycling should focus in the future on the top four contaminants found, including plastic objects, food-soiled paper, plastic bags, and Styrofoam. A small percentage of the recycling carts contained recyclables in plastic bags, and it may be worthwhile to address this in future public outreach materials.
- Public outreach for organics could instead focus on the materials that should be included in the carts, instead of focusing on the materials that should not be in the carts. This way, greater diversion of food scraps could be promoted.
- Instances were observed where it appeared that the household had placed the wrong material in a cart because the proper cart was full. Encouraging customers to use the right size of containers and informing them about how to handle extra amounts will be an ongoing need in the future.

The report for this project also provides information about how to conduct future tagging projects.

King County UTC Cart Contamination Project 2013, Phase 2, Final Report

Introduction

The King County Cart Contamination Project was conducted under the Revenue-Sharing Agreement (RSA) between Republic Services and King County, Washington. Republic Services is conducting several projects pursuant to the RSA, and in general the projects are designed to improve the recycling programs in the unincorporated areas of King County. The Cart Contamination Project is designed to reach out to customers and inform them about specific problems they may be having. For this project, Republic Services retained Green Solutions (Rick Hlavka), who was assisted by dgb Consulting (David Baker).

This report discusses the results of Phase 2 of this project. An earlier report addressed the results of Phase 1 for this project, which was conducted in April and May, 2013.

Project Approach

Many tagging projects have been conducted by Republic Services, Green Solutions and others, and these have been found to be an effective way to inform people. For this project, Republic Services wanted to “push the envelope” and asked the Green Solutions Team to pioneer a new approach that included several innovative steps:

- **Tagging garbage carts:** This step was taken to encourage more diversion to the recycling and organics carts. Garbage carts were examined for organic or recyclable materials, and then these items were written on an “oops” tag that was hung on the garbage cart.
- **Estimating the amount of contaminants:** The types and amounts of contaminants observed in the recycling and organics carts were noted on a data collection form (see Attachment A). For the garbage carts, the amounts of organics and recyclables observed in the carts were noted in the same manner.

These activities were first conducted in Phase 1 of this project and further refined in Phase 2. These additional steps have yielded significantly more data and results than a typical tagging project.

This phase of the project (Phase 2) was conducted in unincorporated areas east of Renton (see map in Attachment B). Phase 1 of this project was conducted farther south, in the Petrovitsky

area between Renton and Kent (but still in unincorporated King County). These areas were chosen based on the results of previous tests showing significant differences in the recycling program performance in these two areas. Results of composition tests conducted on the recyclables collected from these areas showed significant differences in both contamination levels and diversion rates, hence it was decided that these two areas would provide an opportunity to test the potential range of results from tagging.

The areas used for Phase 2 have weekly garbage collection and every-other-week recycling and yard waste collection. The recycling and yard waste collections are conducted on an alternating schedule. The schedule used for this phase of the project was:

June 3, 4, and 5 – initial inspection and tagging of recycling and garbage carts.

June 10, 11, and 12 – initial inspection and tagging of yard waste carts.

June 17, 18, and 19 – repeat inspection of recycling and garbage carts.

June 24, 25, and 26 – repeat inspection of yard waste carts.

This schedule allowed customers to be informed on one collection day and the carts inspected on a following collection day to check for improvement.

Lists of customers for each day (or route), shown in the same order that the customers are collected, were provided by Republic Services. To the extent possible, the Green Solutions Team chose a few hundred customers from the end of these route lists for tagging on Mondays, Tuesdays and Wednesdays. The customers at the end of the list were used so that the tagging crews could keep ahead of the collection trucks. For the Tuesday route, however, choosing customers near the end of the route would have put the tagging crews in an area where the customers were very spread out, as opposed to an area the beginning of the route where households were much more densely placed. For the Tuesday route, Republic crews revised their normal route sequence to allow the tagging crews extra time in the area near the beginning of their routes.



Photo 1: Tagging crew examining a yard waste cart, June 11, 2013.

The step-by-step process used at each address was:

- Checking for which carts were set out and noting those that weren't out on a data collection form.
- For carts that were set out, checking inside to look for contaminants in the recycling and organics carts, or to look for recyclables and organics in the garbage carts (see Photo 1). Crews used their best efforts to dig at least partway into the carts.
- The amounts of contaminants in each cart were noted and the weight of the contaminants in the entire cart estimated based on the amounts observed.
- If the cart(s) being tagged that day had problems, an "oops" tag was attached to the cart with a rubber band. The specific problems were noted on the back of the tag. If the cart(s) being tagged were good, a "looks great" tag was attached to the cart (see Photo 2), except for "good" garbage carts. Garbage carts that were noted as being "okay" on the data collection form were not tagged for several reasons, but primarily because of the fact that the crew was not able to dig all of the way to the bottom of the garbage carts and hence could not be certain that the garbage carts were completely okay.
- For the first week of tagging, a brochure was also attached to the garbage carts with a rubber band. The brochure provided specific guidelines on what materials should go into each of the three carts and also general guidance on waste handling. In the few cases where a recycling cart was set out at an address but no garbage cart, the brochure was attached to the recycling cart instead.
- The crew then proceeded to the next address.



Photo 2: "Good" tag being applied to a yard waste cart, June 11, 2013.

The initial list of addresses included many more addresses than needed for the target of 500 customers. On the first week out, the crews tagged as many carts as possible for the first two days before being overtaken by the collection trucks, and then did enough on the third day to slightly exceed a total of 500 households (a few extra addresses were checked to allow for people that might later request to be removed from the project). After the first week of tagging, the same addresses were checked on subsequent tagging events. The same staff checked the same addresses and carts each week to increase the consistency of the visual estimation process.

Copies of the tags used for Phase 2 are shown in Attachment C.

Customer Interactions

Tagging crews spoke to several customers while they were out in the field. By far, the majority of these customers were curious and cooperative with, and even appreciative of, the tagging project. Only two customers (less than 1%) objected to having their carts checked. One of these customers verbally requested us not to check their carts at the time that the tagging crew was there. The other customer taped a note to the top of their garbage can stating that we had no legal right to look inside their can unless we were employed by the garbage collection company. Although the tagging crews met this condition, the customer's request to not have their cans checked was still respected and that address was removed from the tagging list. A third customer was also dropped from the tagging crew's route list because they called to complain that the crew had spilled garbage from their can onto the ground and left it there. The tagging crews were of course very careful not to make a mess or create litter problems, so it is unknown what actually happened in this case.

As mentioned above, an overwhelming majority of the customers were okay with the tagging crews checking carts, and were even welcoming of the feedback. A few of the instances for this situation included:

- A man drove up to the crew after they had tagged his garbage can for food and was sincerely interested in finding out more about how to compost it.
- An older woman called to the tagging crew from the front door to ask what they were doing. The crew explained that and they chatted back and forth a bit, in the process the woman saying that she was really happy with the recycling program.
- A man saw the tagging crew approaching his house on their third visit to the area, and quickly dug through his garbage cart to move recyclables to the recycling cart.

There are many more stories like this, where people asked what the crews were doing and then expressed their approval or even asked how well they did. By and large, the customers were sincerely interested in feedback. A few people simply ignored the tagging crews, primarily in cases where the people were leaving their house to get into their cars and go somewhere.

As in Phase 1 of this project, very few of the tags were left by the customers on their carts, although some of the brochures were left on the carts apparently in order to have those stay there as a convenient reference. There also seemed to be a tendency to leave the recycling tags on the carts more than the garbage tags. Only seven tags (about 2% of the garbage tags) were still on the carts two weeks after those carts had been tagged, but there were 32 recycling tags (about 7%) and 24 brochures (about 5%) still on carts two weeks later.

Results

Results for the Numbers of Good and Bad Carts

The total numbers of carts inspected and tagged for Phase 2 of this project are shown in Table 1. The total number of customers included in this tagging project was initially 510, but three customers were removed from the project at their request and another eight carts were emptied out of sequence by the recycling truck in the third week, leaving a total of 499 carts. Not all of these customers have signed up for yard waste service whereas almost all of the customers subscribe to recycling. For the 499 garbage and recycling customers, only 337 of these also subscribe to yard waste collection. The figures in Table 1 have been adjusted for the lost addresses and actual number of yard waste customers.

Table 1: Numbers of Carts Inspected and Tagged

Type of Cart:	Garbage Carts		Recycle Carts		Organics Carts	
Visit:	1	2	1	2	1	2
Not Setout	43	95	60	113	73	105
Inspected	456	404	439	386	264	232
Tagged;						
Good Tag	NA	NA	303	NA	241	NA
Oops Tag	326	NA	136	NA	23	NA

The number of carts tagged is one of the more important numbers shown in Table 1, since the goal of this project was to reach out to the customers and influence their behavior. There are spillover benefits for non-tagged customers who might see the tags on neighbors' carts or hear about the tagging effort from their neighbors, but the primary impact of this project was on the people whose carts were actually tagged. As can be seen in Table 1, the number of carts tagged included 326 garbage carts, 439 recycling carts and 264 yard waste carts. For the 456 garbage carts that were inspected in the first visit, 130 carts were "okay" (i.e., were not observed to contain any recyclable or compostable materials). Since only the "bad" garbage carts were being tagged, only the 326 customers with the wrong materials in their garbage cans were tagged and so it is only these 326 households that can be tested for behavioral changes that may have resulted from tagging.

The general results for setout and contamination rates are shown in Table 2. Table 2 helps to frame the discussion by indicating the total numbers of carts that were not set out versus set out and either contaminated or not. The setout rates for the garbage and recycling carts, for

Table 2: Setout and Contamination Rates (Percent)

Type of Cart:	Garbage Carts		Recycle Carts		Organics Carts	
Visit:	1	2	1	2	1	2
Not Set Out	8.6%	19.0%	12.0%	22.6%	21.7%	31.2%
Good Setout	26.1%	23.2%	60.7%	60.7%	71.5%	65.3%
Contaminated	65.3%	57.7%	27.3%	16.6%	6.8%	3.6%

Note: numbers highlighted in yellow show the carts that were tagged.

instance, decreased significantly from the first to the second visits (which were two weeks apart), whereas the yard waste carts decreased only slightly over a different (but overlapping) two-week period. These numbers are a little misleading, however, since these are for all carts (not just the carts that were tagged). Furthermore, since these figures are expressed as percentages, there is the tendency for other figures to appear to change due to changes in the percent of non-setouts. For instance, the number of garbage carts not set out on the second visit more than doubled, making it appear as if both the number of good setouts and contaminated setouts decreased. Since it was the goal of this project to influence behavior through tagging, the rest of this report focuses only on those carts that were actually tagged.

The figures shown in Tables 1 and 2 merely “scratch the surface” for the information that can be extracted from this project. Since the primary goal of this project is to test and demonstrate the degree to which this approach can influence people’s behavior, the analysis should focus on those people whose carts were actually tagged. The figures in Tables 1 and 2 include many people that did not have their cart set out for the first visit, and so were not directly contacted or influenced by the tagging teams. The opposite of this is also true, in that not all of the customers that had their cart tagged on the first visit also put out their carts in later weeks. For the garbage carts, for instance, 50 of the 326 tagged households did not set out their garbage carts on the second visit, and so only 276 of the 326 tagged households were actually tested for behavioral changes. For the recycling carts, 79 of the 439 tagged households did not set out their recycling carts on the second visit, and so only 360 of the tagged households were tested for behavioral changes. For the yard waste carts, 56 of the 264 tagged households did not set out their carts on the second visit, and so only 208 of the tagged households can be analyzed.

Tables 3, 4 and 5 show the results for those customers who were tagged on the first visit for the garbage, recycling, and yard waste carts, respectively. The first column for each visit shows the numbers of carts included in the analysis, and the second column for each visit shows the results (in percentages) excluding the households that did not set out their carts. The figures in the second column are more important, since nothing can be said about the quality of the carts that were not set out and including the non-setouts tends to mask the actual results.

Table 3: Setout and Contamination Rates for the Tagged Garbage Carts

Garbage Carts	Visit 1		Visit 2	
	Tagged Carts Only	Excluding Non-Setouts	Tagged Carts Only	Excluding Non-Setouts
Not Set Out	NA	NA	50 carts	NA
Good Setout	NA	NA	61 carts	22.1%
Contaminated	326 carts	100%	215 carts	77.9%
Totals	326 carts	100%	326 carts	100%

The data for the second visit includes only the 326 garbage carts tagged in the first visit.

Table 4: Setout and Contamination Rates for the Tagged Recycling Carts

Recycling Carts	Visit 1		Visit 2	
	Tagged Carts Only	Excluding Non-Setouts	Tagged Carts Only	Excluding Non-Setouts
Not Set Out	NA	NA	79 carts	NA
Good Setout	303 carts	69.0%	281 carts	78.1%
Contaminated	136 carts	31.0%	79 carts	21.9%
Totals	439 carts	100%	439 carts	100%

The data for the second visit includes only the 439 recycling carts tagged in the first visit.

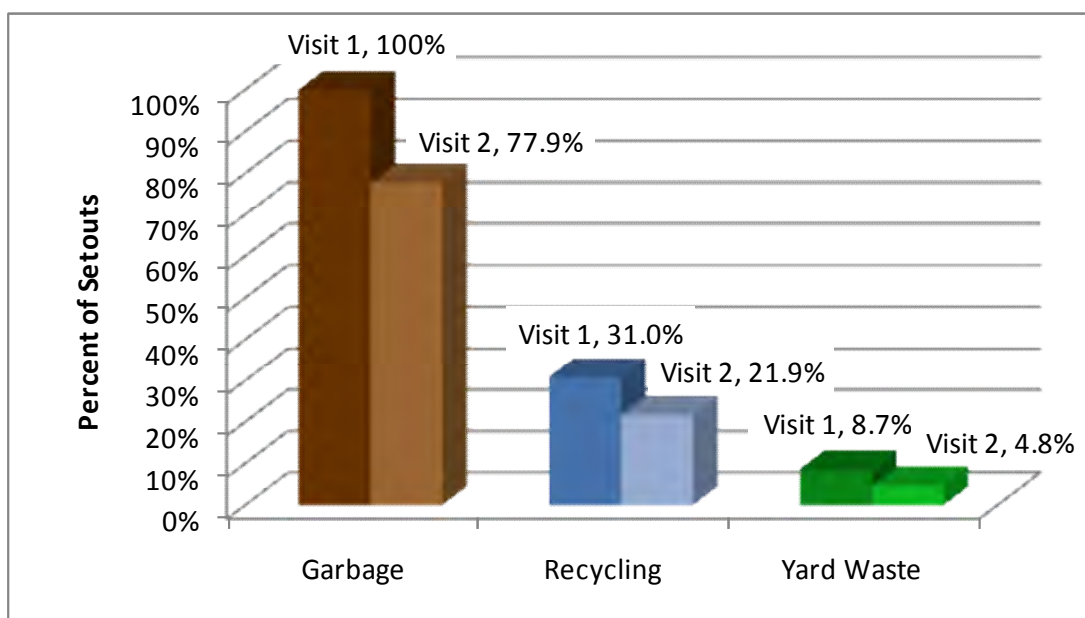
Table 5: Setout and Contamination Rates for the Tagged Organics Carts

Yard Waste Carts	Visit 1		Visit 2	
	Tagged Carts Only	Excluding Non-Setouts	Tagged Carts Only	Excluding Non-Setouts
Not Set Out	NA	NA	56 carts	NA
Good Setout	241 carts	91.3%	198 carts	95.2%
Contaminated	23 carts	8.7%	10 carts	4.8%
Totals	264 carts	100%	264 carts	100%

The data for the second visit includes only the 264 yard waste carts tagged in the first visit.

The results in Tables 4, 5 and 6 can also be displayed graphically (see Figure 1). Figure 1 shows a series of two columns for each cart, beginning with the results of the first visit, and then the second visit. As shown in Figure 1, the percentage of “contaminated” garbage carts (garbage carts containing recyclable and compostable materials) was 100% in the first visit, which is because it was only the “contaminated” garbage carts that were tagged in the first week. The number of contaminated garbage carts dropped from 100% to 77.9% on the second visit, presumably primarily due to tagging (random behavior and other factors could also be contributing). The numbers of contaminated recycling and yard waste carts also dropped from the first to the second visit.

Figure 1: Percentage of Setouts with Contamination



Results for the Estimated Amounts of Contaminants

The process used in this study for estimating the weights of contaminants observed in the carts is not as accurate as other studies that involve sorting and weighing, but the weight estimates still provide an interesting sense of the relative amounts of contaminants observed in the carts. Based on these estimates, there appears to have been a significant reduction in the amount of contaminants observed in the recycling and organics carts, and a reduction in the amount of organics and recyclables observed in the garbage carts, as a result of the tagging project (see Tables 6, 7 and 8).

Table 6: Estimated Amounts of Recyclables and Organics Observed in the Garbage Carts

Garbage Carts, Pounds of Organics and Recyclables			
	1st visit	2nd visit	% Change
Food Scraps	1,210	621	-49%
Food-Soiled Paper	274	204	-26%
Recyclable Paper	140	85	-39%
Yard Debris	99	53	-47%
Recyclable Plastics	94	45	-52%
Recyclable Metals	61	33	-46%
Glass	54	31	-43%
Paper Containers	13	7	-45%
Clothing	13	10	-23%
Cardboard	12	13	6%
All Other Materials	3	1	-67%
Total, All Materials	1,972	1,102	-44%
Average Pounds per Cart	7.14	3.99	-44%

Table 7: Estimated Amounts of Contamination Observed in the Recycling Carts

Recycling Carts, Pounds of Contaminants			
	1st visit	2nd visit	% Change
Plastic Objects	32	5	-86%
Food-Soiled Paper	21	14	-31%
Plastic Bags	21	9	-54%
Styrofoam	15	4	-75%
Non-Recyclable Paper	14	14	-1%
Non-Recyclable Metal	7	1	-93%
Clothing	5	7	41%
Yard Debris	3	1	-60%
All Other Materials	6	11	83%
Total, All Contaminants	124	71	-43%
Average Pounds per Cart	0.35	0.20	-43%

Table 8: Estimated Amounts of Contamination Observed in the Organics Carts

Organics Carts, Pounds of Contaminants			
	1st visit	2nd visit	% Change
Wood	20.0	7.0	-65%
Non-Recyclable Paper	3.0	0.8	-73%
Recyclable Paper	2.0	0	-100%
Recyclable Plastics	1.0	1.2	20%
Recyclable Metals	0.7	0.4	-43%
Paper Containers	0.5	0	-100%
Plastic Packaging	0.5	0.1	-80%
All Other Materials	18.8	2.4	-87%
Total, All Contaminants	48.5	13.9	-71%
Average Pounds per Cart	0.23	0.07	-71%

Tables 6, 7, and 8 show the estimated weights of materials observed in the garbage, recycling and organics carts, respectively. The materials are listed in each table in order of the highest amount of material to lowest (based on the amounts observed in the first visit). The last column of each table shows the percent of change in the amount of each material from the first visit to the second visit. The figures shown are only for the tagged carts that were set out for both visits, to avoid biasing or inflating the results by comparing a different sampling of carts. In most cases, the percent change is a negative amount (in other words, there was a reduction in the amount observed). Materials not shown in a table either do not apply to that type of cart or were not found.

As can be seen in Tables 6, 7 and 8, there was a reduction in most of the contaminants observed in the recycling and organics carts, and also a reduction in the amount of recyclable and organic materials observed in the garbage carts. The definitions shown in Attachment D provide more information as to what is included in the material categories shown in these tables.

Comparison of Results to Phase 1

Phase 1 and Phase 2 of this project were conducted slightly differently but the results are similar. The amount of contamination found in each of the types of carts and the degree of improvement from tagging are similar (although direct comparisons are difficult due to the use of three visits in Phase 1 versus two visits for Phase 2). The total improvement found in Phase 1 for all three of the carts is larger than what was found in Phase 2, but the third visit used in

Phase 1 helped to show continuing (and thus greater) improvement. The most common recyclables and organics found in the garbage carts are in the same order for the top three materials (food scraps, food-soiled paper and recyclable paper) for both phases. The top contaminants found in the recycling carts are not exactly the same, but are close. The types of contaminants found in the yard waste carts are somewhat different. Other observations and conclusions are also fairly similar for the two phases.

One of the larger differences between the two phases is the lower amount of negative customer interactions experienced in Phase 2. In Phase 1, it was clear at the time that the practice of taking pictures of cart contents (which was done in Phase 1 but not in Phase 2) pushed some customers to object to the tagging project.

Conclusions

The figures in Table 3 show that 22.1% of the garbage carts improved as a result of this tagging project. The recycling carts appear to have improved by almost 10%, with the number of contaminated carts dropping from 31.0% to 21.9% during the tagging project (see Table 4). The amount of improvement for the yard waste carts was less (see Table 5), but there was less room for improvement to begin with since so many of the carts were already contamination-free. The number of yard waste carts with contamination, however, was cut almost in half, decreasing from 8.7% to 4.8%.

There also appears to have been a significant reduction in the total amounts of contaminants observed in the recycling and organics carts, and a reduction in the amount of recyclables and organics observed in the garbage carts. During the course of the tagging project, the amount (estimated weight) of contamination dropped by 71% in the yard waste carts, 44% in the garbage carts and 43% in the recycling carts.

Other results can be gathered from the data and anecdotal evidence collected for this project. The most significant of these conclusions and observations include:

- The contents of almost all of the yard waste carts were very clean. A few carts were very contaminated, which appeared to be due to the cart being used for garbage.
- About three-quarters of the tagged garbage carts initially contained food waste, but this dropped to slightly more than half (51%) after tagging. Food waste was often observed in the garbage carts of households that were also placing food waste in their yard waste carts, indicating that even the people participating in the food waste program are not diverting 100% of their food waste.
- A small number of the recycling and yard waste cans and carts need to be more clearly identified with labels to make sure those are collected by the right truck.

- Most customers are okay with cart inspections, with only a small percentage (less than 1%) raising any objection to this approach. Many more customers than that were appreciative of the feedback.
- There appears to be significant confusion about the recyclability of plastic bags. There were several times where a customer was observed to have placed both “bags of bags” (which are acceptable) and loose plastic bags (which are not) in their recycling carts.
- Milk cartons and similar items were often observed in the garbage carts of households that otherwise appeared to be avid recyclers, indicating some confusion about the recyclability of this material.
- Public outreach for recycling should focus in the future on the top four contaminants found, including plastic objects (non-recyclable types of rigid plastics), food-soiled paper, plastic bags (including removing plastic bags from newspapers and cardboard trays and boxes), and Styrofoam. The next most common contaminants after the top four (such as non-recyclable types of paper and metal) are not as easy to explain to the general public and also not as large of a problem.
- Public outreach for organics could instead focus on the materials that should be included in the carts, instead of focusing on the materials that should not be in the carts. This way, greater diversion of food scraps could be promoted.
- A small percentage (about 2%) of the recycling carts contained recyclables in plastic bags, and it may be worthwhile to address this in future public outreach materials.
- Instances were observed where it appeared that the household had placed the wrong material in a cart because the proper cart was full. Encouraging customers to use the right size of containers and informing them about how to handle extra amounts will be an ongoing need in the future.

It seems very likely that the results of this tagging project, as well as pre-existing conditions such as setout and contamination rates, are influenced by external factors such as weather and demographics. These factors were researched but without any firm conclusions. Some interesting trends were noted in the weather’s effect on setout rates, such as:

- rain and cooler temperatures in the week before possibly causing a lower setout rate for yard waste carts.
- precipitation on the morning of a collection day causing a lower setout rate for carts, but the impact of this appears to be greater for recycling carts than for garbage carts.

Correlating the weather patterns to these impacts could not be accomplished with any certainty, however, and the primary conclusion of this exercise is that much more data is

needed to provide a reliable assessment of the impact of weather, demographic and other factors. Furthermore, the results from tagging projects may not be the best source of data in some cases, such as for setout rates, since by necessity the tagging crews must stay ahead of the collection trucks and so missed a few containers that were set out right before the truck got there.

The approach used for this tagging project worked out well, but a number of refinements or changes could be considered for future projects:

- Future tagging demonstration projects could be conducted adequately with two visits for each type of cart. The use of three visits in Phase 1 of this project was unnecessary and made interpretation of the results difficult and confusing. For future efforts where the impact does not need to be documented, the second visit would not be necessary at all (although repeat visits, perhaps spaced several months apart and only using the “oops” tags, would provide excellent reinforcement of the message).
- Future tagging efforts should consider the use of tags that tell the truck driver not to pick up that container, in cases where the contents are so seriously contaminated that the customer should be asked to clean it up first.
- Carts could be checked six months later to test for long-term behavioral changes, although the results of this approach could be skewed by a number of factors if not designed properly (such as issues with crew consistency and seasonal changes in materials generated).

Next Steps

This project has demonstrated that tagging is a valuable and effective method for outreach, and could be employed in the future as a means of reaching people that otherwise might not be paying attention to mailers and other forms of outreach. Should Republic Services decide to pursue tagging in the future using in-house staff, there are several ways this could be implemented. Our recommendation would be to structure any future tagging projects to include:

- Crews of two people, both for safety reasons as well as convenience and efficiency. Having two people on a crew allows one person to wear gloves and dig into the carts, while the other person marks on and attaches the tags.
- Specific feedback, through notes written on the back of the tag, are very important and every effort should be made to communicate clearly this way.
- One visit per household is adequate for the level of results achieved here, but repeat visits should be considered for reinforcement or for the worst offenders.

- Highly contaminated recycling and yard waste carts should be flagged so that the drivers of the collection trucks know not to pick them up, and the customer notified to clean the carts.
- Photos should be taken of the really bad setouts, especially if the cart is rejected for collection, in case there are questions or disputes later.
- With a little experience, a crew of two people should be able to check 350 carts per day (assumes two carts per household, no data records, and very few photos), but this will be affected by the season (for both day length and weather), the amount of time available before the truck catches up to the crew, the average distance between customers, and other factors.
- Many areas have alternating schedules for the recycling and yard waste carts, so that there is no one day when all three of the carts (garbage, recycling and yard waste) can be checked at the same time. Unless yard waste contamination is a large problem in a particular area, future efforts should tag only the recycling and garbage carts (since this project found the yard waste carts to be generally very clean).

Table 9 shows a cost estimate for the approach outlined above. The cost estimate assumes a one-month effort, which allows the costs for basic supplies (visibility vests, pens, etc.) to be amortized over that much time at least. If the crews can inspect and tag 350 carts (175 households) per day and each household is visited only once, then 3,500 customers could be tagged in one month. This assumes 20 days of tagging per month, whereas in reality the crews may need to take off an occasional day to plan and map out the next set of routes or to re-stock supplies. For a total estimated cost of \$24,400 and 3,500 households visited, the resulting cost for this approach would be slightly less than \$7 per customer.

Table 9: Cost Estimate for Future Tagging Project using Employees

Item	Number	Unit Cost, \$	Amount	Comments
Staff (2 part-time)	280 hours	\$50/hour (includes benefits)	\$14,000	Assumes 7 hours per day, including prep and travel.
Mileage	120 miles per day	\$0.565/mile	\$1,400	Assumes local staffing.
Tags	7,000 tags	NA	\$8,000	Includes initial setup and printing of tags.
Other supplies	NA	NA	\$1,000	Includes rubber bands, visibility vests, pens, and other supplies.
Total			\$24,400	

Attachment A, Data Collection Forms

Shown below are partial copies of the two data collection forms used for the Monday route (one for recycling and garbage carts and another form for yard waste carts, since those were checked at a different time). The addresses have been partially deleted for privacy reasons, and the forms are slightly reduced to fit on the page better.

[illegible]

Date: _____

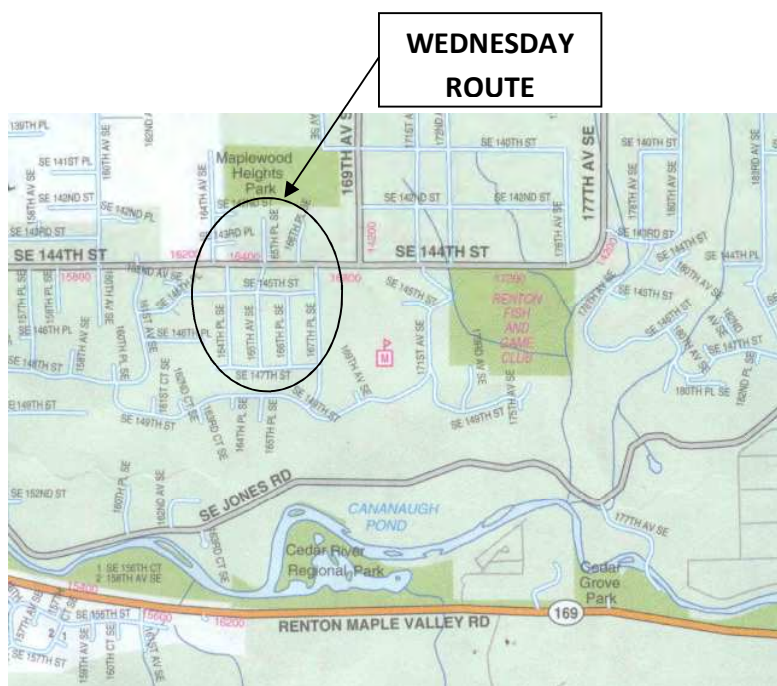
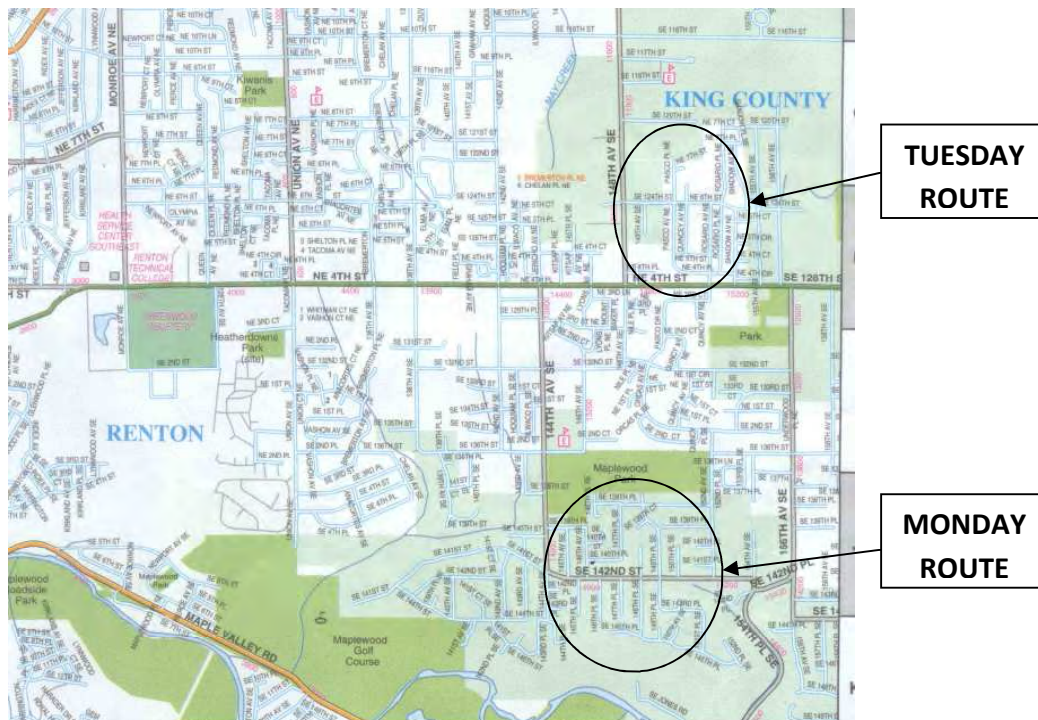
Start Time: _____

Recorder: _____

127 stops			Organics Cart			Comments
			No	Ok	Contamination	
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	145TH PL SE				
RH	XXXXXX	SE 142ND ST				
RH	XXXXXX	142ND ST				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	146TH PL SE				
RH	XXXXXX	SE 142ND ST				
RH	XXXXXX	147TH PL SE				
RH	XXXXXX	147TH PL SE				
RH	XXXXXX	147TH PL SE				
RH	XXXXXX	147TH PL SE				

Attachment B, Maps of Routes used for Tagging Project

The maps below show the areas used for the Phase 2 tagging project.



Attachment C, Tags used for Phase 2

The front and back sides of the tags used for Phase 2 of this project are shown in this attachment, slightly reduced in size from the original 4.25" by 12". The tags shown in this attachment include:

- The "good" recycling tag, which was placed on carts that were reasonably free of contamination (crews did not count minor contaminants such as gum wrappers or bottle caps for this assessment).
- The "oops" recycling tag, which was used to notify customers about items that should not be in the recycling carts. At the time the tag was attached, crews wrote on the back of the tag to identify the specific material(s) that were a problem in that cart. For instance, Styrofoam was written in below the "Garbage" heading when it was observed in the carts, and "paper towels" were written in below the "Food Scraps and Food-Soiled Paper" heading when this was found. In doing this, crews attempted to write notes legibly and in plain English, while also being brief.
- The "good" yard waste tag, which was used like the "good" recycling tags (that is, for organics carts that were reasonably free of contamination).
- The "oops" yard waste tag, which was used to notify customers about items that should not be in the yard waste carts. Again, this tag was used like the "oops" recycling tag, with notes written on the back to identify the specific material(s) that were a problem in that cart.
- The "oops" garbage tag, which was used to notify customers that recyclable and compostable items should be placed in the other carts. Notes were also written on the back side of this tag (or check marks placed in the boxes provided) to indicate the materials that should instead be recycled, composted or donated for reuse.

In the first week, a brochure (not shown here) was also distributed to the customers by hanging it on the garbage carts. The brochure provided specific guidance as to which materials were meant to go into each cart, plus additional information on how to recycle other items that are not accepted curbside and how to properly handle hazardous waste. That brochure was formatted as a fold-out poster, with a size of 11" by 17" (5.5" by 8.5" when folded for distribution).

YOUR RECYCLING LOOKS GREAT!

We were in your neighborhood today to check recycling carts. Your recycling looks great! Nice job!

RECYCLING

Printed on
Recyclable
Paper



THUMBS UP!

We were in your neighborhood today to check recycling carts. Your recycling looks great!

HELPFUL TIPS

- Buy items with minimal packaging. If minimal packaging is unavoidable, look for packaging that is recyclable instead!
- Reusable items, like coffee cups and washable dishrags save space in the cart and help you make less garbage.
- Buy local produce.



DID YOU KNOW?

While most King County residents recycle, more than 60% of what ends up in the Cedar Hills Regional Landfill could have been recycled or composted.

Keep up the great work! Working together to properly sort materials, we can save money, time, and our planet.

Questions? Feel free to contact us!

KING COUNTY
206.682.9730



OOPS!

We were in your neighborhood today to check recycling carts, and we discovered a few items out of place.

RECYCLING



We were in your neighborhood to check recycling carts, and we discovered a few items out of place.

ALWAYS REMEMBER:

- Never put food, liquid, or loose plastic bags in the recycling cart.
- Please do not bag or box recyclables. Leave recyclable materials loose.

Please take a moment to read the listed items below. These items were placed in the Recycling cart, but should be placed somewhere else.



GARBAGE



CONTAINERS WITH FOOD (Empty containers and rinse out all food residue)



FOOD SCRAPS & FOOD-SOILED PAPER



OTHER

Keep up the great work! Working together to properly sort materials, we can save money, time, and our planet.

Questions? Feel free to contact us!

KING COUNTY
206.682.9730



YOUR YARD WASTE LOOKS GREAT!

We were in your neighborhood today to check yard waste carts. Your yard waste looks great! Nice job!

YARD WASTE



THUMBS UP!

We were in your neighborhood today to check yard waste carts. Your yard waste looks great!

HELPFUL TIPS

- Empty the contents of your kitchen food scrap container into your yard waste cart frequently to avoid flies and odors.
- Keep your cart clean by lining the bottom with newspapers or layer food scraps and food-soiled paper with yard waste. Paper bags will also help.
- To keep smells down, sprinkle baking soda in your kitchen container and / or yard waste cart.



DID YOU KNOW?

Almost **30%** of what ends up in the landfill is food scraps and food-soiled paper, all of which can be recycled in your curbside yard waste cart.

Keep up the great work! Working together to properly sort materials, we can save money, time, and our planet.

Questions? Feel free to contact us!

KING COUNTY
206.682.9730



OOPS!

We were in your neighborhood today to check yard waste carts, and we discovered a few items out of place.

YARD WASTE



We were in your neighborhood to check yard waste carts, and we discovered a few items out of place.

ALWAYS REMEMBER:

- Do not place yard waste or food scraps in plastic garbage bags.
- Food scraps and food-soiled paper can only be recycled in the yard waste cart supplied by Republic Services.
- Please NO pet waste, kitty litter or diapers.
- Additional yard waste can be collected in PAPER yard waste bags.

Please take a moment to read the listed items below. These items were placed in the Yard Waste cart, but should be placed somewhere else.



RECYCLABLES



GARBAGE



PET WASTE *(Please double bag and place in your garbage cart)*



OTHER

Keep up the great work! Working together to properly sort materials, we can save money, time, and our planet.

Questions? Feel free to contact us!

KING COUNTY

206.682.9730



REPUBLIC
SERVICES

OOOPS!

We were in your neighborhood today to check garbage carts, and we discovered a few items out of place.

GARBAGE



We were in your neighborhood to check garbage carts, and we discovered a few items out of place.

ALWAYS REMEMBER:

- Please do not put the following items into your garbage:
 1. Recyclables
 2. Reusables (*coffee cups, working appliances, etc.*)
 3. Hazardous Waste (*TVs, computers, solvents, etc.*)
 4. Yard and Food Waste

Please take a moment to read the listed items below. These items were placed in the Garbage cart, but should be placed somewhere else.



RECYCLABLES



HAZARDOUS WASTE



YARD WASTE & FOOD SCRAPS

- ☐ You have yard waste collection. Please put food scraps in your yard waste cart.
- ☐ Food waste can be put in our yard waste carts. Sign up for yard waste service today at (206)682-9730.



OTHER

- ☐ We found reusables that could have been donated to charity.

Keep up the great work! Working together to properly sort materials, we can save money, time, and our planet.

Questions? Feel free to contact us!

KING COUNTY

206.682.9730



Attachment D, Abbreviations for Contamination found in Carts

The following abbreviations and definitions were used for the contamination found in the recycling and organics carts, and for the recyclable and compostable materials found in the garbage carts.

Plastics:

B - plastic bags and stretch wrap (in recycling carts, note only unbagged bags or plastic wrap over other items, such as a box), and compostable bags are okay in the yard waste carts

OPB - other plastic bags (primarily food bags)

RP - recyclable plastic bottles and all other types of recyclable plastics

PP - non-recyclable plastic packaging, inc. food-soiled pkg., bakery / meat trays and pill bottles

PO - plastic objects, such as CD's, toys, garden hose, plates, utensils, clothes hangers, etc.

S - Styrofoam

OB - oil bottles and other plastic containers from toxic materials

Paper:

OCC - cardboard

PC - milk cartons, juice boxes, frozen food pkg., cereal boxes, and other recy. paper containers

P - other recyclable paper, inc. shredded paper (shredded paper is also okay in YW cart)

BP - other non-recyclable paper found in recycling cart, or non-compostable paper in YW cart

FS - food-soiled paper, inc. paper towels, plates, uncoated cups, food wrap, uncoated bags, egg and berry cartons, pizza boxes and waxed OCC

Glass:

G - any glass that doesn't belong in the cart where observed

Metal:

M - recyclable metal

BM - non-recyclable metal

Organics:

YW - yard waste, such as grass clippings, leaves and branches, inc. houseplants

F - food

W - wood (but a small amount of clean wood is okay in YW cart)

Other:

D - diapers

HW - hazardous wastes (must specify exactly what was found under comments)

C - clothing and textiles, inc. shoes

L - liquids (specify what under comments)

O - other (for misc. non-recy. and non-compostables found in those carts, note item under comments)