SOLID WASTE STREAM STUDY FOR WAYNE, NEBRASKA

Prepared for

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1.0 INTRODUCTION

Engineering Solutions & Design, Inc. (ES&D) was contracted by WasteCap Nebraska to perform a limited waste characterization study to provide waste stream information for five selected communities in Nebraska. One-day field sampling events were conducted at the solid waste facilities where each of the five selected community's waste was delivered for disposal.

1.1 STUDY PURPOSE AND DEFINITIONS

The main objective of this study was to identify the waste stream characteristics of the five selected Nebraska communities. These five communities are involved in zero waste efforts and this study is designed to provide a basic understanding of the composition of the waste in each community. This information can then be utilized to identify opportunities for reducing and eventually eliminating waste in these communities.

In order to better understand the purpose of this project, it is important to define waste characterization, also known as a waste sort or waste pick. In general, a waste characterization project encompasses sorting a portion of the solid waste stream. For this project, the waste sort encompassed sorting through a portion of the one-day solid waste stream at five predetermined selected facilities. Solid waste that was sorted during these one-day field sorting events was generated from a variety of users and included residential, commercial, or mixed waste.

Throughout this report a variety of terms specific to the waste characterization process are used. Definitions for some of these terms are listed in Table 1.1. For purposes of this study, waste generated at apartment complexes was considered either residential or commercial waste depending upon how it was collected and delivered to the solid waste facility. Apartment waste placed in dumpsters and collected together with waste from commercial generators such as restaurants, offices, retail stores, etc. was considered a part of the commercial waste stream. Conversely, apartment waste that was placed in cans, bags and/or toters and collected along with waste collected from single family dwellings was considered a part of the residential waste stream.

TABLE 1.1
DEFINITIONS

Term	*Definition*
Field Sorting Event	Activities undertaken at a participating solid waste facility that encompassed all functions necessary to gather data to accurately determine the characteristics of the waste stream (also see Waste Pick or Waste Sort).
Waste Pick or Waste Sort	The sorting of a sample of waste to determine its characteristics. This effort can be used to define the characteristics of the entire waste stream or to identify specific items in the waste stream.
Load	The contents of a solid waste collection vehicle.
Sample	The portion of the load selected for sorting. The optimum sample size varies from 200 to 300 pounds.
Waste-Material Category	A defined single category for a portion of the waste stream or a group of related waste-material components. For example, paper fibers, food waste, yard waste, and diapers are waste-material categories; and the paper fibers category comprised of the cardboard, office paper, newsprint, magazines, paperboard, and mixed paper waste-material components.
Waste-Material Component	A defined portion of the waste stream that combines with other related components to form a category. For example, cardboard, PET #1, clear glass containers, and aluminum containers are all waste-material components.
Visual Inspection	An inspection conducted by walking around the load once it is removed from the collection vehicle. This inspection is utilized to identify large items in a load as well as to ascertain a broad concept of the characteristics of the load.
Residential Waste	Waste generated by households at either single family residences or apartment residences.
Commercial Waste	Waste collected from restaurants, grocery stores, dry goods stores, apartment buildings, small businesses, office buildings, schools, medical centers, and/or similar facilities.
Mixed Waste	A combination of commercial and residential waste.

TABLE 1.1
DEFINITIONS (continued)

Term	*Definition*
Curbside or Street Collection	The process of placing bags, cans, carts and/or toters filled with solid waste at the curbside or edge of street for collection.
Front Loader	A solid waste collection vehicle that collects waste utilizing two forks to lift various size containers or dumpsters. Solid waste is loaded into the top of the truck and compacted within the box. This type of truck is typically utilized for the collection of solid waste generated by commercial users.
Rear Packer	A solid waste collection vehicle that collects waste by placing it in an opening at the rear of the truck. The waste can be placed manually or via automated means. The solid waste is mechanically pushed into the box of the truck and compacted. This type of truck is typically utilized to collect solid waste generated by residential users.
Side Loader	A solid waste collection vehicle that collects waste by placing it in an opening at the side of the truck. The waste can be placed manually or via automated means. The solid waste is mechanically pushed into the box of the truck and compacted. This type of truck is typically utilized to collect solid waste generated by residential users.
Roll-Off	A solid waste collection vehicle that collects waste deposited in a large metal container (dumpster) from one location, such as a construction site, large store, shopping mall, or industrial site. This vehicle then delivers the waste to a disposal facility, where the container is rolled off and unloaded. The empty container is then returned to the waste generator.
Bags	Non-rigid plastic containers that are filled with solid waste and placed at the curb or in alleys for collection. The opening of the container is usually secured by a metal or plastic tie.
Cans	Rigid metal or plastic containers that are filled with solid waste and placed at the curb or in alleys for collection. The opening in these containers is typically secured with a lid.

TABLE 1.1
DEFINITIONS (continued)

Term	***Definition***
Carts or Toters	Rigid plastic containers that are filled with solid waste and placed at the curb or in alleys for collection. These containers have wheels and are designed to be utilized by collection vehicles that have automated mechanisms for lifting the container and unloading it into the collection vehicle. The opening in these containers is typically at the top and secured with a lid that is attached to the container.
Dumpsters	Rigid metal or plastic containers that are filled with solid waste. These containers are typically rectangular in shape and are typically utilized to service large commercial waste generators. These containers are collected by front loading vehicles s that utilize forks to lift the dumpster onto the top of the truck where the container is tipped and the contents unloaded in the vehicle. The opening in these containers is typically at the top or side and is secured with a lid that is attached to the container.

1.2 PARTICIPATING FACILITIES

One-day field sorting events (waste sorts) were undertaken at facilities where each selected community's solid waste was delivered for disposal. The five selected Nebraska communities included Imperial, Wayne, Louisville, Hastings, and Broken Bow (see Map 1.1) and are briefly delineated below.

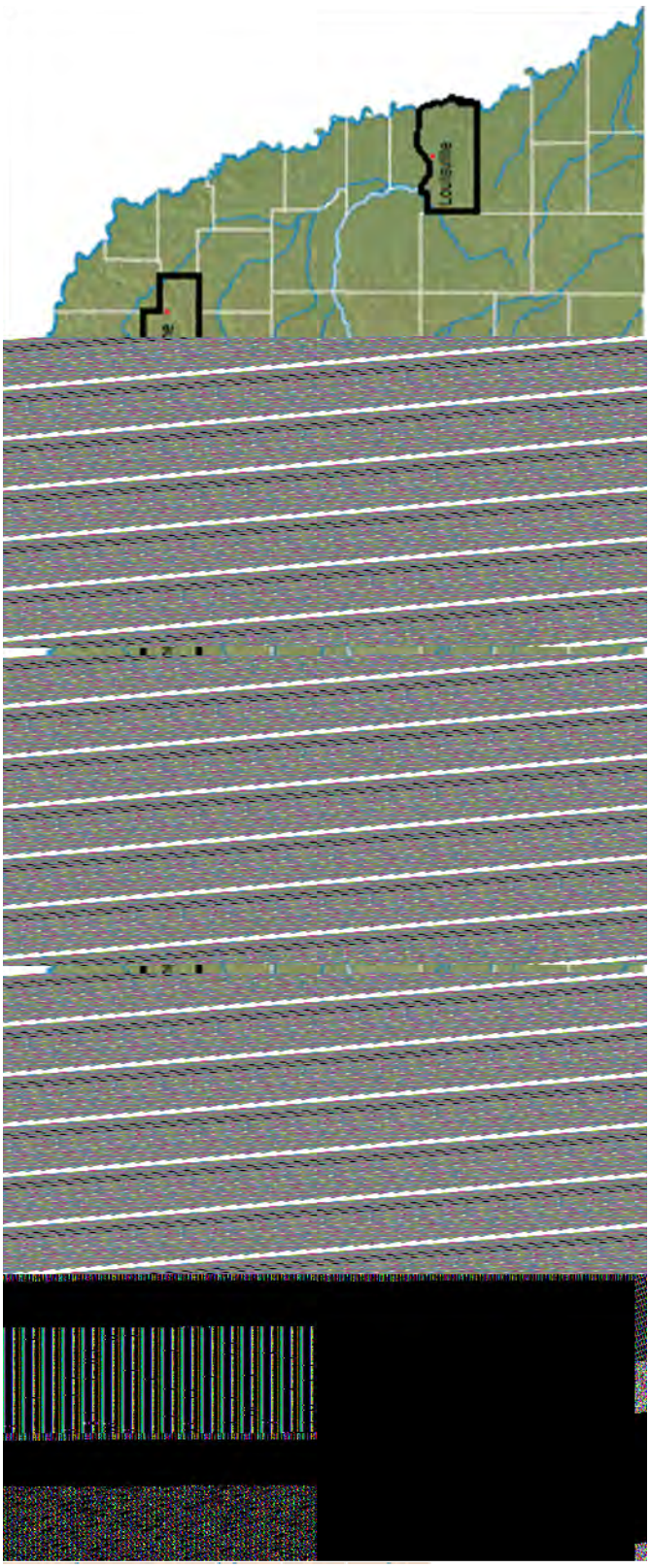
1. All of the residential and commercial waste collected in Imperial is delivered to the South West Nebraska Transfer Station on Tuesdays and Thursdays. The transfer station is owned and operated by the South West Nebraska Solid Waste Agency and is located south and slightly west of the city. Imperial is the county seat of Chase County and is located in the southwest corner of Nebraska.

2. Wayne's residential and commercial solid waste is collected by a private hauling company on Wednesdays and delivered to the City of Wayne Solid Waste Transfer Station. This facility is privately owned and operated. It is located near the eastern boundary of the city. Wayne serves as the county seat for Wayne County, which is in the northeast portion of Nebraska.

3. Louisville is located in Cass County, just south of the Cass County-Sarpy County line. Louisville's residential waste is collected by a private hauling company on Thursdays and delivered to the Sarpy County Landfill. Commercial waste generated in Louisville is collected throughout the week by a variety of private haulers along with waste from other communities and delivered to the Sarpy County Landfill. The landfill is publicly owned and privately operated. It is located near Springfield, Nebraska, which is south and slightly west of the Omaha Metropolitan Area.

4. All of Hastings' residential and commercial waste is collected by private haulers and delivered to the City of Hastings Landfill. Waste from Hastings is delivered to the landfill every weekday. The landfill is publicly owned and operated. It is located in Adams County in the southwestern quadrant of the city. Hastings is the county seat for Adams County.

5. Broken Bow's residential and commercial solid waste is collected by a private hauling company and delivered to the Custer Transfer Station, which is located in the western portion of the city. The transfer station is privately owned and operated. The majority of Broken Bow's waste is collected and delivered to this facility on Mondays and Wednesdays. Broken Bow is in Custer County, which is located in the approximate center of the state, and serves as the county seat.



MAP 1.1
LOCATION OF FIVE SELECTED COMMUNITIES

1.3 PRE-SORT SITE ASSESSMENTS

During the week of August 19, 2014, ES&D visited each community and facility selected for participation in this study. ES&D's project team met with the landfill or transfer station manager at each facility and explained the field activity procedures and the team's needs. Then, the project team toured the facility, reviewed the facility's operation procedures, and discussed the facility's service areas. During the facility tour, the project team ascertained the best and least intrusive area for the team to conduct its field sorting activities. Detailed discussions were undertaken between the project team and each facility manager to identify the flow of waste into each site, day-to-day variations in solid waste delivered to each site, and any specific peculiarities in the solid waste delivered to each site.

At the conclusion of these site visits, ES&D established a schedule for the field activities and determined the sorting area needs and configuration at each facility. Keeping in mind that only waste from each of the selected communities would be sampled, the schedule for field sorting events was established and is presented in Table 1.2.

TABLE 1.2
SCHEDULE OF FIELD SORTING EVENTS

Community	Facility	Day and Date of Scheduled Field Sorting Event
Imperial	South West Nebraska Transfer Station	Tuesday, September 30, 2014
Wayne	City of Wayne Solid Waste Transfer Station	Wednesday, October 1, 2014
Louisville	Sarpy County Landfill	Thursday, October 2, 2014
Hastings	City of Hastings Solid Waste Landfill	Friday, October 3, 2014
Broken Bow	Custer Transfer Station	Monday, October 6, 2014

2.0 METHODOLOGY

During field sorting events at each participating facility, the work day varied in length and was dependent upon the facility's operating hours and the anticipated number of loads from the selected community. Set-up time consumed approximately one-half hour as did breakdown time at the end of each day.

At each facility the waste sort team size varied based on the size of the facility and the anticipated number of samples. The sort team was typically comprised of the project manager, an individual to collect and record data (data analyst), and one or two additional individuals to assist in the sorting process. All field sorting team members were outfitted with Tyvek protective suits, Kevlar lined gloves, safety goggles, hard hats, and high-visibility safety vests.

The first step in the sort process is setting up the site. At the City of Hastings Landfill, the sort area was located as close to the working face as possible, but in a location that did not adversely impact the operation of the facility. The sorting area was set up within 100 feet of the edge of the working face in order to reduce the distance team members needed to traverse when carrying samples to the sort area.

A two-tent complex comprised the sort area. One of the tents was configured as a work station with sort tables where portions of the sample were placed for categorizing. Two or three material sorters sorted and categorized waste in this tent. The second tent was configured with tables, scales, and supplies for material weighing and data gathering. Two scales were utilized for weighing captured samples and sorted waste. A floor scale (with the capacity to accurately weigh up to 220.0 pounds) was positioned adjacent to the tracking table and a smaller scale (with the capacity to accurately weight up to 100.00 pounds) was placed on the tracking table. This configuration allowed for an ease of use and reduced the need for excessive bending and lifting.

An identical configuration was used at the transfer station facilities where field sorting events were undertaken for this project. However, instead of erecting a tent complex, the stations and tables were set up inside the building. At all of these facilities, the sort area was located in a segregated portion of the building so the sort team's interference with the facility's operation was minimized.

At the end of each day, the sort area was dismantled. All equipment was placed in the proper carrying cases and loaded into the team's vehicles. All setup and breakdown procedures were reviewed with, and approved by, the facility operators to reduce misunderstandings and allow for adjustments as necessary.

2.1 LOAD SELECTION PROCESS

When a vehicle arrived at the site with waste from the selected community, an initial interview was conducted with the driver to re-confirm the load content and collection location. Upon confirmation that the load contained waste from the selected community, the driver was directed to unload the vehicle at a segregated location near the landfill's working face or adjacent to the sorting area in the transfer station.

Vehicles were unloaded in thirds. This was accomplished by unloading the first third of the load and then moving the vehicle forward approximately 10 feet. The next third was then unloaded and the vehicle moved again. The final third of the load was then unloaded. Depending on how tightly the waste was compacted within the vehicle, the load flowered which allowed for an easier selection of the sort sample.

After the vehicle was unloaded, the driver was interviewed in more detail. A standard interview form was utilized for consistency. Some of the information gathered during this interview included: (1) vehicle owner; (2) type of collection vehicle; (3) type of waste – residential, commercial, or mixed; (3) county of origin and specific service area, if available; (4) net weight of load, if available; and (5) any driver observations or noted anomalies within the load.

In addition to completing an interview with the vehicle driver, a detailed visual inspection of each selected load was undertaken. An example of the interview and visual inspection form utilized throughout this study is presented in Table 2.1. The visual inspection entailed observing the load being discharged from the collection vehicle and walking around the entire perimeter of the load once it was discharged (a walk around). The walk around was first conducted in a clockwise direction. Once the entire perimeter was traversed, a second walk around was conducted in a counter-clockwise direction. This method allowed for a complete observation of the load while also taking into account variations in lighting, the likely skewed position of the load, and viewing the load from a variety of angles.

During the unloading and walk around inspections, all anomalies and large seams of a particular waste category were noted. Photographs of each load were taken to note the overall characteristics of the load along with a photograph of the delivering vehicle. All large or bulky items were noted, and where possible, the predominant materials of the load were determined.

TABLE 2.1
EXAMPLE INTERVIEW AND VISUAL INSPECTION FORM

CONTROL #		SAMPLE BIN NUMBERS	
FACILITY		DATE	
TRUCK OWNER		TRUCK #	
TIME IN		NET WGT	
TYPE OF TRUCK	☐ REAR ☐ FRONT ☐ SIDE ☐ ROLL-OFF		
SERVICE AREA TYPE OF WASTE DRIVER OBSERVATIONS	County: _____Community: _____ ☐ RES ☐ COM ☐ MIX ☐ Single Family ☐ Apartments ☐ Retail ☐ Offices ☐ Restaurants ☐ Nur Home ☐ Hospital ☐ Dr Offices ☐ Schools		

CPUs		Televisions		Sofas	
Keyboards		VCR or DVD		Stuffed Chairs	
Monitors		Tires		Mattresses	
Printers		Wood Pallets		Fluorescent Bulb	
Stereos		Small Apps		Oil Filters	
Speakers		Large Apps		Dead Animals	

Lumber ☐ Plumbing Fix ☐ Elec Wire/Cable ☐ Insulation ☐ Siding ☐
Shingles ☐ PVC Pipe ☐ Plastic Strap ☐ Carpet ☐ Metal ☐
Doors ☐ Windows ☐ Drywall ☐ Linoleum ☐ Styrofoam ☐ Plastic Bins ☐
Patio Furn ☐ Wood Furn ☐ Metal Furn ☐ Office Furn ☐
Yard Equip ☐ Garden Hose ☐ Bicycles ☐ Car Seats ☐ Strollers ☐
Plastic Toys ☐ Stuffed Toys ☐ Books ☐
Car Parts - Body ☐ Car Parts - Engine ☐ Limbs & Brush ☐ Yard Waste ☐

2.2 SELECTING THE SAMPLE

After the selected load was discharged from the collection vehicle and the detailed visual inspection was completed, a decision was made to determine what portion of the load was to be sampled. The portion to be sampled was randomly selected keeping in mind that a broad spectrum of data was desired. Using information and observations garnered from the visual inspection, locations within the load were selected and the sample materials were collected from these locations. The goal was to gather a sample weighing between 200 and 300 pounds. It was important to maintain a consistent sample size in order to ensure accuracy, allow for continuity between sort locations, and allow for ease in controlling the sort activities. This results in greater confidence in the data.

2.3 SORTING AND CATEGORIZATION PROCESS

After a load was discharged from the delivering vehicle and the portion to be sampled was determined, the physical waste sort could commence. Waste was gathered from the designated load portion and placed into sampling bins. The sample bins were then carried to the sort area, weighed and then taken to the sort station. The sort station was comprised of two tables with a series of various sized bins. Each bin was labeled with a specific material category or component. Solid waste was removed from the sample bins and placed on the tables where it was sorted into the different waste-material categories/components by placing the material in the bin that best corresponded to the material. As each bin became full, it was weighed on a digital bench scale and its weight recorded. Table 2.2 presents an example of the form used to record the waste-material category weights for each sample. Table 2.3 provides brief definitions of each of the waste-material categories and components used throughout this study.

After the team sorted, categorized and weighed the designated sample materials, the waste was discarded. Depending on the facility and site constraints, the waste was discarded onto the tipping floor at transfer stations, into the bucket of a front-end loader, or onto a portion of the working face at the participating landfill.

TABLE 2.2
EXAMPLE DATA RECORDING SHEET

CONTROL NUMBER		**SAMPLE BIN NO.**	
FACILITY		**DAY/DATE**	
SAMPLE BIN WGT		**SAMPLE BIN WGT**	
SAMPLE BIN WGT		**SAMPLE BIN WGT**	
SAMPLE BIN WGT		**SAMPLE BIN WGT**	
GROSS SAMPLE WEIGHT		**NET SAMPLE WEIGHT**	

MATERIAL CATEGORY	WEIGHT	WEIGHT	WEIGHT	WEIGHT	WEIGHT	WEIGHT
Cardboard						
Office Paper						
Newsprint						
Magazines						
Paperboard/Liner Board						
Mixed Paper						
PET#1						
HDPE #2						
Other Numbered Containers						
Plastic Film/Wrap/Bags						
Other Plastics						
Glass Containers						
Other Glass						

TABLE 2.2
EXAMPLE DATA RECORDING SHEET (continued)

MATERIAL CATEGORY	WEIGHT	WEIGHT	WEIGHT	WEIGHT	WEIGHT	WEIGHT
Aluminum Cans						
Tin Cans						
Other Aluminum						
Other Tin						
Food Waste						
Diapers						
Textiles/Rubber/Leather						
Yard Waste						
Non-Distinct						
Household Hazardous						
Electronic Waste						
Empty Aerosol Cans						
Mixed Metals						
Dry-Cell Batteries						
Misc. C/D Waste						
Wood						
Oil Filters						

TABLE 2.3
WASTE-MATERIAL CATEGORY DEFINITIONS

PAPER FIBERS CATEGORY	
Cardboard	Cartons and boxes made of corrugated paper
Office Paper	High-grade paper, printing and writing papers including ground-wood and thermo-chemical pulps
Newsprint	Printed ground-wood newsprint and other minimally bleached ground wood
Magazines	Glossy papers and inserts including catalogs, magazines, and mailings
Paperboard/Liner Board	Heavyweight liner board, cereal boxes, and forms
Mixed Paper	Paper not included above or that is not easily recycled including carbon paper, tissues, napkins, paper towels, foil-lined paper, and waxed-coated papers (i.e. milk and juice cartons)
PLASTICS CATEGORY	
PET #1	Soft drink, water or mouthwash bottles and similar containers with PET or #1 inscribed on the container
HDPE #2	Milk, water or juice bottles and similar containers with HDPE or #2 inscribed on the container
Other Numbered Containers	Clear food packaging, wire and cable insulation, squeezable bottles, ketchup bottles, yogurt containers, margarine tubs, compact disc jackets, egg cartons, meat trays, and similar materials with #3, #4, #5, #6 or #7 inscribed on the container
Plastic Film/Wrap/Bags	Plastic bags and film including dry cleaning bags, bread bags, retail bags, trash bags, plastic wrap, and bubble wrap
Other Plastics	All other plastics including compact discs, hard plastic toys and similar materials that do not have a number inscribed on them
GLASS CATEGORY	
Glass Containers	Clear and colored glass bottles and jars
Other Glass	Window glass, mirrors, light bulbs, ceramics

TABLE 2.3
WASTE-MATERIAL CATEGORY DEFINITIONS (continued)

METALS CATEGORY	
Aluminum Cans	Beverage cans made of non-ferrous metal
Tin Cans	Empty ferrous metal containers including tin cans, steel cans and metal containers to which a magnet adheres
Other Aluminum	Ferrous metal pieces that are not containers and to which a magnet adheres
Other Tin	Non-ferrous metals that are not containers including cookware, take-out containers, and metals to which a magnet does not adhere
OTHER WASTE CATEGORIES	
Food	Vegetative matter and animal byproducts
Diapers	Plastic disposable diapers
Textiles/Rubber/Leather	Clothing, shoes, cushions, curtains, rubber mats, rugs, and similar products
Yard Waste	Leaves, grass clippings, garden waste, and brush
Non-Distinct Waste	Miscellaneous materials, kitty litter, wax, soap, etc. and those items made of mixed materials including the following categories.
Household Hazardous	Paints, pesticides, cleaners, solvents, antifreeze, etc. and containers with any unused portion of these products
Electronic Waste	Computer parts and peripherals, small appliances, cameras, cellular phones and other wireless devices, televisions, audio and stereo equipment, videocassette recorders and digital video disc players, video cameras, telephones, fax machines, copy machines, video game consoles, and similar products
Empty Aerosol Cans	Pressurized containers that dispense a substance as an aerosol
Mixed Metals	Items that contain both ferrous and non-ferrous materials
Dry-Cell Batteries	Cell phone batteries and other alkaline and non-alkaline batteries
Misc. C/D Waste	Pieces of asphalt shingles, drywall, plumbing fixtures, HVAC and similar pieces of materials used in construction
Wood	Dimension lumber used in construction and plywood pieces
Oil Filters	Filters that treat oil in automobiles, trucks, and other machinery

2.4 WEIGHT DETERMINATION

To facilitate weighing each sampling bin, a portable electronic scale (Ohaus ES Bench Scale, Model #ES100L) was utilized. The scale's weighing capacity is accurate to 0.1 pound up to a capacity of 220.0 pounds. At the sorting stations, as each categorized bin became full it was carried to a separate scale and weighed. This scale's (Champ SQ with an Ohaus Model CD-11 indicator) weighing capacity is 100.00 pounds and is accurate to 0.01 pounds. The gross weight of the bin and waste was recorded and the bin was transported to a separate area and emptied. For some categories, each bin was filled and weighed several times. For other categories, each bin was either fully- or partially-filled and weighed at the end of the categorization process for that specific sample. When the categorization process for each selected sample was complete, the gross weight (bin + waste), bin weight, and net weight (gross weight - bin weight) for each waste-material category or component was totaled.

2.5 DATA RECORDING AND QUALITY CONTROL

The data for each sample was recorded on forms prepared specifically for this project (see Table 2.1 and Table 2.2). The data forms were prepared so that the data could be easily entered into a computer data base. Data for each sample was recorded on separate forms. Each sample was assigned a unique control number. Each sample's control number was recorded on all forms and data related to that specific sample. This numbering system ensured that data from one sample was not contaminated with information from another sample.

All sort procedures were monitored regularly by the project manager throughout each field sorting day. Each sort result was reviewed for anomalies and no sample was discarded until the data was initially reviewed.

3.0 DATA RESULTS AND ANALYSIS

Wayne is the county seat for Wayne County, Nebraska and is located in the northeast portion of the state. Wayne's residential and commercial solid waste is collected by a private hauling company on Wednesdays and delivered to the City of Wayne Solid Waste Transfer Station. This facility is privately owned and operated. It is located near the eastern boundary of the city.

According to U.S. Census Bureau data, the population of Wayne was 5,660 and its land area encompassed 2.251 square miles. Additionally, Wayne County's population totaled 9,595 in 2010 and it occupied a land area of 443 square miles.

3.1 WORK PLAN

During the pre-sort site visit to Wayne and the transfer station that accepts its waste, ES&D's project team met with the facility's manager and explained the field activity procedures and the team's needs. Then, the project team toured the facility and reviewed the facility's operation procedures. During the facility tour, the project team ascertained the best and least intrusive area for the team to conduct its field sorting activities. Additionally, through discussions with the facility's operations staff, the project team ascertained when solid waste from Wayne was delivered to the facility, day-to-day variations in the solid waste delivered to the site, and any specific peculiarities in the solid waste delivered to the site. At the conclusion of this site visit, ES&D decided that Wednesday would be the best day to undertake the one-day field sorting event for Wayne.

After discussing the sort team's needs, it was decided that the sorting area would be set up inside the transfer station building, in the northern portion of the building. Collection vehicles would follow their normal routine and deposit their loads onto the tipping floor in the southern bay. Once the sample was captured and all pertinent information obtained, operators could employ their normal procedures and place the load into the transfer trailer.

3.2 FIELD SORTING EVENT AND CONDITIONS

Field activities to sort Wayne's waste were undertaken on Wednesday, October 1, 2014. The set up and organization of waste characterization equipment was conducted inside the transfer station. The sort area configuration encompassed two stations with one used for sorting waste and one for weighing and recording weights.

One load of mixed waste from Wayne was delivered to the transfer station by Gill Hauling on Wednesday, October 1, 2014. Once the waste was unloaded onto the tipping floor, the driver interviewed, the visual inspection conducted, and the sample captured, the remaining waste was pushed into a subterranean transfer trailer with a front-end loader and the area was cleaned.

The captured sample was taken to the sort area where it were sorted, categorized, and weighed following the methodology outlined in Section 2.0 of this report. After each of the materials from the sample were sorted, categorized, and weighed, they were discarded directly into the transfer trailer.

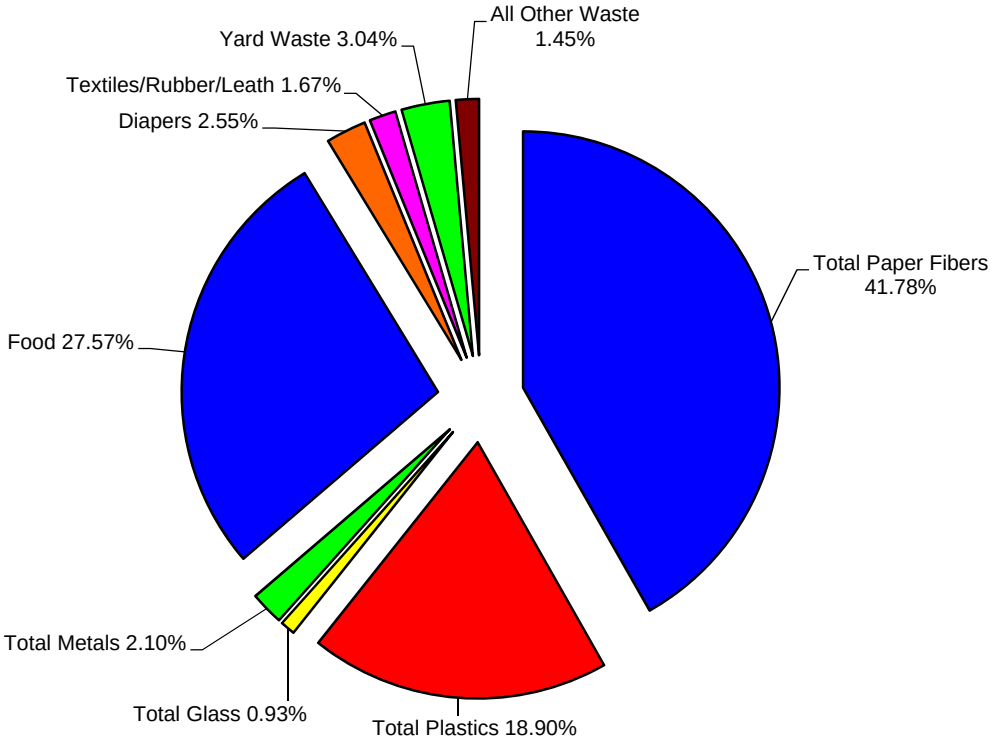
3.3 DATA RESULTS

Detailed data for the sample was compiled throughout the one-day field sorting event undertaken for Wayne. For example, the weights of the materials found in the sample were recorded, items sighted during the visual inspection were quantified and noted, and sample specifics like the type of waste, county of origin, etc. were also noted. The sample's weight data along with its specifics were then compiled into a summary table, which is presented in the table and charts on the following pages.

TABLE 3.1
WEIGHT DATA SUMMARY FOR WAYNE

DAY AND DATE	Wednesday, October 1, 2014	
ORIGIN OF WASTE - COMMUNITY	Wayne	
TYPE OF WASTE	Mixed	Single Family Homes, Apartments, Retail, Restaurants, Nursing Homes, Doctors' Offices, Schools
NET WEIGHT AND TYPE OF TRUCK	6.92 tons	Rear Packer

Material Category	Net Weight (pounds)	% of Material Category	% of Sorted Sample
Cardboard	27.65	22.08%	9.22%
Office Paper	19.50	15.57%	6.51%
Newsprint	3.75	2.99%	1.25%
Magazines	2.30	1.84%	0.77%
Paperboard/Liner Board	16.95	13.53%	5.65%
Mixed Paper	55.10	43.99%	18.38%
TOTAL PAPER FIBERS	**125.25**		**41.78%**
PET #1	6.50	11.47%	2.17%
HDPE #2	2.80	4.94%	0.93%
Other Numbered Containers	3.50	6.18%	1.17%
Plastic Film/Wrap/Bags	22.00	38.83%	7.34%
Other Plastics	21.85	38.57%	7.29%
TOTAL PLASTICS	**56.65**		**18.90%**
Glass Containers	2.05	73.21%	0.68%
Other Glass	0.75	26.79%	0.25%
TOTAL GLASS	**2.80**		**0.93%**
Aluminum Cans	2.15	34.13%	0.72%
Tin Cans	3.30	52.38%	1.10%
Other Aluminum	0.30	4.76%	0.10%
Other Tin	0.55	8.73%	0.18%
TOTAL METALS	**6.30**		**2.10%**
Food	82.65		27.57%
Diapers	7.65		2.55%
Textiles/Rubber/Leather	5.00		1.67%
Yard Waste	9.10		3.04%
Non-Distinct Waste	4.35		1.45%
TOTAL WEIGHT OF SORTED SAMPLE	**299.75**		**100.00%**



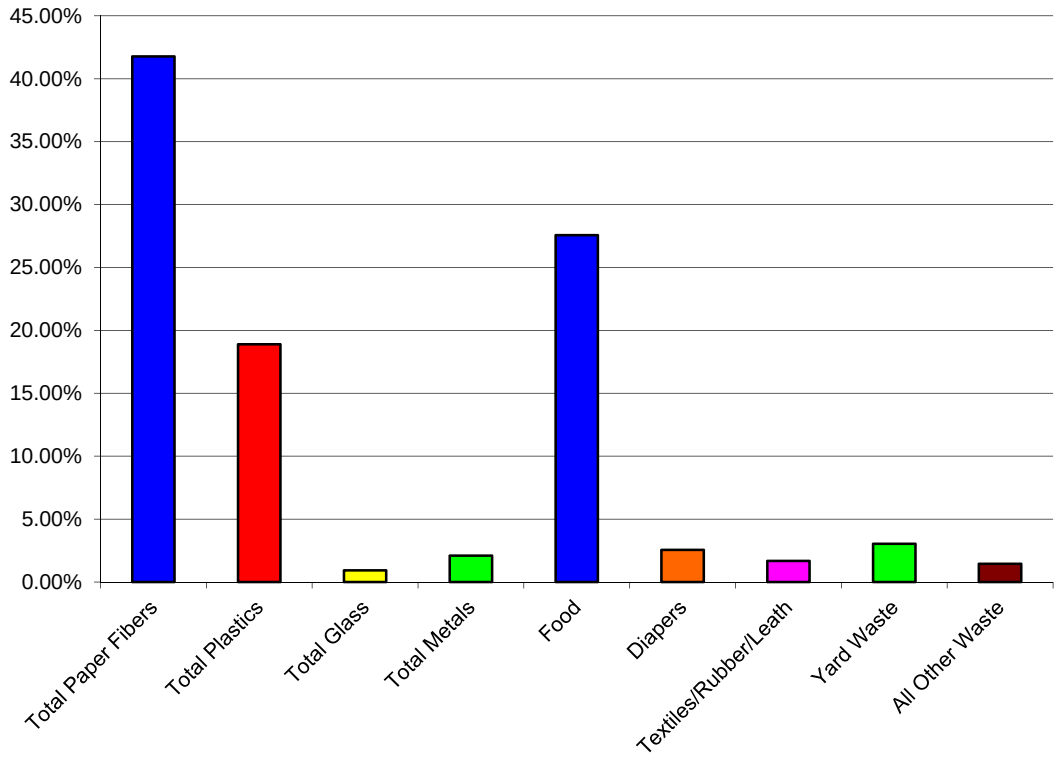


CHART 3.1
DISTRIBUTION OF THE WEIGHT DATA
FOR WAYNE

3.4 DATA ANALYSIS

Utilizing the data presented in the previous section, the one-day field sorting event results were analyzed. This analysis focused on the percentage of each material category and its percentage of the total sample. The analysis also evaluated the nine categories that comprise the waste stream (paper fibers, plastics, glass, metals, food, diapers, textiles\rubber\leather, yard waste, and non-distinct). These categories provide a distinct separation of materials within the sample and allow for ease in identifying those portions of the sample with potential for recovery and reuse.

3.4.1 Waste Characterization

One load of mixed municipal solid waste (residential and commercial) generated in the community of Wayne was sampled for this project. The sample was then sorted into categories and components to determine the waste's characteristics.

The largest category found in the one load of mixed waste generated in Wayne was paper fibers which accounted for 41.78% of the total sample. The largest component of this category was mixed paper, which comprised 18.38% of the sample. The smallest category in this sample was glass, which comprised only 0.93% of the total sample.

The paper fibers, plastics, glass, and metals categories combined comprised 63.71% of the total sample. Of the remaining nine categories, the largest category was food which accounted for 27.57% of the total sample.

3.4.2 Recycling Potential

Approximately 96% of the sample captured and sorted during the one-day field sorting event undertaken for this community is potentially recoverable and/or recyclable. Almost 42% of these materials are paper fibers and over 18% of these materials are plastics.

In an effort to further identify the recycling and/or recoverable potential of materials found in the waste stream, materials were classified as high, medium, or low signifying their potential for recycling or recovery. The potential for recycling or recovery of any material found in the solid waste stream depends on the: (1) demand for the material; (2) value of the material; (3) location of processing facilities; and (4) reuse potential of the material.

For certain materials, cardboard for example, the demand and the value of the material is high and this often outweighs the cost to transport the material to a processing facility. This results in cardboard having a high potential.

In turn, the Number 5 through 7 plastics do not have a high value, but do have a good demand level. The cost to transport the material is less than cardboard because these plastics are lighter weight and more of the material can be transported in one load. This results in the Number 5 through 7 plastics having a medium potential.

Glass has a low demand and value and there are very limited processing facilities for these materials. Further the raw material utilized in the production of glass is plentiful and inexpensive and the reuse of glass on a large scale is limited given its fragile nature. This results in glass having a low potential.

In general, and for purposes of this study, the following materials have been classified as having a high recycling or recovery potential:

- cardboard
- office paper
- paperboard/liner board
- PET #1
- HDPE #2
- aluminum cans
- food
- yard waste
- textiles/rubber/leather

Those materials that have been classified as having a medium recycling or recovery potential include:

- newsprint
- magazines
- mixed paper
- other numbered containers
- film/wrap/bags
- tin cans
- other aluminum
- other tin

Finally, those materials that have been classified as having a low recycling or recovery potential include:

- other plastics
- glass

When the materials found in the sample captured and sorted during the one-day field sorting event undertaken for Wayne are segregated using the classifications as explained above, more than 57% of the recyclables and recoverables are considered as having a high potential; more than 30% of the recyclables and the recoverables are considered as having a medium potential; and 8% of the recyclables and recoverables are considered as having a low potential.

3.4.3 Commercial Waste Characteristics

The one load of waste generated in Wayne and sampled for this project contained both commercial and residential waste. The commercial accounts that were collected in this load included retail stores, restaurants, hospitals, Doctor's offices, schools, and nursing homes.

The impact of the commercial accounts collected and sampled in this load can be seen in the quantity of food, mixed paper, office paper, and film and bags. The sizeable amount of food can likely be attributed to the collection of waste from retail stores (which includes grocery stores), schools, and restaurants. The mixed paper category is impacted by retail stores, schools, restaurants, and nursing homes because of the amount of paper towels and food containers generated and disposed by these establishments. In addition, waste collected from restaurants, retail stores, and nursing homes impact the quantity of film and bags found in a load. The type of film that is typically discarded is shrink wrap and the number of bags that are discarded increases given the number of times waste canisters are emptied during the day.

3.4.4 Visual Inspection Analysis

A visual inspection was undertaken for each load sampled for this project. The items noted during the visual inspection included a few electronic items, items that were of significant interest, and items that were too bulky and/or heavy to be included in a 200 to 300 pound sample. The sampled load of residential and commercial waste from Wayne contained a number of large items including lumber, carpet, plastic bins, Styrofoam, automobile engine parts, metal and patio furniture, stuffed toys, and PVC pipe.

4.0 WASTE REDUCTION POTENTIAL

The following section provides observations made during the field sorting event conducted at the City of Wayne Solid Waste Transfer Station and throughout the development of this report. In addition, we utilized the results of the analyses presented previously in this report to develop a set of conclusions. Both the observations and conclusions consider the concept of waste reduction and the ultimate goal of zero waste.

4.1 OBSERVATIONS

A number of observations were made during the field sorting event for Wayne. These observations are provided in no particular order and should be considered as observations made at the time or during the report preparation.

1. The solid waste load sorted at the City of Wayne Solid Waste Transfer Station contained a number of materials that can be recycled. These items include: cardboard, paperboard, newsprint, office paper, mixed paper, HDPE #2 containers, PET #1 containers, aluminum cans, tin cans, and other numbered plastic containers.

2. The transfer station where field sorting events were conducted was well organized and maintained.

3. While at the transfer station, it was noted that a few loads of waste were delivered to the facility by private citizens. These loads contained municipal solid waste as well as construction material.

4. While conducting the visual inspection, building materials, furniture, car parts, and toys were noted.

5. The collection vehicle that was selected for sorting was a rear packer.

6. Adult diapers were found as frequently as baby diapers.

7. Food comprised 27% of the waste stream.

8. Plastics comprised almost 19% of the waste stream. Film and bags comprised a predominant part of the plastics waste stream, followed by other plastics and PET #1.

9. The amount of glass and metals in the waste stream was relatively small. Glass was approximately 1% of the waste stream and metals comprised a little over 2% of the waste stream.

10. The amount of yard waste in the sampled loads was relatively small. This is likely due to the time of year when the sort occurred along with the state's yard waste ban.

11. The amount of textiles/rubber/leather was 1.67% of the waste stream. This category varies significantly and is dependent upon the time of the month and time of year. More textiles/rubber/leather are found in loads at the end and beginning of each month, when most rental leases expire. Additionally, more of these materials are found in the early fall and late spring, which corresponds to the start and end of the school year.

12. Non-distinct waste comprised only 1.45% of the waste stream. The non-distinct waste included pens, badges, and other mixed metal and plastic items.

4.2 CONCLUSIONS

The conclusions provided in this section are based on the observations presented previously as well as our experience with previously conducted waste characterization studies.

1. Based on this limited study, it appears the Wayne waste stream can be reduced. The percentage of potential reduction varies from 57% to 95%, depending upon the materials that are targeted for recycling or recovery.

2. The more recyclables that can be captured, based on total numbers, the greater the potential for a recycling program's success.

3. Continual public education and training should be instituted in order to increase the amount of recycling and waste reduction that occurs, with an emphasis on capturing recyclables at the point of generation.

4. A system of collecting the recyclables and recoverables at the community level as well as at the regional and state level should be established. As the public is better motivated and trained to recycle, a well-functioning system must be in place to respond to the increased amount of recyclables.

5. Financial support of the recycling efforts from local, regional, and state agencies as well as the private sector should continue. This support should address education and infrastructure needs, with the goal of the recycling system reaching self-sustainability.