

# Final Waste Characterization Study

Prepared for:



Prepared by:



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## SOLID WASTE AUTHORITY OF CENTRAL OHIO

## DRAFT WASTE CHARACTERIZATION STUDY

JUNE 2013

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- Appendix A Health and Safety Plan for the 2012 SWACO Waste Characterization Study
- Appendix B Health and Safety Plan for the 2013 SWACO Waste Characterization Study

## **SECTION I**

## **INTRODUCTION**

The Solid Waste Authority of Central Ohio (SWACO) contracted with GT Environmental, Inc. (GT) to conduct a residential/commercial waste characterization study of the solid waste generated within Franklin County after curbside, drop-off recycling, and other recycling activities have been completed. SWACO is reviewing several development projects that are dependent on the types of waste received at the SWACO Sanitary Landfill. The most recent study on the composition of SWACO's waste was completed in 2005. New data from the completed waste sort will provide detailed and current information to SWACO and its constituents regarding the value and composition of waste resources managed at the Authority's facilities. The objective of this study is to characterize the current Franklin County solid waste stream to assist SWACO and their current and potential development partners to estimate quantities of solid waste materials available for specific projects. This completed two-phase waste characterization study will establish a baseline of the quantities of materials hauled to SWACO's three transfer stations and landfill. This understanding of the waste stream's makeup may be used to strategically leverage the effectiveness of current and potential partnerships.

The waste composition study was completed in two sampling phases conducted at each of the three SWACO transfer stations and the SWACO Sanitary Landfill. The first phase of the study was conducted in December of 2012 and focused on characterizing waste that was first managed at one of SWACO's transfer stations. The second phase was conducted in June of 2013 and focused on characterizing waste that was directly hauled (DH) to the landfill.

This report presents the individual methodology, data, and summary of results for each phase of the sort, as well as combined data and results for both phases of the report.

**SECTION II****PHASE I – METHODS**

This section summarizes the methods used to characterize the residential and commercial waste stream generated in Franklin County after curbside and drop-off recycling has been completed during phase I of the waste characterization study. Sorting activities took place during December 3, 2012 through December 7, 2012. Components of the waste stream were characterized by manually sorting samples from the municipal solid waste stream into categories. SWACO determined the material categories for the waste characterization study by requesting input from outside organizations interested in SWACO's solid waste that have the ability to process municipal solid waste (MSW). The potential development partners were asked to provide a list of waste categories they would like defined as part of this waste characterization study.

**WASTE SAMPLING**

The number of samples was determined using a formula in the Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231 – 92). The following formula was used to determine the number of samples necessary to achieve a 95% confidence level:

$$n = (t^*s/e\bar{x})^2 \quad (1)$$

where:

- $t^*$  = student  $t$  statistic corresponding to the desired level of confidence,
- $s$  = estimated standard deviation,
- $e$  = desired level of precision, and
- $\bar{x}$  = estimated mean.

Using plastic as the “governing component” to determine the standard deviation and mean for the formula, it was determined that 43 samples were needed per waste sort.

SWACO operates three transfer facilities and a landfill. In 2011, the SWACO Sanitary Landfill accepted 1.07 million tons of waste.

- Morse Road Transfer Station – 128,000 tons (2011)
- Jackson Pike Transfer Station – 153,000 tons (2011)
- Georgesville Road Transfer Station – 76,000 tons (2011)
- Franklin County Sanitary Landfill – 635,000 tons (direct-haul only) (2011)

In addition to tonnage direct-hauled to the SWACO Sanitary Landfill and transferred by SWACO operated transfer stations, approximately 78,000 tons of waste was transferred to the landfill by non-SWACO operated transfer stations.

The first sorting event included sampling at three SWACO-owned transfer stations. The number of samples sorted at each facility was based mainly on the percentage of total

waste received by SWACO-owned transfer stations in 2011. The following table presents the number of samples to be sorted at each facility:

Facility	Number of Samples	Total Samples Sorted, Phase I
Morse Road Transfer Station	17	43
Georgesville Road Transfer Station	7	
Jackson Pike Transfer Station	19	

## TRANSFER STATION SAMPLING PROCEDURES AND METHODOLOGY

The methodology and procedures for selecting waste samples to be sorted at each transfer station were developed in accordance with the Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231 – 92). Activities on each sorting day were conducted as follows:

1. The project manager worked with the transfer station manager to select a safe location to set up the sorting station which included tables, waste containers and the scale. The scale was positioned on a clean, flat, level surface. Figure 1 presents the sorting locations selected at each transfer station.

**Figure 1 – Sorting Locations at Transfer Stations**

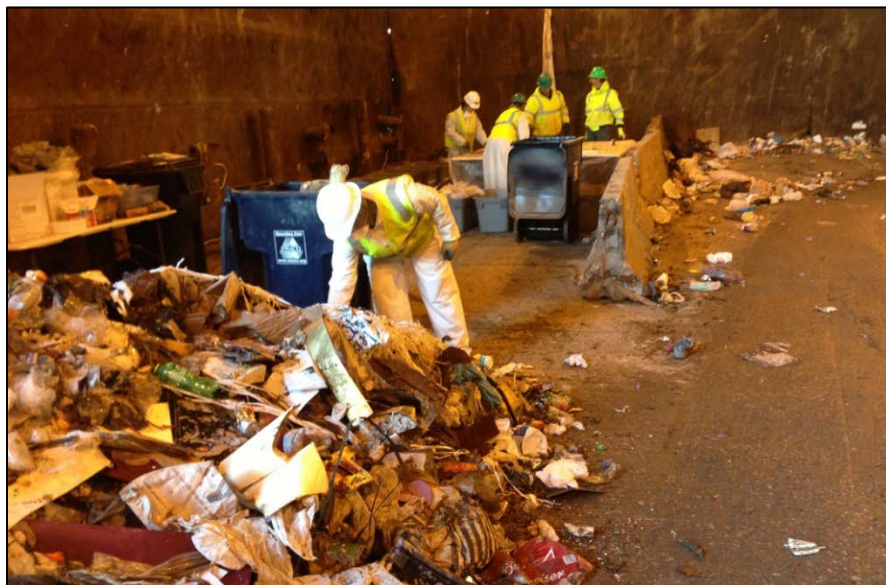




*Selected locations for sorting activities at Georgesville, Jackson Pike, and Morse Road Transfer Stations, respectively. Areas were swept clean and framed with cement barriers prior to commencing sorting activities.*

2. The accuracy of the scale was tested daily using a known reference weight. Each container used for sorting was weighed and the tare weights were recorded. When bins became moisture laden due to wet materials, bins were wiped dry with a cloth.
3. A section of the tipping floor was dedicated for selecting and staging refuse samples (see Figure 2). The area was swept clean prior to selecting the sample so the sample would not be contaminated by existing materials.

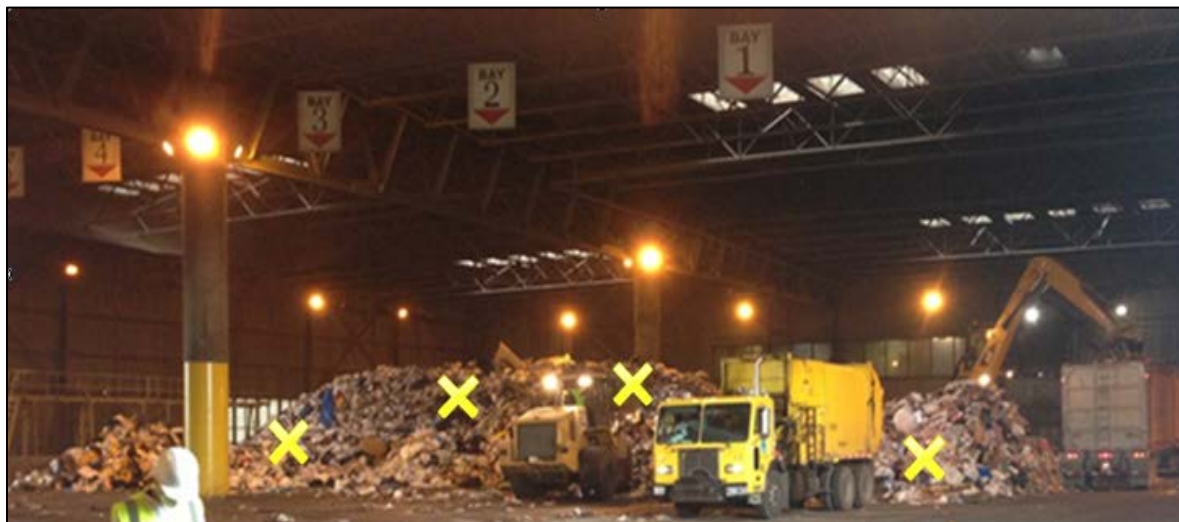
**Figure 2 – Refuse Sample Staging Area**



*The refuse sample staging area is on the left-hand side of the above photo. This area was separated from the area where trucks empty refuse, and therefore, was not contaminated with existing materials or other materials on the tipping floor.*

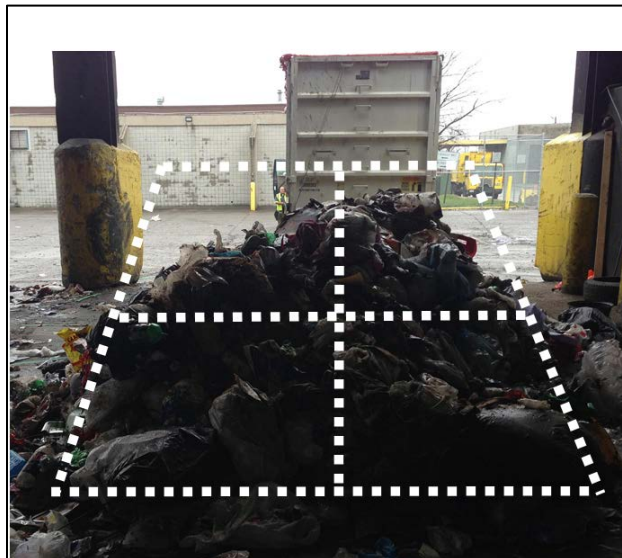
- The sample was selected using the following methodology. The front end loader was instructed to select a mix of waste from the tipping floor pile. Each sample selection was to include materials from four different locations of the pile. Figure 3 illustrates the sampling concept.

**Figure 3 – Sampling Concept**

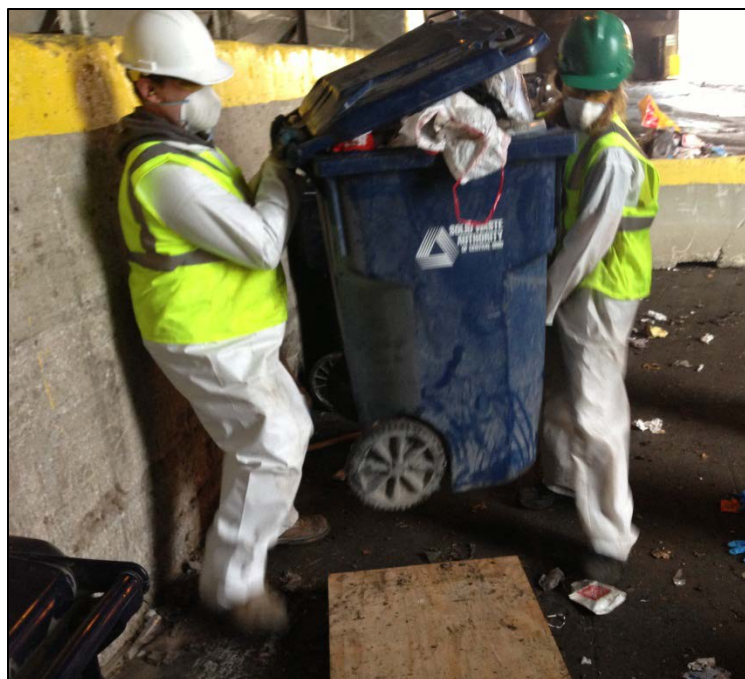


*The front end loader selected small scoops from four locations in the pile on the tipping floor. The locations in the pile were selected from two locations near the bottom of the pile and two locations near the top of the pile. Each yellow X in the photo above displays the approximate locations where sample selections were targeted at Jackson Pike Transfer Station.*

The sample was moved into the area dedicated for selecting a sub-sample to sort. The waste was spread into a square or rectangular shape. The waste sorting team selected materials from four different quadrants of the sample waste pile. The following Figure 4 illustrates an example of how each sample pile was divided into quadrants.

**Figure 4 – Sample Pile Quadrants**

Materials selected from the four sample pile quadrants were placed into a wheeled cart and weighed prior to being moved to the sorting tables. The target weight for each sorting sample was 200 to 300 pounds. Figure 5 shows two members of the sorting team picking up a full wheeled cart to place on the scale.

**Figure 5 – Obtaining Weight of Samples Prior to Sorting**

The totes typically needed to be filled twice with materials from the sample waste pile to reach the targeted 200 to 300 pound range for each sorting sample. After each 200 to 300 pound sample was sorted and weighed from the initial sample pile, the remaining waste on the tipping floor was moved back to the main pile. A fresh sample from four locations in the pile was moved to the designated area on the tipping floor for the next sampling event.

- The bags of refuse and loose refuse selected for each sorting sample were opened and the sorting team members manually separated the materials into waste containers for each material category defined by SWACO's potential development partners. Figure 6 presents a list of the material categories requested by the potential development partners to be used in this study.

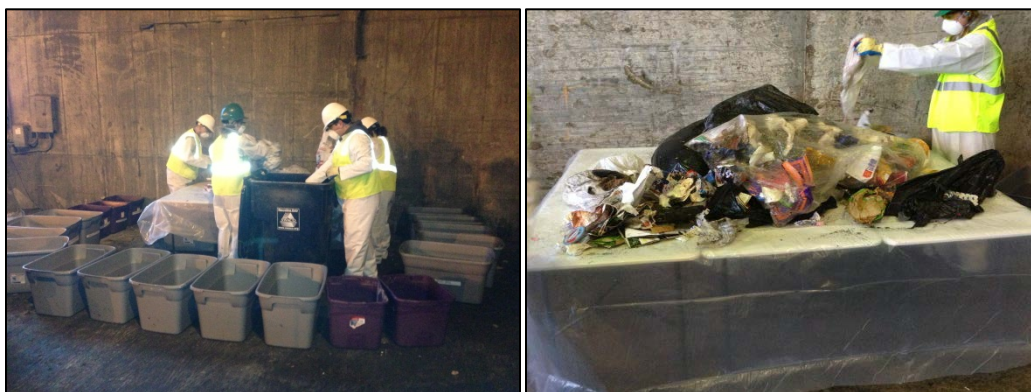
**Figure 6 – Description of Waste Categories**

Major Waste Types	Waste Material Categories	Examples
Fibers	1. OCC – Cardboard	Corrugated cardboard, packing/shipping boxes, paperboard (cereal and soda boxes)
	2. Newspaper	Daily/weekly newspapers (glossy inserts removed)
	3. Office Paper	High grade copy paper, letterhead
	4. Other Mixed Paper	Magazines, glossy paper, brown shopping bags, junk mail, tissues, napkins
Plastics	5. PET #1	PET bottles, trays, tubs, and PET shopping bags
	6. HDPE #2 Natural	Natural HDPE bottles (milk), trays, tubs, and natural HDPE shopping bags
	7. HDPE #2 Colored	Colored HDPE bottles (detergent), trays, tubs, and colored HDPE shopping bags
	8. PVC #3	PVC pipes, tubes, and liners
	9. LDPE #4	LDPE garbage bags, saran wrap, LDPE film plastic
	10. Other Plastics	Plastic #5 Polypropylene (yogurt and other refrigerated food containers), Plastic #6 Polystyrene (disposable food utensils, styrofoam), Plastic #7 (layered or mixed plastics), and unidentifiable plastics

Major Waste Types	Waste Material Categories	Examples
Metals	11. Aluminum Cans	Soda and beer cans
	12. Steel and Tin Cans	Food cans, meal replacement drink cans
	13. Other Ferrous	Steel, stainless steel, wrought iron, pig iron
	14. Other Non-Ferrous	Aluminum, copper, lead, nickel, tin, brass, and precious metals such as gold and silver
Organics	15. Yard/Pet Waste	Leaves, plants, yard trimmings, pet excrement, cat litter
	16. Wood	Treated and untreated lumber, plywood, particle board
	17. Food Waste	Plant based food and non-plant based food
Miscellaneous	18. Container Glass	Clear, brown, green and blue glass bottles and jars in which food products are packaged
	19. Textiles	Clothing, carpet, and bedding
	20. Other	Small sorting residue, diapers, feminine products, bio-hazard materials/sharps, dirt, rock, electronics, HHW, unrecyclable paper coated with foil or plastic
	21. Unsorted	Material lost during sorting process due to factors such as being adhered to floor, wind

The following photos (Figure 7) display different parts of the sorting process, as well as how the sorting area was set up.

**Figure 7 – Stages During Sorting Process**





**Upper left:** Labeled bins were arranged around the sorting table. Members of the sorting team are emptying the wheeled cart on the sorting table. **Upper right:** One wheeled cart (about 100 pounds) of sampled solid waste is displayed on the sorting table. **Lower left:** Labeled bins are being filled with sorted materials. **Lower right:** Small debris on ground after a wheeled cart full of solid waste was sorted. Some materials became adhered to floor, contributing to a small percentage of unsorted or lost materials for some samples.

## DATA REDUCTION

There were 43 samples that were manually sorted during the first sampling event. Data presented for each material category include arithmetic mean by weight, standard deviation, and statistical confidence intervals (95 percent confidence interval).

The following formulas were used to calculate statistical figures on the samples:

$$\text{Arithmetic Mean } (\bar{X}) = \frac{\sum x}{n}$$

$$\text{Standard deviation } (s) = \sqrt{\frac{\sum (x - \bar{x})^2}{(n-1)}}$$

$$\text{Upper/Lower Confidence Interval Limits when } n \geq 30 = (\bar{X}) \pm [1.96 \frac{s}{\sqrt{n}}]$$

$$\text{Upper/Lower Confidence Interval Limits when } n < 30 = (\bar{X}) \pm [t \frac{s}{\sqrt{n}}]$$

Where: n = number of samples  
 x = sample percentage  
 s = standard deviation  
 t = t-table value

**SECTION III****PHASE I – SUMMARY OF RESULTS**

This section summarizes the results from the first phase of waste sampling and sorting activities completed for the waste characterization study. More than 9,500 pounds were sorted from 43 samples of waste collected at SWACO's transfer facilities. The figures and statistics presented in this section will include the following:

- **The arithmetic mean** by material/category presents the average percent of each sample made up by a material/category.
- **The standard deviation** of each material/category indicates the variability of each material/category data set from the arithmetic mean of the material/category. The degree of standard deviation indicates the deviation, or variability for the material/category as a whole. The closer to the arithmetic mean that each number in a dataset is, the lower the standard deviation will be.
- **The upper and lower confidence limits** for each material/category were constructed at a confidence level of 95%. These statistics indicate an interval. If the same waste was sampled on numerous occasions, the true composition of each material/category would fall within the interval in 95% of cases.

**GEORGESVILLE ROAD TRANSFER STATION – DECEMBER 2012**

The following Figure 8 presents the mean composition of 7 samples sorted by material category at the Georgesville Transfer Station. Fibers made up the largest material category by weight (26.8%), followed by other materials (23.3%) and food waste (15.3%).

Figure 8 – Georgesville Road Transfer Station Waste Characterization Arithmetic Mean by Material Category

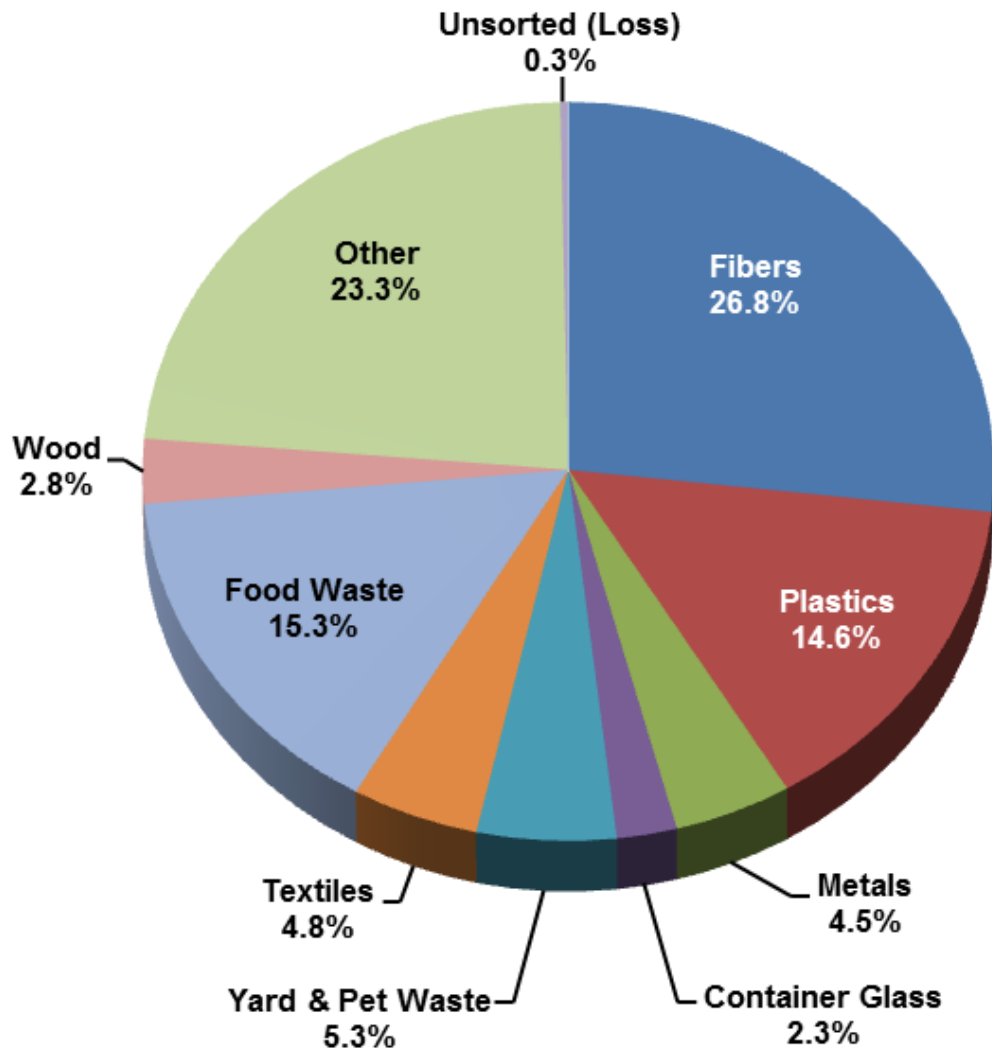


Figure 9 presents the arithmetic mean, standard deviation, and upper and lower confidence limits for each material sorted at the Georgesville Road Transfer Station.

**Figure 9 – Georgesville Road Transfer Station Waste Characterization by Material**

Material	Arithmetic Mean	Standard Deviation	95% Confidence Limits	
			Lower	Upper
<b>Fibers</b>				
OCC- Corrugated Cardboard	10.7%	3.6%	7.4%	14.0%
Newspaper	0.7%	0.9%	0.0%	1.5%
Office Paper	0.8%	0.9%	0.0%	1.6%
Other Mixed Paper	14.6%	3.1%	11.7%	17.4%
<b>Fibers Total</b>	<b>26.8%</b>	<b>8.4%</b>	<b>19.2%</b>	<b>34.6%</b>
<b>Plastics</b>				
PET #1	2.7%	1.1%	1.8%	3.7%
HDPE (#2) Natural	0.4%	0.2%	0.3%	0.6%
HDPE (#2) Colored	1.7%	0.4%	1.3%	2.0%
PVC (#3)	0.1%	0.1%	0.0%	0.2%
LDPE (#4)	3.8%	1.1%	2.8%	4.8%
Other Plastics	5.9%	2.5%	3.6%	8.1%
<b>Plastics Total</b>	<b>14.6%</b>	<b>5.3%</b>	<b>9.8%</b>	<b>19.5%</b>
<b>Metals</b>				
Aluminum Cans	1.0%	0.4%	0.6%	1.4%
Steel/Tin Cans	2.0%	0.5%	1.5%	2.4%
Other Ferrous Metals	0.8%	0.5%	0.3%	1.3%
Other Non-Ferrous Metals	0.7%	0.6%	0.2%	1.3%
<b>Metals Total</b>	<b>4.5%</b>	<b>2.1%</b>	<b>2.5%</b>	<b>6.4%</b>
<b>Uncategorized Materials</b>				
Container Glass	2.3%	1.3%	1.0%	3.5%
Yard & Pet Waste	5.3%	6.7%	0.0%	11.5%
Textiles	4.8%	3.4%	1.7%	7.9%
Food Waste	15.3%	4.5%	11.1%	19.4%
Wood	2.8%	6.3%	0.0%	8.6%
Other	23.3%	6.0%	17.8%	28.9%
Unsorted (Loss)	0.3%	0.4%	0.0%	0.6%
<b>Uncategorized Materials Total</b>	<b>54.1%</b>	<b>28.6%</b>	<b>31.6%</b>	<b>80.5%</b>

**JACKSON PIKE TRANSFER STATION – DECEMBER 2012**

Figure 10 presents the mean composition of 19 samples sorted by material category at the Jackson Pike Transfer Station. Fibers made up the largest material category by weight (26.6%), followed by plastics (15.5%) and other materials (15.0%).

**Figure 10 – Jackson Pike Transfer Station Waste Characterization Arithmetic Mean by Material Category**

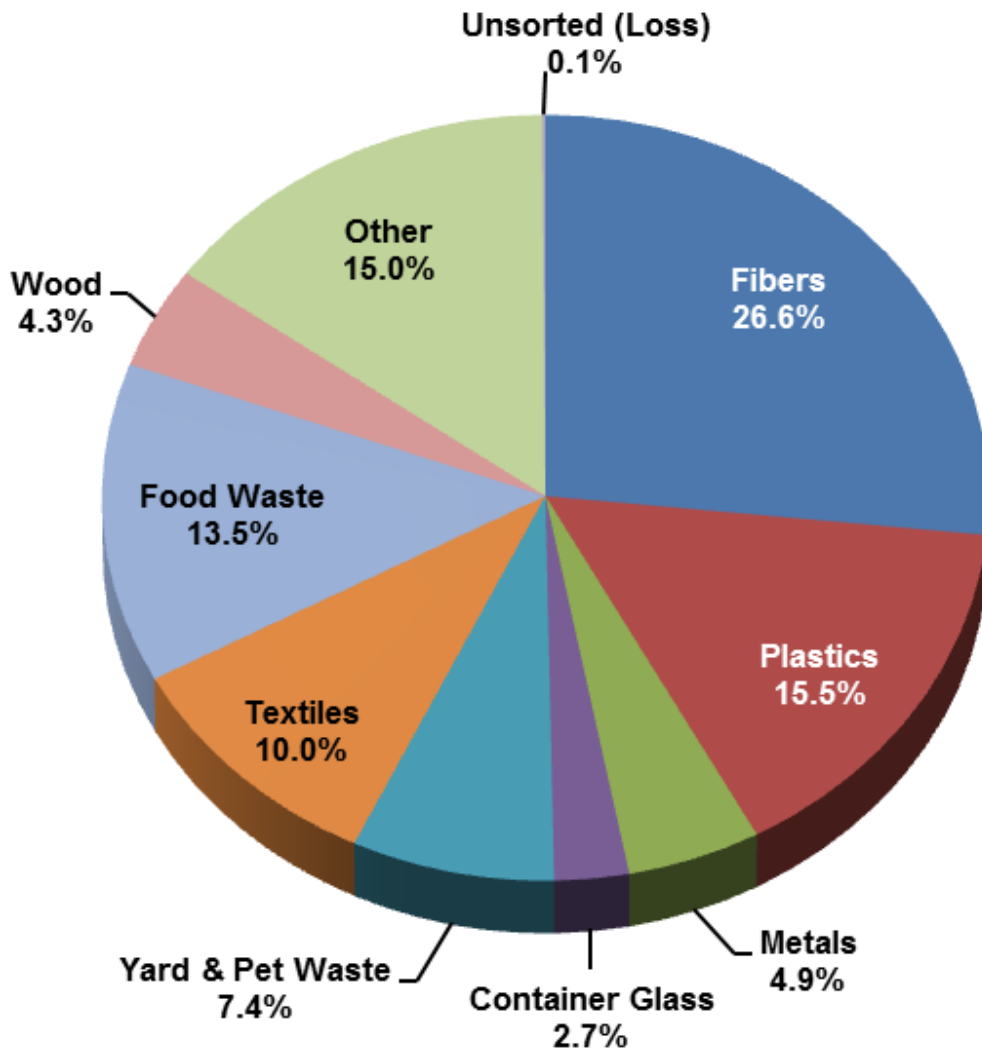


Figure 11 presents the arithmetic mean, standard deviation, and upper and lower confidence limits for each material sorted at the Jackson Pike Transfer Station.

**Figure 11 – Jackson Pike Transfer Station Waste Characterization by Material**

Material	Arithmetic Mean	Standard Deviation	95% Confidence Limits	
			Lower	Upper
<b>Fibers</b>				
OCC- Corrugated Cardboard	9.8%	3.0%	8.4%	11.3%
Newspaper	2.4%	2.6%	1.1%	3.7%
Office Paper	1.3%	1.5%	0.5%	2.0%
Other Mixed Paper	13.1%	4.6%	10.9%	15.4%
<b>Fibers Total</b>	<b>26.6%</b>	<b>11.7%</b>	<b>21.0%</b>	<b>32.3%</b>

<b>Plastics</b>				
PET #1	2.4%	0.9%	2.0%	2.8%
HDPE (#2) Natural	0.6%	0.3%	0.4%	0.7%
HDPE (#2) Colored	1.8%	0.7%	1.4%	2.1%
PVC (#3)	0.1%	0.1%	0.0%	0.1%
LDPE (#4)	3.3%	0.9%	2.9%	3.7%
Other Plastics	7.4%	2.3%	6.3%	8.5%
<b>Plastics Total</b>	<b>15.5%</b>	<b>5.1%</b>	<b>13.0%</b>	<b>18.0%</b>

<b>Metals</b>				
Aluminum Cans	0.9%	0.6%	0.6%	1.2%
Steel/Tin Cans	1.5%	0.8%	1.1%	1.8%
Other Ferrous Metals	1.9%	2.2%	0.8%	2.9%
Other Non-Ferrous Metals	0.6%	0.4%	0.4%	0.8%
<b>Metals Total</b>	<b>4.9%</b>	<b>3.9%</b>	<b>3.0%</b>	<b>6.7%</b>

<b>Uncategorized Materials</b>				
Container Glass	2.7%	1.2%	2.1%	3.3%
Yard & Pet Waste	7.4%	6.2%	4.4%	10.4%
Textiles	10.0%	8.1%	6.1%	13.9%
Food Waste	13.5%	4.7%	11.2%	15.8%
Wood	4.3%	4.6%	2.1%	6.5%
Other	15.0%	6.3%	11.9%	18.0%
Unsorted (Loss)	0.1%	0.3%	0.0%	0.3%
<b>Uncategorized Materials Total</b>	<b>53.0%</b>	<b>31.3%</b>	<b>37.9%</b>	<b>68.2%</b>

**MORSE ROAD TRANSFER STATION – DECEMBER 2012**

Figure 12 presents the mean composition of 17 samples sorted by material category at the Morse Road Transfer Station. Fibers made up the largest material category by weight (29.5%), followed by plastics (16.8%) and other materials (14.7%).

**Figure 12 – Morse Road Transfer Station Waste Characterization Arithmetic Mean by Material Category**

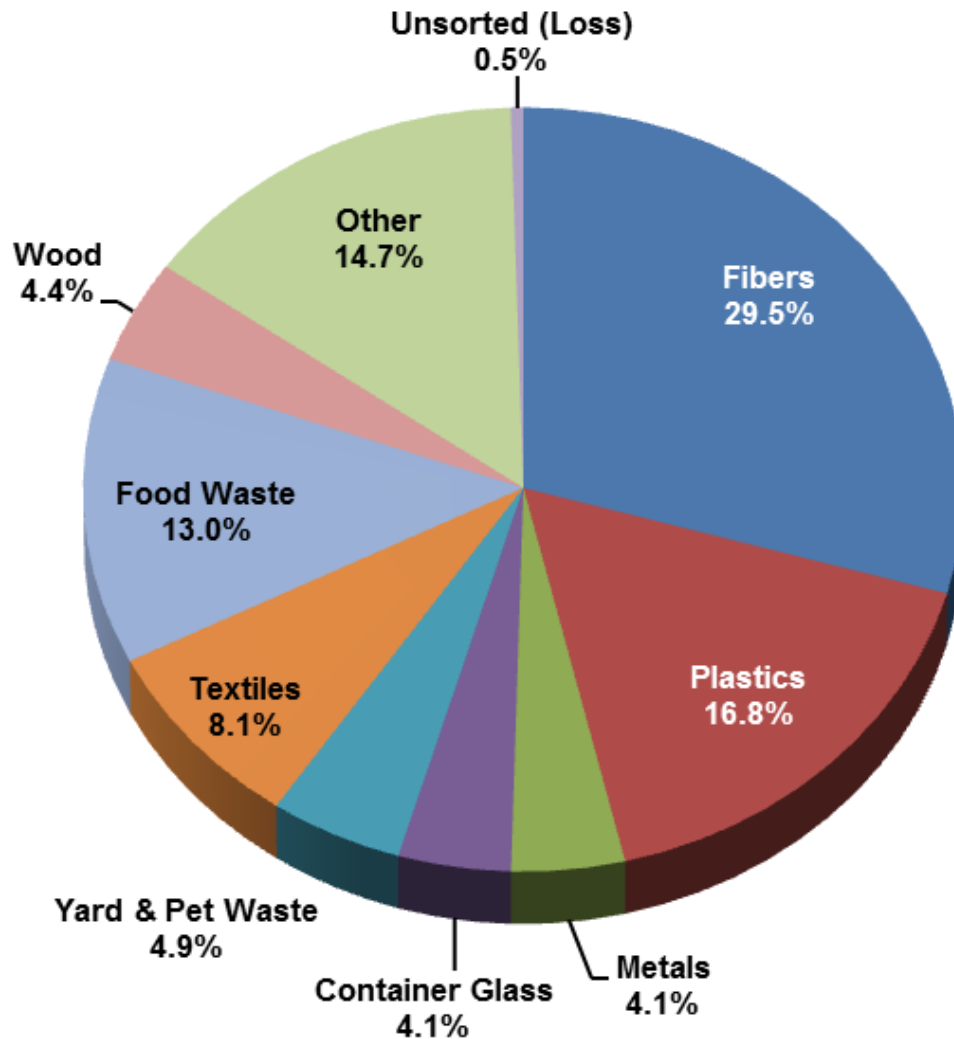


Figure 13 presents the arithmetic mean, standard deviation, and upper and lower confidence limits for each material sorted at the Morse Road Transfer Station.

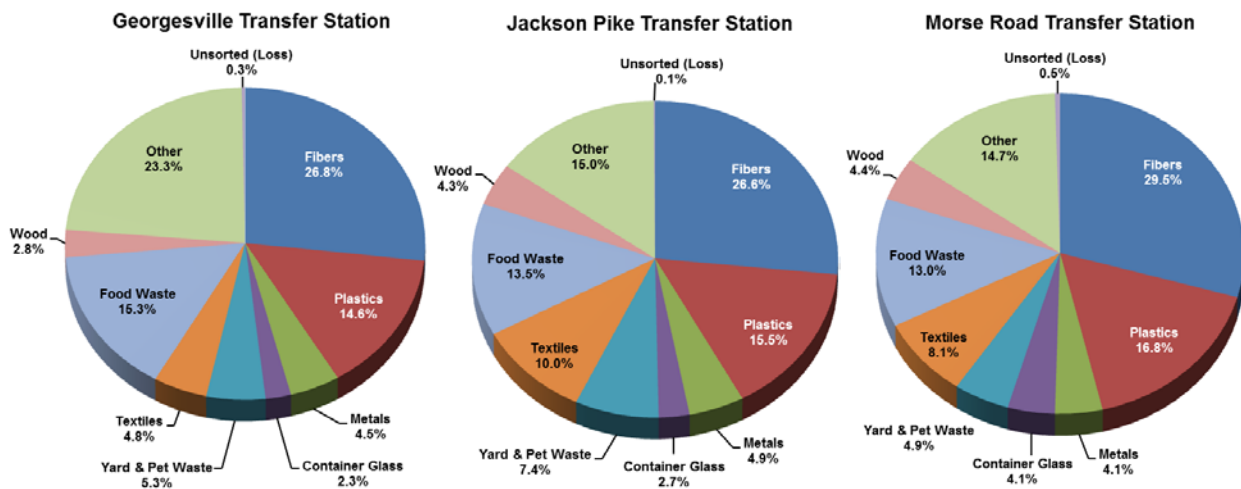
**Figure 13 – Morse Road Transfer Station Waste Characterization by Material**

Material	Arithmetic Mean	Standard Deviation	95% Confidence Limits	
			Lower	Upper
<b>Fibers</b>				
OCC- Corrugated Cardboard	10.0%	4.7%	7.6%	12.4%
Newspaper	1.8%	1.6%	1.0%	2.7%
Office Paper	1.5%	1.8%	0.6%	2.4%
Other Mixed Paper	16.1%	3.4%	14.4%	17.8%
<b>Fibers Total</b>	<b>29.5%</b>	<b>11.5%</b>	<b>23.6%</b>	<b>35.3%</b>
<b>Plastics</b>				
PET #1	2.8%	1.5%	2.0%	3.5%
HDPE (#2) Natural	0.8%	1.4%	0.1%	1.6%
HDPE (#2) Colored	1.6%	1.0%	1.1%	2.1%
PVC (#3)	0.3%	0.9%	0.0%	0.8%
LDPE (#4)	3.5%	0.9%	3.1%	4.0%
Other Plastics	7.7%	2.0%	6.7%	8.8%
<b>Plastics Total</b>	<b>16.8%</b>	<b>7.8%</b>	<b>13.0%</b>	<b>20.8%</b>
<b>Metals</b>				
Aluminum Cans	0.9%	0.4%	0.7%	1.1%
Steel/Tin Cans	1.6%	1.0%	1.1%	2.1%
Other Ferrous Metals	1.1%	1.2%	0.5%	1.8%
Other Non-Ferrous Metals	0.5%	0.3%	0.3%	0.6%
<b>Metals Total</b>	<b>4.1%</b>	<b>2.9%</b>	<b>2.7%</b>	<b>5.6%</b>
<b>Uncategorized Materials</b>				
Container Glass	4.1%	3.4%	2.4%	5.9%
Yard & Pet Waste	4.9%	6.0%	1.8%	7.9%
Textiles	8.1%	5.0%	5.5%	10.7%
Food Waste	13.0%	9.6%	8.0%	17.9%
Wood	4.4%	4.8%	1.9%	6.8%
Other	14.7%	8.1%	10.6%	18.8%
Unsorted (Loss)	0.5%	0.5%	0.2%	0.7%
<b>Uncategorized Materials Total</b>	<b>49.6%</b>	<b>37.4%</b>	<b>30.4%</b>	<b>68.7%</b>

**SWACO TRANSFER STATION SUMMARY – DECEMBER 2012**

Figure 14 presents the mean composition of samples sorted at each of the three SWACO transfer stations. The composition of waste at each of the transfer stations was relatively similar. Paper was the largest category at each of the transfer stations, ranging from 26.6% to 29.5% of the sampled waste stream. Other materials that made up a significant part of the waste stream at each facility were other materials, ranging from 14.7% to 23.3%; plastics, ranging from 14.6% to 16.8%; and food waste, ranging from 13.0% to 15.3%.

**Figure 14 – Waste Characterization by Transfer Station  
Arithmetic Mean by Material Category**



The following Figure 15 presents the overall mean composition of the 43 samples sorted during Phase I of the SWACO waste characterization study. Overall, fibers made up the largest category, comprising 27.8% of the sampled waste stream. Other materials made up 16.2% of the sampled waste stream, and plastics made up 15.9%.

Figure 15 – Overall Waste Characterization for Phase I Sorting Activities  
Arithmetic Mean by Material Category

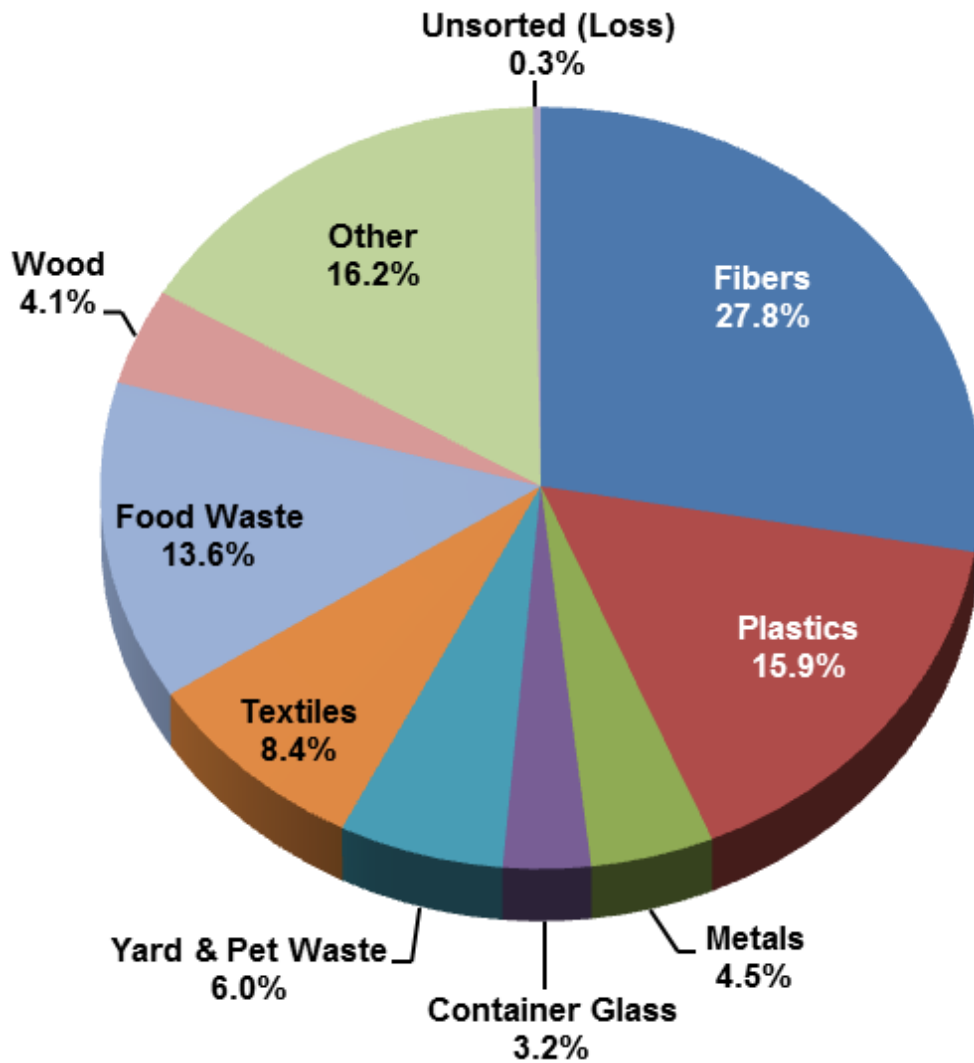


Figure 16 presents the arithmetic mean, standard deviation, and upper and lower confidence limits for each material sorted at SWACO's three transfer stations.

**Figure 16 – Overall Phase I Waste Characterization by Material**

Material	Arithmetic Mean	Standard Deviation	95% Confidence Limits	
			Lower	Upper
<b>Fibers</b>				
OCC- Corrugated Cardboard	10.1%	3.8%	8.9%	11.2%
Newspaper	1.9%	2.1%	1.3%	2.5%
Office Paper	1.3%	1.5%	0.8%	1.7%
Other Mixed Paper	14.5%	4.1%	13.3%	15.8%
<b>Fibers Total</b>	<b>27.8%</b>	<b>11.5%</b>	<b>24.3%</b>	<b>31.2%</b>

<b>Plastics</b>				
PET #1	2.6%	1.2%	2.2%	3.0%
HDPE (#2) Natural	0.7%	0.9%	0.4%	0.9%
HDPE (#2) Colored	1.7%	0.8%	1.5%	1.9%
PVC (#3)	0.2%	0.6%	0.0%	0.4%
LDPE (#4)	3.5%	0.9%	3.2%	3.7%
Other Plastics	7.3%	2.2%	6.6%	7.9%
<b>Plastics Total</b>	<b>15.9%</b>	<b>6.6%</b>	<b>13.9%</b>	<b>17.9%</b>

<b>Metals</b>				
Aluminum Cans	0.9%	0.5%	0.8%	1.1%
Steel/Tin Cans	1.6%	0.8%	1.4%	1.8%
Other Ferrous Metals	1.4%	1.7%	0.9%	1.9%
Other Non-Ferrous Metals	0.6%	0.4%	0.5%	0.7%
<b>Metals Total</b>	<b>4.5%</b>	<b>3.4%</b>	<b>3.5%</b>	<b>5.5%</b>

<b>Uncategorized Materials</b>				
Container Glass	3.2%	2.4%	2.5%	3.9%
Yard & Pet Waste	6.0%	6.2%	4.2%	7.9%
Textiles	8.4%	6.5%	6.5%	10.4%
Food Waste	13.6%	6.9%	11.5%	15.6%
Wood	4.1%	4.9%	2.6%	5.6%
Other	16.2%	7.5%	14.0%	18.5%
Unsorted (Loss)	0.3%	0.4%	0.2%	0.4%
<b>Uncategorized Materials Total</b>	<b>51.8%</b>	<b>34.9%</b>	<b>41.4%</b>	<b>62.3%</b>

**SECTION IV****PHASE II – METHODS**

This section summarizes the methods used to characterize the residential and commercial waste stream generated in Franklin County after curbside and drop-off recycling has been completed during phase II of the waste characterization study. Samples were collected at the landfill June 7, 2013 and June 10, 2013 through June 13, 2013. Sorting activities took place during June 10, 2013 through June 14, 2013. Components of the waste stream were characterized by manually sorting samples from the municipal solid waste stream into categories. The list of material categories for the waste characterization study that was used for phase I of the study was also used for phase II.

The number of samples needed to derive statistically significant results was determined using a formula in the Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231 – 92) (see PHASE I – METHODS). The GT Project Team sorted a total of 43 samples during the second phase of the waste sort.

**LANDFILL SAMPLING METHODOLOGY**

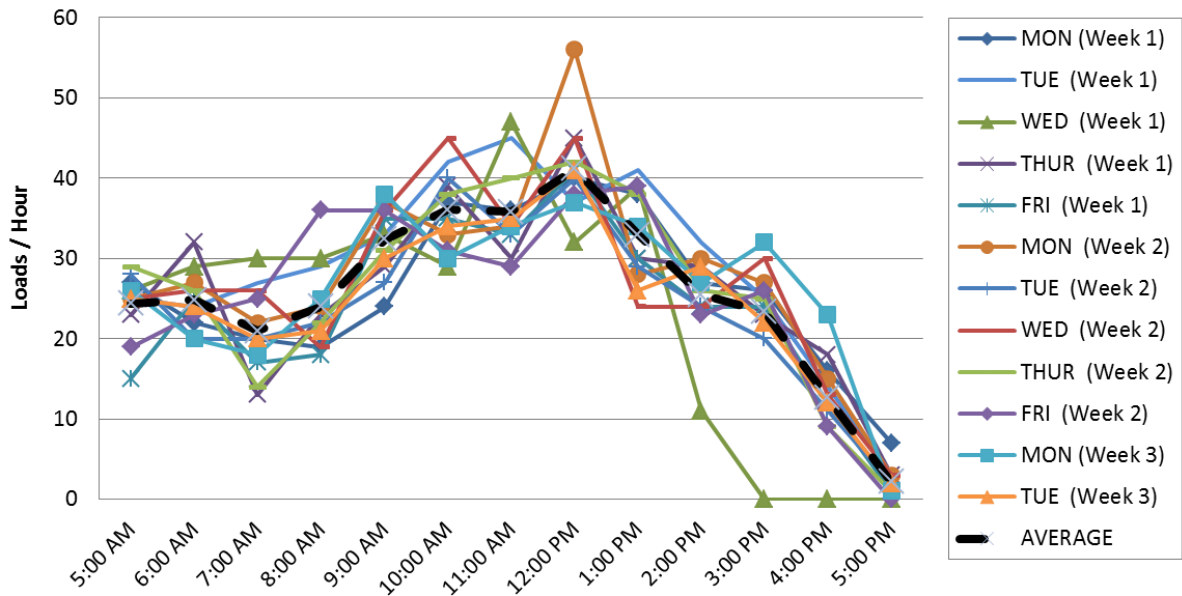
Samples of solid waste for the second phase of the waste characterization study were collected from the working face of SWACO's Franklin County Sanitary Landfill and stored in a roll-off that was delivered to Jackson-Pike Transfer Station, where the sorting activities took place. Sorting activities took place over a 5-day period from Monday to Friday (June 10-14, 2013). Samples that were sorted on the first day of the waste sort were collected on the preceding Friday (June 7, 2013) and delivered to the Jackson Pike Transfer Station prior to Monday (June 10, 2013), where they were stored in a clean, secure area free from the risk of contamination with other solid waste at the transfer station. Nine samples were processed Monday through Thursday and seven samples were processed on Friday for a total of 43 total samples. In all, 8,959 pounds were sorted during the second phase of the study.

The methodology and procedures in this sampling methodology were developed in accordance with the Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231 – 92). Each day that waste samples were collected, the following procedures were followed:

1. Daily, a total of 2,700 to 3,375 pounds of refuse was collected from the landfill. This amount is approximately one and a half times the total amount of refuse needed for daily sorting activities, which ranges from 1,800 to 2,250 pounds of refuse. Additional tonnage collected at the landfill served as a buffer for the sorting crew in the event that extra waste was needed. Circumstances that warrant extra tonnage include encountering refuse deemed unsafe to sort, such as bags of infectious medical waste.

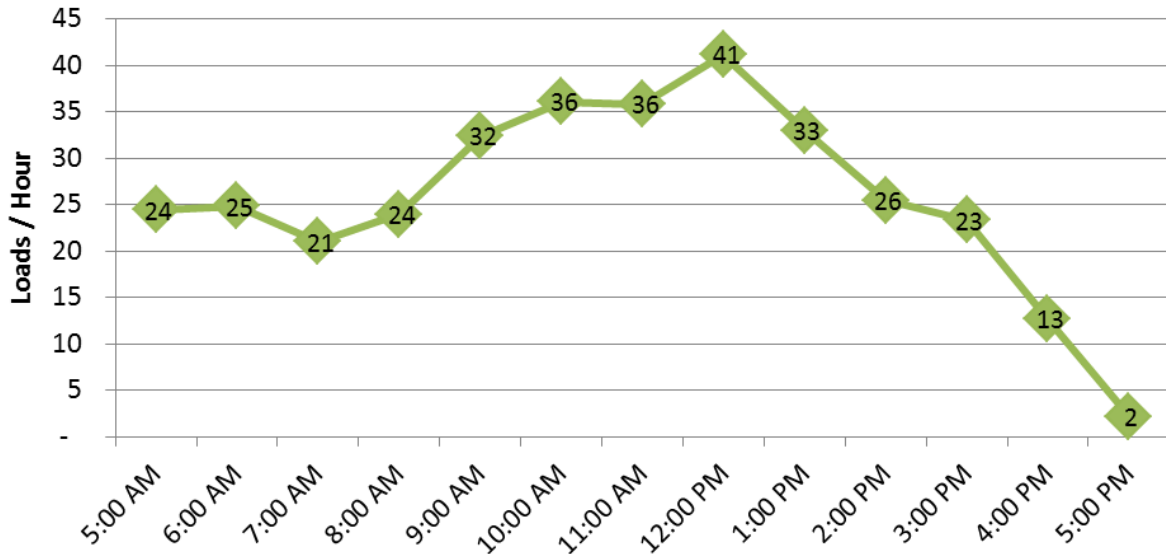
- Sampling at the landfill was conducted during the hours of 9:00 AM and 2:00 PM. To determine the optimal time to conduct sampling activities, detailed data on the quantity of directly hauled (DH) loads received per hour at SWACO’s Franklin County Sanitary Landfill was collected over a period of 12 working days and analyzed. The DH loads counted each hour excluded trailers hauling waste collected at transfer stations. The following figure presents the daily and average DH loads received per hour at the landfill:

**Figure 17 – DH Loads Received per Hour at SWACO Landfill**



The majority (53%) of DH loads received at the landfill occurred during a 5-hour period between 9 AM and 2 PM. The remaining 47% of DH loads received at the landfill occurred over an 8 hour period. The following figure presents the average DH loads received per hour at SWACO’s Franklin County Sanitary Landfill.

**Figure 18 – Average DH Loads Received per Hour at SWACO Landfill**



Sampling efforts at the landfill required a significant investment of time and resources from SWACO and GT. The 9:00 AM to 2:00 PM period was selected for sampling activities instead of sampling during all landfill operating hours to minimize the impact on SWACO’s daily operations and to work within the budgetary constraints of this project.

- Approximately 100 pounds of waste, or the volumetric equivalent of a 64-gallon trash cart, was collected from each DH refuse truck selected to participate in the study. Waste was collected from at least 27 trucks but no more than 34 trucks in order to collect the desired amount of refuse.
- DH refuse trucks were selected to participate in the study by using the following formula:

$$x = \frac{n}{y}$$

Where  $n$  = the average number of DH refuse trucks delivering loads to SWACO’s landfill during 9AM – 2PM

Where  $y$  = the minimum number of refuse trucks to be sorted

Where the  $x^{th}$  DH refuse truck will be sampled

$$6.6 = \frac{179}{27}$$

Rounding down to ensure that an adequate number of trucks are sampled, every sixth DH refuse load was sampled. The GT project manager was stationed on the

working face of the landfill and recorded the DH trucks entering the landfill and which ones to be sampled using the following log:

**Figure 19 – Direct Haul Landfill Sampling Log**

SWACO – Phase II Waste Characterization Study Direct Haul Landfill Sampling Log				
Date: _____ Sample Period: 9 am to 2 pm				
DH Truck Sequence	Truck #	Hauler Name	Residential or Commercial	Sample Time
1 __ 2 __ 3 __ 4 __ 5 __				
6				
7 __ 8 __ 9 __ 10 __ 11 __				
12				
13 __ 14 __ 15 __ 16 __ 17 __				
18				
19 __ 20 __ 21 __ 22 __ 23 __				
24				
25 __ 26 __ 27 __ 28 __ 29 __				
30				
31 __ 32 __ 33 __ 34 __ 35 __				
36				
37 __ 38 __ 39 __ 40 __ 41 __				
42				
43 __ 44 __ 45 __ 46 __ 47 __				
48				
49 __ 50 __ 51 __ 52 __ 53 __				
54				
55 __ 56 __ 57 __ 58 __ 59 __				
60				
61 __ 62 __ 63 __ 64 __ 65 __				
66				
67 __ 68 __ 69 __ 70 __ 71 __				
72				
73 __ 74 __ 75 __ 76 __ 77 __				
78				
79 __ 80 __ 81 __ 82 __ 83 __				

<b>SWACO – Phase II Waste Characterization Study</b> <b>Direct Haul Landfill Sampling Log</b>				
Date: _____ Sample Period: <u>9 am to 2 pm</u>				
DH Truck Sequence	Truck #	Hauler Name	Residential or Commercial	Sample Time
84				
85 __ 86 __ 87 __ 88 __ 89 __				
90				
91 __ 92 __ 93 __ 94 __ 95 __				
96				
97 __ 98 __ 99 __ 100 __ 101 __				
102				
103 __ 104 __ 105 __ 106 __ 107 __				
108				
109 __ 110 __ 111 __ 112 __ 113 __				
114				
115 __ 116 __ 117 __ 118 __ 119 __				
120				
121 __ 122 __ 123 __ 124 __ 125 __				
126				
127 __ 128 __ 129 __ 130 __ 131 __				
132				
133 __ 134 __ 135 __ 136 __ 137 __				
138				
139 __ 140 __ 141 __ 142 __ 143 __				
144				
145 __ 146 __ 147 __ 148 __ 149 __				
150				
151 __ 152 __ 153 __ 154 __ 155 __				
156				
157 __ 158 __ 159 __ 160 __ 161 __				
162				
163 __ 164 __ 165 __ 166 __ 167 __				
168				
169 __ 170 __ 171 __ 172 __ 173 __				
174				

SWACO – Phase II Waste Characterization Study Direct Haul Landfill Sampling Log				
Date: _____ Sample Period: <u>9 am to 2 pm</u>				
DH Truck Sequence	Truck #	Hauler Name	Residential or Commercial	Sample Time
175 __ 176 __ 177 __ 178 __ 179 __				
180				
181 __ 182 __ 183 __ 184 __ 185 __				
186				
187 __ 188 __ 189 __ 190 __ 191 __				
192				
193 __ 194 __ 195 __ 196 __ 197 __				
198				
199 __ 200 __ 201 __ 202 __ 203 __				
204				

- The GT Project Manager directed trucks that were selected to a designated area for sampling. Selected trucks emptied their load in the designated area on the working face.

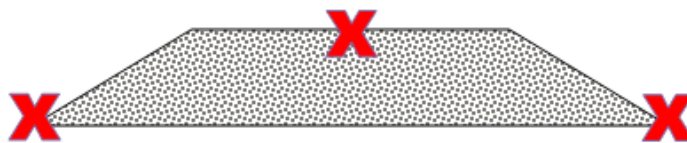
**Figure 20 – Selected DH Truck Unloading in Designated Area**



A front end loader collected consistently sized samples from each participating DH truck’s load, weighing a combined total of approximately 100 to 125 pounds. Samples were not weighed during the selection process; instead, they were estimated visually based on volume. For reference, a heaping 64-gallon container holds approximately 100 pounds of refuse. Samples were selected from three

locations in the truck's load. Refuse will likely be mixed within the truck during compaction, and again during unloading. For consistency, samples were collected at each end of the pile and the center, as shown in the figure below:

**Figure 21 – Sample Locations from Selected DH Loads**



6. Grab samples were loaded into a roll-off.

**Figure 22 – Front Loader Grabbing Waste Samples and Loading Roll-Off**



At the conclusion of the sampling period (daily from 9:00 AM to 2:00 PM), the roll-off was delivered to the Jackson-Pike Transfer Station.

## PHASE II SAMPLING PROCEDURES AND METHODOLOGY

The methodology and procedures in this sorting methodology were developed in accordance with the Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM D5231 – 92).

1. The roll-off containing samples collected at the landfill during a one-day period were emptied in a designated area of the Jackson Pike Transfer Station tipping floor. The claw loader spread the sample on the tipping floor into a thin rectangular pile so all portions of the pile could be accessed for sampling.
2. The rectangular pile was visually divided into nine quadrants. The GT Project Team selected a 200-250 pound sample from each of the nine quadrants in the sampling pile. The following figure presents the sampling grid approach the GT Project Team

utilized for selecting samples. Selected samples were weighed prior to being unloaded on the sorting tables.

**Figure 23 – Sampling Grid**



3. At the conclusion of the sorting activities each day, the GT Project Team coordinated with the Jackson Pike Transfer Station Manager to have all the waste delivered for sorting activities packed back into a roll-off and returned to the landfill. This waste was removed from the tipping floor before the roll-off containing the next set of sampling material was delivered. Refuse collected on different days for sampling activities did not become commingled.
4. The accuracy of the scale was tested daily using a known reference weight. Each container used for sorting was weighed and the tare weights were recorded. Bins were wiped clean after each sample on an as-needed basis when they became moisture laden or soiled.
5. The weighed samples of waste were emptied on the sorting table and the sorting team members manually separated the materials into waste containers that meet the definitions for the waste categories included in Figure 6: Description of Waste Categories.

**Figure 24 – Sorting Crew Manually Separating Materials**

Weights are recorded on the data sheets and weights are measured to the nearest tenth of a pound.

10. Sorting continued until the maximum particle size of the remaining material from each sample was approximately 2 inches or less. The remaining particles were swept into the 'Other' bin. Bins were weighed and data was recorded for each material category after all waste from each 200-250 pound sample was sorted. The immediate floor area around the sorting table was checked for fallen debris. Debris from the floor was sorted.
11. After the waste was weighed, bins were dumped in a designated area separate from the pile to be sampled so sorted waste would not become commingled with unsorted waste. Floors and the table were swept clean after each sample.

**SECTION V****PHASE II – SUMMARY OF RESULTS**

This section summarizes the results from the second phase of waste sampling and sorting activities completed for the waste characterization study. More than 8,900 pounds were sorted from 43 samples of waste collected at SWACO's Franklin County Sanitary Landfill. The figures and statistics presented in this section will include the following:

- **The arithmetic mean** by material/category presents the average percent of each sample made up by a material/category.
- **The standard deviation** of each material/category indicates the variability of each material/category data set from the arithmetic mean of the material/category. The degree of standard deviation indicates the deviation, or variability for the material/category as a whole. The closer to the arithmetic mean that each number in a dataset is, the lower the standard deviation will be.
- **The upper and lower confidence limits** for each material/category were constructed at a confidence level of 95%. These statistics indicate an interval. If the same waste was sampled on numerous occasions, the true composition of each material/category would fall within the interval in 95% of cases.

**FRANKLIN COUNTY SANITARY LANDFILL – JUNE 2013**

The following Figure 25 presents the mean composition of 43 samples sorted by material category. Fibers made up the largest material category by weight (30.6%), followed by plastics (18.6%), other materials (12.1%), and food waste (11.9%).

Figure 25 – Franklin County Sanitary Landfill Waste Characterization Arithmetic Mean by Material Category

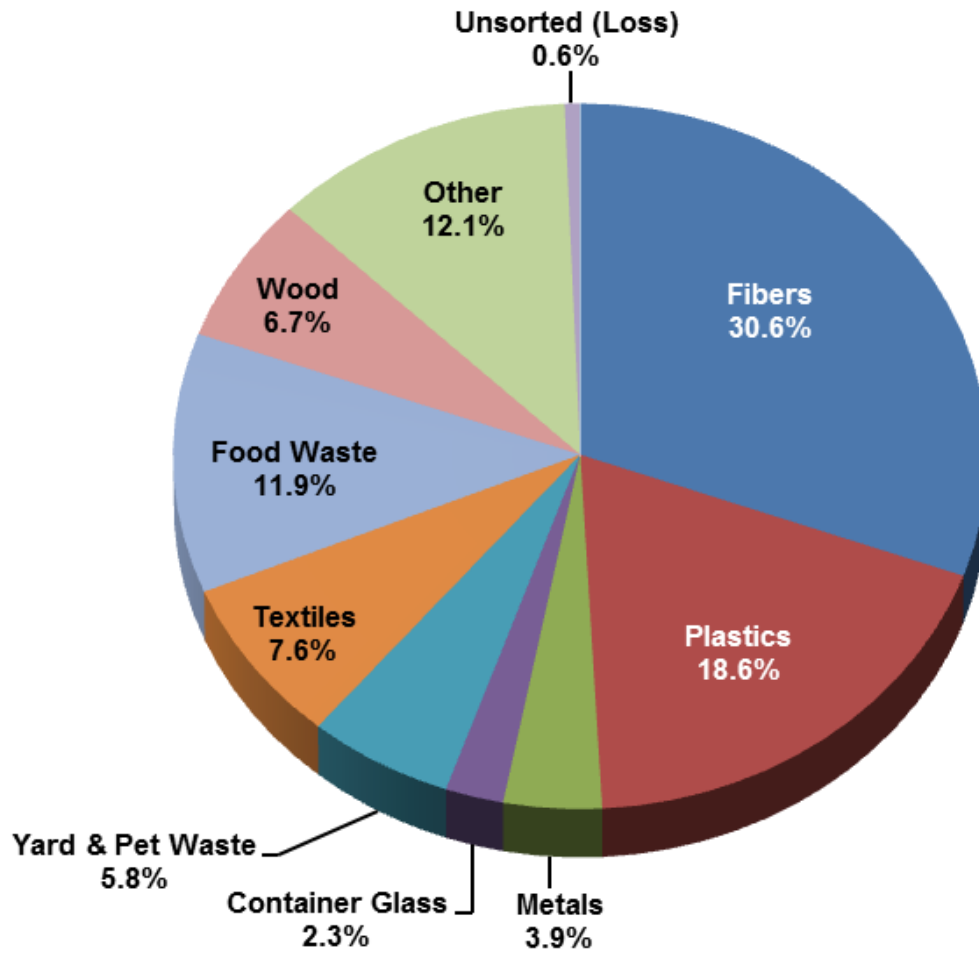


Figure 26 presents the arithmetic mean, standard deviation, and upper and lower confidence limits for each material sorted from the Franklin County Sanitary Landfill.

**Figure 26 – Franklin County Sanitary Landfill Waste Characterization by Material**

Material	Arithmetic Mean	Standard Deviation	95% Confidence Limits	
			Lower	Upper
<b>Fibers</b>				
OCC- Corrugated Cardboard	12.7%	4.3%	8.9%	16.5%
Newspaper	1.9%	2.1%	1.3%	2.4%
Office Paper	4.3%	4.1%	3.0%	5.5%
Other Mixed Paper	11.7%	4.5%	8.2%	15.2%
<b>Fibers Total</b>	<b>30.6%</b>	<b>14.9%</b>	<b>21.4%</b>	<b>39.7%</b>

<b>Plastics</b>				
PET #1	3.1%	1.4%	2.1%	4.0%
HDPE (#2) Natural	0.3%	0.3%	0.2%	0.4%
HDPE (#2) Colored	1.3%	1.6%	0.9%	1.7%
PVC (#3)	0.4%	0.9%	0.3%	0.5%
LDPE (#4)	4.4%	2.3%	3.1%	5.8%
Other Plastics	9.0%	3.4%	6.3%	11.7%
<b>Plastics Total</b>	<b>18.6%</b>	<b>9.9%</b>	<b>13.0%</b>	<b>24.1%</b>

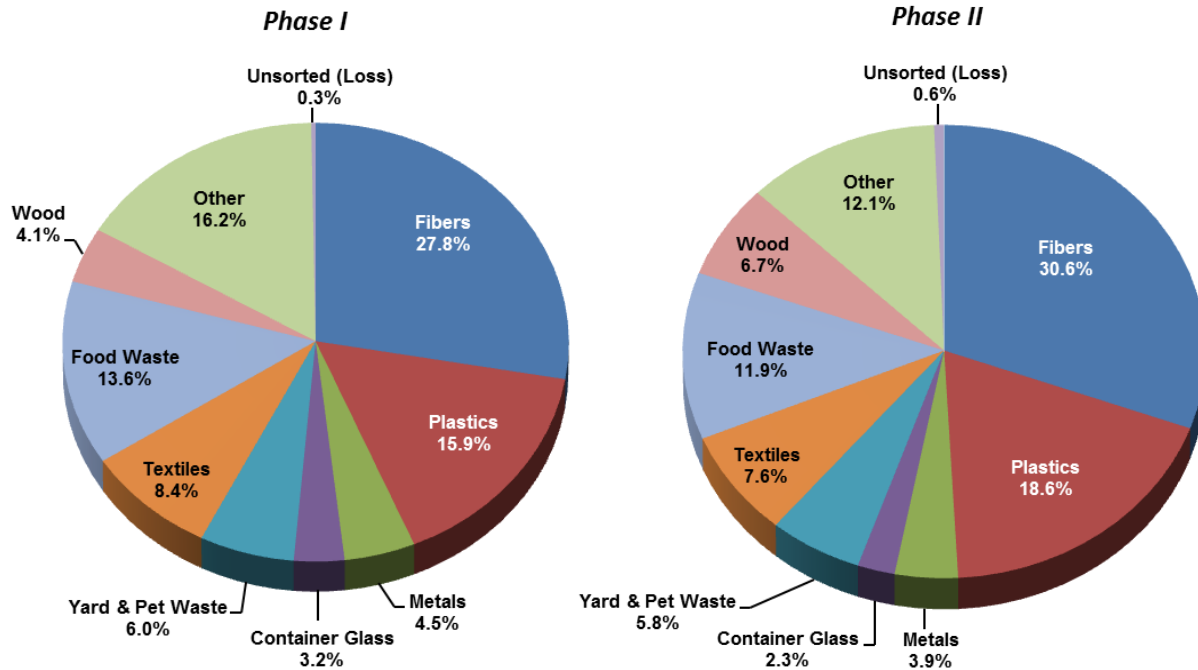
<b>Metals</b>				
Aluminum Cans	0.6%	0.3%	0.4%	0.8%
Steel/Tin Cans	0.8%	0.6%	0.5%	1.0%
Other Ferrous Metals	1.8%	2.3%	1.2%	2.3%
Other Non-Ferrous Metals	0.7%	1.4%	0.5%	1.0%
<b>Metals Total</b>	<b>3.9%</b>	<b>4.7%</b>	<b>2.7%</b>	<b>5.0%</b>

<b>Uncategorized Materials</b>				
Container Glass	2.3%	2.1%	1.6%	3.0%
Yard & Pet Waste	5.8%	6.2%	4.0%	7.5%
Textiles	7.6%	7.3%	5.3%	9.8%
Food Waste	11.9%	7.4%	8.3%	15.5%
Wood	6.7%	4.8%	4.7%	8.7%
Other	12.1%	7.6%	8.5%	15.7%
Unsorted (Loss)	0.6%	0.6%	0.4%	0.8%
<b>Uncategorized Materials Total</b>	<b>47.0%</b>	<b>36.0%</b>	<b>32.9%</b>	<b>61.0%</b>

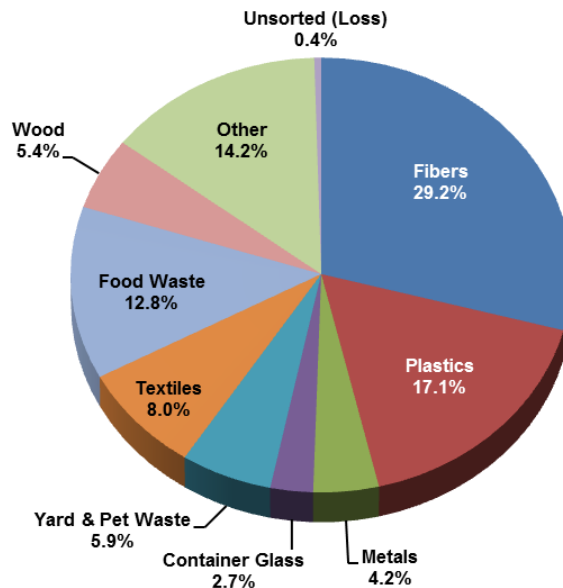
**SECTION VI COMBINED SUMMARY OF RESULTS**

This section summarizes the results from both phases of the waste characterization study.

**Figure 27 – Arithmetic Mean by Material Category**



**Figure 28 – Total Percent of Materials Sorted by Weight (Phase I and II)**



## **Appendix A**

# **Health and Safety Plan for the 2012 SWACO Waste Characterization Study**

**HEALTH AND SAFETY PLAN FOR THE  
2012 SWACO WASTE CHARACTERIZATION STUDY**

EMERGENCY PHONE NUMBERS

Fire, First Aid, Ambulance, Police: **911**

Hospital Nearest to Morse Road Transfer Station:  
Mount Carmel St. Ann's: **614-898-4000**

Hospital Nearest to Georgesville Road Transfer Station:  
Doctors Hospital: **614-544-1000**

Hospital Nearest to Jackson Pike Transfer Station:  
Mount Carmel: **614-234-5000**

FIELD RESPONSIBILITY:

Jim Skora, Project Manager:  
**330-603-0138**

Scott McFarland, Morse Road Transfer Station Manager:  
**614-678-2866**

Ed Zinn, Georgesville Road Transfer Station Manager:  
**614-484-8929**

Terry Blazer, Jackson Pike Transfer Station Manager:  
**614-517-5901**

GT Environmental, Inc.  
635 Park Meadow Road, Suite 112  
Westerville, OH 43081  
**(614) 794-3570**

**A copy of this Health and Safety Plan must be kept at the site during all field activities.**

November 2012

## **Health and Safety Plan**

GT Environmental, Inc (GT) is committed to providing a safe and healthy work environment and ensuring that its employees and subcontractors are safe when working at client facilities and sites. GT has developed this Health and Safety Plan (HASP) to be used by employees and subcontractors performing work at client sites where hazards may exist.

This Health and Safety Plan (HASP) was developed for site workers performing the SWACO Solid Waste Characterization Study with GT. The purpose of the HASP is to inform site workers of potential health and safety hazards that may be encountered at the transfer stations. It was prepared with the best available information regarding physical and chemical hazards. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this study, adherence to the requirements and recommendations in the HASP will significantly reduce the potential for occupational injury.

### **PROPOSED SCOPE OF WORK**

- Select samples of waste to be sorted and transport waste from designated area near tipping floor to designated sorting area.
- Manually sort waste into designated material categories.
- Weigh bins of sorted materials on a scale.
- Transport sorted waste to designated area.

### **RESPONSIBLE INDIVIDUALS**

Safety during the waste sort will be the responsibility of the Project Manager. The Project Manager may temporarily suspend activities on site if there appears to be a threat to health and safety. Other health and safety-related responsibilities of the Project Manager are described below.

The Project Manager will primarily be responsible for:

- Assuring members of the GT project team have access to the appropriate protective equipment and that the protective equipment is being properly utilized.
- Assuring that the GT project team is aware of the safety procedures outlined in the HASP and understand the potential hazards associated with activities at the site.

- Supervising the GT project team's adherence to health and safety protocol and correcting conditions that could result in injury or exposure to hazardous substances.

## **SCOPE AND APPLICABILITY**

A copy of this health and safety plan must be kept at each site during field activities.

The provisions in this plan are mandatory for the GT project team, which includes subcontractor personnel under contract with GT to perform services during the waste characterization study.

Prior to conducting field work, individuals who will be performing field work must read this Health and Safety Plan. If any information presented in the plan is unclear, the reader will contact the Project Manager for clarification. When all of the information has been read and understood, the individual will sign a copy of the acknowledgement shown on the following page.

## ACKNOWLEDGEMENT OF RECEIPT, HEALTH AND SAFETY PLAN

### Confirmation of Notification

#### HEALTH AND SAFETY PLAN FROM THE SWACO 2012 WASTE CHARACTERIZATION STUDY

As an employee or subcontractor of GT Environmental, Inc., I have read the Health and Safety Plan (HASP). I hereby acknowledge that I understand the contents of this plan and that I will use personal protective equipment and follow procedure specified in the HASP. I confirm that I will provide and use appropriate footwear during field activities. Appropriate footwear is defined as hard-soled, non-slip, steel toe boots.

I understand GT Environmental, Inc. will provide:

- Hard hats
- Safety glasses
- Gloves (inner: nitrile; outer: latex-coated kevlar)
- Safety vest
- Tyvek suit
- Ear plugs
- Dust mask

The aforementioned safety items provided by GT must be used during sorting activities. **I understand that all safety regulations must be observed and violations of safety rules or use of safety equipment is grounds for dismissal.**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## **EMERGENCY INFORMATION**

Emergency telephone numbers for reporting an emergency are listed on the cover of this Plan.

## **ACCIDENTS/INJURIES**

Depending on the severity of an injury, treatment may be given at the site by trained personnel or emergency medical technicians, or the victim may be transported to a hospital. The address and phone number of the nearest hospital to each transfer station is below:

### **Morse Road Transfer Station:**

Mount Carmel St. Ann's  
500 S. Cleveland Ave.  
Westerville, OH 43081  
614-898-4000

### **Georgesville Road Transfer Station:**

Doctors Hospital  
5100 West Broad St.  
Columbus, Ohio 43228  
614-544-1000

### **Jackson Pike Transfer Station:**

Mount Carmel  
793 West State Street  
Columbus, OH 43222  
614-234-5000

## **FIRE**

The potential for fire exists at the sites. Smoking will be prohibited by project participants while on site.

## **EVACUATION**

The Transfer Station Manager is responsible for judging if circumstances require members of the GT project team to evacuate an area during field activities. Specific evacuation procedures will be covered on the first day at each site prior to beginning field work. The GT project team will comply with evacuation procedures as defined by each Transfer Station Manager.

## **ACCIDENT/INCIDENT REPORTING**

If an accident or incident develops at the site, the first responder should take the following course of action:

- Contact the appropriate emergency service for assistance.
- Contact the on-site Project Manager
- Provide an incident report to the Project Manager

## **ACCIDENT/INCIDENT REPORT FORMAT**

In the event of an accident or incident, the first responder should provide the following details related to the event to the Project Manager:

- Name and contact number of person(s) reporting
- Location of accident/incident (i.e. name of transfer facility)
- Casualties (i.e. fatalities, disabling injuries)
- Summary of accident/incident, including date and time
- Suspected/known cause(s) of accident/incident

## **GENERAL FIELD SAFETY PROCEDURES**

Safety is the responsibility of all members of the GT project team in performing field activities. Following the procedures in this Plan will minimize the risk of injuries and accidents. Anticipated hazards while conducting field activities include, but are not limited to:

- Sharp objects, such as nails, razor blades, needles, and broken glass
- Projectiles caused from the unloading of waste from vehicles or from containers that can burst under pressure
- Physical hazards from the operation of heavy equipment such as motorized vehicles and trash compactors
- Fire or explosion caused by the ignition of methane gas or other chemicals
- Animal or insect bites
- Site physical hazards such as uneven terrain caused by debris and water hazards

## **SAFETY EQUIPMENT**

The GT Project Team must use the following personal protective equipment during field activities. GT will provide:

- Hard hats
- Safety glasses
- Gloves (inner: nitrile; outer: latex-coated kevlar)
- Safety vest

- Tyvek suit
- Ear plugs
- Dust mask

Each individual on the GT Project Team will provide and use appropriate footwear during field activities. Appropriate footwear is defined as hard-soled, non-slip, steel toe boots. Individuals will also bring sufficient water for personal use to the site each day.

## **SITE STAND OPERATING PROCEDURES**

GT project team members will conduct themselves in a professional manner at all times. The following restrictions will also be observed by all GT personnel and subcontractors performing field activities:

- Working while under the influence of intoxicants is prohibited
- Smoking anywhere on site is prohibited
- During sorting, materials should be brushed aside rather than projecting hands into a bag or pile of materials to minimize the risk of cuts or punctures from sharp objects
- Loose clothing will not be worn on-site. Long hair must be worn up inside hard hat
- Eating, drinking, and chewing gum, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material during field activities is prohibited.
- Personnel will not be admitted to the site without the proper safety equipment
- All personnel must adhere to established safety procedures at each transfer station.
- Work areas will be established for the location of various field activities; personnel are not permitted to work outside these areas unless instructed by the Project Manager.
- Contact with contaminated or potentially contaminated material should be avoided. Whenever possible, do not walk through un-solid materials including liquids or mud. Do not sit or kneel on the ground.
- Personnel should not walk in areas where heavy equipment will be operating or where there is a high risk of being struck by projectiles. Personnel will be informed of such areas prior to the start of field activities by the Transfer Station or Project Manager.
- If food or water is consumed at the site, it should only be consumed in a designated area after the decontamination procedure has been completed
- The use of earphones or any media-playing device that could reduce the ability of personnel to hear safety notifications or heavy equipment is prohibited
- Personnel must notify Project Manager if animals or insects that pose a threat to health and safety are discovered. The Project Manager will instruct personnel of the appropriate course of action.
- Any medical emergency supersedes routine safety requirements

On the first day at each transfer station, the GT project team will review the location of lavatory, water supply, extra safety equipment, and telephones. The Transfer Station Manager will review existing health and safety protocol, including evacuation procedures.

Each day before entering the site, the GT Project Manager will review that each member of the GT project team is wearing appropriate safety gear as prescribed in this Plan. At this time, equipment will be reviewed for any tears or malfunctions.

During field activities, all members of the GT project team will wipe off unknown or hazardous residues immediately. If personal protective equipment becomes damaged during field activities, it will be repaired or replaced immediately.

Personnel experiencing any physical discomfort, abnormalities, fatigue, or lightheadedness will immediately stop work, notify the Project Manager or the Data Manager, and leave the area with an escort.

## **HOUSEKEEPING**

Work areas will be kept clean and orderly at all times. Personnel should remove any tripping hazards from the immediate work area. Slipping hazards must be wiped up immediately from the sorting area.

## **DECONTAMINATION**

The risks of illness due to ingesting hazardous, toxic, diseased, or decomposed materials from the work site are significant. To minimize these risks, personnel should remove and store the outer layers of their personal protective equipment (i.e. Tyvek suits, gloves, hard hat, and dust mask) on-site. Hands, face, and nails should be thoroughly washed or scrubbed with hot water and soap prior to engaging in any activity likely to transmit materials encountered on-site into the mouth.

## **Appendix B**

# **Health and Safety Plan for the 2013 SWACO Waste Characterization Study**

**HEALTH AND SAFETY PLAN FOR THE  
2013 SWACO WASTE CHARACTERIZATION STUDY**

EMERGENCY PHONE NUMBERS

Fire, First Aid, Ambulance, Police: **911**

Hospital Nearest to SWACO Franklin County Sanitary Landfill:  
Doctors Hospital: **614-544-1000**

Hospital Nearest to Jackson Pike Transfer Station:  
Mount Carmel: **614-234-5000**

FIELD RESPONSIBILITY:

Jim Skora, Project Manager:  
**330-603-0138**

Jack Stacy, SWACO Franklin County Sanitary Landfill Manager:  
**614-871-5100**

Terry Blazer, Jackson Pike Transfer Station Manager:  
**614-517-5901**

GT Environmental, Inc.  
635 Park Meadow Road, Suite 112  
Westerville, OH 43081  
**614-794-3570, ext. 16**

**A copy of this Health and Safety Plan must be kept at the site during all field activities.**

June 2013

## **Health and Safety Plan**

GT Environmental, Inc (GT) is committed to providing a safe and healthy work environment and ensuring that its employees and subcontractors are safe when working at client facilities and sites. GT has developed this Health and Safety Plan (HASP) to be used by employees and subcontractors performing work at client sites where hazards may exist.

This Health and Safety Plan (HASP) was developed for site workers performing the SWACO Solid Waste Characterization Study with GT. The purpose of the HASP is to inform site workers of potential health and safety hazards that may be encountered at the transfer stations. It was prepared with the best available information regarding physical and chemical hazards. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this study, adherence to the requirements and recommendations in the HASP will significantly reduce the potential for occupational injury.

## **PROPOSED SCOPE OF WORK**

- Select samples of waste to be sorted and transport waste from designated area near tipping floor to designated sorting area.
- Manually sort waste into designated material categories.
- Weigh bins of sorted materials on a scale.
- Transport sorted waste to designated area.

## **RESPONSIBLE INDIVIDUALS**

Safety during the waste sort will be the responsibility of the Project Manager. The Project Manager may temporarily suspend activities on site if there appears to be a threat to health and safety. Other health and safety-related responsibilities of the Project Manager are described below.

The Project Manager will primarily be responsible for:

- Assuring members of the GT project team have access to the appropriate protective equipment and that the protective equipment is being properly utilized.
- Assuring that the GT project team is aware of the safety procedures outlined in the HASP and understand the potential hazards associated with activities at the site.

- Supervising the GT project team's adherence to health and safety protocol and correcting conditions that could result in injury or exposure to hazardous substances.

## **SCOPE AND APPLICABILITY**

A copy of this health and safety plan must be kept at each site during field activities.

The provisions in this plan are mandatory for the GT project team, which includes subcontractor personnel under contract with GT to perform services during the waste characterization study.

Prior to conducting field work, individuals who will be performing field work must read this Health and Safety Plan. If any information presented in the plan is unclear, the reader will contact the Project Manager for clarification. When all of the information has been read and understood, the individual will sign a copy of the acknowledgement shown on the following page.

**ACKNOWLEDGEMENT OF RECEIPT, HEALTH AND SAFETY PLAN**

**Confirmation of Notification**

**HEALTH AND SAFETY PLAN FROM THE SWACO 2013 WASTE  
CHARACTERIZATION STUDY**

As an employee or subcontractor of GT Environmental, Inc., I have read the Health and Safety Plan (HASP). I hereby acknowledge that I understand the contents of this plan and that I will use personal protective equipment and follow procedure specified in the HASP. I confirm that I will provide and use appropriate footwear during field activities. Appropriate footwear is defined as hard-soled, non-slip, steel toe boots.

I understand GT Environmental, Inc. will provide:

- Hard hats
- Safety glasses
- Gloves (inner liner: nitrile; outer: latex-coated Kevlar)
- Safety vest
- Polypropylene suits
- Ear plugs
- Dust mask

The aforementioned safety items provided by GT must be used during sorting activities. **I understand that all safety regulations must be observed and violations of safety rules or use of safety equipment is grounds for dismissal.**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## **EMERGENCY INFORMATION**

Emergency telephone numbers for reporting an emergency are listed on the cover of this Plan.

## **ACCIDENTS/INJURIES**

Depending on the severity of an injury, treatment may be given at the site by trained personnel or emergency medical technicians, or the victim may be transported to a hospital. The address and phone number of the nearest hospital to each facility is below:

### **SWACO Franklin County Sanitary Landfill:**

Doctors Hospital  
5100 West Broad St.  
Columbus, Ohio 43228  
614-544-1000

### **Jackson Pike Transfer Station:**

Mount Carmel  
793 West State St.  
Columbus, OH 43222  
614-234-5000

## **FIRE**

The potential for fire exists at the sites. Smoking will be prohibited by project participants while on site.

## **EVACUATION**

The Transfer Station Manager or Landfill Manager is responsible for judging if circumstances require members of the GT Project Team to evacuate an area during field activities. Specific evacuation procedures will be covered on the first day at each site prior to beginning field work. The GT Project Team will comply with evacuation procedures as defined by each Transfer Station or Landfill Manager.

## **ACCIDENT/INCIDENT REPORTING**

If an accident or incident develops at the site, the first responder should take the following course of action:

- Contact the appropriate emergency service for assistance.
- Contact the on-site Project Manager
- Provide an incident report to the Project Manager

## **ACCIDENT/INCIDENT REPORT FORMAT**

In the event of an accident or incident, the first responder should provide the following details related to the event to the Project Manager:

- Name and contact number of person(s) reporting
- Location of accident/incident (i.e. name of transfer or landfill facility)
- Casualties (i.e. fatalities, disabling injuries)
- Summary of accident/incident, including date and time
- Suspected/known cause(s) of accident/incident

## **GENERAL FIELD SAFETY PROCEDURES**

Safety is the responsibility of all members of the GT Project Team in performing field activities. Following the procedures in this Plan will minimize the risk of injuries and accidents. Anticipated hazards while conducting field activities include, but are not limited to:

- Sharp objects, such as nails, razor blades, needles, and broken glass
- Projectiles caused from the unloading of waste from vehicles or from containers that can burst under pressure
- Physical hazards from the operation of heavy equipment such as motorized vehicles and trash compactors
- Fire or explosion caused by the ignition of methane gas or other chemicals
- Animal or insect bites
- Site physical hazards such as uneven terrain caused by debris and water hazards

## **SAFETY EQUIPMENT**

The GT Project Team must use the following personal protective equipment during field activities. GT will provide:

- Hard hats
- Safety glasses
- Gloves (inner: nitrile; outer: latex-coated kevlar)
- Safety vest
- Tyvek suit
- Ear plugs
- Dust mask

Each individual on the GT Project Team will provide and use appropriate footwear during field activities. Appropriate footwear is defined as hard-soled, non-slip, steel toe boots. Individuals will also bring sufficient water for personal use to the site each day.

## **SITE STAND OPERATING PROCEDURES**

GT Project Team members will conduct themselves in a professional manner at all times. The following restrictions will also be observed by all GT personnel and subcontractors performing field activities:

- Working while under the influence of intoxicants is prohibited
- Smoking anywhere on site is prohibited
- During sorting, materials should be brushed aside rather than projecting hands into a bag or pile of materials to minimize the risk of cuts or punctures from sharp objects
- Loose clothing will not be worn on-site. Long hair must be worn up inside hard hat
- Eating, drinking, and chewing gum, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material during field activities is prohibited.
- Personnel will not be admitted to the site without the proper safety equipment
- All personnel must adhere to SWACO's established safety procedures at the work site.
- Work areas will be established for the location of various field activities; personnel are not permitted to work outside these areas unless instructed by the Project Manager.
- Contact with contaminated or potentially contaminated material should be avoided. Whenever possible, do not walk through un-solid materials including liquids or mud. Do not sit or kneel on the ground.
- Personnel should not walk in areas where heavy equipment will be operating or where there is a high risk of being struck by projectiles. Personnel will be informed of such areas prior to the start of field activities by the Transfer Station, Landfill, or Project Manager.
- If food or water is consumed at the site, it should only be consumed in a designated area after the decontamination procedure has been completed.
- The use of earphones or any media-playing device that could reduce the ability of personnel to hear safety notifications or heavy equipment is prohibited.
- Personnel must notify Project Manager if animals or insects that pose a threat to health and safety are discovered. The Project Manager will instruct personnel of the appropriate course of action.
- Any medical emergency supersedes routine safety requirements.

On the first day at each transfer station, the GT Project Team will review the location of lavatory, water supply, extra safety equipment, and telephones. The Transfer Station or Landfill Manager will review existing health and safety protocol, including evacuation procedures.

Each day before entering the site, the GT Project Manager will review that each member of the GT Project Team is wearing appropriate safety gear as prescribed in this Plan. At this time, equipment will be reviewed for any tears or malfunctions.

During field activities, all members of the GT Project Team will wipe off unknown or hazardous residues immediately. If personal protective equipment becomes damaged during field activities, it will be repaired or replaced immediately.

Personnel experiencing any physical discomfort, abnormalities, fatigue, or lightheadedness will immediately stop work, notify the Project Manager or the Data Manager, and leave the area with an escort.

## **HOUSEKEEPING**

Work areas will be kept clean and orderly at all times. Personnel should remove any tripping hazards from the immediate work area. Slipping hazards must be wiped up immediately from the sorting area.

## **DECONTAMINATION**

The risks of illness due to ingesting hazardous, toxic, diseased, or decomposed materials from the work site are significant. To minimize these risks, personnel should remove and store the outer layers of their personal protective equipment (i.e. polypropylene suits, gloves, hard hat, and dust mask) on-site. Hands, face, and nails should be thoroughly washed or scrubbed with hot water and soap prior to engaging in any activity likely to transmit materials encountered on-site into the mouth.