














# Using Orlando's Recycling Quality Index to Determine Changes in Recycling Behavior

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# Recycling Quality Index (RQI)

**RQI** : is a numerical value that is inversely related to the quantity of categories of contaminants that the residents have in their recycling cart and is directly related to their recycling quality

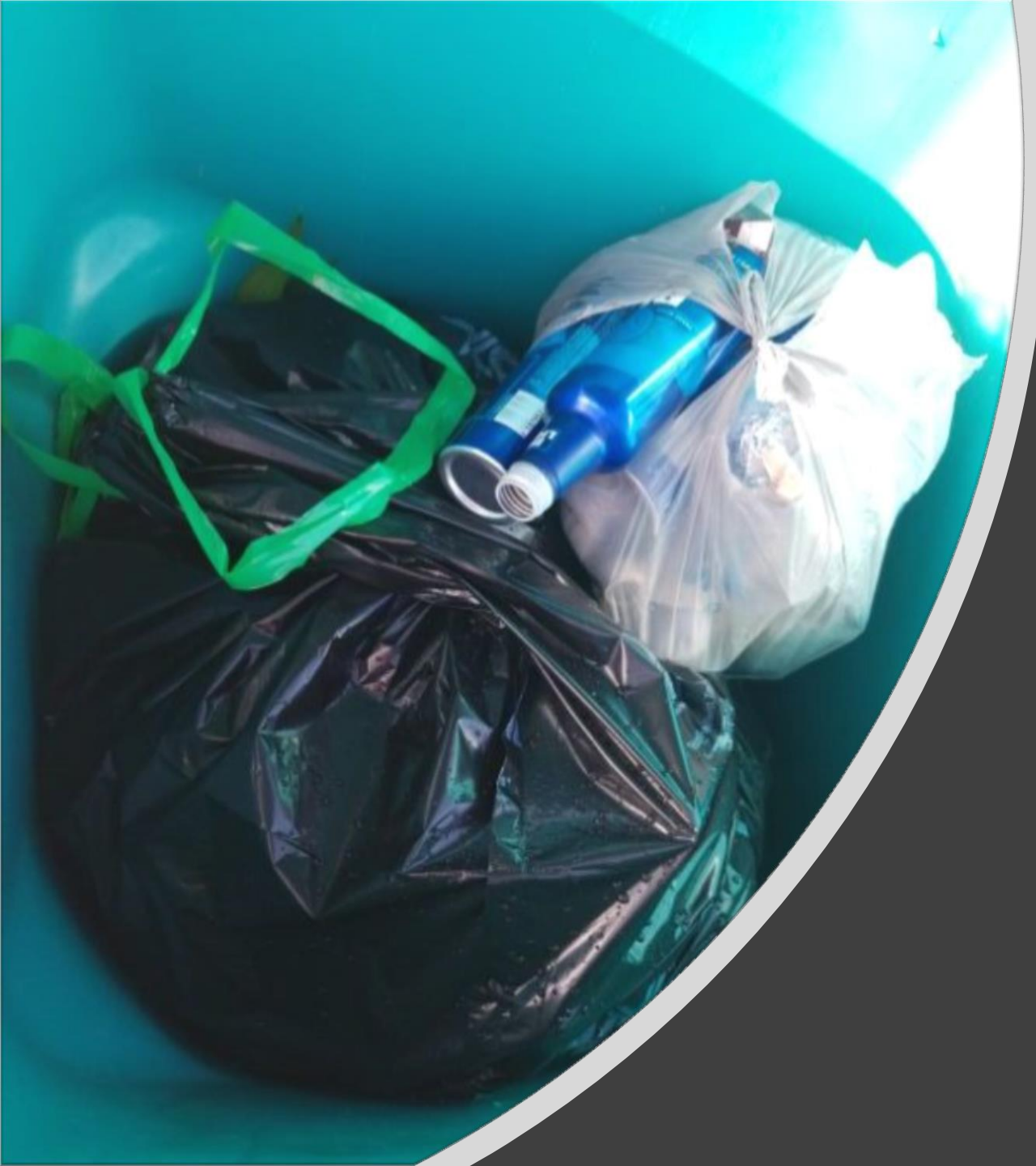
# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10
RQI	10	9	8	7	6	5	4	3	2	1	0
Recycling quality											
	Good					Bad					

**Application:** Measure the change after any type of intervention is applied within a neighborhood

- Communication strategies
  - Labeling (Bi-lingual)
  - Door to door education
  - Promo activity
  - Mail and email distribution
  - Cart tagging
- Operational Change
  - Adjust collection frequency
  - Removing cart for a probationary period
  - Adjust container size
  - Providing alternative equipment

# Contamination categories

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Bagged  
recycling(BR)



Plastic bags-thin(PB-THIN)





Plastic bags-thick (PB-THICK)



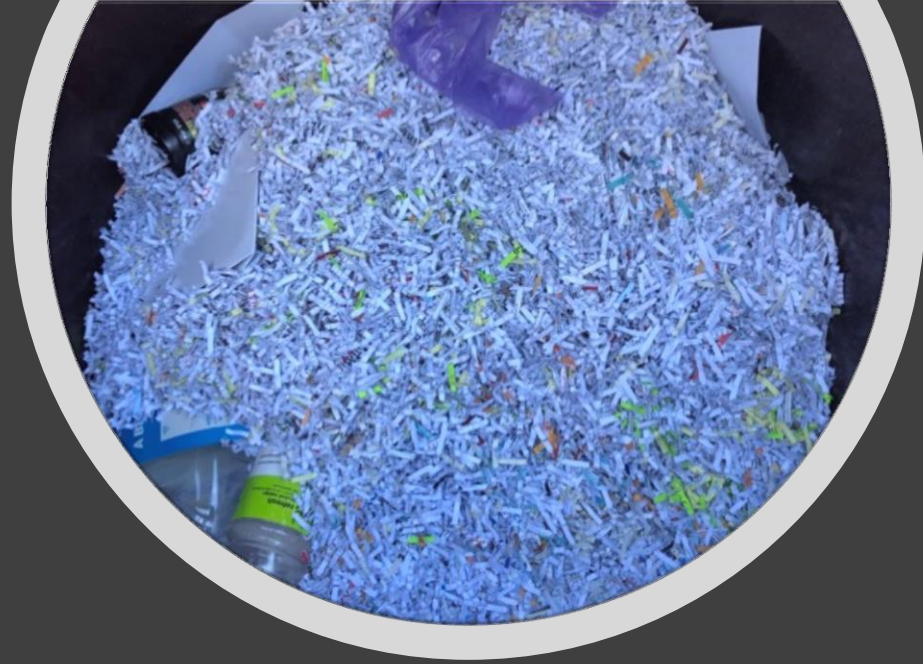
Flexible plastic items(FPI)

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Food waste(FW)







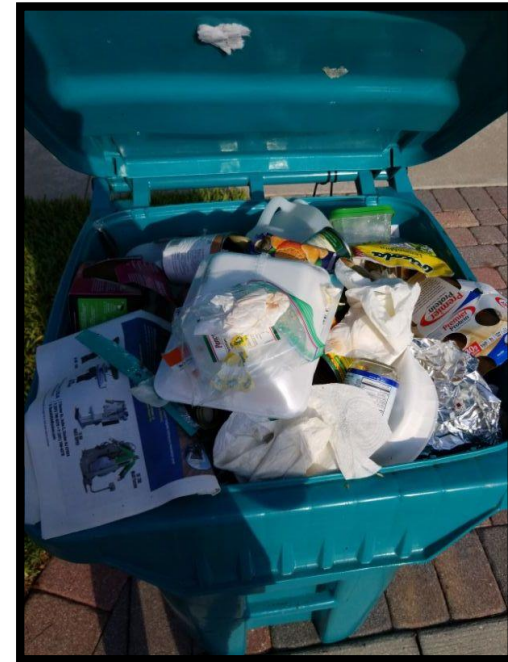
Paper products(PP)



# Cardboard(CB)



# Styrofoam(SF)





Yard waste(YW)







Textile (TE)

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Metal items that are not a can(ME)

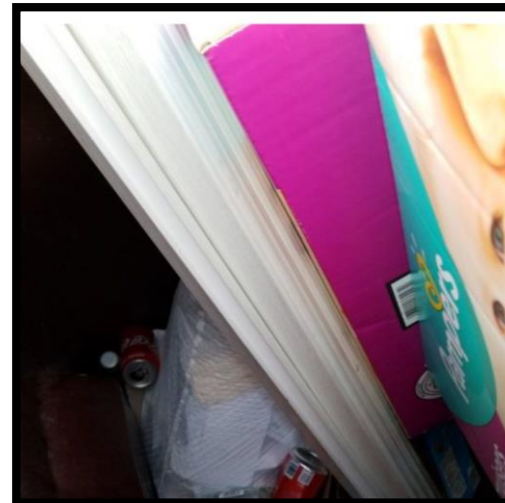




Tanglers (TA)

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# Construction debris (CD)







Household garbage(HG)

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Engelwood Recycling Stu...

Address

Residence number not visible

Location

Capture Location

Barcode

Capture Barcode

Cart ID

New Photo

Capture Photo

50%

Next



Lake Nona Recyclin...

Contamination

- None
- BR-Bagged Recycling
- PB-THIN-Thin plastic bags
- PB-THICK-Thick plastic bags
- FPI-Flexible plastic items
- FW-Food waste
- PP-Paper products
- SF-Styrofoam
- YW-Yard Waste
- TE-Textile
- ME-Metals that are not a can

50%

Next

# Data capture

# RQI calculations

Single family Recycling  
Contamination Study



# Data sheet

	K	L	N	O	P	R	S	U	X	Y	Z
1	Device Date/Time	Submission Form Name	Residence number	Street name	Location	Cart ID	New Photo	Contamination	Time	Device ID	
114	12/12/2019 13:12	Lake Nona Recycling Study	11949	Charlton Ln	28.394430,-81.263541	5001963	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	FPI-Flexible plastic items Plastic Bags packaging wrap	8:12 AM	0afbd10e23996056	
115	6/13/2019 12:02	Lake Nona Recycling Study	11950	Charlton Ln	28.394037,-81.263964		<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Other	8:00 AM	1ec07cf6c105b6d7	
116	6/20/2019 11:57	Lake Nona Recycling Study	11950	Charlton Ln	28.393997,-81.264053		<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	None	7:56 AM	fc0a0bd3d8ff008d	
117	6/27/2019 11:57	Lake Nona Recycling Study	11950	Charlton Ln	28.394034,-81.264021		<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Plastic Bags	7:56 AM	0afbd10e23996056	
118	12/12/2019 13:13	Lake Nona Recycling Study	11950	Charlton Ln	28.393992,-81.263936		<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	FPI-Flexible plastic items PB-THIN-Thin plastic bags	8:12 AM	fc0a0bd3d8ff008d	
119	12/19/2019 13:05	Lake Nona Recycling Study	11950	Charlton Ln	28.394132,-81.264034		<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	HG-Household garbage	8:04 AM	fc0a0bd3d8ff008d	
120	1/9/2020 13:07	Lake Nona Recycling Study	11950	Charlton Ln	28.394003,-81.263993		<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	FPI-Flexible plastic items	8:05 AM	fc0a0bd3d8ff008d	
121	6/13/2019 12:07	Lake Nona Recycling Study	11957	Charlton Ln	28.394236,-81.263400	07 052559	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Plastic Bags Pizza boxes	8:05 AM	e5151b5761973302	
122	6/20/2019 11:51	Lake Nona Recycling Study	11957	Charlton Ln	28.394267,-81.263438	07 052559	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	None	7:49 AM	0afbd10e23996056	
123	6/27/2019 11:51	Lake Nona Recycling Study	11957	Charlton Ln	28.394100,-81.263373	07 052559	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	None	7:50 AM	0afbd10e23996056	
124	11/21/2019 13:20	Lake Nona Recycling Study	11957	Charlton Ln	28.393902,-81.263300	7052559	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	None	8:20 AM	0afbd10e23996056	
125	12/12/2019 13:19	Lake Nona Recycling Study	11957	Charlton Ln	28.394118,-81.263365	7052559	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	None	8:18 AM	0afbd10e23996056	
126	12/19/2019 13:09	Lake Nona Recycling Study	11957	Charlton Ln	28.394143,-81.263356	7052559	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	7451004022 Plastic Bags packaging wrap	8:08 AM	0afbd10e23996056	
127	6/13/2019 12:04	Lake Nona Recycling Study	11962	Charlton Ln	28.394062,-81.263960	06 052451	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Other Plastic Bags	8:02 AM	1ec07cf6c105b6d7	
128	6/20/2019 11:59	Lake Nona Recycling Study	11962	Charlton Ln	28.394128,-81.263688	06 052451	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Other	7:56 AM	0afbd10e23996056	
129	6/27/2019 11:55	Lake Nona Recycling Study	11962	Charlton Ln	28.394061,-81.263999	06 052451	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Plastic Bags Textile Other	7:54 AM	0afbd10e23996056	
130	7/18/2019 12:17	Lake Nona Recycling Study	11962	Charlton Ln	28.394031,-81.263880	06 052451	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Plastic bags(thin, usually transparent): Paper: bags	8:16 AM	0afbd10e23996056	
131	12/12/2019 13:16	Lake Nona Recycling Study	11962	Charlton Ln	28.394269,-81.263639	6052451	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	FPI-Flexible plastic items PP-Paper products	8:15 AM	fc0a0bd3d8ff008d	
132	1/16/2020 13:03	Lake Nona Recycling Study	11962	Charlton Ln	28.394056,-81.263762	6052451	<a href="http://www.gocanvas.com/values/7">http://www.gocanvas.com/values/7</a>	FPI-Flexible plastic items	8:02 AM		
133	6/13/2019 12:09	Lake Nona Recycling Study	11965	Charlton Ln	28.394138,-81.263223	04 000018	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	Other	8:06 AM	1ec07cf6c105b6d7	
134	6/20/2019 11:52	Lake Nona Recycling Study	11965	Charlton Ln	28.393990,-81.263230	04 000018	<a href="http://www.gocanvas.com/values/6">http://www.gocanvas.com/values/6</a>	None	7:51 AM	0afbd10e23996056	





# Calculations

## House #1

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10
RQI	10	9	8	7	6	5	4	3	2	1	0
Recycling quality											
	Good <span style="float: right;">Bad</span>										

	Cat Pre Edu	Tot Cat Pre Edu	Pre Edu RQI		Δ RQI	Result
Week 1	PB, PC, HG	PB, PC, HG, TE, FW, SF	4		3	Increase
Week 2	PB, TE, FW					
Week 3	PB, SF, PC					
	Cat Pos Edu	Tot Cat Pos Edu	Pos Edu RQI			
Week 1	PB	PB, PC, HG	7			
Week 2	PB, PC					
Week 3	HG					

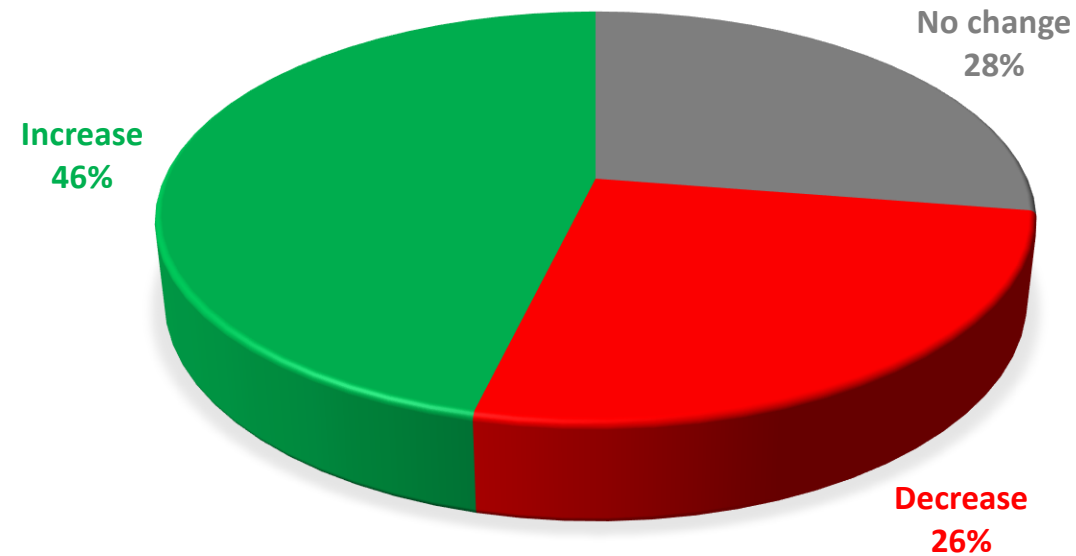
# Results

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Door to door education		
Residences that increased their RQI (higher recycling quality post education)	Residences that decreased their RQI (lower recycling quality post education)	Residences that showed no changes
37	21	22

# Graph the results

POST EDUCATION CHANGE IN RQI (DOOR TO DOOR OR DOOR HANGERS)



# RQI calculations

Multifamily recycling  
contamination study



# Adaptability of the RQI to different neighborhoods

## Single family houses



## Multifamily and Commercial



## Flexibility of the RQI

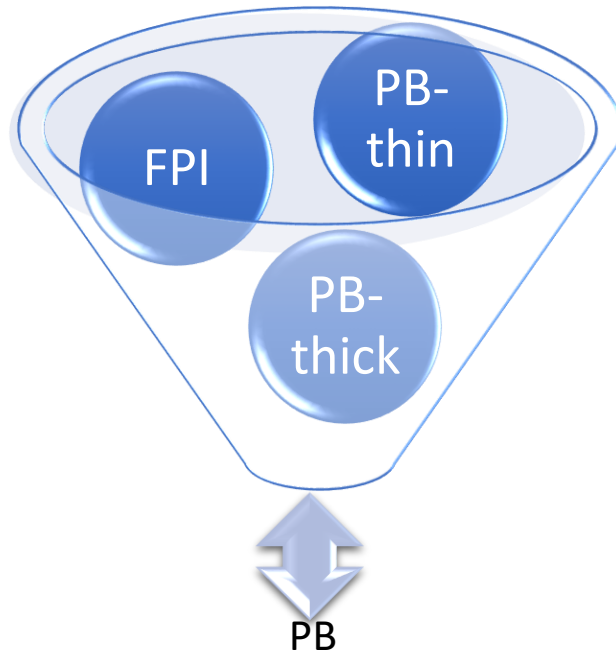
### RQI Scale

# categories of contaminants	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
RQI	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Recycling quality															
	Good <span style="float: right;">Bad</span>														

# Flexibility of the RQI categories

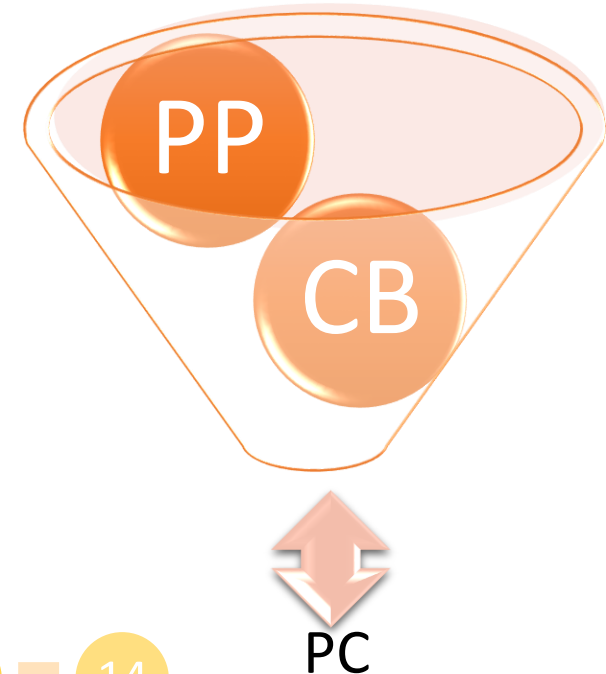
## 10 categories

- NC
- PB
- SF
- FW
- YW
- TE
- PC
- HG
- ME
- CD



## 14 categories

- NC
- PB-THIN
- PB-THICK
- FPI
- SF
- FW
- YW
- TE
- PP
- CB
- HG
- ME
- CD
- TA



$$13 + TA = 14$$

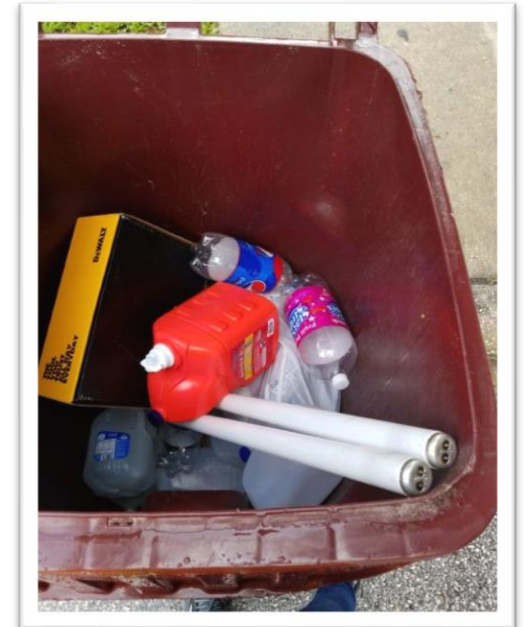
# Additional contamination categories

## Split Household garbage category

- Electric items
- Non-electric items

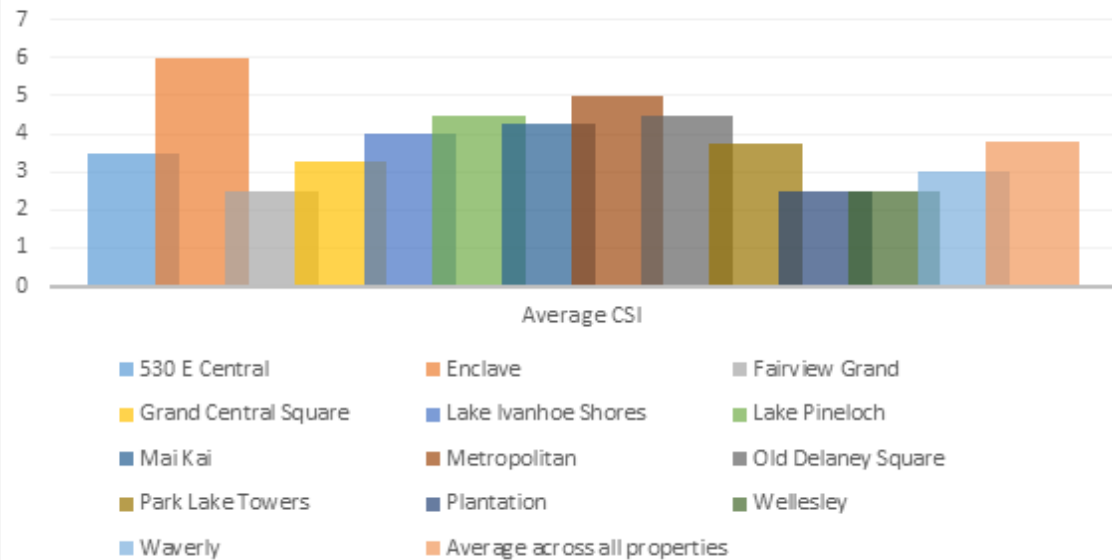


## Hazardous household wastes

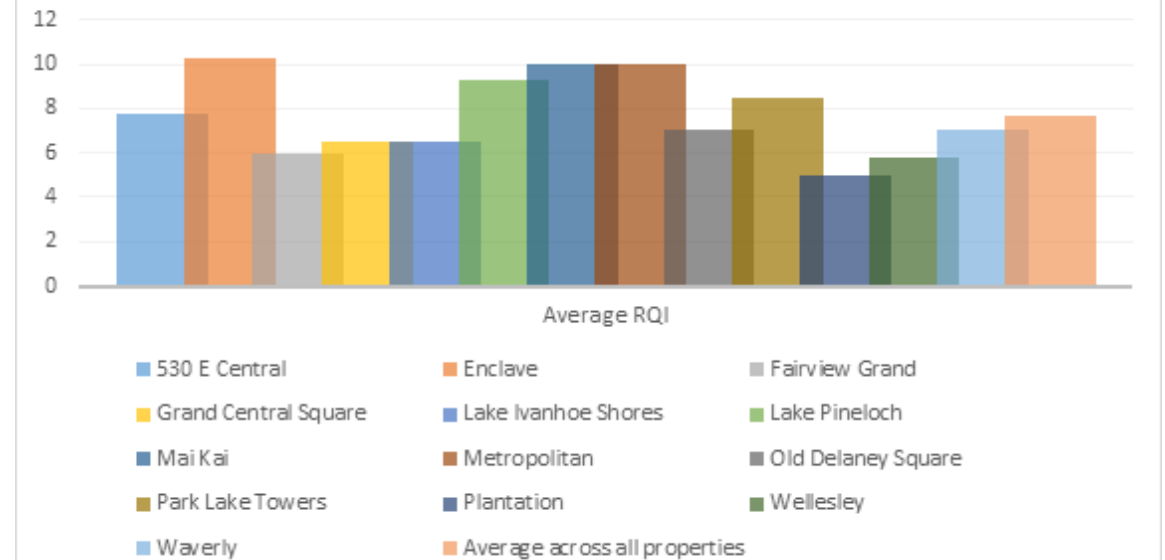


# RQI provides legitimacy to other indices

CSI Pre-tote Average



RQI Pre-tote Average



# What the RQI does NOT show

- The “depth” of contamination
- The frequency of single contaminants
- Capture rate comparisons



# Problems unique to multifamily applications

## Transient residency

- 50% of Orlando residents live in multifamily housing
- 40%-50% of apartment leases are NOT renewed annually.
  - Remedial strategies (including use of RQI) must be long-term.

## Point source ambiguity

- Unable to determine where contamination comes from
- Centralized location of recycling containers
- Containers available 24/7

## Insufficient yardage

- .5yd/ single family household
- 6yd for multifamily property of 250+ units
  - This disparity leads to greater and more diverse contamination

# Recap

RQI measures the change in recycling behavior

RQI allows for targeted educational campaigns

RQI can be adapted to multiple scenarios