University of Illinois Urbana-Champaign Campus Building Waste Characterization & Opportunity Assessment

May 2024

Prepared For:
University of Illinois Facilities & Services (F&S) Waste Management Department

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Introduction

Illinois Sustainable Technology Center

The Illinois Sustainable Technology Center (ISTC) is housed within the Prairie Research Institute at the University of Illinois Urbana-Champaign (U. of I.). ISTC provides information, resources, and technical assistance to help organizations improve their environmental footprint. Within ISTC, the Technical Assistance Program (TAP) makes companies and communities more competitive and resilient with sustainable business practices, technologies, and solutions. TAP works at the intersection of industry, science, and government to help organizations achieve profitable, sustainable results.

The TAP Zero Waste Illinois team provides a variety of cost-effective, sustainable material management services to assist clients throughout Illinois and beyond in their journey to zero waste. We help organizations achieve zero waste at every step by being a resource for innovative disposal and reuse of materials, and by conducting waste audits and assisting with materials management planning, supply chain optimization, and stakeholder engagement.

Project Background

Previous Collaborations

As part of the U. of I. campus community itself, TAP's Zero Waste Illinois program has a long history of collaborating with the university's Facilities & Services (F&S) Waste Management department and other campus sustainability stakeholders to better manage materials and reduce waste and associated negative environmental impacts resulting from campus operations.

Figure 1: A MaxR three-bin recycling station.

Beginning in 2014, ISTC worked with F&S on a two-phase building waste characterization study, which involved sampling and characterizing waste streams from eight buildings, including two residence halls, one academic building with laboratories, one academic building without laboratories, an administrative building, the student union, a bookstore, and a mixed-use event building. Each building was also audited for availability and location of refuse and recycling bins. Additionally, employee and student occupants of the study buildings were surveyed to gauge knowledge of current programs, gaps in service, and overall satisfaction with the campus recycling program. With this data, ISTC made recommendations to improve waste reduction and diversion for the individual buildings, as well as campus-wide recommendations.

In 2019, ISTC also conducted an indoor solid waste and recycling collection and infrastructure assessment and improvement study, which among other recommendations, spurred the acquisition and deployment of new three-bin recycling collection stations to improve the consistency of recycling infrastructure, in an effort to increase both the quantity and quality of recyclable materials recovered on campus. Summaries of these and other waste reduction, diversion, and education projects conducted by ISTC for the U. of I. campus, along with links to relevant reports and other results can be found on the TAP website.

This Audit

In Fall 2021, members of the ISTC TAP's Zero Waste Illinois team began discussions with representatives from the F&S Waste Management department, the Institute of Sustainability, Energy, and Environment (iSEE), and the Illini Union (one of the buildings included in the aforementioned campus building waste characterization study) about conducting follow-up campus waste audits. These discussions included interest in ascertaining: the efficacy of the newer three-bin recycling stations, which continue to be deployed in various campus buildings but have not completely replaced older bins, in improving recycling behavior; whether recovery of recyclables has changed over time in buildings previously audited; and current levels and types of contamination in the recycling stream. The ISTC zero waste team's schedule did not permit pursuit of an audit in the spring of 2022, so discussions were put on hold until the fall semester. This also allowed F&S time to conduct a search for a full-time zero waste coordinator, ensuring dedicated staffing to address waste audit findings.

Project Funding

The university's first full-time Zero Waste Coordinator, Daphne Hulse, was hired in September 2022, and F&S resumed conversations with ISTC regarding the types of spaces to focus on, representative buildings, and budget requirements. Ms. Hulse applied for funding from the Student Sustainability Committee (SSC) to supplement available F&S funds and cover the costs of auditing eight buildings. The SSC grant was awarded in late spring 2023, and thus plans were made to conduct the audit in fall 2023.

Objectives

F&S was interested in exploring the following objectives through the current waste audit:

- Assess current campus waste management practices, waste streams, and process flows, particularly in four selected "activity zones" (see "Activity Zone Approach" below for a definition of these activity zones).
- For any buildings included in the current study which had been part of previous building waste audits conducted by ISTC in 2014 and 2015, determine whether and how the

composition of the landfill-bound and recycling waste streams have changed over time. When considering changes over time for the previously studied buildings, it will be important to consider whether and how the COVID-19 pandemic impacted waste management procedures, purchasing practices due to supply chain issues, and behavior patterns, particularly those related to hygiene, among campus community members.

- Gauge awareness among members of the campus community, especially those who regularly spend time in the study buildings, regarding campus waste management programs and practices.
- Determine, if possible, if the presence of newer three-bin collection stations improves collection of recyclables in terms of quantity and quality, with more recyclables successfully placed in recycling bins and less contamination in those recycling bins. It should be noted that such comparisons are challenging, given the uneven deployment of the newer three-bin stations across campus. While not all buildings on campus have these newer stations (only 70 buildings have them, as of this report), and while not all older recycling bins have been replaced, most of the buildings selected for the current audit have at least one of these stations. A cleaner comparison of the efficacy of newer versus older indoor recycling infrastructure could have been made if, for each activity zone studied, one building with only newer three-bin stations and one building with only older recycling bins was analyzed. However, this does not reflect the reality in most buildings on campus; the newer stations have been deployed in existing buildings based on a number of factors, including, but not limited to, supply, availability of funds to obtain additional newer stations, foot traffic in (with preference given, initially, to the deployment of newer bins in high-use areas), requests from campus departments/units, renovation of spaces, etc. The newer bins have been integrated into facility standards so that future campus buildings include the cost of these newer bins in the initial construction costs, however, new buildings on campus are relatively few. These issues will be revisited in the "Analysis of Waste Audit Data" section of this report.

What is a Waste Audit? Why Conduct a Waste Audit?

A waste audit is an assessment that identifies and measures the types of waste generated by an individual, household, organization, or institution. This typically involves hand-sorting of materials from landfill-bound (trash) and recycling waste stream samples into pre-determined material categories (e.g. cardboard, mixed paper, plastic bottles, other plastic containers, etc.) and weighing the amounts of each of those categories present in the samples. Calculating the percentage of a sample waste stream represented by each material category in turn highlights specific opportunities for waste prevention and reduction, and diversion. In October 2023 ISTC conducted a waste audit to identify and measure the types of landfill and recycling material generated on the University of Illinois Urbana campus.

The main reason a waste audit is conducted is to better understand waste and recycling generation. Better understanding these material streams allows the university to better manage them. Data from this waste audit will assist the university with a variety of activities including, but not limited to:

- Assessing how waste and recycling streams differ based on building type and use
- Assessing waste and recycling infrastructure across campus
- Reviewing purchasing standards and policies
- Exploring the development of new waste reduction and diversion programs
- Tailoring education campaigns
- Reducing contamination in the recycling stream
- Prioritizing potential improvement strategies to target those which would have the greatest impact on waste reduction or diversion

Audit Methodology

See the "Waste Audit Process" section of this report for details on audit methodology, and "Stakeholder Engagement" for a description of interactions with campus community members that were also part of the current study.

Activity Zone Approach

Due to the size and volume of waste and recycling generated on campus, sorting all material is not feasible. Thus, ISTC and F&S used an activity zone approach for this waste audit. This involves selecting a representative set of buildings across campus based on classification of a building according to its main function and service. For the purposes of this waste audit, activity zones and their respective buildings included:

1. **Academic.** These are buildings that primarily serve as spaces for student instruction. These buildings also may have offices, conference rooms, lounges, computer labs, and cafes. Representative buildings in this activity zone are the Business Instructional Facility (BIF) and the Campus Instructional Facility (CIF).

Business Instructional Facility (BIF)

Campus Instructional Facility (CIF)

2. **Academic + Laboratory.** These are buildings which house research and/or instructional laboratories. They may also house classrooms, offices, conference rooms, and lounges. Representative buildings in this activity zone are Roger Adams Laboratory (RAL) and Noyes Laboratory.

Roger Adams Laboratory (RAL)

Noyes Laboratory

3. **Multi-Activity.** These buildings serve more than one substantial function. This could be a combination of athletic or recreation facilities, study space, food services, etc. Representative buildings in this activity zone are the Illini Union and the Activities and Recreation Center (ARC).

Activities and Recreation Center (ARC)

Illini Union

4. **Student Living.** This is comprised of buildings that serve as on-campus student housing. Representative buildings in this activity zone are Lincoln Avenue Residence Halls and Allen Residence Hall. Because Lincoln and Allen residence halls share a dining facility as well as trash and recycling infrastructure, these buildings were treated as one building.

Allen Residence Hall

Lincoln Avenue Residence Halls (LAR)

Waste audit data from this list of buildings was used to formulate recommendations for waste reduction through improvements to education & outreach, infrastructure, policy, programming, purchasing, research, and collaborating with externally controlled retail outlets in campus buildings. Those recommendations for improvement can then be applied to other buildings that fall within the same activity zone categorization. This allows a campus to examine waste data and recommendations from a moderate list of buildings and make materials management plans that will impact broad areas of campus.

Building Walkthroughs

After the activity zones and buildings were chosen, ISTC contacted facility managers and/or building service worker(s) (BSW) supervisors from each building to schedule a walkthrough. On September 11th, 12th, and October 3rd, ISTC walked through each building to assess current conditions and infrastructure, discussed waste and recycling challenges and successes with facility managers, and determined the best method for sample collection during the waste audit. A review of current conditions can be viewed in "Current Management Practices" section of this report. More detailed notes from each building walkthrough were provided separately to the university F&S team.

Why Study Campus Waste? Connection to Illinois Climate Action Plan

University of Illinois Urbana-Champaign's Climate Commitments

The Illinois Climate Action Plan (iCAP) outlines a path for the University of Illinois Urbana-Champaign to achieve carbon neutrality as soon as possible, and no later than 2050.

The university first made this commitment in 2008 when it became a signatory to the American College and University Presidents' Climate Commitment (ACUPCC), later renamed the Second Nature Carbon Commitment for its emphasis on emissions. This program is managed by the non-profit organization, Second Nature. Illinois was the first Big Ten university to submit a climate action plan to Second Nature. That original 2010 iCAP was approved by Interim Chancellor Robert Easter on May 10, 2010. The online iCAP Portal was established in May 2012 to track and share updates on campus sustainability initiatives and progress.

In 2016, the university also became a signatory to Second Nature's Climate Resilience Commitment, which charges campuses to work with community partners to examine the vulnerabilities of their land management, infrastructure, and energy production. These two commitments are part of what is now known as Second Nature's Presidents' Climate Leadership Commitments. Institutes of higher education whose president/chancellor have signed onto at least one of the Presidents' Climate Leadership Commitments, become part of the Climate Leadership Network. In fall 2019, University of Illinois President Timothy Killeen reinforced these commitments for all three University of Illinois campuses by signing the Global Climate Letter, now known as the United Nations Framework Convention on Climate Change (UNFCCC) Race to Zero campaign, as one of more than 300 Global Universities and Colleges.

The iCAP is updated every five years, with input from students, faculty, staff, and community members. The current version, iCAP 2020, includes 56 specific SMART (specific, measurable, achievable, relevant, and time-based) objectives, within eight themes: Energy, Transportation, Land & Water, Zero Waste, Education, Engagement, Resilience, and Implementation.

Progress toward iCAP goals involves detailed analysis, research, and formulation of recommendations by topical iCAP Teams comprised of faculty, staff, and student members. Recommendations are then considered by the iCAP Working Group, a committee of midlevel administrators as well as students, staff, and faculty members, which evaluates and routes them to the appropriate campus unit or to the Sustainability Council for further evaluation and implementation. The Sustainability Council is chaired by the Chancellor and is composed of campus decision makers at the highest level. See a diagram of the process on the iCAP portal.

Campus Zero Waste Goals

Zero waste is an ideal state, defined by the Zero Waste International Alliance (ZWIA) as "the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health."

The iCAP 2020 includes seven primary goals related to zero waste. "Zero Waste" is the fifth chapter of the iCAP, and thus these goals are designated as 5.1, 5.2, etc. Each goal listed below is linked to further information on the iCAP Portal.

5.1: Create sustainable procurement reporting guidelines and increase compliance to 100% of business managers through training and outreach by FY24.

5.2: Reduce the total campus waste going to landfills from 5,049 tons in FY19 to 4,544 tons or less in FY24, which is a decrease of at least 10%.

> **5.2.1:** Install appropriate waste collection infrastructure throughout the University District, with new indoor bins placed in at least 150 buildings by FY24.

5.3: Establish a culture of reuse, with two major campuswide zero-waste events using durable goods and composting in FY22, four in FY23, six in FY24, and eight in FY25.

> **5.3.1:** Develop a comprehensive Zero Waste messaging campaign by FY21 and achieve a cumulative total of 10,000 "Use the Bin" pledges by FY24. The “Use the Bin” pledge involves filling out an online form pledging to always use recycling bins on campus, and agreeing that if a recycling bin can’t be found, the individual will hold on to their recyclables until one is found. If a recycling bin can’t be found, the individual will hold on to their recyclables until one is found.

5.4: Promote food scraps reduction on campus through a behavior change campaign, and tracking and recovery of surplus food for donation, with at least five new areas tracking and reporting their food waste by FY22.

5.5: Develop a detailed comprehensive plan including implementation and operational costs/benefits to sustainably dispose of all food scraps and other organics by FY24, and fully implement the plan by FY33.

5.6: Increase the use of local food to 35% by FY30.

> **5.6.1:** Implement the Food Literacy Project by FY24 by tracking carbon, nitrogen, and water footprints for food items in campus dining halls.

5.7: Establish a green cleaning program that meets LEED v.4 requirements by FY24.

Analyzing the profiles of waste streams on campus and making recommendations for improved waste reduction and recycling based on data is an essential part of working toward zero waste-related goals within the iCAP, particularly goals 5.2, 5.3, and 5.4. The data and recommendations summarized within this report are meant to support F&S in its contributions to those goals. Illinois’ Institute for Sustainability, Energy, and the Environment (iSEE) published its most recent update on progress toward these goals in January 2024.

Current Materials Management Practices

The F&S Waste Management department provides campus-wide recycling and waste hauling. The university's Waste Transfer Station (WTS) is located at 10 St. Mary's Road, Champaign, IL, 61820.

Campus Solid Waste & Recycling Statistics & Material Fates

Solid Waste

In fiscal year 2022 (which represents July 1, 2021 to June 30, 2022), the Urbana-Champaign campus generated and landfilled 4,240.09 tons of solid waste, which is below the iCAP target for FY24 (4,554 tons) based on campus climate action plan goals. This number was reported by the WTS based on weights from collection trucks. In FY23 (July 1. 2022 to June 20, 2023), campus landfilled 5,824.21 tons of waste. Though the FY23 landfilled tonnage is comparable to those from pre-COVID-19 pandemic years (5,508 tons were landfilled in FY18 and 5,911.42 tons were landfilled in FY19), a consistent downward trend in campus waste generation has not yet been established. Additionally, it is important that the university continue to strive for further waste reduction and prevention regardless of the iCAP goal because enrollment increases each year, and with more people present on campus, waste generation is bound to increase.

Through the university's current solid waste hauling contract with Green for Life (GFL), solid waste collected at the WTS is currently being sent to Clinton Landfill #3 in Clinton, IL. According to the Illinois Environmental Protection Agency (IEPA) 2022 Illinois Landfill Disposal Capacity Report, as of 2021, this landfill was estimated to have 44 years of lifetime expectancy.

Recyclables & Other Diverted Materials

There are more than 3,000 recycling bins in campus buildings for paper, plastic bottles #1&2, and aluminum cans. There is also a newspaper and cardboard drop-off location at the southeast corner of Oak Street and Kirby Avenue in Lot E14.

The following standard materials are currently collected for recycling by the F&S Waste Management department:

- **Paper** (including: all types of office paper; shredded paper, newspaper; magazines; journals; all types of envelopes; junk mail; ream wrappers; books; phone books; and manila and file folders)
- **Plastic bottles #1&2**
- **Aluminum cans**
- **Cardboard**
- **Scrap metal**

Additional materials may be recycled on campus via special programs coordinated by departments or student organizations. Other special recycling pilot programs have been

coordinated by F&S. Examples of such materials include single-use batteries, nitrile gloves, etc. Information on some of these programs is available online via the iCAP Portal, particularly within the "Zero Waste" theme. However, it should be noted that many entries in the iCAP portal need updating so the status of some programs is unclear. This may be due to several reasons including:

- There are many stakeholders contributing to iCAP including F&S, the Institute for Sustainability, Energy, and Environment (iSEE), the College of Education's Office for Math, Science, and Technology Education (MSTE), the iCAP Working Group, topical iCAP Teams, the Office of Student Sustainability, the Student Sustainability Committee,, and various staff and students working on specific initiatives.
- The campus community is transient. Faculty, staff and students who spearheaded initiatives may no longer be at the university or may no longer be involved due to changes in duties or roles.
- The campus Zero Waste Coordinator position (within F&S) has only recently become a full-time position. Prior to that it was a part-time position and there was also a period when the position was vacant.
- Some programs may have fallen by the wayside during disruptions caused by the COVID-19 pandemic.
- Some special or pilot recycling programs may never have been reported to F&S or described on the iCAP portal.

Some materials, such as regulated electronic devices, are collected on the three University of Illinois System campuses and managed at the system level, being sent to either Secure Recycling Services or Secure Processors for recycling when they are no longer appropriate for redistribution on campus or to other state agencies. Given all these factors, data on recycling of special materials, beyond the five categories of standard materials (paper, cardboard, plastic bottles #1&2, aluminum cans, and scrap metal) may not be available to F&S, it may be limited, or its accuracy may be questionable. Therefore, in this report, we will share only reliable data which F&S has for the five categories of standard materials accepted for recycling on campus, materials gathered for donation during end-of-semester Dump & Run events, and food wase diverted via Grind2Energy systems at Housing dining halls (see "Current Campus Waste Reduction & Diversion Initiatives" below for further information on the latter two programs).

In FY23, campus sold a total of 1,239.07 tons of recyclable materials, including:

- 581.96 tons of scrap metal;
- 203.92 tons (246 bales) of mixed paper;
- 9.75 tons (18 bales) of aluminum beverage cans;
- 11.75 tons (33 bales) of plastic bottles #1&2; and
- 431.69 tons (565 bales) of cardboard.

Additionally, 231 tons of food scraps were processed via Grind2Energy systems at university dining halls and 9.89 tons of unwanted materials were collected and donated to local non-profits

during student move-out as part of the Dump & Run program. Again, see "Current Campus Waste Reduction & Diversion Initiatives" below for further information on these programs.

Scrap metal is taken by F&S to Mervis Recycling, Mack's Twin City Recycling, and Mack's Auto Recycling, all of which are in Urbana, IL. Bales of other recyclables collected on campus are picked up by Green for Life (GFL) and taken to their recycling facility in South Pekin, IL. From there, materials are sent to brokers and mill-buyers as follows. Please note that this list is not exhaustive, and the fate of materials beyond the point of reaching these destinations is not currently known.

- **Cardboard (Old Corrugated Containers, or OCC)**
  - Pratt Industries, Valparaiso, IN
  - Graphic Packaging, Kalmazoo, MI and Middletown, OH
  - Green Bay Packaging, Ft Atkinson, WI
- **Sorted Office Paper (SOP):** Georgia Pacific, Green Bay, WI
- **Newsprint:** Hartmann, Rolla, MO
- **High-density Polyethylene (HDPE, a.k.a. plastic #2):** KW Plastics, Troy, AL
- **Polyethylene (PET, a.k.a. plastic #1):** Mohawk Flooring, Summerville, GA
- **Aluminum**
  - Novelis, Berea, KY
  - Constellium, Muscle Shoals, AL

Why Did the Landfilled Tonnage Increase in FY23?

The primary reason for the increase of landfilled materials in FY23 as compared to FY22 was likely a mechanical failure of the sorting line at the WTS for nearly a quarter of the fiscal year (during April, May, June, and half of July). All of the sorting-line crew members were sent home during that period, so nothing coming through the WTS was undergoing the formal second manual sorting process (see "Sorting at the Campus Waste Transfer Station (WTS)" below for details). Some cardboard and paper were pulled out of collected trash by WTS staff members, but nearly all collected trash went straight to the landfill. Thus, large amounts of potentially recyclable materials were lost due to the inability to reclaim them from landfill-bound trash.

It is likely that the increase in landfilling of materials was also partially due to a breakdown in communication regarding a bag color standard developed pre-pandemic to assist in proper sorting of accepted recyclables vs. materials to be sent to landfill. This communication breakdown resulted in collected recyclables being bagged in black bags in some buildings instead of blue bags, leading sorters at the WTS to mistake those materials for trash from bathrooms or laboratories which are normally not sorted. In other words, recyclables were being mistakenly landfilled because of inconsistent bag color usage. More information on the bag color standard and ISTC observations about the color of liners used in collection bins can be found below in the "Materials Management on Campus" and "Sorting at the Campus Waste Transfer Station (WTS)" sections of this report. F&S efforts to effectively convey the bag color standard are already underway, and this will hopefully result in getting municipal solid waste

(MSW) diversion efforts back on track and lead to progress toward the iCAP goal of reducing the amount of waste sent to landfills.

Materials Management on Campus

Within campus buildings, Building Service Workers (BSWs) move most material from interior bins/collection infrastructure to dumpsters and consolidated building collection containers, though building occupants may occasionally do so. F&S coordinates BSWs for most buildings on campus, but in buildings occupied by auxiliary (non state-funded) units, including a few of the buildings involved in the current waste characterization study, those units coordinate their own BSWs. In other words, BSWs working in buildings occupied by auxiliary units are the employees of those units, whereas all other BSWs on campus are employees of F&S. Regardless of this, F&S provides and services all exterior dumpsters and collection containers on campus, and transports collected materials to the WTS (see "Sorting at the Campus Waste Transfer Station (WTS)" below for additional information on procedures there).

Outdoor trash and recycling bins (e.g. those along pathways, such as the ones on the Quad, or outside buildings) have until recently been emptied by staff from the F&S Grounds Department, not the F&S Waste Management Department. At the end of 2023, outdoor bin service and maintenance transitioned to Waste Management Department to ensure procedural consistency and improved planning related to outdoor waste collection. For more information, contact the Waste Management Department.

In general, **comingled paper** is collected in recycling bins found in campus buildings and in outdoor spaces on campus. Anyone wishing to recycling large quantities of books should call F&S at 217-244-SAVE or email recycling@illinois.edu. To dispose of large quantities of paper, as might occur during an office clean out, individuals or departments may request large paper totes to supplement their building's normal bins. Secured versions of these totes are available for papers containing potentially sensitive materials.

Plastic bottles with resin code numbers 1 and 2 and aluminum cans are collected together in recycling bins found in campus buildings and in outdoor spaces on campus. Steel, tin, and glass are ***not*** acceptable in bins designated for "Bottles & Cans."

According to the F&S Waste Management and Recycling webpage, as well as recycling flyers and bin labels that can be downloaded from that page, **cardboard** is ***not*** acceptable in campus paper recycling bins. However, the newer three-bin stations currently being deployed across campus (see Figure 1) routinely indicate that cardboard should be placed in the same bin as mixed paper; this may lead to confusion among campus community members regarding proper handling of cardboard. In any event, it is true that cardboard collection procedures vary among campus buildings. In some buildings, occupants might leave flattened boxes near other recycling bins for consolidation by Building Service Workers (BSWs). According to the F&S webpages and bin labels, building occupants should contact facility managers or BSWs for best cardboard recycling practices in any given building.

Bulk quantities of other types of metal (i.e. **scrap metal**), beyond aluminum beverage containers, can be picked up by F&S from campus buildings upon request. Dedicated public-facing bins for collection of scrap metal do not exist in campus buildings.

Consolidation of paper, bottles, and cans collected from inside buildings, for pick up by F&S, varies by building, and is largely dependent on available outdoor space in the building's dock area (examples of different indoor bins as well as dumpsters can be found on the F&S website). The size and type of main dumpster required for efficient collection of a building's landfill-bound waste impacts the remaining space available for separate recycling collection infrastructure. Some buildings have dedicated paper dumpsters. Other buildings have one or more blue recycling totes for separate consolidation of paper, bottles, and cans. At buildings that generate high volumes of cardboard, there may be dedicated containers for cardboard collection; in some instances where dedicated cardboard containers do not exist, flattened cardboard is placed in the building's main dumpster, and might be plucked from the landfill-bound waste during a second sort at the WTS. In instances of extreme space limitation, blue-bagged recyclables may be placed in the landfill-bound dumpster. F&S picks up trash and recycling from the various types of outdoor dumpsters and collection bins at campus buildings and transports it to the WTS.

Waste Management Processes for Building Types Included in this Audit

ISTC staff walked through the following campus buildings with facility management staff, after consulting with F&S to identify representative examples of specific types of buildings for inclusion in the current waste audits. These types of buildings were designated as Academic, Academic + Laboratory, Multi-Activity, and Student Living (see "Activity Zone Approach"; note that a campus audit, including all possible activity zones, was not within the parameters of available funding). Summaries of general observations are included below with significant observations from building walkthroughs included wherever relevant; more detailed notes and photos from building walkthroughs have been provided to F&S to facilitate conversations with facility managers regarding relevant strategies for improvement.

Process flow charts have been developed for each of the four activity zones to map the overall collection process of trash and recycling. Minor deviations from, or modifications to, these processes may occur from one building to another, or among different areas within the same building on campus, due to differences in building layout and/or distinct functions of spaces (e.g. classrooms, offices, student residential rooms, common areas, etc.). However, these figures provide a good general overview of building-level waste management. Snapshots of these flow charts are shown in Figures 2-3 and the full charts can be viewed in Appendix B.

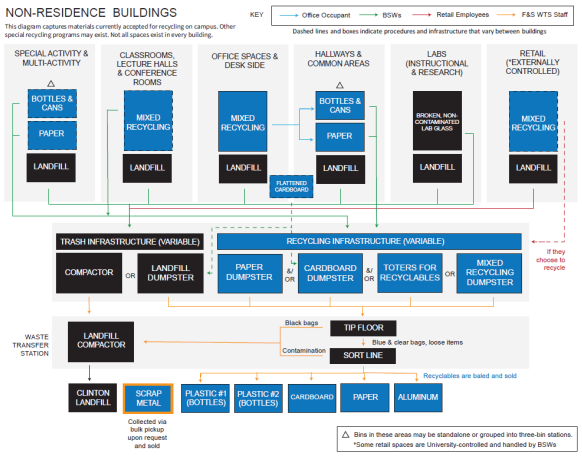


Figure 2. A snapshot of the process flow diagram describing collection processes in non-residential buildings (Academic, Lab, and Multi-Activity).

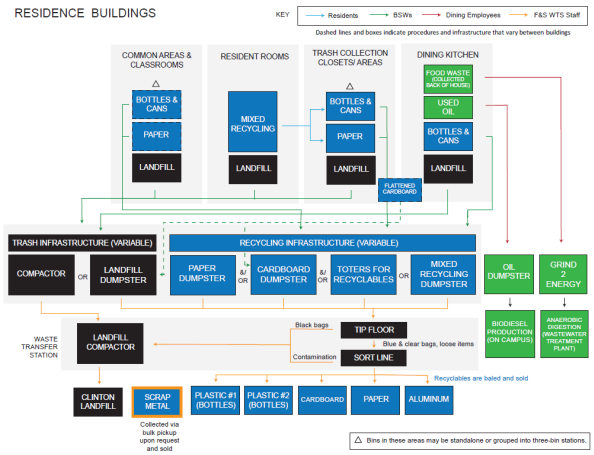


Figure 3. A snapshot of the process flow diagram describing collection processes in residential buildings.

The style of indoor collection bins varies widely across campus and may also vary within a single building. As previously mentioned, newer MaxR three-bin collection stations, like the one shown in Figure 1, are being deployed across campus, but have not fully replaced older, existing collection bins. As of this report, according to F&S inventory, 245 MaxR Bins (almost all 3-bin stations, but some single-item bins) have been deployed across 70 campus buildings. The style and color of MaxR bins may also vary based on exceptions granted to specific departments for bins that better suit the aesthetics of a space.

Figure 4. MaxR three-bin station at the Campus Instructional Facility (CIF) with customized gray color.

Figure 5. Three-bin station, including recycling and trash bins, in the Business Instructional Facility (BIF).

The number and exact placement of trash and recycling bins varies as well, largely based on foot traffic and patterns of disposal observed within buildings by facility managers and BSWs. With the introduction of the newer branded three-bin collection stations, the university is working to ensure that trash and recycling containers are equally present, visible, and convenient.

Bin labeling or signage also varies from building to building or within the same building. Newer, branded MaxR three-bin stations as seen in Figure 1 and Figure 4 above tend to include small icons and words indicating what material types should be placed in each bin; these stations may or may not include backboards for additional guidance. Non-standard three-bin stations, as seen in Figure 5 above, may have less explicit icons and verbiage, with the “chasing arrows” recycling symbol being present alongside words to indicate a bin is intended for recyclables. Recycling bin labels available for download from the F&S Waste Management & Recycling webpage, featuring lists and images of acceptable materials, may be posted on or near some recycling bins, but older bins persist with less clear signage, some of which may have once been the standard used by F&S, and some of which may have been produced independently by building occupants.

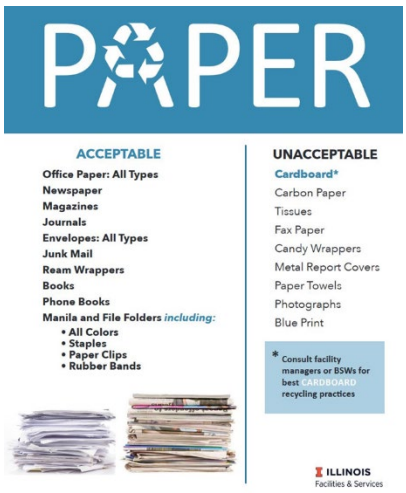


Figure 6. Bin labels available to download from F&S website.

Figure 7 (left). Example of F&S bin label in use.
Figure 8 (middle). Example of bin label produced by building occupants.
Figure 9 (right). Example of an older “Bottles & Cans” bin label.

There is also variance as to the type of external collection containers present at the buildings that were part of the study. All buildings had two or three types of containers depending on the type and quantity of material generated. See Table 1 below for a breakdown on external collection containers as each building. ARC was the only building that did not have an external container dedicated to mixed recycling; back-of-house recycling totes are kept indoors. Examples of different indoor bins as well as dumpsters can be found on the F&S website.

Building	Landfill (Trash) Compactor	Landfill (Trash) Dumpster	Recycling Dumpster	Paper Only Dumpster	Recycling Tote(s)	Cardboard Dumpster
BIF		x			x	
CIF		x	x			
RAL		x		x	x	
Noyes		x			x	
Illini Union	x				x	x
ARC		x			x	x
Lincoln & Allen	x				x	X

Table 1. External collection infrastructure of audited buildings.

Activity Zones: Academic & Academic with Labs

Building walkthrough notes in this section are broken down into building spaces of Offices, Hallways and Common Areas, Classrooms and Lecture Halls, and Labs. This section primarily focuses on the four buildings that represent these two activity zones (Academic & Academic with Labs) but notes and images from other buildings are included here as well since they also have these types of spaces.

Offices

In all activity zones included in this study, individual offices and communal office spaces (e.g., areas with cubicles) tend to have small deskside trash and recycling bins, though whether each office or desk has dedicated bins varies from building to building. More open, communal office spaces may have fewer deskside bins, with a greater number of shared bins depending upon the layout of desks and workspaces. Deskside recycling bins tend to be blue, often with the "chasing arrow" recycling symbol on the side, and not lined with a bag (though some instances of lined deskside recycling bins were observed, possibly for easier collection of shredded paper), whereas deskside trash bins are typically lined with a bag, though the color of the bag varies, typically being either black or clear and colorless or white.

Figure 10 (left). Typical deskside arrangement with lined black/gray trash can & unlined blue recycling bin.

Figure 11 (right). Atypical instance where both recycling & trash bins were lined.

In most campus buildings, office occupants/desk users are expected to empty deskside recycling bins into communal recycling bins in hallways or common areas, whereas deskside trash bins are emptied by BSWs. This may be partially to allow individuals time to retrieve papers that may have accidentally been placed in deskside recycling bins. One exception to this rule was observed during the recent building audits; at the Illini Union, BSWs empty all deskside bins, both trash and recycling.

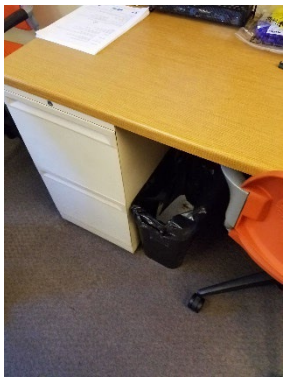
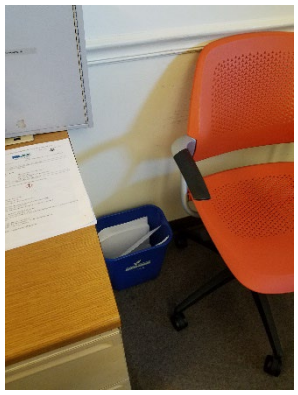


Figure 12 (left) and 13(right). Deskside recycling and trash bins at Illini Union.



Hallways and Common Areas

Larger recycling and trash bins are frequently present in hallways of buildings of all types, with a mixture of bin types and sizes present in most buildings. Only one building included in the current audits had consistent bins in all hallways; the Campus Instructional Facility (CIF) exclusively had branded three-bin stations, all in a customized grey color rather than Illini orange and blue, in hallways throughout the building (see Figure 4 above). Standalone recycling bins for “Bottles & Cans” are often placed near vending machines. Where printers or copy machines exist, in mail rooms, lounges, computer labs, or adjacent to offices and communal office spaces, it is common to see standalone paper recycling bins of varying sizes and types, for the convenient disposal of misprints, unnecessary papers, and ream wrappers. However, during building walkthroughs ISTC did observe some copiers with trash bins nearby rather than recycling bins. Bin liner usage and color varies from building to building as well, both for

recycling and trash collection bins. Recycling bins are most frequently lined with blue bags, though in some cases clear or black may be used; small bins that would be appropriately sized for deskside use tend to remain unlined. Trash bags in standalone receptacles may be clear and colorless, black, or occasionally white. In nearly all cases where three-bin stations are present, branded or not, blue bags are used for recycling bins and clear for trash. In ISTC's walkthroughs, it was observed that the three-bin stations in the Illini Union have teal bags for recycling and black bags for trash; no clear, colorless bags are used in any bins within that building.

Figure 14. Example of trash bin near printer/copier.

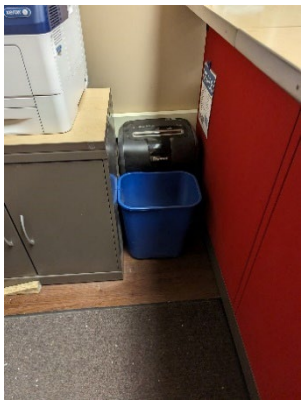


Figure 15. Examples of small paper recycling bins near printers/copiers.

In buildings where both classrooms and labs are present (Academic + Laboratory), hallways may also include collection bins for glass. See "Laboratories" below for additional details.

Classrooms, Lecture Halls, and Conference Rooms

Figure 16. Examples of food and drink restriction signage outside lecture halls in Noyes Lab (left) & BIF (right).

Classrooms and lecture halls tend to only have trash receptacles present near their entrances, due to space limitations. Food and drink are not allowed in lecture halls, and many have signs to that effect posted at entrances with trash receptacles just outside or inside for disposal of associated materials. Provision of recycling bins for bottles and cans within those spaces would enable rule breaking behavior. The type and size of trash bins in class spaces varies, and bin

liners also vary, being black, clear/colorless, and occasionally white with varying transparency. It is also the case that small meeting rooms (which may double as classrooms) and larger conference rooms tend to only have trash receptacles.

Figure 17. Examples of trash receptacles within classrooms observed at CIF.

Laboratories

In buildings that include instructional and research laboratories, sharps, waste chemicals, chemically contaminated wastes, radioactive wastes, and biohazards are collected per procedures outlined by the Division of Research Safety (DRS). Those materials are outside the scope of ISTC's waste audits and for the most part were not included in the materials sorted. A couple of exceptions are noted below because they were encountered during ISTC's waste sampling and sorting.

Figure 18: Collection bins for contaminated wastes and gloves in instructional lab at Noyes.

Autoclaved biohazardous materials

Some biohazardous materials may be disposed of in the normal trash if they are first sterilized by being treated via high pressure and temperature in an autoclave. In the case of such materials, the standard procedure is to treat the materials within a red biohazard bag. Once it has been treated, the then sterilized material is to be placed within a black trash bag, which will ensure the material is not subjected to a second manual sort at the WTS (see "Sorting at the Campus Waste Transfer Station (WTS)" for further details). ISTC encountered one such bag of material collected from the landfill-bound trash sampled from an Academic + Laboratory building. When the black outer bag was opened and a biohazard bag was observed within, the interior bag was not breached, and the material was weighed simply because it was part of the total waste collected. This is noted within the charts included later in this report in (see the "Waste Audit Results" section for further details).

Laboratory glass

Within instructional laboratories, broken glass that is not chemically contaminated is collected in sturdy, blue and white cardboard boxes lined with a plastic bag, while chemically-contaminated broken glass is placed in sharps collection containers. When full, the boxes are sealed with tape, marked as clean lab glass for the trash (if the box does not already have this printed on it), and placed into the building's dumpster for landfill-bound waste, as instructed by the DRS. It was confirmed that this procedure is followed in instructional labs in the buildings included in the current waste audits (Noyes and RAL), and ISTC observed such boxes during building walkthroughs. However, without further outreach to research labs, it is unclear whether this procedure is consistently followed within research laboratories, and F&S personnel indicated that they have observed broken laboratory glass in trash collected from buildings with laboratories.

Figure 19. Example of non-contaminated broken glass collection at Noyes.

Figure 20. Glass collection bin in hallway of RAL.

Empty glass chemical bottles and jars are typically neutralized and their labels are removed or crossed out, prior to collection in hallways for disposal in the landfill-bound dumpster (if appropriate, given the contents). It was unclear whether the contents of those collection bins were then boxed up, sealed, and labelled as clean lab glass prior to placement in building dumpsters, but DRS policy does not explicitly say such containers should be boxed up. Neutralized or not, such containers will undoubtedly break when being put into dumpsters, during transport to the WTS, or when tipped out and processed with other waste at the WTS. Because F&S has observed broken glass in trash from laboratory buildings that is not sealed in boxes, ISTC included notes in instructions for BSWs distributed prior to sample collection asking that any broken glass put into trash collection bins be double-bagged.

In general, ISTC observed that within lab spaces, trash containers were lined with black bags, though some special waste containers (e.g., the boxes for broken glass) might be lined with clear, colorless bags. As was the case in other buildings, bin types and bin liner colors used varied in standalone bins; where newer, branded three-bin stations were present, blue bags were used for recycling and clear for trash. Some special collections were observed in buildings containing laboratories and are outlined under “Special Material Collections” below.

Activity Zone: Student Living

Housing is an auxiliary unit of the university, and it should be noted that as such, it employs its own BSWs, although F&S still provides waste and recycling hauling.

Student rooms within residence halls have small recycling bins and trash cans similar in size to deskside bins in office spaces. Residents are responsible for transporting their own recycling and trash to common trash and recycling rooms, which frequently are little more than a closet, featuring bins of varying types and sizes, with non-standard signage (i.e., not the signage available for download from the F&S website), presumably produced by Residential Life. There tend to be one to two trash/recycling rooms per floor in a building.

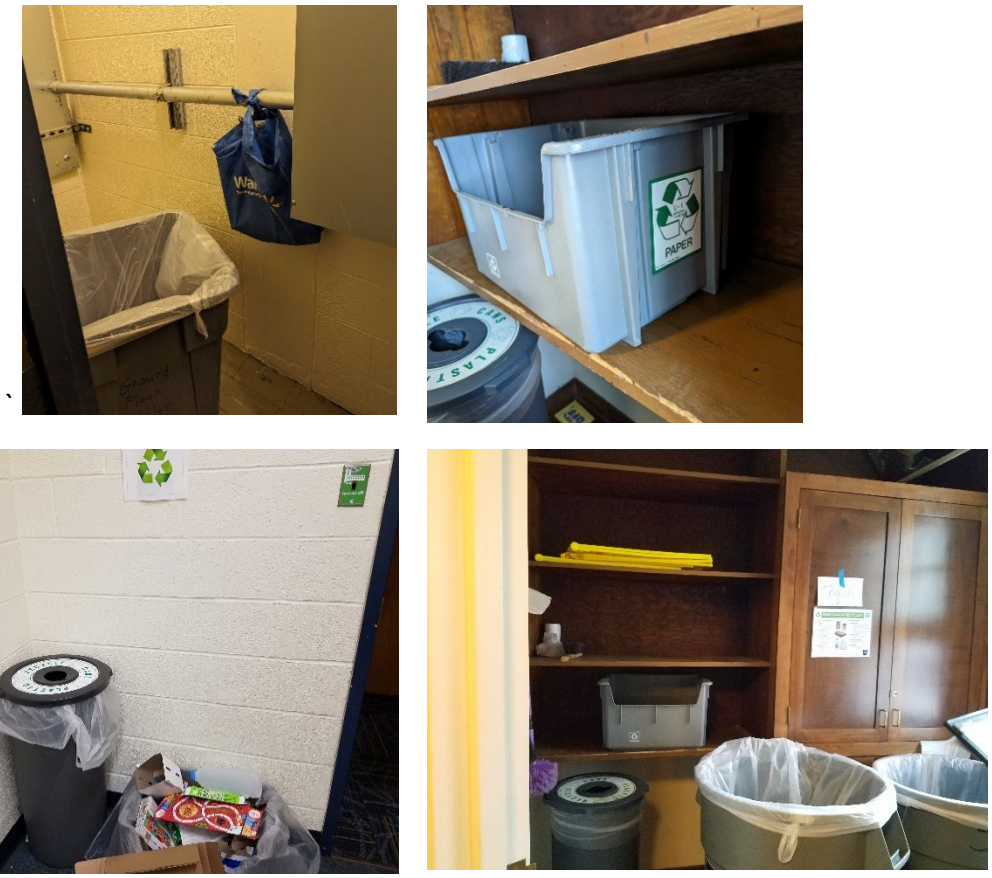


Figure 21 (above, 4 images). Examples of trash and recycling rooms observed in Allen and LAR.

Figure 22 (above, 4 images). Details of signage from trash and recycling rooms observed at Allen and LAR. Note that several signs encourage the recycling of steel food cans, which are only collected through special collection.

Observing signage present in the trash and recycling rooms (which varies widely and is presumably generated by representatives of Residential Life; facility managers and BSWs do not create communications intended for students as a matter of procedure), it seems that student residents are instructed to recycle food cans, although those are not typically accepted in recycling bins throughout other campus buildings. During ISTC's walkthrough of Allen and LAR (which share a dock, external waste collection infrastructure, and a dining hall), facility staff noted that they collected food cans from kitchen operations for recycling and call F&S to pick those up as bulk metal for recycling. However, it is unclear whether food cans placed by student residents in trash and recycling are incorporated into those bulk metal collections. In any event, instructions to recycle such cans in residence halls may lead to confusion and potential

contamination of the recycling stream when students encounter recycling bins for “Bottles & Cans” elsewhere on campus.

No branded three-bin stations are present in Allen and LAR, though facility staff indicated that other residence halls have them. During ISTC’s walkthroughs of Allen and LAR, it was noted that BSWs use whatever bin liners are of an appropriate size and readily available when lining recycling and trash receptacles. Facility staff explained that blue bags were used in the past for lining recycling bins, but because these bags were no longer available from Campus Stores, Mail & Receiving (CSMR), they were no longer used in residence halls.

Figure 23. Examples of recycling bins in residence halls erroneously lined with clear (left) or black (right) bags.

Staff also noted that prior to the COVID-19 pandemic, residence halls had moved away from provision of paper towels in restrooms in favor of hand dryers. During the pandemic, paper towel dispensers were re-installed in residence hall restrooms to align with hand-washing standards at the time, and currently, both paper towels and hand dryers are used in restrooms. Staff lamented this fact due to the amount of paper towel waste regularly observed as well as the recurring cost of buying these consumables. Current guidance from the Centers for Disease Control (CDC) indicates that there is *“not enough scientific evidence to determine if using a clean towel or an air hand dryer to dry your hands is more effective at reducing germs on your hands. Both are effective ways to dry your hands. Germs spread more easily when hands are wet, so make sure to dry your hands completely, whatever method you use.”* In fact, other buildings on campus display this guidance to indicate that either hand dryers or paper towels may be used effectively and safely.

Figure 24. Signage observed in a restroom at the Illini Union, indicating both electric dryers and paper towels as acceptable means of drying hands.

At all campus dining halls, food waste is captured for recycling via anaerobic digestion through a partnership with the Urbana-Champaign Sanitary District. See “Grind2Energy” under “Current Campus Waste

Reduction & Diversion Initiatives" below for further details. All dining halls also employ Leanpath systems to weigh and photograph food waste so the reasons behind specific types of wastes can be determined along with opportunities to prevent such waste in the future. See this case study highlighting use of this technology on campus. Further, all campus dining facilities are also employing reusable to-go containers (Good2Go). Students can request the reusable containers when checking out and pay a one-time fee. Used containers can be returned to dining halls for cleaning. See this Youtube video outlining how the program works. Additionally, Housing recycles used cooking oil, via the Illinois Biodiesel Initiative, in which the used oil from dining halls is converted into biodiesel fuel that has been used by campus vehicles at the F&S Garage and Car Pool since spring of 2006. Additional notes related to waste management within residence halls are included in the "Special Material Collections" section.

Figure 25. Leanpath system of scale and camera on a counter in a campus dining hall kitchen.

Figure 26. Good2Go reusable takeout container return bin at LAR dining hall.

Activity Zone: Multi-Activity Buildings

Multi-activity buildings have a variety of unique activities and types of spaces within which is reflected in wastes generated. Here we examine specifics from the multi-activity buildings included in the current study: the Activities and Recreation Center (ARC) and the Illini Union. Campus Recreation, which oversees the ARC, and the Illini Union are both auxiliary units of the

university, and it should be noted that as such, they employ their own BSWs, although F&S still provides waste and recycling hauling for their buildings.

ARC

The ARC includes various gyms and courts for exercise and sports, pools, locker rooms, an instructional wellness kitchen, offices, and meeting rooms. A café space is present on the first floor near the entry to the building but is currently not occupied by a vendor. While food may be brought in for meetings in the building, the sale of food within the building is currently restricted to a few vending machines and the sale of chips, candy, soda, and water at the front desk. Food waste is generated within the instructional kitchen as well. Besides classes, the kitchen hosts a weekly food pantry that serves students on Tuesdays and Saturdays. This results in some additional food waste generation as well as extra cardboard generation.

Bins and bin liners in the offices and meeting rooms are as outlined above under “Offices.” Trash bins throughout the facility are typically lined with black bags, with clear bags used in office spaces only. Recycling bins are lined with blue bags unless they are small deskside bins, in which case they are unlined. Three newer MaxR three-bin stations are present in the building (see Figure 1 in the Introduction for an example).

Multiple older tan, Rubbermaid multi-bin stations are present throughout the building, along with standalone trash bins of various types. The tan Rubbermaid stations vary widely in terms of their labeling, and multiple aspects of their labeling may result in confusion among building occupants. For example, the “chasing arrows” recycling symbol is displayed on the fronts of these units, even though they include trash bins as well as recycling bins. Additionally, some units include bins labelled as being for “cans/plastic” (presumably analogous to “bottles and cans” bins found elsewhere on campus for collection of aluminum cans and plastic bottles #1&2) as well as labels for “plastic.” Stickers on these units convey that wherever “plastic” is mentioned, plastic beverage bottles are what is being referred to; however, the stickers are small and perhaps easily missed or misunderstood by building occupants.

Figure 27. Example of a tan Rubbermaid multi-bin unit at the ARC.

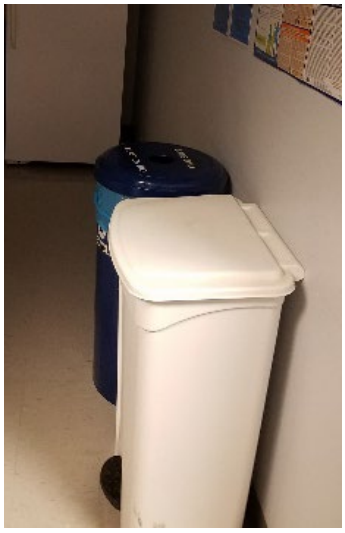


Figure 28 (3 images). Examples of various standalone bins observed at the ARC.

Throughout the facility wherever exercise equipment is located, disposable wet-wipe dispensers are present for building users to sanitize equipment after use. These are often near hand sanitizer dispensers with paper towels and trash cans conveniently placed for disposal of both wipes and used paper towels. Facility management staff noted that wipes and paper towels are major sources of waste in the building, an observation that was confirmed by our audit data.

Facility managers call F&S to pick up old/broken equipment for scrap metal recycling as needed and applicable.

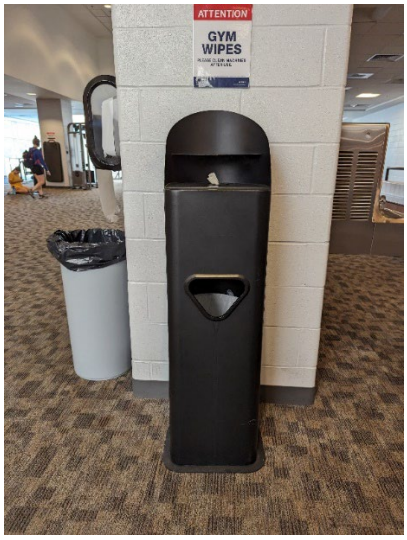


Figure 29. Example equipment wipe dispenser and disposal bin, with hand sanitizer, paper towels, and a standalone trash bin nearby.

Illini Union

The Union consists of event spaces and conference rooms, student lounges, an electronics store/repair service, an art gallery, a food court with multiple dining facilities present, University Catering operations, a Starbucks coffee shop, a seating area and stage in the Courtyard Café, a few small food retailers on the first floor, a hotel, a recreation area (with a bowling alley and other games), a credit union, a computer lab, and various offices.

Figure 30. Example of three-bin stations with shadow boxes at the Illini Union.

Figure 31. MaxR three-bin station without backboard on the upper floor of the Union.

Newer branded three-bin stations are present throughout the building, with those on the first floor and lower level (where the food court exists) having “shadow box” backboards with actual examples of materials generated within the building that might go into each bin, rather than the standard backboard with labels and icons, as seen in Figure 1 in the Introduction. These special displays were purchased from MaxR directly, via a grant from the Student Sustainability Committee (SSC), in an effort to increase proper recycling procedures within the building. Stations on upper floors tend not to have a backboard. Additional MaxR bins are provided for paper recycling in the computer lab, as well as outside near building entrances.

Figure 32. Additional MaxR paper recycling bin in computer lab.

Throughout the food court on the lower level there are currently several green, standalone trash bins with spaces on top for collection of reusable trays, though no food vendors currently use trays. Facility managers noted that renovation of this space is being planned and when that occurs, these older trash bins will be replaced with MaxR three-bin stations for consistency. Older, standalone trash bins of various types can be found throughout the building, in meeting rooms, near entrances, and in some hallways on the upper floors.

Figures 33-35. Various standalone trash bins at the Union, including the green tray-collector type from the food court (right).

Most office spaces have bins as outlined in the “Offices” section above, though within some communal office spaces (e.g. the Student Organization Development & Administration offices) there are some MaxR bins. Throughout the building teal/blue bags are used to line recycling bins; black bags are used to line trash bins.

Restrooms at the Union offer both electric hand dryers and paper towels. Facility staff indicated that structural barriers may exist (the building was historically used as a bomb shelter and has thick walls) that would make installation of new wiring for additional electric dryers challenging.

In the hotel space, all guest rooms currently have a small trash bin but no recycling bins. Trash bins are available near elevators and in vending/ice machine rooms on each floor, but no recycling bins are present in hallways either. ISTC reached out to hotel management staff and learned that plans are currently underway to update guest rooms with cans that would provide both trash and recycling options. Also, although the hotel currently provides travel-sized single-use toiletries, there is a plan to transition to refillable bulk-dispensers in the coming year. ISTC observed discarded travel-sized soaps and other personal care items in trash samples from the Illini Union, so this planned effort should have some positive impacts on waste generation.

Additional details relevant to waste management at the Illini Union are included below under "Retail Outlets" and "Special Material Collections."

Retail Outlets

Wherever cafes or other retail spaces managed by external vendors exist within buildings (e.g., cafes and food service vendors within BIF, CIF, and the Illini Union) the employees of those retailers were responsible for managing any waste or recycling bins within those spaces. In other words, they may use whatever bin types and bags they see fit, and they are responsible for taking trash and recycling to the outdoor dumpsters/collection bins associated with the building in question. In the case of the Starbucks located within the Illini Union, Union staff have worked with café staff to ensure that milk jugs, which are acceptable among "Plastic bottles #1&2" collected for recycling on campus, are placed in "dark blue" bags and included among recyclables for the building. ISTC observed bags of these jugs among the recyclables sampled from the Union. This example may provide inspiration for similar efforts at other locations, and/or campus may wish to consider guidance or requirements for recycling by external vendors operating on campus property.

Special Material Collections

Some notes regarding the collection of special materials for recycling have been included above, particularly in the discussion of practices within student living spaces. Some additional special materials collections, which currently or could apply to multiple building types are outlined below.

Nitrile Gloves

Housing began recycling nitrile gloves in 2014 via the Kimberly-Clark RightCycle program, after working with ISTC's zero waste team to assess multiple options for ways to reduce and recycle

the gloves used in food service operations. Currently, however, Housing no longer participates in the RightCycle program, finding it restrictive since it only accepts Kimberly-Clark branded gloves. During the COVID-19 pandemic, supply chain pressures forced Housing to switch to less expensive brands of glove, not eligible for recycling by Kimberly-Clark, and the program has not been reinstated, though Housing is interested in exploring glove recycling once again.

Expanding the nitrile glove recycling efforts to other areas of campus was explored after Housing first began participation in the RightCycle program, especially in buildings with laboratories. The original idea was that gloves could be consolidated from other departments with those collected by Housing to make shipments to Kimberly-Clark more efficient. It is also the case that when gloves are recycled from science labs, the chemicals used within those labs must be vetted by Kimberly-Clark to ascertain whether gloves that come in contact with those substances may safely be included in the recycling program. During its current investigation of waste management practices at Noyes and RAL, ISTC learned that nitrile gloves used the instructional laboratories within the Department of Chemistry are collected for recycling via the RightCycle program. The manager of the department's teaching labs has worked with Kimberly-Clark to vet chemicals used in those labs, and personally consolidates the used gloves in the basement of the Chem Annex building, shipping them to a Kimberly-Clark site in West Virginia for processing. Even when Housing was still participating, she found it easier and more convenient to consolidate the department's gloves within the department's space rather than transporting them across campus to Housing's consolidation site. Within the past year, she has additionally worked with three research groups house in RAL and Chemical and Life Sciences Lab (CLSL) to vet the chemicals they use and incorporate them into the Chemistry Department's shipments to Kimberly-Clark. The Chemistry Department purchases Kimberly-Clark branded gloves in such a high volume as to receive a significant discount, removing the barrier of the premium pricing of those products.

Additional information on campus participation in the RightCycle program is available on the iCAP portal; however, this information was last updated in February of 2019 and may no longer be accurate, especially since most, if not all, listed participating locations appear to be associated with Dining Services, a division of Housing, which is not currently participating in the program.

While food service areas and laboratories are widely recognized as sources of nitrile glove waste, ISTC also noted during building walkthroughs that BSWs tend to wear nitrile gloves while emptying bins, especially in restrooms and areas where food waste is generated. This fact may present an opportunity to target BSW glove waste as a special recycling program on campus.

Batteries

From 2012-2015, collection of single-use batteries for recycling through a company called Battery Solutions was coordinated and paid for by F&S. However, funding for this effort was cut in 2015 due to overall campus budget constraints, and since then departments have been encouraged to coordinate and pay for their own battery recycling. Options to recycle both

companies; the university does not specifically endorse any product, service, or company for this or any other purpose.

During building walkthroughs, ISTC learned that the facility manager for Noyes Lab and RAL, collects and recycles batteries from those buildings through Call2Recycle. A partially-filled battery collection bucket was also observed in a mailroom at the ARC, though facility staff members interviewed were uncertain whether or not the program was ongoing, and if so, who was coordinating it. Facility management staff for LAR and Allen Hall reported that batteries were collected for recycling at the front desk of LAR; they were not certain if a similar collection was occurring at Allen and had no direct knowledge of the details of where batteries were being sent. Facility management staff at the Illini Union reported that batteries used to be collected for recycling there, but this was no longer the case and they were not sure why the program ended.

Though a map of public-facing drop-offs for battery recycling, managed by various departments, exists on the iCAP portal, it is unclear if this map is up to date, especially since it indicates the ARC has a public facing collection. Staff there indicated that used to be the case, but it was suspended because it became overwhelming to manage. In any event, when individual units and departments handle their own battery recycling, they are unlikely to share data about the amount and types of batteries recycled with F&S.

Plastic Bags and Film

After receiving inquiries from the Illinois Student Government, F&S began a pilot plastic bag recycling program at the Illini Union Bookstore in the summer of 2021, spearheaded by Shantanu Pai, former campus Zero Waste Coordinator. The program eventually spread to five locations on campus, including the Illini Union and LAR. Acceptable materials in this program included retail bags, produce bags, ice bags, bread bags, newspaper sleeves, and bubble wrap. However, after Mr. Pai left the university and the Zero Waste Coordinator position remained vacant for a time, coordination of and communication about this program fell by the wayside and has not yet been re-established. Two collection bins remain at the Illini Union, but current facility management staff were unfamiliar with the program and uncertain if is ongoing. Staff at LAR indicated that a collection bin remains at that building but they were uncertain who to contact at F&S to have the bins emptied. ISTC staff noted that a bin remains in the entry vestibule of the Illini Union Bookstore, but original signage is no longer present, and the bin was contaminated with trash. The URL listed on the original collection container from the bookstore is no longer active, indicating that original recycler is no longer active.

Figure 36. One of the remaining plastic bag collection bins at the Union, with original signage in place.

Figure 37. Collection bin at the bookstore, filled with trash rather than plastic bags.

Glass Beverage Bottles

Though glass is not included in the materials generally accepted for recycling on campus, as an auxiliary unit, Housing began recycling glass generated as part of University Catering, specifically, beer, liquor, and wine bottles, in 2013. Housing staff report that almost no glass food and beverage packaging is used as part of dining services at residence halls, and thus, glass is not collected from those operations for recycling. To date, University Catering has recycled 130,955 pounds of glass through its efforts.

Used Writing Utensils

During building walkthroughs it was noted that the CIF facility manager collects spent dry erase markers for recycling. He indicated that he thought this was a campus wide program, but he was not certain where they should be taken for recycling and had not yet accumulated enough to make it necessary to empty his collection bucket. He shared a link to an archived announcement from the F&S website with ISTC, indicating a recycling program via TerraCycle for markers, pens, glue sticks, mechanical pencils and related packaging had been established on campus in 2022. Further investigation revealed that this pilot program was launched by an F&S intern now no longer at the university, and current waste management staff at F&S were uncertain of the project status.

3D Printing PLA Plastics

During the walkthrough of BIF, ISTC staff observed a collection bucket in the 3D printing lab, indicating that the student group Enactus was recycling PLA failed prints, remnants, and support materials with funding from the Student Sustainability Committee. However, this project is not mentioned as current on the Enactus website. Investigation of the iCAP portal indicates this project was funded in 2017; individuals involved are likely no longer at the university, and the project is no longer active.

Figure 38. A PLA collection bucket observed at BIF, with materials inside.

Lost and Found Collections

The CIF facility manager maintains an extensive lost and found collection of materials left behind by students attending classes. Clothing, umbrellas, notebooks, water bottles, and electronics, etc. are often left behind, are still useful, and if unclaimed need to be disposed of by the facility manager. It was noted that facility managers could benefit from coordinated collection of such items for donation and/or disposal by F&S, or at the least, that guidance for local outlets for such materials would be beneficial for facility managers.

Sorting at the Campus Waste Transfer Station (WTS)

At the WTS, trucks either dump their contents in a processing area for sorting (on the conveyor belt sorting line or tip floor) or directly into materials to be compacted and sent to landfill. There is a longstanding misconception among members of the campus community that all waste—whether it is placed in a trash can or recycling bin—will undergo a second sort at the WTS, and therefore, imperfect separation of materials accepted for recycling by F&S is not a concern. In other words, if recyclables are placed in trash collection bins, it will not matter because they will be recaptured at the WTS by staff members pulling recyclables out of collected waste as it passes along a conveyor belt. It has never been the case that *all* waste collected by F&S undergoes a second sort at the WTS—the amount of waste generated daily on campus is far too great for it to be physically possible for everything to be sorted at the relatively small campus WTS, which is not automated with sophisticated sorting technology, as some larger, more advanced materials recovery facilities are. Furthermore, a very small crew (typically never more than 4-8 people, frequently including workers from Champaign County's Developmental Services Center, or DSC, via a collaboration with the university) are involved in plucking recyclables out of the trash or cleaning items not collected for recycling on campus (contaminants) out of the recycling stream. Note that DSC workers often rely on easy recognition of recyclables by sight; for example, they may focus on the shape of plastic beverage bottles or milk jugs in order to retrieve plastics with resin codes #1 or #2 from the

materials on the conveyor belt. F&S is exploring updates to the WTS; see "WTS Improvements" below.

Prior to 2019, it was generally the case that recycling bins on campus were lined with blue bags and trash cans were lined with black bags, though there may have been some variation from this practice. In its 2019 Indoor Solid Waste and Recycling Collection Assessment report, the ISTC Technical Assistance Program recommended a shift to using clear bags rather than black bags for landfill (trash) bins, noting that *"Clear liners allow for the materials inside the bag to be viewed at all stages of the material management process. This would be helpful for BSWs in assessing recycling participation and identifying locations that need additional signage or occupant training. As some bags end up on the sorting line in the waste transfer station, having clear bags will allow sorting staff to only open bags with high contamination or fugitive hazards which need to be prevented from entering the waste stream."* F&S did begin implementing this practice, and further modified it to make the task of the WTS sorting staff even more efficient by deciding that trash bins in laboratories or restrooms should continue to be lined with black bags, with clear, colorless bags being used for trash bins in all other areas. This could help prevent exposure of the WTS sorting staff to potentially harmful trace chemicals or biological wastes, since trash bags collected from those areas would, in theory, be immediately distinguishable from trash bags collected from other areas. Black bags could then be moved along straight to materials to be compacted and sent to landfill, without the WTS sorting staff ever needing to open them.

Figure 39. Illustration of F&S bag color standard. Image by ISTC.

Beginning in fall 2019, this bin liner color-coding convention began to be implemented and conveyed to BSWs, though this convention was not formally established as policy in the Campus Administrative Manual, nor formally stated on the F&S website. However, during ISTC's recent building walkthroughs and stakeholder engagement, it became clear that current awareness of the bag color standard was inconsistent, with some facility managers and/or BSWs being completely unaware, others being aware but uncertain of the correct details or if BSWs were following them (e.g., in the case of buildings where BSWs were coordinated by F&S

rather than being overseen by building facility managers), and still others being aware but not following the bag color standard due to supply chain challenges associated with the lack of availability of blue bags from Campus Stores, Mail & Receiving (CSMR). Housing, for example, tends to make all of its purchases through CSMR, and facility staff noted that although their BSWs had used blue bags for recycling bins in the past, they no longer did because these bags were not currently available through CSMR. It seems clear that the impact of the COVID-19 pandemic on various procedures, including waste management and BSW trainings, resulted in a breakdown of communication regarding the bag color standard. Supply chain issues during the pandemic also impacted compliance even among staff aware of the bag color standard, and turnover in the campus Zero Waste Coordinator position (including a period when that position was vacant), exacerbated the communication breakdown about this procedural expectation. Thus, although F&S staff believed that all black bags indicated trash from labs and restrooms, the reality was that those bags could be indicative of trash from common areas as well, meaning that some bags sent directly to landfill should likely have been subjected to a second sort for recovery of recyclables. And although WTS staff believed that all clear, colorless bags were from trash containers, in some cases, these bags were also being used to line recycling bins.

Current Campus Waste Reduction & Diversion Initiatives

The following are highlights of ongoing waste reduction and diversion initiatives. For a complete list of current and historical zero waste efforts, see the “Zero Waste” theme landing page on the iCAP portal, as well as the iCAP portal page for the Zero Waste iCAP Team.

Waste Transfer Station (WTS) Tours

In recent years, F&S has been providing guided tours of the WTS to raise awareness of the size and equipment available as well as waste management procedures at the facility among members of the campus community. Tours are limited to 20 people at a time, on a first come, first served basis. Tours are arranged as needed, based on the number of requests to participate that are in the queue. Individuals and groups can request tour participation via an online form. During ISTC’s building walkthroughs, some facility management staff noted that they recently taken tours at the WTS and found the experience very informative and helpful. Additionally, a video tour is available on the F&S Waste Management & Recycling webpage and can be viewed on YouTube.

Grind2Energy

Beginning in the 2019-2020 school year, Grind2Energy systems began being installed at campus dining facilities to combat food waste issues. Food scraps from kitchen prep and plate waste are fed into the system for grinding. Once the food is ground, the slurry is pumped into a 5000-6000 gallon holding tank outside the dining hall. When the tank is 80% full, the Urbana-Champaign Sanitary District (UCSD) is notified, and a liquid vacuum truck comes to empty out the tank and transport the slurry to the UCSD's anaerobic digester. Methane collected from that anaerobic digester is used to produce electricity via combined heat and power engines. That electricity runs the UCSD wastewater treatment plant and the heat is used to keep the digester warm. Dewatered biosolids from the UCSD digester are also periodically used as fertilizer on agricultural fields. Grind2Energy units have been installed at all university dining halls. A video outlining the process is available on YouTube.

Figure 40. Holding tank for food scrap slurry outside of LAR Dining Hall.

Bin Standardization (Indoor and Outdoor)

As mentioned in the Introduction, ISTC worked with F&S in 2019 on an Indoor Solid Waste and Recycling Collection Assessment. Following that effort, F&S began the process of standardizing indoor waste and recycling collection bins, purchasing the newer MaxR three-bin stations. These bins are made from 97% recycled HDPE (plastic #2); the average station is equivalent to 1000 recycled milk jugs. The process began with the purchase of 113 of these stations and is ongoing, including the inclusion of 3-bin stations in building standards. As of this report, 235 MaxR 3-bin stations have been deployed across 70 campus buildings. An Excel spreadsheet of all buildings with these branded three-bin stations is available on the iCAP portal, though it appears this was last updated in 2022 and may need to be revised to reflect current conditions. The iCAP 2020 target is to have 150 buildings with at least one of the MaxR three-bin stations by FY24. Departments and facility managers may request these three-bin stations for their spaces via an online form.

Figure 41. New dual bin station at southeast corner of Oak & Kirby, by E-14 shuttle parking lot. Image from the iCAP portal.

Beginning in the fall of 2019, the university began the process of replacing standalone concrete outdoor trash bins with dual bins (trash and recycling receptacles together) to make recycling more convenient and hopefully improve participation among members of the campus community and visitors to campus. The first dual bins were installed on Green Street as part of the Multimodal Corridor

Enhancement (MCORE) project construction. F&S, Grounds, and Crafts & Services continue to make progress on these efforts; project updates are available on the iCAP portal. F&S plans to deploy 125 dual bins across campus by fall 2024 and remove concrete bins as they become obsolete.

Dump & Run

This term refers to move-out collections of goods coordinated by F&S. Beginning in 2001, University YMCA began an effort to keep useful items out of landfills by collecting community-donated household goods during the summer and holding a move-in sale near the end of August to allow university students to practice reuse and benefit from reduced prices. This effort became known as "Dump and Run," and in 2012, Housing began collaborating with the University YMCA to collect useful items no longer wanted by students as the moved out of undergraduate residence halls in the spring. These items, along with donated items from the broader community collected over the summer, were included in fall move-in sales. This collaboration continued until the end of 2019, when the University YMCA determined that they collected enough items from the broader community during summers to supply adequate items for their August move-in sale. F&S became the primary university unit organizing collections of useful items during the spring move-out, in collaboration with Housing. The "Dump and Run" name has been maintained by F&S for the move-out collections, but rather than contributing collected goods to the YMCA fall move-in sale, F&S donates items collected to local non-profit organizations. Collections now occur at least twice a year (at the end of each semester) and are not restricted to spring move-outs. Hundreds of volunteers assist with these efforts each year, stationed at central collection locations across campus to provide guidance to students and ensure that appropriate items are being collected for donation. Further details are available on the iCAP portal.

Figure 42 (two images). Images from Dump and Run 2023, from the iCAP portal.

Don’t Waste Campaign with Coca-Cola

The university has had a relationship with Coca-Cola for several years, given that the company has pouring rights for the sale of beverages on campus. Collaboration with Coca-Cola on campus sustainability efforts were born out of discussions at meetings of the Sustainability Council in March of 2022 (see “Connection to Illinois Climate Action Plan” for details on the role of this group in campus sustainability efforts). Per its contract with the university, Coca-Cola and the university have a shared budget to spend on mutually agreed-upon sustainability initiatives. Coca-Cola now collaborates with the Division of Intercollegiate Athletics, Housing, the Illini Union, the Institute for Sustainability, Energy, and Environment, F&S, and others to keep plastic beverage bottles and aluminum beverage cans out of landfill-bound trash. These efforts are referred to as the "Don't Waste" campaign. Additional details and project updates are available on the iCAP portal.

Figure 43. Don't Waste campaign image, featuring a QR code to the F&S Waste Management & Recycling webpage.

Welcome Celebration Recycling

Every fall, new students come to campus and participate in several Welcome Week activities, including a Welcome Celebration that features an outdoor buffet lunch provided by Housing Dining Services and tabling from various campus organizations and interest groups. Several thousand bottles and cans of beverages are served during this event. Beginning in August 2022, Coca-Cola initiated its first "Don't Waste" campaign efforts through provision of 60 portable dual bins for landfill-bound waste and recycling for the Welcome Celebration to help capture beverage containers for recycling. Those bins were branded with the university and Coca-Cola logos, the “Don’t Waste” slogan, and a QR code to the F&S Waste Management & Recycling webpage. Bins at the initial event were corrugated plastic; however, it became clear those would not be sturdy enough to withstand high winds or for long-term use. At the 2023 celebration, DIA trash barrels and square recycling bins F&S had in its inventory were used instead of the corrugated plastic bins. Recently, branded wraps have been developed which can be placed around reused intermediate bulk containers (IBC, aka syrup vats). Student volunteers assist at the Welcome Celebrations, guiding participants to recycle beverage containers in the proper bins.

Fighting Illini, Fighting Waste

This refers to Don't Waste campaign efforts that specifically target athletic events.

Basketball Game Recycling: On November 14, 2022, the day before America Recycles Day, the first Fighting Illini, Fighting Waste basketball game event occurred at the State Farm Center. Volunteers wearing "Be Orange, Go Green" t-shirts assisted fans with proper disposal of beverage bottles and cans in recycling bins. Fans following correct procedures were eligible for random give aways of Illini branded t-shirts or tote bags as part of being "caught green handed." The purpose of the event was to begin encouraging fans to think about recycling at the State Farm Center. At that initial event, over 280 lbs. of clean cardboard, aluminum cans, and plastic beverage bottles were diverted from landfills. See this video highlighting that initial event.

Figure 44. Signage featured at the second Fighting Illini, Fighting Waste basketball event.

A second Fighting Illini, Fighting Waste event was held at the March 2, 2023 basketball game against the University of Michigan at State Farm Center. Ninety (90) student volunteers with the help of 2 staff volunteer leads helped divert 1,280 pounds of recyclable material away from the landfill (cardboard, paper, bottles, and cans). In total, the event achieved a 28% waste diversion rate. In spring 2024, two additional Fighting Illini, Fighting Waste basketball games were held, including a women's game on March 3rd and a men's game on March 5th. At the March 3rd event, a total of 460 lbs. of recyclables were collected from State Farm Center; however, a diversion rate is not available because the total waste collected was from more than just the basketball game. At the March 5th event, a total of 1,040 lbs. of recyclables were collected and a 10% diversion rate was achieved. The success of these events contributed to a recommendation by the iCAP Zero Waste Team to implement recycling as a permanent feature at the State Farm Center.

Tailgate Recycling

During the spring 2023 semester, the iCAP Zero Waste Team submitted a recommendation for F&S and the Division of Intercollegiate Athletics (DIA) to jointly launch a pilot tailgate recycling program, beginning during the fall 2023 football season. In May 2023, the recommendation was approved by both Director of Athletics Josh Whitman and F&S Executive Director Ehab Kamarah. For this program, Coca-Cola funded volunteer t-shirts, giveaway t-shirts, and 20 outdoor recycling bins to collect loose bottles and cans from tailgaters. The first tailgate recycling event was held on September 23, 2023. F&S provided blue bags for collection of recyclables; DIA parking lot supervisors disseminated those to tailgate participants when they checked into parking areas by car. The bags had paper instructions stapled to them listing acceptable recyclables (plastic beverage bottles and aluminum beverage cans), and a tailgate

lot map with locations of "collection hubs" for filled blue bags (at which F&S recycling garbage pans were placed).

Figure 45. Green rolloff purchased for use at tailgate recycling and other events generating high volumes of recyclables.

Student volunteers were posted at the collection hubs to guide tailgaters and provided education about campus recycling. The 20 Coca-Cola recycling bins were placed near entry points to Memorial Stadium for the collection of loose (non-bagged) recyclables as visitors finished drinks before entering. Illini t-shirts were offered as rewards to tailgaters that segregated and recycled their waste effectively. At this initial event, 1,000 lbs. of recyclables were collected and diverted. The WTS purchased a green rolloff dumpster specifically for recycling (Fig. 45). It was used at the inaugural tailgate recycling event and will be used at future tailgate recycling events as well as other events that produce high volumes of recyclables and would benefit from a dedicated recycling dumpster.

Recyclopedia

F&S is currently working on a comprehensive recycling guide, to ultimately be made available on its website, inspired by similar guides available on the Champaign and Urbana municipal websites. This “Recylopedia” would clarify proper management practices for the five primary commodities currently accepted for recycling by the WTS (mixed paper, cardboard, plastic beverage bottles #1&#2, aluminum cans, and scrap metal). F&S recognizes that there is a myriad of other products that present themselves on campus, and community members would benefit from guidance for appropriate disposal methods, even if those methods are not coordinated by the WTS. Such guidance will be incorporated into the Recyclopedia, and this resource will be continuously updated. Opportunities to post QR codes to this online resource near recycling bins and in residence hall trash/recycling rooms are already being discussed.

Paper Towel Recycling and Reduction

As part of its efforts related to green cleaning, F&S has made some preliminary investigations into a paper towel recycling program (Tork Paper Circle) with the company Essity. Though there is interest in piloting this program, no pilots have yet been started. Because of the high-volume of disposable wipes currently used at the Activities and Recreation Center (ARC) for cleaning equipment between users, it could be worthwhile to pilot the replacement of disposable wipes with the provision of paper towels and spray bottles of cleaner, with the source separation and recycling of paper towels via Tork Paper Circle. An alternative focused more on waste reduction would be to conduct a cost-benefit analysis to determine the logistical and economic feasibility

of providing spray bottles of cleaner and cloth wipes that could be laundered for equipment cleaning.

F&S is piloting transition to new paper towel dispensers which will help reduce paper towel waste by reducing the need to swap out partial rolls. In 2023, 17 buildings transitioned to the new paper towel dispensers over the holiday break (December 2023 – January 2024). The Building Services team is slated to transition an additional 40-60 buildings during the 2024 summer break.

WTS Improvements

F&S is currently investigating possible high- and low-tech infrastructure improvements for the WTS, including replacement of aging equipment and investment in AI-assisted sorting.

In 2017, The Office of the Provost approved funding of up to $1.65 million for a new recycling baler at the WTS. The new baler is expected to be fully operational by August 2024, replacing a baler that has served the facility since 1997. Staff expect higher efficiency, greater reliability, and new research opportunities from the new equipment.

Funded in 2023 through the Institute for Sustainability, Energy and the Environment's "Campus as a Living Laboratory" program, F&S is collaborating with researchers from the Grainger College of Engineering (led by Dr. Nishant Garg) to develop and explore use of an automated system that employs computer vision for fast and accurate waste characterization at the WTS; however, this is still in the pilot phase.

The Waste Audit Process

The waste audit took place over a 5-day period, October 23 – 27th, 2023. Samples were collected from each building and brought back to the sorting location, behind the Waste Transfer Station (WTS), to be sorted and weighed by ISTC staff and university volunteers. The ASTM standard test method for determination of the composition of unprocessed municipal solid waste through manual sorting (ASTM D5231) was used as the guiding document to conduct sampling and sorting. When using this method, the goal is to sort samples of 200-300 pounds. This goal was not reached for all streams/buildings. The waste audit includes three steps: collection, sorting, and weighing & recording.

Figure 46. ISTC Waste Audit setup located behind the WTS.

Figure 47. A gaylord box with signage outside the Illini Union. BSWs placed materials in these boxes, which were then collected by ISTC.

Collection

Upon completion of the building walkthroughs, ISTC developed a plan for sample collection. The week prior to the waste audit, information sheets were sent out to BSWs for each location (by F&S for buildings that they serviced, or by facility managers and/or BSWs supervisors in the case of auxiliary units) that indicated the number and location of gaylord collection containers and how they should be used during the week of the waste audit. BSWs were instructed to follow their typical collection procedure, but instead of placing bagged materials into the usual totes, dumpers, or compactors, they were asked to place materials into the designated gaylords each day, until and unless the gaylords were full and until ISTC removed the gaylords from the premises. ISTC would regularly check the gaylords and remove samples, allowing for more materials to be added to them. In the event the gaylords filled up during a BSW shift, materials could simply be placed into the normal collection containers. On Monday morning October 22nd, ISTC delivered gaylord collection containers to each building and labeled them accordingly. This method was used to ensure that ISTC was only collecting samples generated during the week

of the waste audit. The number of gaylords each building received matched the number of types of collection containers that are typically on site (See Table 1.)

Building	Landfill (Trash) Gaylord	Recycling Gaylord	Cardboard Gaylord
BIF	x	x	
CIF	x	x	
RAL	x	x	
Noyes	x	x	
Illini Union	x	x	x
ARC	x	x	x
Lincoln & Allen	x	x	X

Table 2. Presence of cardboard gaylords at audited buildings during the collection period.

Throughout the week, ISTC collected samples and removed the gaylords from the premises once a 200-300 pound sample weight was reached for each landfill and recycling stream. Although cardboard was collected separately at some buildings (those with dedicated cardboard dumpsters), it was still counted toward the overall weight of the recycling sample.

Sorting

Prior to the start of the waste audit, ISTC worked with F&S to determine sorting categories for landfill and recycling streams. It was decided that landfill bound material and recycling bound material would be sorted into thirty-one categories. These categories were chosen based on current waste management practices, F&S waste reduction and recycling goals, hauler material acceptance, and anticipated generation of specific materials. The full list of sorting categories and their definitions can be found in Appendix B.

The sorting procedure began by outfitting all waste audit members with the appropriate personal protective equipment including coveralls, latex gloves, puncture resistant gloves, and eye protection as well as having volunteers review the sorting categories. As waste and recycling samples were brought to the waste audit station, materials were emptied onto the waste audit table. ISTC and university volunteers would each pick a few categories and work their way around the table collecting materials. Sorted materials were placed into a variety of bins surrounding the table.

Weighing and Recording

Figure 48: ISTC staff and university volunteers sorting landfill-bound waste.

Once all items from a given building/stream were sorted (e.g. landfill from ARC), they were brought over to the floor scale to be weighed. One ISTC staff member handled the recording of all weights for consistency. Once it was determined that the 200–300-pound sample was met for a given building/stream, no further sorting or weighing would take place for that building/stream. A 200-pound recycling sample was not reached over the five-day collection period for five of the eight buildings. While this may reflect typical generation at these buildings, there may have also been confusion on the collection process among BSWs, since WTS staff reviewed the sampling plan prior to the audit and believed adequate samples would be obtained. Table 3 below shows the total weights of material that were collected, sorted, and weighed & recorded throughout the week.

Activity Zone	Building	Stream	Pounds Sorted
Academic	BIF	Landfill	247.6
Academic	BIF	Recycling	69.8
Academic	CIF	Landfill	279.9
Academic	CIF	Recycling	105.4
Academic + Lab	RAL	Landfill	243.3
Academic + Lab	RAL	Recycling	142
Academic + Lab	Noyes	Landfill	243.8
Academic + Lab	Noyes	Recycling	61.1
Multi-Activity	Illini Union	Landfill	209
Multi-Activity	Illini Union	Recycling	276.1
Multi-Activity	ARC	Landfill	255
Multi-Activity	ARC	Recycling	116.7
Student Living	Lincoln & Allen Halls	Landfill	263.7
Student Living	Lincoln & Allen Halls	Recycling	293.6

Table 3. Total weights of waste streams collected in audited buildings during the week of the audit.

Summary of Waste Characterization Study Findings

The pie charts in this section show the overall results from all material collected during the waste characterization study. This represents landfill (trash) and recycling material from all activity zones representing the eight buildings included in the audit. For each building, the goal was to collect at least a 200 lb sample each for landfill and recycling to ensure a representative outcome, however, recycling samples for five of the eight buildings were under this mark. This was likely due to lack of generation or logistical issues with collection on the days of the audit. Another important detail to note is that carboard makes up the majority of most recycling totals as that material was readily available for collection and recording during the audit and because cardboard naturally weighs more than some other recyclables, such as plastic beverage bottles.

For the purposes of this study, “Landfill Stream” refers to material that was placed in trash receptacles and “Recycling Stream” refers to material that was placed in recycling receptables.

Total Landfill Stream
A combined 1742.3 pounds of material were collected and sorted across all four activity zones, representing eight buildings. The most common materials found in the combined landfill stream (by weight) were paper towels at 23.1%, food scraps at 12.6%, liquids at 6.6%, and mixed paper at 6.1%, combining for 48.4% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	34.0%
Compostable	17.1%
Currently Recyclable	12.9%
Landfill	18.9%
Potentially Recyclable	17.1%

Table 4: Potential material fates for summary data from the landfill stream

* The potential material fate is determined by considering the best waste management solution for each material category.

Summarized Landfill Material

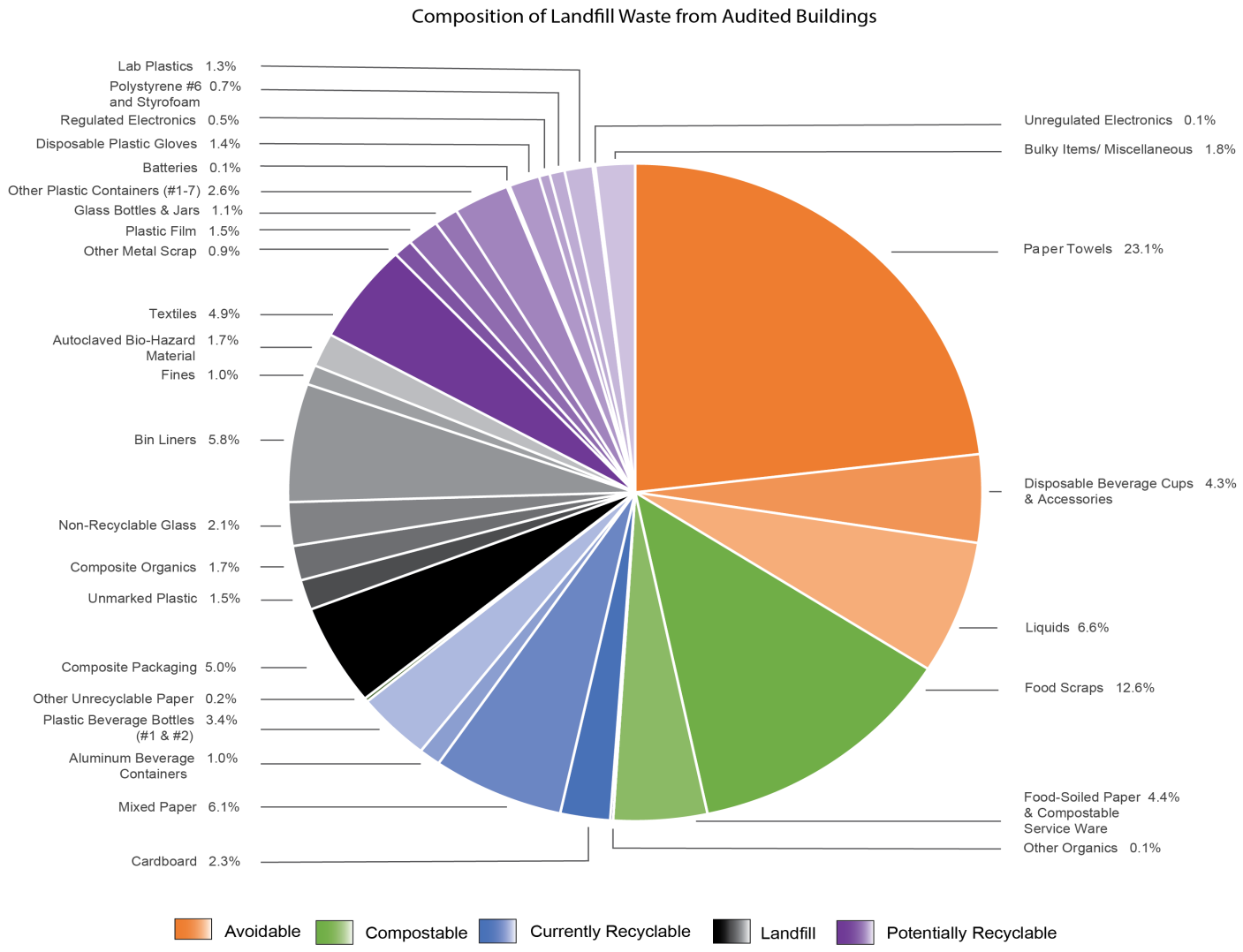


Figure 49: Material breakdown of summarized audit findings for landfill stream

Recycling Stream

A combined 1064.7 pounds of material were collected and sorted across all four activity zones, representing eight buildings. The most common materials found in the combined recycling stream (by weight) were cardboard at 62.3%, mixed paper at 9.9%, plastic beverage bottles at 7.1%, and liquids at 5.0%, combining for 84.3% of all material sorted. A total of 18.6% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	8.6%
Compostable	1.2%
Currently Recyclable	81.4%
Landfill	4.0%
Potentially Recyclable	4.8%

Table 5: Potential material fates for summary data from the recycling stream

Top 5 Contaminants in Recycling Stream**	
Liquids	5.0%
Disposable Beverage Cups & Accessories	2.1%
Glass Bottles & Jars	1.8%
Paper Towels	1.5%
Other Plastic Containers #1-7	1.3%

Table 6: Top 5 contaminants in recycling stream for all buildings excluding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Summarized Recycling

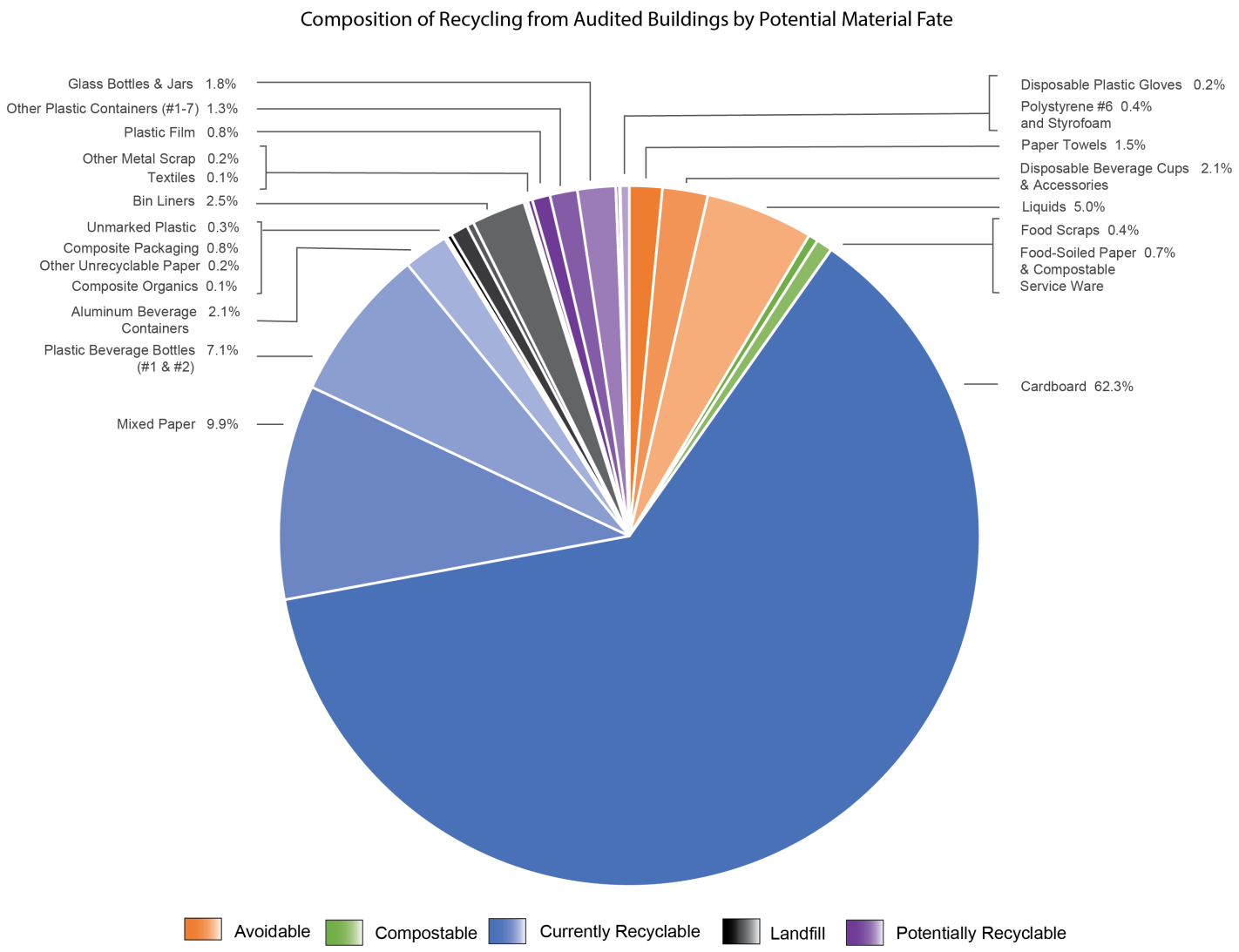


Figure 50: Material breakdown of summarized audit findings for recycling stream

Waste Characterization Study Results by Activity Zone

The pie charts below detail data for each of the four activity zones material was collected from during the waste characterization study. These are Academic Buildings, Academic Buildings with Labs, Multi-Use Buildings and Residence Halls.

Academic Buildings

The two buildings that represent the academic activity zone were the Campus Instructional Facility (CIF) and the Business Instructional Facility (BIF). CIF has a variety of classrooms, common areas, break rooms, and staging areas and very few offices. This building is almost exclusively classrooms. There is an Espresso Royale coffee shop located in the building, and catered events often occur. BIF has a mix of offices, classrooms and conference rooms. Café Kopi is a food service operation that exists in the building; small meetings for which external groups may bring in food, as well as large catered events also occur.

Landfill Stream

A combined 527.5 pounds of material were collected and sorted across this activity zone. The most common materials found in the landfill stream (by weight) were paper towels at 30.8%, food scraps at 13.5%, liquids at 8.0%, and bin liners at 7.8%, combining for 60.1% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	45.8%
Compostable	18.4%
Currently Recyclable	7.9%
Landfill	17.7%
Potentially Recyclable	10.2%

Table 7: Potential material fate breakdown for the landfill stream in academic buildings

* The potential material fate is determined by considering the best waste management solution for each material category.

Landfill Material from Academic Buildings

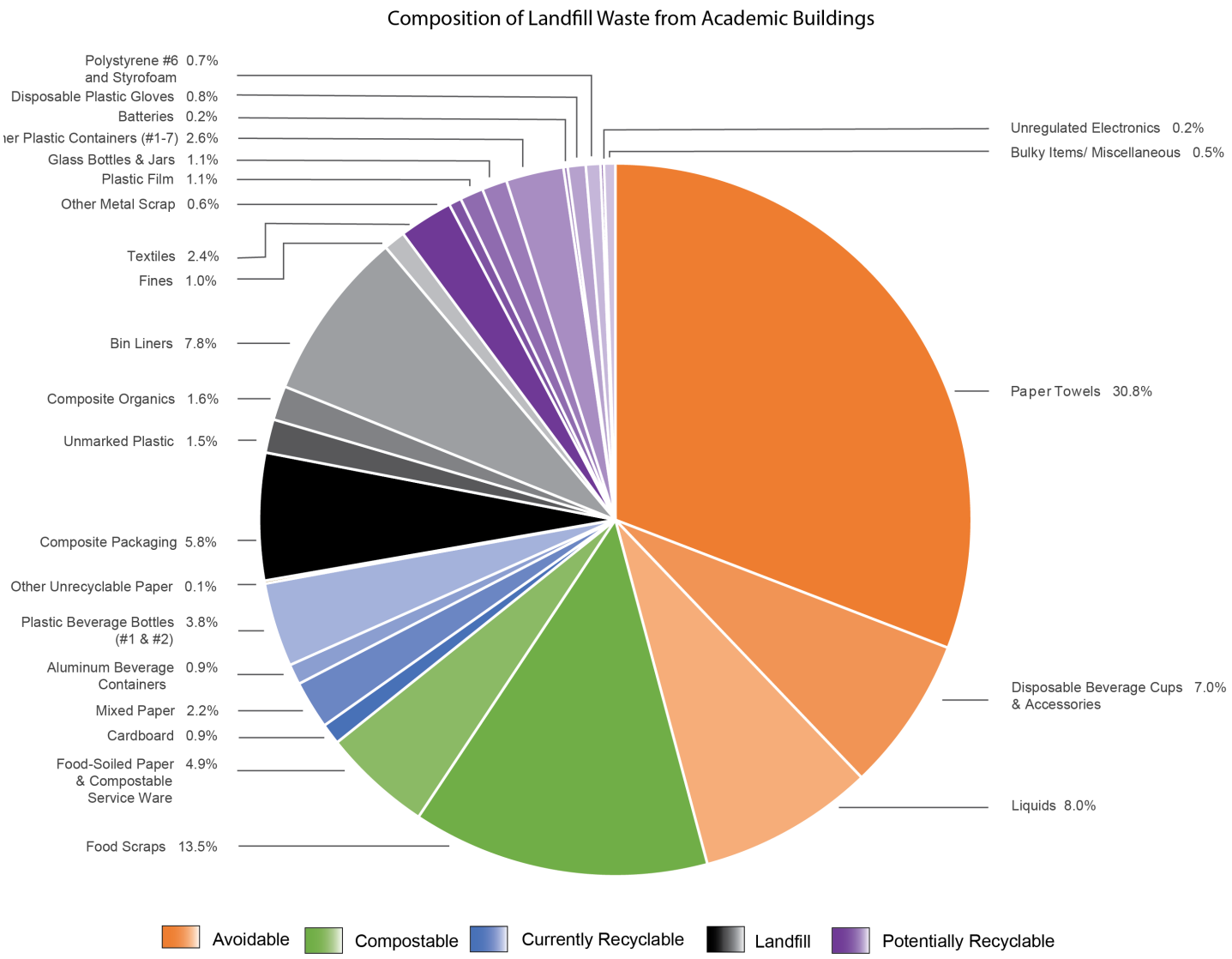


Figure 51: Material breakdown of audit findings for the landfill stream in academic buildings

Recycling Stream

A combined 175.2 pounds of material were collected and sorted across the academic activity zone. The most common materials found in the recycling stream (by weight) were cardboard at 69.5%, bin liners at 5.1%, plastic beverage bottles at 4.4% and mixed paper at 3.7%, combining for 82.7% of all material sorted. A total of 19.8% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	6.0%
Compostable	2.2%
Currently Recyclable	80.2%
Landfill	6.6%
Potentially Recyclable	5.0%

Table 8: Potential material fate breakdown for the landfill stream in academic buildings

Top 5 Contaminants in Recycling Stream**	
Disposable Cups & Accessories	3.6%
Glass Bottles & Jars	3.0%
Liquids	2.1%
Food Soiled Paper & Compostable Service Ware	1.9%
Other Plastic Containers #1-7	1.3%

Table 9: Top 5 contaminants in recycling stream in academic building excluding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Recycling from Academic Buildings

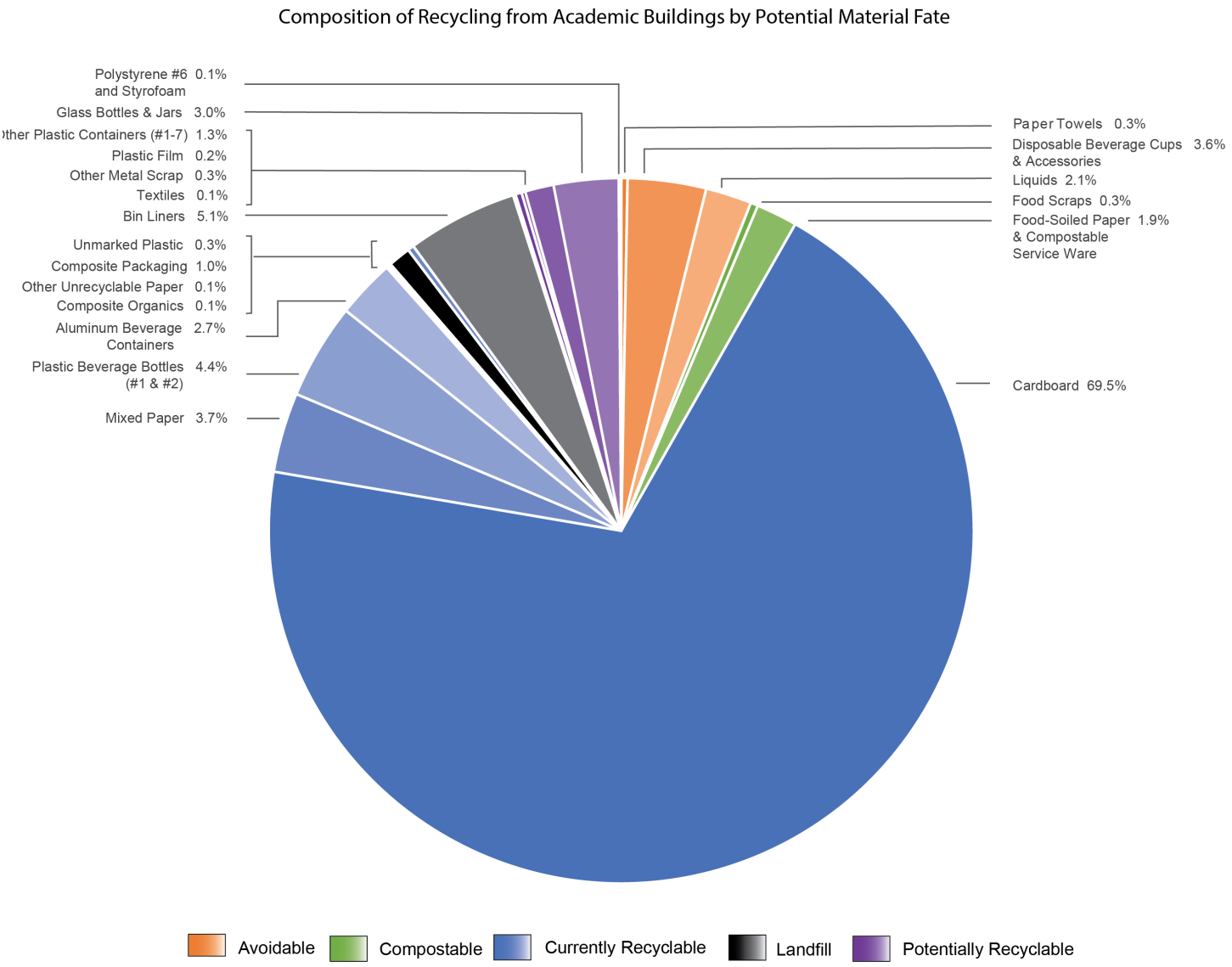


Figure 52: Material breakdown of audit findings for the recycling stream in academic buildings

Academic Buildings with Labs

The two buildings that represent the academic buildings with labs activity zone were Noyes Laboratory and Roger Adams Lab (RAL). Noyes lab consists of classrooms, labs, offices, a glass shop, a student lounge area and a library. RAL consists of offices, labs, classrooms and a receiving area.

Landfill Stream
A combined 487.1 pounds of material were collected and sorted across this activity zone. The most common materials found in the landfill stream (by weight) were paper towels at 18.0%, mixed paper at 13.7%, non-recyclable glass at 7.7%, and food scraps at 6.7%, combining for 46.1% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	27.2%
Compostable	9.5%
Currently Recyclable	21.0%
Landfill	22.9%
Potentially Recyclable	19.4%

Table 10: Potential material fate breakdown for the landfill stream in academic buildings with labs

* The potential material fate is determined by considering the best waste management solution for each material category.

Landfill Material from Academic Buildings with Labs

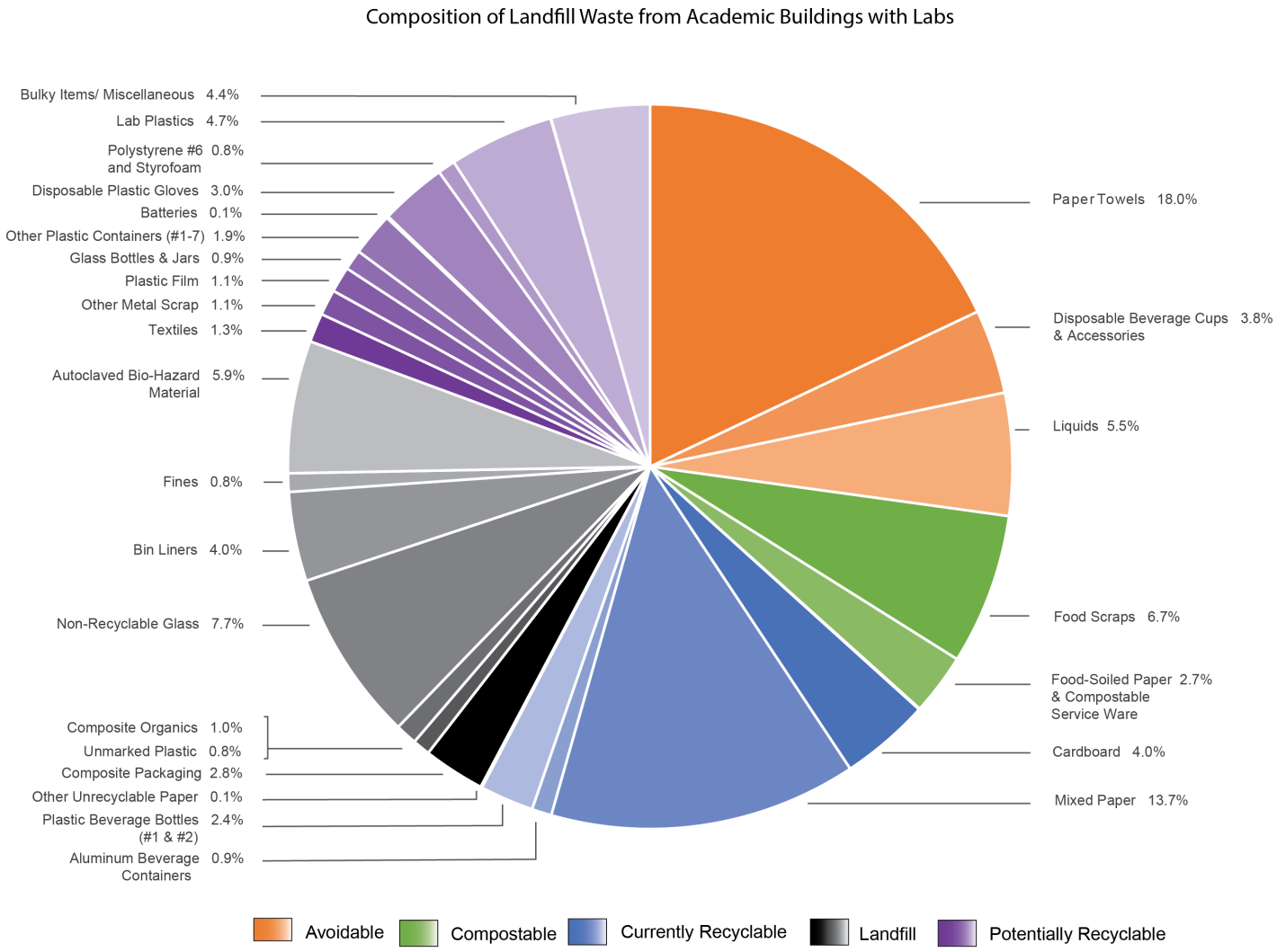


Figure 53: Material breakdown of audit findings for the landfill stream in academic buildings with labs

Recycling Stream

A combined 203.1 pounds of material were collected and sorted across the academic buildings with labs activity zone. The most common materials found in the recycling stream (by weight) were cardboard at 57.5%, mixed paper at 22.2%, plastic beverage bottles at 3.3% and liquids at 2.6%, combining for 85.6% of all material sorted. A total of 14.6% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	6.0%
Compostable	0.6%
Currently Recyclable	85.4%
Landfill	3.7%
Potentially Recyclable	4.3%

Table 11: Potential material fate breakdown for the landfill stream in academic buildings with labs

Top 5 Contaminants in Recycling Stream**	
Liquids	2.6%
Paper Towels	1.8%
Disposable Beverage Cups & Accessories	1.6%
Glass Bottles & Jars	1.6%
Polystyrene #6 & Styrofoam	1.3%

Table 12: Top 5 contaminants in recycling stream in academic buildings with labs exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Recycling from Academic Buildings with Labs

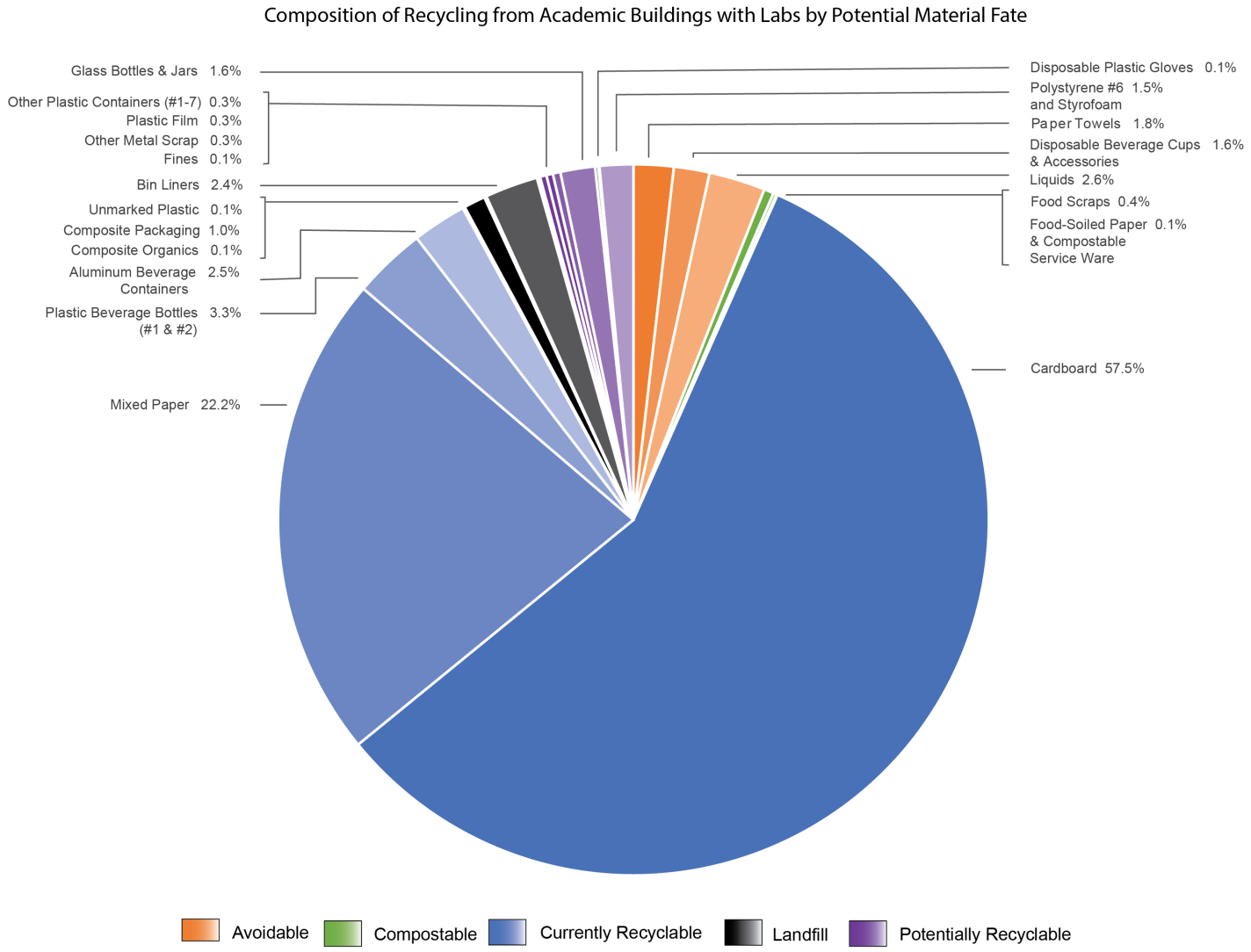


Figure 54: Material breakdown of audit findings for the recycling stream in academic buildings with labs

Multi-Activity Buildings

The two buildings that represent the multi-activity zone include the Activities & Recreation Center (ARC) and the Illini Union. ARC consists of offices, fitness areas, sports courts, locker rooms, meeting rooms, an instructional kitchen and a pool. Large catered events occur at this facility occasionally, as do smaller meetings with outside food brought in. A food pantry that serves students operates out of the instructional kitchen with regular weekly hours. The Illini Union consists of event spaces and conference rooms, student lounges, an electronics store/repair service, a food court with multiple dining facilities present, University Catering operations, a Starbucks coffee shop, seating area and a stage in the Courtyard Café, a few small food retailers on the first floor, a hotel, a recreation area (with a bowling alley and other games), a credit union, a computer lab, and offices.

Landfill Stream
A combined 464 pounds of material were collected and sorted across this activity zone. The most common materials found in the landfill stream (by weight) were paper towels at 25.3%, textiles at 13.5%, food scraps at 10.3%, and both liquids and bin liners at 6.4% each, combining for 61.9% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	35.1%
Compostable	15.0%
Currently Recyclable	10.1%
Landfill	16.1%
Potentially Recyclable	23.7%

Table 13: Potential material fate breakdown for the landfill stream in multi-activity buildings

* The potential material fate is determined by considering the best waste management solution for each material category.

Landfill Material from Multi-Actvity Buildings

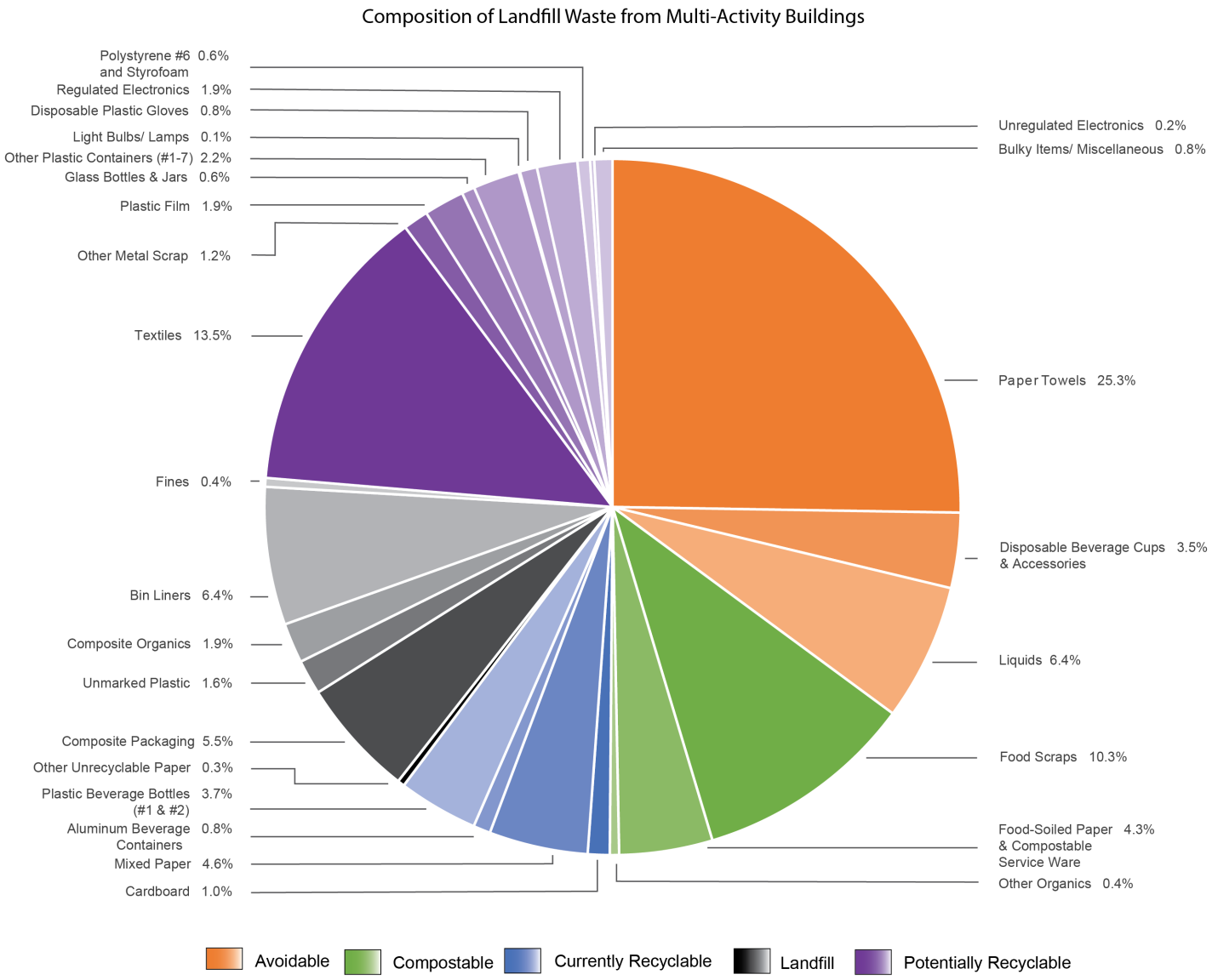


Figure 55: Material breakdown of audit findings for the landfill stream in multi-activity buildings

Recycling Stream

A combined 392.8 pounds of material were collected and sorted across the multi-activity zone. The most common materials found in the recycling stream (by weight) were cardboard at 58.9%, liquids at 10.2%, plastic beverage bottles at 8.5% and mixed paper at 8.1%, combining for 85.7% of all material sorted. A total of 23.1% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	13.3%
Compostable	0.8%
Currently Recyclable	76.9%
Landfill	2.7%
Potentially Recyclable	6.2%

Table 14: Potential material fate breakdown for the landfill stream in multi-activity buildings

Top 5 Contaminants in Recycling Stream**	
Liquids	10.2%
Disposable Beverage Cups & Accessories	3.1%
Glass Bottles & Jars	2.1%
Other Plastic Containers #1-7	2.1%
Plastic Film	1.3%

Table 15: Top 5 contaminants in recycling stream in multi-activity buildings exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Recycling from Multi-Actvity Buildings

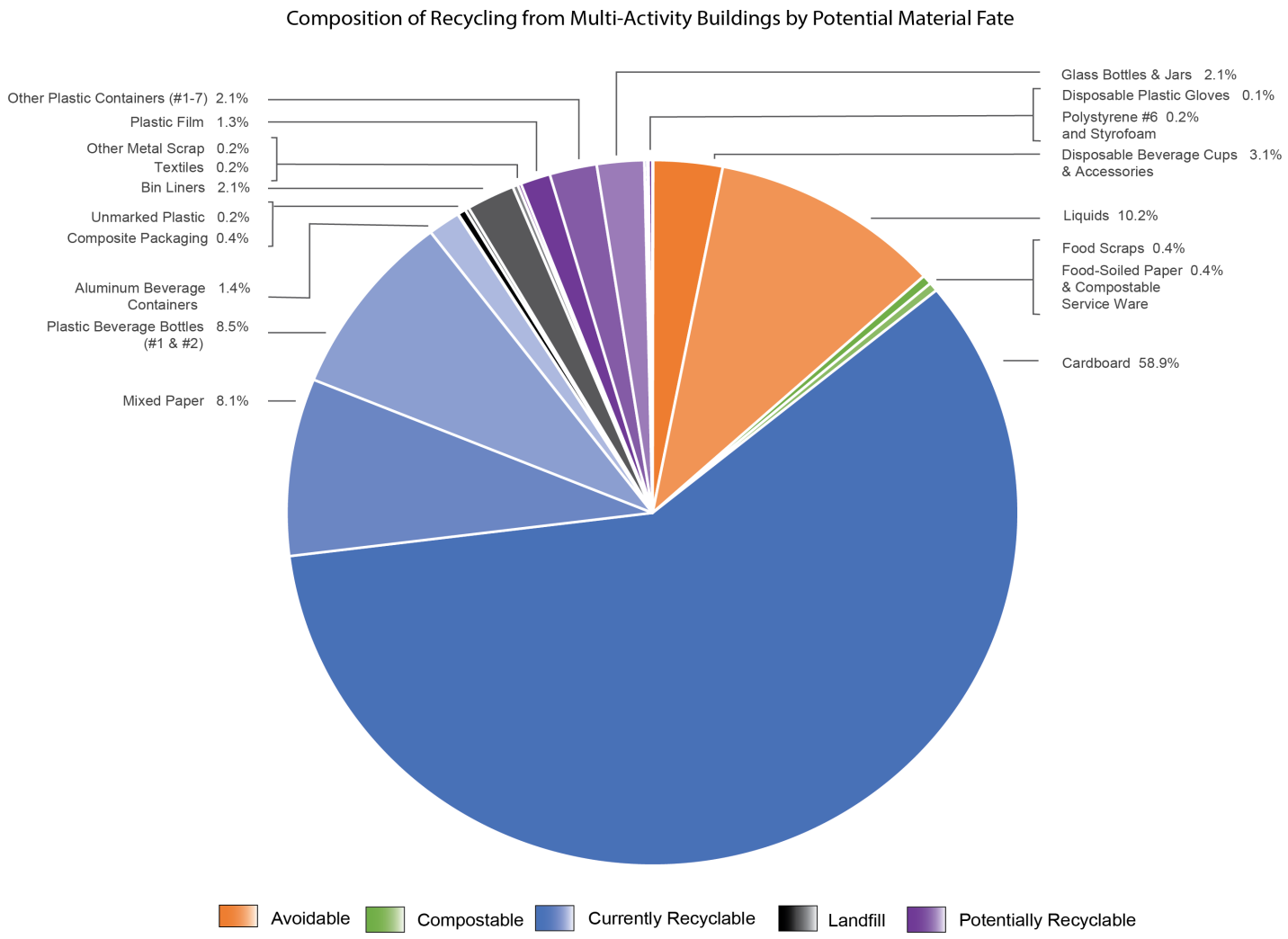


Figure 56: Material breakdown of audit findings for the recycling stream in multi-activity buildings

Student Living

The two buildings that represent the student living activity zone are Lincoln Avenue Residence Halls (LAR) and Allen Hall. These two buildings share outdoor waste and recycling collection infrastructure so data collected represents the conglomeration of that material. Allen Hall consists of student living, a dining hall that is shared with LAR, a ceramics lab, computer lab, music room and a fitness room. LAR consists of student living as well as the shared dining hall previously mentioned.

Landfill Stream
A total of 263.7 pounds of material were collected and sorted across this activity zone. The most common materials found in the landfill stream (by weight) were food scraps at 26.0%, paper towels at 13.5%, composite packaging at 6.8%, and food service paper & compostable service ware at 6.3%, combining for 52.6% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	21.1%
Compostable	32.2%
Currently Recyclable	12.8%
Landfill	19.0%
Potentially Recyclable	14.8%

Table 16: Potential material fate breakdown for the landfill stream in student living buildings

* The potential material fate is determined by considering the best waste management solution for each material category.

Landfill Material from Student Living

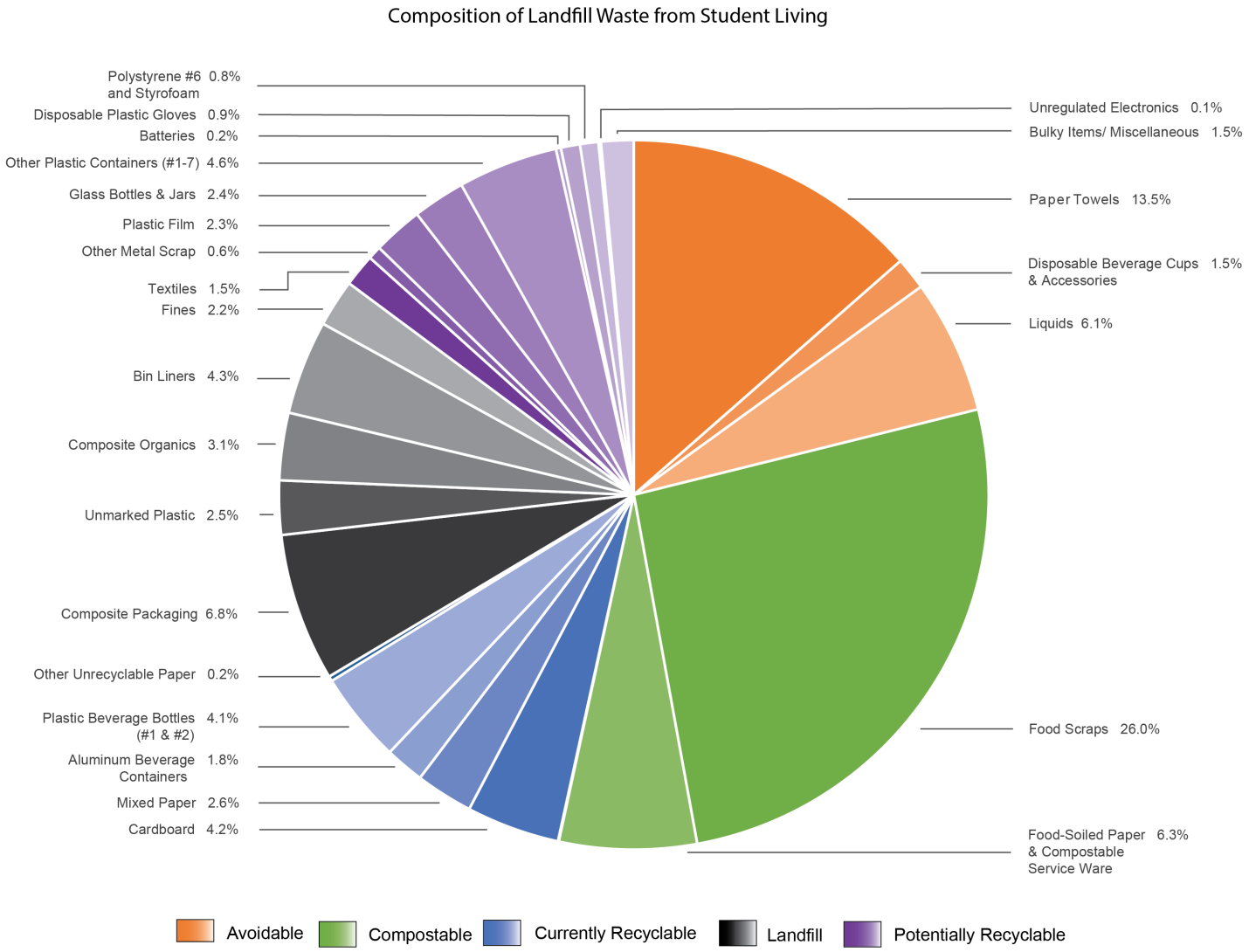


Figure 57: Material breakdown of audit findings for the landfill stream in student living buildings

Recycling Stream

A total of 293.6 pounds of material were collected and sorted across the student living activity zone. The most common materials found in the recycling stream (by weight) were cardboard at 66.0%, plastic beverage bottles at 9.6%, mixed paper at 7.5% and paper towels at 4.0%, combining for 87.1% of all material sorted. A total of 14.7% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	5.6%
Compostable	1.4%
Currently Recyclable	85.3%
Landfill	4.5%
Potentially Recyclable	3.2%

Table 17: Potential material fate breakdown for the landfill stream in student living buildings

Top 5 Contaminants in Recycling Stream**	
Paper Towels	4.0%
Liquids	1.3%
Composite Packaging	1.2%
Food Solied Paper & Compostable Service Ware	0.9%
Plastic Film	0.9%

Table 18: Top 5 contaminants in recycling stream in student living exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Recycling from Student Living

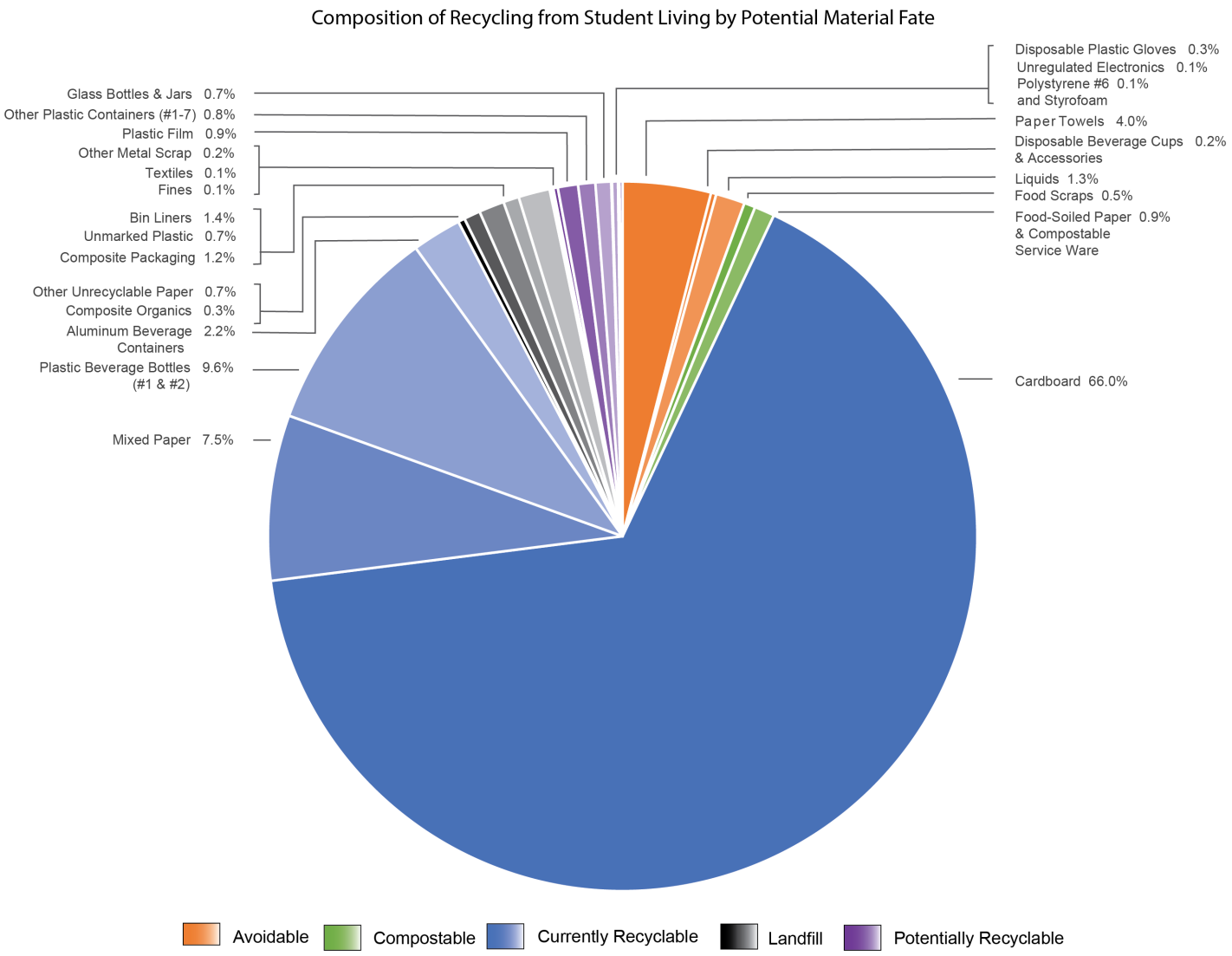


Figure 58: Material breakdown of audit findings for the recycling stream in student living buildings

Stakeholder Engagement

Stakeholder engagement is an important component of a waste characterization study. While the physical waste audit gives us insights into waste and recycling generation, stakeholder engagement allows for an exploration of behaviors, attitudes, and awareness. ISTC conducted informal and formal stakeholder engagement with university-affiliated staff and students in several ways, as outlined below.

In the project planning stage, ISTC worked with F&S to develop questions for stakeholder focus group sessions, adapted from a building occupant survey administered in conjunction with 2015 campus building waste audits, with additional questions added to reflect current campus waste management procedures and interests. These questions, related to waste management and recycling practices on campus, were meant to help the research team gauge awareness of current waste management practices, expectations, and allow individuals who regularly occupy the buildings involved in the study to provide suggestions for ways to reduce waste and improve collection of recyclables for those buildings and campus in general. The plan was to conduct four virtual focus groups (one per activity zone included in the current audits (See "Activity Zone Approach.")

Ultimately, the building waste audits were scheduled in October to accommodate ISTC and F&S schedules while also taking into account large events and other out-of-the-ordinary circumstances at study buildings that might impact waste generation, resulting in atypical samples. The audit period ended in late October, meaning that virtual focus group sessions would begin in November. Given the week-long break in November for the Thanksgiving holiday, the focus on finals and wrapping up the semester in the first few weeks of December, and the fact that winter break would begin in mid-December, resulting in many students leaving campus, the study team realized the timing of four virtual focus group sessions might negatively impact participation. To avoid the necessity of scheduling several additional focus group sessions at the end of the Fall 2023 semester to accommodate the busy schedules of students, staff, or extending the project timeline to include additional focus group sessions at the beginning of the Spring 2024 semester, it was decided to offer an online survey using Webtools at the same time as the four planned focus group sessions. The Webtools survey consisted of exactly the same questions as those posed to focus group participants, so that more members of the campus community would have the opportunity to provide feedback during this busy time. The link to the survey and the option to submit written feedback in lieu of focus group attendance was included in invitations and other promotional materials for the focus groups. Focus group participants were also given the link to the Webtools form, in case they would like to provide additional comments beyond those they were able to provide during the virtual focus group sessions. The closing date for the survey coincided with the beginning of winter break.

Because focus group participants were assured that input provided to ISTC would be anonymized when shared with F&S, the Webtools survey was also structured to allow for anonymous feedback. Names and credentials were not associated with responses. Recruitment for the survey and focus group were accomplished via personal email invitations to more than

40 campus groups and individuals (including relevant registered student organizations, facility contacts, etc.), submissions to the university email news bulletins geared toward faculty, staff, and students (e.g., Eweek, GradLinks, and INews), submissions to the Institute for Sustainability, Energy, and Environment (iSEE newsletter), social media posts, digital signage in the audit buildings, submissions to the campus communicators listserv for sharing via digital signage and/or newsletters throughout campus, and promotion at relevant events. In total, 86 people completed the survey by the due date of December 22nd, 2023.

Informal Dialogues: Many informal yet valuable dialogues about campus waste occurred "over the sorting table," as student and staff volunteers shared their own experiences and stories while assisting with the study. Some examples: a Waste Transfer Station (WTS) employee came to help, and through conversation explained the nuanced rationale behind some "recyclability" questions. A senior student working on her own waste research brought insights from other areas of campus.

Short, routine interactions with building staff and occupants also shaped our understanding of building use, communication strategies, and routine function of waste management. One Building Service Worker (BSW) commented during a pickup that people were bypassing our sample collection bins because they didn't know that "landfill" meant trash; we promptly edited our signs.

Building Walkthroughs: As explained in the Introduction, a waste characterization study begins with a building walkthrough to assess current conditions including both infrastructure and materials management practices. During this time, ISTC assesses trash and recycling bins (sizes, colors, location, and signage), makes note of unique factors (e.g., specialty recycling locations), and also gets the chance to ask building staff members specific and relevant questions. These in-situ interviews provide opportunities to ask questions about the ever-changing usage of a particular place, filling in gaps that waste stream analysis alone cannot answer. They also provide an opportunity to assess ground-level awareness of rules and guidelines that don't always "trickle down" to individual staff members. Walkthroughs of the eight buildings in this study informed "Current Management Practices" above. We are grateful for the building staff who walked us through their buildings and answered our many questions to the best of their abilities.

Survey: The modified 2023 survey as posted to Webtools, as well as the new focus group questions, can be found in Appendix D.

Focus Groups: ISTC conducted four focus group sessions, one for each Activity Zone (See "Activity Zone Approach"), during the month of November. Attendees of these sessions received a briefing on the history and methodology of our waste audit, then had the opportunity to introduce themselves and respond to a series of open-ended questions on waste habits on campus that paralleled the questions in the survey. Additionally, the focus group sessions included a preliminary overview of waste audit data for the relevant activity zone and allowed for relevant discussion and reactions from participants. As anticipated, the focus group sessions were poorly attended, though discussions were animated and the source of valuable information

the for the study team. Focus group participants and survey respondents were not mutually exclusive groups (due to provision of the Webtools link to focus group participants). Thus, it can only be asserted that at least 86 members of the campus community provided feedback to ISTC during the months of November and December 2023, either via focus group discussion, the Webtools survey, or some combination of the two.

Themes from all Stakeholder Engagement

Key Takeaways:

- Centralization, communication, and standardization of education is key.
- Leadership should build on progress already made by individuals.
- People want to do the right thing but lack actionable information. 80% of respondents said that they find recycling "Very Important," but only 15.3% said they felt "Very Informed" about recycling on campus.
- Mixed Messaging (in signage, education, and related to myths of what is sent to the landfill and what is sorted) leads to confusion and contamination.

BSWs: On the Front Lines of Waste Management

- Variation in BSW Training, Ordering, and Procedures: Although F&S services all campus buildings in the sense of hauling trash and recycling from outdoor dumpsters and bins, it does not coordinate waste management staff for all buildings. Auxiliary units on campus employ their own BSWs and handle purchasing and storage of their own waste-management supplies (e.g., bin liners). One manager described a departure from a standardized handbook for F&S-coordinated BSWs "a few years back," seemingly around the time of bag color standard implementation in 2019. COVID-19 may also have impacted training procedures. Thus, training, awareness of the bag color standard, and product ordering for items like bin liners/bags are not standardized across all campus buildings, let alone across auxiliary buildings. Procedures also vary between F&S-coordinated BSWs and BSWs of auxiliary, non-F&S-coordinated buildings. Standardizing BSW procedures and facilitating communication between BSWs across campus might improve uniformity of waste procedures.
    - Diversion from bag color standard due to lack of awareness: In conversations with various stakeholders, ISTC discovered that many people had simply not heard of the bag color standard at all, but were amenable to the idea. Only two survey-takers self-identified as BSWs; of these two, both responded that they were "Not Familiar" with the bag color standard, and both reported that following the bag color standard was "Not applicable to my role." Multiple facility managers and BSWs commented that they would happily work to comply if F&S requested them to and clarified expectations.
    - Variation in bin liner usage due to facility circumstances: It was noted that BSWs may tend to prioritize bags appropriate for the size, shape, and usage of a bin, as well as double-bag bins based on experience with leakage or bag strength. Bags of the appropriate size and strength for every circumstance at a location may not

be readily available in a given color to comply with the F&S bag color standard (see CSMR's Stock Limitations).

- CSMR's Stock Limitations: Several BSW supervisors noted that bulk ordering of colored trash bags, among other things, is limited by the unit's own bulk storage capacity as well as availability in the campus store or approved outside vendors. Housing, for example, chooses to purchase its bin liners from Campus Stores, Mail & Receiving (CSMR) for a variety of reasons, but mainly due to storage space limitations within their buildings. Stakeholders noted that in recent years, CSMR has not carried the blue bags typically used for lining recycling bins, which led to Housing no longer using blue bags for recycling bins. Additionally, auxiliary units are charged a markup for using CSMR, and thus some auxiliaries find it most cost-effective to purchase products from external vendors, if that is feasible given on-site storage capacity and other factors.
- Staff relationships with BSWs: Most building occupants only rarely interact with their BSWs, leading to uncertainty about BSW procedures. For example, some respondents expressed worries that their BSWs were emptying recycling bins into the trash (see "Mixed Messaging, Myths, and "Little Trust" below). In some cases, this may be a misinterpretation of routine F&S procedure, where bags from both trash and recycling bins may be comingled in one dumpster and later sorted. In other circumstances, it may be truly comingled, whether due to BSW misunderstanding of WTS sorting procedures, or as a valid judgement call on the part of BSWs, who empty those bins frequently and may choose to divert bags they deem "too contaminated" to the landfill. Most building occupants want to learn more and develop better relationships with their BSWs. *"Tell us what BSWs are trained to do,"* said one respondent.
- Green Purchasing Guidance: Respondents expressed that they had not seen adequate messaging or leadership from campus on recommending or supplying more environmentally friendly, "green" cleaning products (e.g., through CSMR or through more explicit and consistent messaging in iBuy, the university's online purchasing platform). They would like to see an increase in campus efforts to do so, perhaps expanding on the hard work and research that individual departments have done on finding products. A few respondents suggested that they would appreciate the opportunity to provide input on the products and quantities ordered in bulk by CSMR.
- Full Paper Towel Rolls in the Trash: Several respondents explained why our audit might have found dozens of nearly-full-looking paper towel and toilet paper rolls in campus buildings: night shift workers must ensure that the rolls don't run out until the next night. In high-traffic areas, a holder with three half-full rolls might run out, and BSWs might be blamed or called in to fix the situation; thus, crews in some buildings proactively replace rolls before they are fully used. Limited storage space for partially used rolls and lack of guidance on how to handle this problem resulted in wasted paper.

The Waste Transfer Station (WTS)

- Misconceptions of a Higher Capacity WTS: Many stakeholders had the mistaken impression that since the WTS processes an entire campus's worth of garbage and recycling, it must have a large team of personnel, large-scale mechanical sorting equipment, and/or even high-tech optical sorting equipment. It currently has none of these things. One respondent's comment: *"One would have hoped by now that an*

institution as accomplished as the UofI would have harnessed AI and robotics to sort its trash."

- "Every bag is sorted" myth: This misconception that all bags get a second sort leads to the assumption that the WTS must have the capacity to sort every bag through staff or machinery. This is not the case; the WTS has a small team with little mechanization; thus, not every bag is given a second sort. (See "Not All Bags are Sorted" below.)
- Bottle Shape Matters More Than Number: Hand-sorting of high volumes of waste is accomplished each day at the WTS by a small crew, including some with developmental disabilities. (See "Sorting at the Waste Transfer Station (WTS)" in Current Practices.) This means that plastics are often picked out by shape rather than by resin code number, which is why F&S messaging has historically specified plastic beverage bottles as acceptable for recycling, rather than all plastics #1 and #2. This peculiarity results in confusion among members of the campus community, since not all bottles are #1-2 and not all #1-2 plastics look like bottles. During sample sorting, there was even debate among F&S-employed volunteers about whether a non-beverage container with resin code #1 would be perceived as a "bottle" by the sorting crew. This unique procedure is one barrier to expanding the types of plastic containers accepted for recycling on campus.

Recyclable Streams, Big and Small

- The "Main Five": Paper, plastic, cardboard, aluminum, and scrap metal are listed on the F&S recycling page as "acceptable," but two of those (cardboard and scrap metal) are not accepted in public-facing recycling bins. This is confusing.
    - Cardboard collection is especially confusing to respondents, because procedures for handling it vary so widely from building to building and are not communicated to building occupants through clear, convenient means (e.g., via signage). Messaging on paper bin labels and on the F&S website suggests consulting facility managers or BSWs for building-specific procedures. However, there's no reason to believe that students attending class in a building or infrequent visitors to a building would 1) know who the building's facility manager is and how to contact them; 2) be willing or able to take the time to do that when the need to dispose of cardboard arises; or 3) encounter BSWs (especially when in some cases, BSWs may work during times when the building is not occupied). One person summed it up: *"Cardboard recycling is also extremely unclear of how/where. The paper bins say NO CARDBOARD. Ok, so where does our cardboard go? Does the university not accept cardboard?"* 63% of survey respondents said that they would put cardboard in a standard public-facing recycling bin, which is contrary to F&S guidance, and 12% said they were "not sure."
    - 71% of survey respondents reported that they would put a tin can (e.g.,a soup can) in a public-facing campus recycling bin." Tin cans are accepted as part of bulk metal pickups from dining halls, but not in any public-facing recycling bins.
- Glass: Although glass recycling was not specifically mentioned in survey questions, open responses and waste audit data suggested that many people are unsure if glass is accepted on campus. Glass is highly recyclable and accepted in Champaign and Urbana

curbside recycling. Housing recycles glass alcohol bottles generated through University Catering; however, the university does not currently recycle glass of any kind through public-facing bins. Older bin labels listing only “Bottles and Cans" might suggest that any type of beverage bottle—plastic or glass—is accepted for recycling on campus.

- Bulk Pickup: Who, What, When, Where? Some departments or units regularly call F&S for bulk pickups of scrap metal, bulk paper and books, pallets, car batteries and other specially collected items and are thus confident about the recyclability of these materials on campus and proper handling procedures. Others may be unaware that certain bulk materials can be recycled on campus or confused about proper handling.
- Batteries: Many community members were vaguely aware of a collection box for single-use batteries in their building or department but had no idea who serviced it or when. *"There used to be a battery drive in OUA, where batteries were stored and then taken in for disposal, but in my three years here, I've never seen that bin emptied,”* was one representative comment in this vein. Some buildings had buckets full of batteries in a back room, but with no labeling, signage, or point person. Some individuals knew that F&S no longer coordinated battery recycling, but not all knew how current management of this waste stream worked.
- Doing It for Themselves: People and departments across campus are trying mail-in box programs to recycle special items not currently accepted through campus recycling. Initiatives include the Kimberly-Clark RightCycle program for nitrile gloves in lab settings, TerraCycle for pens and markers, and likely more initiatives that this audit did not uncover. These programs are generally small in scale, low in visibility, and often the passion project of one individual or one department.

Perceived High-Volume Materials by Building

Building occupants listed these items as high-volume materials, but this list does not necessarily represent the data collected during our sorting.

- ARC: Paper towels, wipes
- Allen & LAR: Paper towels, cardboard (OCC)
- BIF: Food and associated waste (ex. Boxes, utensils) from events
- CIF: Food, dry erase markers
- RAL: Styrofoam, lab waste (Kimwipes, weigh boats, pipets), glass
- Noyes: Glass, lab waste

Difficult-to-Recycle Items

- Keurig Pods, Fast Food Packaging, Single-Use Utensils, Cups, Straws, Coffee Cups, Styrofoam, Coated Paper Cartons, Unmarked Plastic, Food-Soiled Items, Mixed-Material Items (Plastic-Coated Paper, Plastic-Coated Foil, Etc.)
    - Solutions of reduction and reuse: Respondents noted that many of the above items (especially food-soiled and composite single-use plastic like takeout containers, chip bags, and Keurig pods) will continue to be difficult to recycle, and may best be replaced by reusable alternatives. One respondent stated this clearly in regards to single-use food packaging: “*No campus entity should be*

using non-reusable food containers including the businesses operating out of campus buildings."
    - Food-soiled paper could also be addressed through a compostable stream.
- Electronics/E-Waste, Batteries
    - One respondent noted that cords, audio devices, and items without storage/memory are less likely to be accepted by campus surplus, which has limited capacity.
    - E-waste and batteries can cause harm in landfills, but stakeholders struggle to find the infrastructure to reuse or recycle them. *"I have no idea what to do with dead batteries and electronics,"* one respondent said.
- Bubble Wrap, Plastic Bags, Shrink Wrap, Plastic Film, Ziploc Bags
    - Plastic film products (e.g., plastic shopping bags, bubble wrap, bubble mailers, most cereal bags, Ziploc bags, etc.) are currently recyclable through store drop-off programs in the area, and were once collected on campus. Respondents requested similar programs for Styrofoam, noting the recent closure of the nearby Dart facility that used to process Styrofoam.
- Other difficult-to-recycle items listed by stakeholders included glass, tape/stickers, paper bags, bathroom paper towels, glossy paper, residential food waste, lab plastic, tin cans, cardboard, ink cartridges, wrappers, anything that needs to be rinsed, motor oil, oil-based paint, tires, household propane tanks wind turbine blades, un-donatable textiles, disposable wipes for cleaning exercise equipment between users, catered food, and ink and toner cartridges.

Why Do People Not Recycle, or Recycle Too Much?

- Not All Bags Are Sorted: The survey asked respondents if they believed this statement: "The materials in all of our campus building bins are sorted for recycling whether they are placed in the trash or recycling bin, so it doesn't matter what bins I use." 10.6% of respondents agreed that all bags are sorted, while another 23.5% said they were "Not Sure." This persistent myth is resoundingly false, given the limitations of the WTS.
    - The only deciding factor in a bag being sorted or not is its color, per WTS (see above). Campus awareness of this bag standard is low. 52% of survey respondents said they were "Not Familiar" with this standard, and another 35% said they were only "Somewhat Familiar".
- Mixed Messaging, Myths, and "Little Trust": People often see or hear about both trash and recycling (especially in certain high-contamination areas) being put in the same trucks or dumpsters. They also might hear the myth that "all bags are sorted," and contribute to contamination by carelessly putting things in the incorrect bin. Even bin signage might be outdated and incorrect for current recycling streams and methods. National news coverage of the efficacy of recycling and/or the impacts of commodity markets on recycling may make individuals feel uncertain about whether recycling in general is worthwhile. The net result is apathy and confusion.
    - Countless responses showed stakeholder uncertainty that materials placed in indoor recycling bins were truly recycled.
        - "*In our unit in the Union, we always provide a recycling bin next to our trash bins,"* wrote one survey respondent. *"But I often see the BSWs just*

dump everything into the same large container when they are emptying our bins. It's discouraging, because why have the big blue multi-compartmental trash and recycling bins in the rest of the building if it doesn't matter?"

- *"It is very unclear to tell if the recycling bin contents truly get recycled or not."*
- *"I sometimes wonder if the items actually get recycled or just dumped with the rest of the garbage."*
- *"I hear people say that the recycling just ends up in the trash after it is picked up. It would be nice to dispel that myth."*
- *"My main concern with the current recycling system is not knowing which things can be actually recycled, and which cannot."*
- *"I like to know my efforts at recycling... are not wasted."*

- The opposite problem arose from the myth that all bags of all colors are sorted, regardless of source. People who believe this myth might put trash in recycling bins, contaminating the recycling stream. They may also put recycling in trash bins, believing that it will be sorted out, reducing diversion rates. One respondent wrote: *"if it is OK to mix in recyclables with the regular garbage (you will separate it later), then why are there stations that ask you to separate? ... People either do not know, do not understand, or do not believe that recyclables are pulled out of the waste stream after collection. It is confusing when this is said, but then special bins are established for separating waste. Which is it? This needs to be made clear."*

- "Whatever their hand gets to first": Respondents suggested that especially in high-traffic, high-speed areas like hallways, people are less inclined to read signage closely. For example, a student rushing to dispose of a single-use coffee cup before class might not notice the difference between a trash can and a recycling bin on a 3-bin station.
- "Wishcycling": People with good intentions often put unrecyclable items or items not locally accepted for recycling in recycling bins despite being unsure if they will be recycled – a phenomenon called "wishcycling." Sometimes this might occur on campus because items are accepted for recycling through other programs in the broader Champaign-Urbana area, but not on campus. Part of the survey (Attached as Appendix D) asked how respondents might categorize 13 items. Of these, 7 items (Tin Cans, Plastics 3-7, and plastic bags) are not acceptable in standard public-facing recycling bins on campus. The average respondent (of 86 responses) put 46% of the 7 unacceptable items in the recycling, although answers ranged from 0% wishcycling (all correctly placed in the trash) to 100% wishcycling (all incorrectly placed in the recycling.) Effective materials management education teaches not only what can be recycled, but also what cannot.
    - The most frequently recycled "unacceptable" item was tin cans, with 71% of our survey-takers reporting that they would put them in standard public-facing campus recycling bins. This makes sense, as tin cans are commonly accepted in most curbside recycling programs, including those of Champaign and Urbana.
    - The least frequently recycled "unacceptable" item was plastic bags, with only 15% of respondents reporting that they would put them in standard public-facing campus recycling bins.

Education and Signage

- Misleading, Outdated, Contradictory and Irregular Signage: Most buildings contain a mix of outdated F&S signage, new F&S signage, and/or signage (sometimes outdated or inaccurate) created by building occupants. Standardized, clear signage with links or QR codes for more information *"makes it easier and more convenient for all parties,"* as one respondent said.
    - Source Separation: Building occupants reported being unsure if recyclables can be co-mingled. *"Are the blue bins only for paper, or can we put a plastic drink bottle in there? Are they mixed or not?"* asked a respondent.
    - Bottles & Cans: This vague phrase, common in older F&S signage, can be too vague. With no additional information, a bin simply labeled "Bottles & Cans" might be misinterpreted to accept glass bottles or tin food cans. In some cases (ex. CIF's 3-bin stations), one of the bin's icons could easily be misinterpreted as a glass bottle.

Figure 59. An image (left) of CIF recycling bins and detail (right) of "Bottles & Cans" icons, including what could be interpreted as a glass bottle in the leftmost circle. Glass bottles are not accepted in any public-facing campus recycling bins, per F&S guidelines.

- Standardized Bin Shape, Size, and Presence: Respondents reported that recycling bins can be hard to find due to scarcity, placement, or unusual shape, size, or color (not necessarily focusing on buildings that were included in the current audit). One stakeholder commented that *"it would be nice to have more distinct recycling bins."* Many respondents appreciated the clarity and visibility of 3-bin stations, including staff at the Union, who affirmed that building users recycle better in 3-bin stations. 69% of survey respondents said in question 35 that 3-bin stations make it "Very Easy" to determine where to put different items; another 25% said "Somewhat Easy."
    - None At All: A few respondents from outside the audited buildings said that their area had no recycling bin (Robert Evers Lab) or that it had been removed (Greg Hall).
    - More Attention: Respondents listed lab hallways and *"every floor except first floor"* as places that needed more recycling bins. "*Does this mean every time I*

want to recycle something I have to walk down to the first floor and down two halls to recycle?" wrote a respondent.

- Transparency: Stakeholders want to hear and see more about waste on campus. *"Any word about how trash is dealt with is better than not knowing,"* wrote one respondent. Many didn't know where to find any recycling information online, and links to more information are not readily available on the F&S flyers.
    - *"I just tried to find a current list [of currently recyclable items on] the F&S website and failed. I googled and couldn't find anything that I knew was current,"* wrote one respondent. *"I'm happy to post guide lines in our office and educate our students if I know what they are."*
    - Students, faculty and staff want to know why some items are accepted or not. Glass, despite being highly recyclable, is not accepted. Cardboard and bulk metal are accepted, but not in public facing bins.
    - One stakeholder suggested that F&S publicizing bills and hauling data might help people put a price tag on campus recycling.

Stakeholder Suggestions for New Programs

- Rag Reuse Program at the ARC: the Multi-Activity focus group discussed the possibility of a rag reuse and laundering program to replace the many single-use microfiber wipes currently used to clean exercise equipment.
- Composting: Staff, faculty, and students all expressed avid interest in a campus-wide composting program, including 33 mentions of "compost" across 86 survey responses.
    - One respondent's suggestion: *"MCAD (Minneapolis College of Art and Design) has an incredibly robust recycling/compost system in their cafeteria and staffing to direct visitors and new students to learn the system."* Respondents also suggested Vassar College, Beloit College, and Portland, Oregon as having composting programs worth emulating.
- Battery and E-Waste Recycling: Although current battery and personal e-waste recycling are fragmented, many respondents saw a need for the improvement of these programs.
- Recycling Collaboration: Many respondents expressed a wish for the university to work with Champaign and Urbana's municipal recycling programs, especially in order to expand glass recycling on campus. *"I am surprised by the fact that UIUC's waste transfer station accepts few[er] types of commodities than the larger communities,"* wrote one respondent.
- Office recycling etiquette: One respondent described Penn State's deskside bin policy: a cardboard flat for paper and a small container for daily trash, to be emptied by the desk occupant into hallway bins. *"It helped separate things from the source and get buy-in from everybody,"* the respondent noted, reflecting on a visit they had made to that campus.
- Cardboard Box Reuse: Several respondents would like to see spaces for reusing cardboard boxes. *"I am always sad to break down a perfectly good box for the recycling bin,"* said one respondent.
- Single-Use Plastic Reduction: A few survey respondents followed the EPA's waste reduction hierarchy of "reduce" before "reuse, recycle!" They suggested more proactive solutions including top-down regulatory support for individuals, departments, and

businesses to reduce or eliminate single-use plastic such as water bottles, lab plastic, straws, takeout containers and plastic bags. "*More effort should also be done to decrease single use items in the first place - e.g., put a ban on plastic bottled water,"* wrote one. *"We must find a way to move from single-use plastics across the university, even in all commercial sites on campus and in campus town,"* said another.

Stakeholder Suggestions for Infrastructure Improvement

- Interest in Reducing Paper Towels: Stakeholders across activity zones were interested in finding creative solutions to reduce paper towel waste and costs. Most were amenable to alternatives, wherever feasible, including the installation of hand dryers or systems of managing used towels through composting or recycling. Barriers to paper towel reduction and elimination include:
    - Impacts of COVID-19 sanitation/hygiene precautions: For example, prior to 2020, Housing had removed paper towel dispensers and switched to electric dryers, then had to reinstall paper towel dispensers as part of response to the pandemic. They continue to purchase and provide towels but dislike the waste and costs associated with this practice.
    - While many buildings on campus have signage reflecting current CDC guidance that either electric dryers or paper towels are equally appropriate for hand drying, without direct communication and about the safety of hand dryers coming from F&S, some facility managers may continue to wonder and err on the side of caution, providing towels even if they might feasibly reduce or eliminate them.
    - Wiring for additional electric hand dryers might be challenging in some buildings/areas, e.g. the Illini Union, which was built to serve as a bomb shelter.
    - Some high-traffic areas might need to provide both electric dryers and paper towels to efficiently service the number of people within a bathroom during various times/days.
    - Elimination of paper towels may not be feasible in some areas due to a potential need to address spills or due to space restrictions, such as in teaching labs or instructional kitchens, where sinks are abundant and spills are probable.
- Rinse Locations: Especially near hotspots like break rooms and coffeeshops, respondents wanted options to quickly rinse single-use plastics (for cleaner recycling) and their own reusable containers (in order to encourage reuse).
- Year-Round Recycling Drop-Offs: Respondents expressed interest in permanent drop-off locations for hazardous waste, E-waste, and batteries.
- BigBelly: One respondent suggested the implementation of BigBelly solar-powered trash compactors for outdoor receptables in order to reduce the number of pickups. *"University of CA Berkeley has been using these for years now,"* wrote the respondent. "*We are behind. Why?"* (In fact, such compactors were installed around the Illini Union in the past but were removed because compacted materials could not be given a second sort.)

Stakeholder Suggestions for Education

- "Simpler to read": Bite-size, routine education is more effective than long reports at quickly communicating relevant information. Respondents expressed interest in seeing recycling education in existing communications including EWeek, the Daily Illini, the Illinois App, massmail, and newsletters, as well as in clear signage on or near all bins.
    - Trainings: Several stakeholders suggested education through mandatory trainings for faculty, staff, and students.
    - Stakeholders expressed interest in receiving recycling educational materials in various formats, both digital and printed.
    - Another stakeholder suggestion: Provide multilingual options where possible, and always include lots of pictures for wider accessibility.
- Student Involvement: One student called for "*More student-initiated, student-led collaborations."* A faculty member wrote, *"My students designed apps for recycling and apps for product exchange."* Students can create bold and effective change given the tools and information to do so, and they want to help improve waste management.
- WTS Awareness & Improvements: Many stakeholders who did understand the limitations of the WTS expressed a wish for improved mechanical sorting, more staff, and higher-tech sorting methods, as well as greater awareness.
    - Stakeholders reported that touring the WTS dramatically improves understanding of WTS policies and empathy for its employees. One staff member suggested that tours are especially beneficial for older employees like them. *"I was always told "just throw it in the trash, [it] will get sorted,"* wrote one respondent, *"Until I attended a tour of the sorting facility."* A faculty member wrote, *"the only reason I know anything [about campus recycling] is because of a class I took were we actually visited the recycling site."*

Analysis

Landfill/Trash Stream in 2023 Audits

“All material sorted” in the section below refers to the 1742.3 pounds of material sorted as part of the landfill/trash stream.

- Looking across all activity zones, only 18.9% of all material sorted was considered waste that has no other potential fate than being sent to landfill.
  - This ranged between 16.1% (multi-activity buildings) – 22.9% (academic buildings with labs)
- Looking across all activity zones, 34% material sorted was considered avoidable.
  - This ranged between 21.1% (student living) – 45.8% (academic buildings)
  - Paper towels (categorized as avoidable in this study since that is the best solution where feasible, though they might also be considered compostable or potentially recyclable) represented the largest material category (by weight) found in our landfill/trash stream samples at 23.1% of all material sorted.
    - This ranged from 13.5% (student living) to 30.8% (academic buildings).
- Outside of material that was considered waste that should go to landfill and material that considered avoidable, materials considered currently recyclable, potentially recyclable, and compostable represented 12.9%, 17.1%, and 17.1%, respectively, of all material sorted from the landfill stream samples.
  - Capturing the 12.9% of currently recyclable material would have resulted in an additional 224.76 pounds of material could have been recycled. Extrapolating this to campus wide generation in FY23, this would result in an additional 1,502,646.18 pounds of recyclable material that could be baled and sold.
  - There was variation among the activity zones as to what material (of those categorized as currently recyclable) was most likely to end up in the landfill/trash.
    - Plastic beverage bottles (#1 and #2) were most abundant (by weight) in the trash in academic buildings.
    - Mixed paper was most abundant in the trash in academic buildings with labs and multi-activity buildings.
    - Cardboard, followed closely by plastic beverage bottles #1 and #2) was most abundant (by weight) in the trash in student living buildings.
  - Food scraps (categorized as compostable in this study, though we acknowledge that in some instances they may be avoidable through behavioral changes) represented the second largest material category (by weight) in our landfill/trash stream samples at 12.6% of all material sorted. This ranged greatly from 6.7% (academic buildings with labs) to 26% (student living).

Recycling Stream in 2023 Audits

“All material sorted” in the section below refers to the 1065.7 pounds of material sorted as part of the recycling stream.

- Looking across all activity zones, 81.4% of all material sorted was correctly recycled (i.e., disposed of in existing recycling collection infrastructure).
  - Cardboard represented 62.3% of all material sorted, while mixed paper and plastic beverage bottles (#1 and #2) represented 9.9% and 7.1%.
- Looking across all activity zones, 8.6% of all material sorted was considered avoidable.
  - This ranged between 6% (academic buildings and academic buildings with labs) to 35.1% (multi-activity buildings).
  - Liquids (categorized as avoidable in this study) represented the largest material category (by weight) contributing to contamination of recycling at 5% of all material sorted.
    - This ranged from 1.3% (student living) to 10.2% (multi-activity buildings).
- Looking across all activity zones, 18.6% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.
  - This ranged from 14.7% (student living) to 23.1% (multi-activity buildings).
  - Liquids represented the largest (by weight) material category contributing to contamination at 5.0% of all material sorted.
    - Liquid contamination presents a problem as it can also contaminate currently recyclable items such as mixed paper and cardboard. Even if these materials are placed in the proper collection containers by building occupants or BSWs, they must remain clean and dry to be eligible for baling and sale as commodities.
  - Looking at the top five largest sources of contamination from each activity zone, liquids is the only material category that appears in all four activity zones. “Glass bottles and jars” and “disposable beverage cups & accessories” each appear in three of the four activity zones (neither category is a top five contaminant in the student living activity zone).

Comparison to Previous Campus Audits

As noted in the "Introduction," F&S was interested in determining, for any buildings included in this study which had been part of previous building waste audits conducted by ISTC in 2014 and 2015, whether and how the composition of the landfill-bound and recycling waste streams has changed over time. Variance in methodologies make comparison of study results challenging. ISTC conducted several campus waste audits at other institutions since the previous U. of I. audits were conducted, and during that time, our methodologies and approaches have evolved. The previous studies predate ISTC’s activity zone approach. In our more recent waste audits,

including the current (2023) U. of I. building audits, we also address potential material fates in a slightly different way than we did for the previous audits. For example, in the previous U. of I. reports, the terms “recyclable” or “recyclables” as portions of the waste stream were used to describe the five main material categories currently accepted for recycling at the campus WTS, as well as other materials that might technically be recycled, instead of separating the data into “currently recyclable” and “potentially recyclable” as was done in the 2023 audits. In the 2023 study, ISTC and F&S agreed to consider paper towels, liquids, and paper cups [part of "disposable beverage cups (paper & plastic) & accessories"] as “avoidable” materials, whereas in 2015, these materials were included under the umbrella of “compostable” materials.

ISTC also currently tends to sort waste streams into more abundant and distinct categories (though as always, the materials sorting categories used are identified and defined in concert with audit clients), and definitions of those categories are always included in study reports. Definitions of the 12 materials sorting categories examined in 2014 were not included in the report. Thus, identifying analogous categories to the 31 categories used in 2023 is difficult. For example, the 2014 study included a “miscellaneous solids” category, which might be analogous to “bulky items/miscellaneous” in the 2023 study, but that cannot be confirmed without those definitions. Also, weights for a distinct category of “liquids” were not reported upon in either the 2014 or 2015 study, whereas in the 2023 study, liquids were collected and weighed separately for both the landfill-bound and recycling waste stream samples. As noted above, in 2015, liquids were considered part of the group of materials deemed “compostable” (see pg. 7 of the 2015 report, under the bulleted list of “Key findings and observations about the university’s landfill-bound waste stream throughout the sample”), but they are not specifically mentioned in the material category definitions (Appendix B, pg. 51 of the 2015 report). Perhaps they were included as part of “fines” in 2015, but without specific mention in the category definitions, that cannot be confirmed. In the 2023 study, liquids were found to be a significant contaminant present in the recycling stream. The fact that the previous reports don't include separate liquid quantities in waste stream data makes it impossible to gauge how or whether this issue has changed over time.

Of the two previous campus building waste audits, only the buildings included in the 2015 study were also included in the 2023 study, namely: Allen/LAR, BIF, RAL, and the Illini Union. Thus, comparisons between the 2015 and the 2023 study are potentially more useful, yet still challenging due to methodology variance.

- A separate breakdown of materials by category within the recycling stream is not included in the 2015 report, so comparison of contaminants in the recycling stream over time is not possible.
- Looking at the combined landfill/trash streams in the 2015 and 2023 studies:
    - In 2015, "compostables" represented nearly 45% of the waste stream. In the current study, only 17.1% of the total landfill stream (combined for all eight buildings) was considered "compostable." This difference is largely due to differences in sorting categories and potential material fate definitions, as outlined above. In the 2023 study, paper towels and liquids were considered “avoidable,” and comprised 23.1% and 6.6% of the combined landfill/trash

stream, respectively. Paper cups were included in the "disposable beverage cups (paper & plastic) & accessories" category, which comprised 4.3% of the landfill/trash stream.

- Food scraps were 22.0% by weight of the combined landfill/trash stream in 2015, whereas they were 12.6% of the combined landfill/trash stream in 2023. One might suspect that efforts within dining halls, such as Grind2Energy, are responsible for a decrease in such material being sent to landfill. However, if you look at building-level data from 2015 and 2023, food scraps were 25.6% and 26.0% at Allen/LAR respectively. So, food scraps were a *higher* portion of that building's landfill/trash stream in 2023. This might be due to other variables not accounted for in either study. For example, plate waste scraped into trash bins by diners before returning their trays to the kitchen, and food waste from student residences is not captured for processing in the Grind2Energy systems.
- In 2015, food scraps and paper towels were the largest and second largest material category (by weight) in the combined landfill/trash stream, representing 22.0% and 14.1%, respectively. These two materials were again the most abundant in the combined landfill/trash stream in 2023, though they switched places with paper towels being the largest (at 23.1%) and food scraps being the second largest material category by weight (at 12.6%).
- In 2015, it was noted that "non food-service paper" (equivalent to "mixed paper" in the 2023 study), was the top "recyclable" present in the landfill-bound/trash stream. (Remember that "recyclables" in 2015 included technically recyclable materials whether or not they were currently accepted by the WTS.) In the 2023 data, "mixed paper" (by weight) is the top material currently accepted for recycling at the WTS ("currently recyclable") which appears in the landfill/trash stream, at 6.1%.

- Looking at data for BIF, in the 2015 study, food scraps and paper towels were the most abundant materials (by weight) in the landfill/trash stream, at 24.5% and 19.1%, respectively. In 2023, paper towels were the most abundant material (by weight) in the landfill/trash stream (25.4%), followed by food scraps (12.7%).
- Looking at data for RAL, in 2015, paper towels and lab plastics tied for the most abundant materials (by weight) in the landfill/trash stream, each representing 14.2%. Cardboard was the second most abundant material (by weight) at 12.3%, with non food-service paper (analogous to "mixed-paper" in the current study) a close third at 12.1%. In the 2023 data, non-recyclable glass was the most abundant material (by weight) in that building (15.3%), followed by mixed-paper (14.7%), autoclaved bio-hazard materials (11.8%), and paper towels (11.5%). In 2023, lab plastics represented 7.9% of the landfill/trash stream by weight and cardboard was only 2.4%.
- Looking at data for the Illini Union, in 2015, food scraps were the most abundant material (by weight) in the landfill/trash stream (32.0%), followed by food-service paper (15.3%), and paper towels (10.4%). In 2023, food scraps were again the most abundant material (by weight) in the landfill/trash stream (18.6%), followed by paper towels (12,0%), and food-soiled paper & compostable service ware (analogous to "food-service paper," but

broader, including things like soiled pizza boxes and wooden coffee stirrers which would also be compostable) at 8.8%.

- Looking at data for Allen/LAR, in 2015, the most abundant materials (by weight) in the landfill/trash stream were food scraps (25.6%) and paper towels (12.7%), followed by a tie between non food-service paper (analogous to mixed-paper) and composite plastic (both at 11.9%). In 2023, food scraps were once again the most abundant material (by weight) in the landfill/trash stream (26.0%), followed by paper towels (13.5%), and composite packaging (broader than, but including what likely would have been deemed composite plastic in 2015; 6.8%).

Impacts of MaxR Three-Bin Stations

As another objective of this report, F&S had hoped to determine if the indoor bin updates involving deployment of MaxR three-bin stations in buildings positively impacts collection of currently accepted recyclables in terms of quantity and quality, with more recyclables successfully placed in recycling bins and less contamination in those recycling bins. However, most of the buildings selected for inclusion in the current audit have at least one MaxR station along with various other bins; thus, a clean comparison between buildings in each activity zone could not be made. If, for each activity zone studied, one building with only MaxR three-bin stations for recycling and another building with only older standalone recycling bins was chosen for inclusion, comparisons could have been possible. The Academic activity zone came closest to this scenario in the current study; BIF had no MaxR three-bin stations present, while CIF had 16. Considering samples sorted from the landfill-bound/trash stream of both buildings, 9.8% of BIF's sample was comprised of "currently recyclable" materials, whereas only 6.2% of CIF's was "currently recyclable." This might imply that having more MaxR stations positively impacts recycling behavior, but two buildings are a small and likely insufficient sample size upon which to base such an assertion.

Further, BIF's infrastructure does include some three-bin recycling stations--they simply are not MaxR branded stations with the same labeling and icons. As reported above under "Education and Signage" in the "Stakeholder Engagement" section, campus community members have expressed appreciation for the clarity and visibility of three-bin stations. While this does not translate to improved recycling behavior in the presence of three-bin stations (MaxR or otherwise), there is at least an implied perception among campus community members that such bins are easier to understand and interact with than standalone bins. The fact that BIF does have some form of three-bin stations, just not as many as CIF, could be meaningful. However, looking at data and building walkthrough observations for the Multi-Activity zone, both the ARC and Illini Union have multi-bin stations. Comparing the two buildings, ARC has relatively inconsistent recycling

Figure 60: Example of MaxR dual bin near north entrance of the Illini Union.

infrastructure including three MaxR three-bin stations (see Figure 1) and four to five other tan multi-bin stations with labeling that varies slightly from station to station (see Figure 27). The Illini Union has relatively consistent recycling infrastructure, including several MaxR three-bin stations (some with shadowbox backboards displaying example materials and some without any type of backboard) as well as standalone MaxR indoor bins (e.g. for paper; see Figures 30-32 on pgs. 31-32) and MaxR dual bins near outdoor entries (see Figure 50).

Landfill-bound/trash samples from the ARC included 11.0% “currently recyclable” materials whereas these samples from the Illini Union included 9.0% “currently recyclable” materials. So, perhaps the real key to the differences between the amount of “currently recyclable” materials present in the landfill streams of BIF and CIF, as well as the differences when comparing the ARC and Illini Union is the difference in *consistency* of infrastructure. All recycling bins available in CIF look the same (MaxR stations with a customized grey color, all with consistent icons and labels), whereas a mixture of non-MaxR three-bin stations and several types of standalone recycling bins for bottles + cans, and paper, exist at BIF. A larger sample size would be preferable before making conclusions. Future campus building audits might be conducted focusing on one activity zone, with more than one building representing each variable (either all MaxR stations vs. none or all consistent recycling bins and signage vs. inconsistent recycling) and equal numbers of buildings per variable. Similarly, Allen/LAR had no MaxR three-bin stations, but other residence halls on campus do. A future study might involve Allen/LAR and a second residence hall with MaxR bins that is roughly comparable to Allen/LAR in terms of other variables key to quantities and types of waste generation (e.g. similar occupancy levels, both locations having a dining hall on site, etc.), provided Allen/LAR does not obtain MaxR stations in the interim (facility contacts expressed interest in obtaining MaxR stations during building walkthroughs). An alternative means to assess the efficacy of the MaxR three-bin stations would be to conduct audits at multiple buildings within the same activity zone that have a mix of MaxR three-bin stations and other types of recycling infrastructure, *keeping the data from different recycling bin types in the same building separate*. Then the levels of contamination present in different types of recycling bins could be assessed and compared, although differences in signage/icons/bin labeling and bin placement would also need to be taken into account.

Based on stakeholder input in the current study, clear communication about proper recycling procedures is crucial for improved collection of currently accepted recyclables. So, to the extent that deployment of MaxR bins can be seen as part of such clarity, they are important. That is the most that can be said about their efficacy without further research.

Strategies for Improvement

The following recommendations are grouped into seven themes or "strategy types" to assist the reader in quickly identifying the types of activities entailed or stakeholders involved: Education & Outreach, Infrastructure, Programming, Policy, Purchasing, Retail, and Research. Rather than group the recommendations by strategy type, recommendations that relate to similar materials are listed together in the table (e.g., multiple strategies related to bin liner reduction or nitrile glove recycling are grouped).

Each recommendation is deemed applicable to one or more specific activity zones; in instances where the recommendation relates to all four activity zones in this study and broadly across campus, the recommendation is categorized as "campus wide."

Further, the anticipated impact of recommendations on the waste stream and/or proper understanding of and compliance with campus waste management procedures among campus community members is estimated as high, medium, or low. This is admittedly subjective, but is meant to assist with prioritization, since it is not feasible to work on all suggestions at once, given considerations of budget, staff capacity, coordination among units, time required to enact policy change, etc.

Any links to products, services, or companies in the table below are for informational purposes only, and should not be construed as endorsements by ISTC, the Prairie Research Institute, or the University of Illinois Urbana-Champaign.

Strategy Table

Activity Zone Key: CW = Campus-wide | AC = Academic | ACL = Academic + Laboratory | MA = Multi-Activity |SL = Student Living
Responsible Party Key: F&S = Facilities & Services | FMs = Facility Managers | Stores = Central Stores & Receiving | DRS = Division of Research Safety |iSEE = Institute for Sustainability, Energy, and Environment | Campus Rec = Campus Recreation | DIA = Division of Intercollegiate Athletics

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
1	Education & Outreach	Expand tours of the Waste Transfer Station (WTS) to help the campus community better understand the recycling process. • Require all existing BSWs (F&S coordinated & auxiliary) to tour the WTS. Make this part of onboarding new BSWs. • Continue to advertise and facilitate WTS tours for faculty, staff and students.	**CW**	**High**	**F&S** **Auxiliaries**
2	Education & Outreach	Communicate bag color standards to all facility managers and BSWs (including auxiliary) via BSW manuals, training, direct communications, etc. This effort should be ongoing, and efforts should be made to gather feedback from BSWs.	**CW**	**High**	**F&S** **Auxiliaries** **FMs**
3	Education & Outreach Purchasing	Meet with departments/units to determine whether bag color standard is being followed in their buildings. Where it is not, work to understand and address barriers to implementation with those units and other relevant stakeholders (e.g. Purchasing, Central Stores, etc.) to address those barriers.	**CW**	**High**	**FMs** **Stores** **Purchasing**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
4	Education & Outreach	Explore use of the Illinois App for sharing information on waste management and recycling procedures, barriers, challenges, lessons learned, linkage to the Recyclopedia (when released), etc. Different "groups" within the app could be formed for different segments of the campus community for targeted messaging and peer-to-peer networking and information sharing (e.g. BSWs, staff, faculty, undergraduate students, and graduate students).	**CW**	**Medium**	**F&S** **iSEE**
5	Education & Outreach	Create a separate social media presence for F&S zero waste efforts to increase visibility of recycling, reuse, and diversion information on campus.	**CW**	**High**	**F&S**
6	Education & Outreach	Use campus digital signage network, new and existing e-bulletins, and social media to: • Share waste reduction and recycling best practices with campus community members and dispel misconceptions • Provide instructions on how to contact F&S with questions (e.g., via recycling@illinois.edu). • Inform campus community members about the iCAP portal. Consider presentations, videos, or online tutorials to help people understand how to navigate and submit suggested additions and/or revisions.	**CW**	**High**	**F&S**
7	Infrastructure	Explore strategies to address liquid contamination in the recycling stream.	**CW**	**High**	**F&S**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
	Education & Outreach Programming	• Modify labels and signage on all collection bins for plastic beverage bottles and cans to instruct individuals to empty liquids before disposing of containers. • Consider inclusion of QR codes for building-specific maps of for restrooms, water fountains, or other locations where liquids could be poured out. • Develop an outreach campaign to underscore the role of liquids as a major contaminant in recycling and the importance of keeping liquids out of recycling bins. • Pilot the use of liquid disposal bins near bottle and can collection bins in high-traffic areas (indoors and outdoors). See Arconas and CleanRiver for examples.			
8	Infrastructure	Consider reducing the number of deskside trash and recycling bins in office spaces, encouraging office occupants to take items for disposal to bins in hallways and other common areas where standardized signage and labels could more clearly convey what items belong in each bin. This might decrease confusion around acceptable recyclables and proper practices while also reducing the total number of plastic bin liners used and thus sent to landfill.	**AC, ACL, MA**	**Medium**	**F&S** **Auxiliaries** **FMs**
9	Programming Policy	Assess feasibility of options for reducing bin liner waste via pilot projects, e.g., emptying recycling bins without removing bin liners; eliminating bin liners where possible; and/or using reusable, washable bin liners.	**CW**	**Medium**	**F&S** **Auxiliaries**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
10	Education & Outreach	Work with the Division of Research Safety(DRS), facility managers, and other departmental staff to communicate and enforce standard disposal methods of non-contaminated lab glass to improve safety for waste management staff.	**ACL**	**Low**	**DRS**
11	Programming Education & Outreach Purchasing	Improve battery recycling on campus. • Update public-facing battery recycling map on the iCAP portal through collaboration with existing departments. • Seek funding to support campus coordination for recycling of single-use batteries. • Consult with DRS to clarify their battery recycling services and promote this as appropriate. • Use campus digital signage, e-bulletins, newsletters, and social media to educate departments/units about recycling options they might pursue (e.g., Call2Recycle). • Consult with Purchasing about highlighting single-use batteries made from recycled materials for which manufacturer recycling programs are also available in iBuy and purchasing guidelines.	**CW**	**Low**	**F&S** **DRS** **Housing** **FMs** **Purchasing**
12	Infrastructure	Explore multiple strategies to reduce and/or recycle paper towel waste. • Conduct a pilot of Essity's Tork Paper Circle paper towel recycling program to divert paper towel waste, preferably in a	**CW**	**High**	**F&S**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		high-volume generation area where towels cannot be completely eliminated through provision of electric hand dryers or use of launderable cloths for surface cleaning. • Explore efficient bathroom appliances that will cut down on toilet paper and paper towel waste such as hand dryers, foot door openers, trifold paper towel holders, bidets and one-at-a-time toilet paper roll holders that may reduce the likelihood of needing to replace still-usable rolls. • Consult with the City of Urbana to explore the feasibility of composting used paper towels from food service operations and restrooms at the Landscape Recycling Center.			
13	Purchasing Policy	Work with Campus Recreation to explore disposable wipe waste reduction through alternative procedures for cleaning exercise equipment between users. For example, paper towels and spray bottles of cleaners might be offered instead, along with a pilot of paper towel recycling through Tork Paper Circle (as suggested above). Another option would be to provide spray bottles of cleaner and employ a cloth gym towel laundering service, such as this.	**MA**	**High**	**Campus Rec** **Purchasing**
14	Programming	Restart plastic bag recycling program using existing collection infrastructure at Union and LAR, updating signage and raising awareness to reduce contamination and increase usage. Consider adding additional drop-off locations or expanding the program to a campus wide film recycling effort, based on success at pilot sites. See	**CW**	**Medium**	**Illini Union** **Housing**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		Nextrex and UMBC resources. The UMBC Office of Sustainability has offered to share their experiences and lessons learned.			
15	Programming	Explore options to restart 3D filament recycling program at BIF and pilot replication at other 3D printing labs on campus. Options might include the use of on-site recycling equipment (e.g., a Filabot, which other universities have successfully used), Terracycle zero waste boxes, or other mail-in recycling services.	**AC**	**Low**	**University Maker Spaces**
16	Programming	Coordinate collection and donation of lost and found collections at campus buildings, perhaps in conjunction with existing Dump and Run activities.	**CW**	**Low**	**F&S, FMs**
17	Programming Purchasing Retail	Explore strategies to reduce single-use food and beverage packaging. • Work with Purchasing and retailers operating on campus property to establish reusable alternatives for disposable cups and other food service packaging. For example, Starbucks has piloted reusable cups and might be willing to discuss/explore the feasibility of their use on campus. Systems such as r.cup have been deployed in Seattle movie theaters and other entertainment venues. and use of this or something similar on campus could be considered. • Explore expansion of Freestyle beverage vending (such as those in the Quad Shop at the Illini Union and in dining halls)	**CW**	**High**	**Illini Union** **Vending Machine Vendors** **Housing** **Dining** **Athletics** **Purchasing**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		along with reusable cups to reduce generation of single-use plastic beverage bottles.			
18	Education & Outreach Purchasing	Educate campus on reducing generation and increasing recycling of mixed paper. Refer to Illinois Green Libraries: Paper Use and Recycling for ideas, including: • Printing only when necessary • Make double-sided printing the default on all campus printers • Digitizing information where possible • Purchasing recycled-content paper • Ensure paper recycling bins are adjacent to all printing stations	**CW**	**Medium**	**University Libraries** **Document Services** **Purchasing**
19	Retail Policy Purchasing	Work with facility managers, Purchasing, and retailers operating on campus property to increase recycling. • Establish recycling protocols for materials accepted for recycling on campus (e.g. the recycling of milk jugs by the Starbucks at the Illini Union). • Explore contract language requiring retailers to recycle.	**CW**	**Medium**	**Illini Union** **Purchasing** **FMs**
20	Purchasing Research	Work with Purchasing (and possibly the zero waste iCAP team and/or iSEE interns) to consult with BSWs, campus units and departments to understand and address issues related to waste-management supply purchasing and environmentally preferable purchasing options in	**CW**	**High**	**F&S** **Purchasing** **iSEE**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		general, in both iBuy and from external vendors. Use feedback collected to develop specific sustainable purchasing policies for relevant product categories.			
21	Education & Outreach	Publicize F&S green cleaning efforts to improve awareness of waste reduction aspects via EWeek, digital signage, social media, etc.	**CW**	**Low**	**F&S**
22	Research	Work with the Champaign County Environmental Stewards (CCES) and local governments to explore solutions for materials such as glass, plastic film, and expanded polystyrene.	**CW**	**Medium**	**F&S**
23	Research	Work with the Champaign County Environmental Stewards (CCES) and local governments to explore solutions for management of organic waste (including food waste, animal bedding, manure, etc.).	**CW**	**Medium**	**F&S**
24	Research Infrastructure Programming	Work with faculty and student researchers to ideate and explore the feasibility of both low and high-tech upgrades to the WTS for improving sorting efficiency and capacity. • Consider expansion of the list of plastic types (beyond resin codes #1&#2) accepted for recycling on campus. This may depend upon the results of Dr. Nishant Garg's exploration of automated sorting with computer vision, as that technology could address sorting staff capacity limitations.	**CW**	**High**	**F&S**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		• If storage space for collected recyclables is a barrier, consult with local governments and their approved waste haulers to see if collaboration is possible.			
25	Education & Outreach	Encourage collaboration between students and staff in residence halls to improve communication related to recycling. • Mobilize Sustainability LLC to work with Housing's Residential Life department on posting F&S approved, clear signage to improve collection and source separation of recyclables in residence halls. • Develop Resident Advisor (RA) training related to proper recycling to empower them to train student residents on correct procedures.	**SL**	**Medium**	**Housing**
26	Programming	Consult with Housing Dining Services to determine if food cans generated by student residents and consolidated in trash/recycling rooms could be incorporated into dining hall food can collections that F&S picks up in bulk for scrap metal recycling. If feasible, work with Residential Life on appropriate messaging for student residents.	**SL**	**Low**	**Housing**
27	Infrastructure Education & Outreach	Work to update and standardize recycling and trash collection signage across campus buildings and floors using accurate, accessible signage that provides options for more information online.	**CW**	**High**	**F&S** **Auxiliaries** **FMs**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		• Consider partnering with specific buildings to pilot clear communication for the handling of materials that vary from building to building based on space/infrastructure. • Conduct a bin audit of all MaxR three-bin stations to ensure that icons and labels coincide with other messaging from F&S regarding whether or not cardboard is acceptable in paper recycling bins and the fact that glass bottles are not currently acceptable in bins for collecting plastic beverage bottles and cans. • Provide clear avenues for departments and individuals to print additional copies of recent, accurate signage. • Prioritize accessibility for the go.illinois.edu/recycling homepage, including ability to search for individual materials. • Consider including information on the bag standard and "Frequently Asked Questions" regarding common concerns of building occupants. Consider multilingual accessibility of materials.			
28	Infrastructure	Continue to standardize bin infrastructure by encouraging the replacement of existing bins with MaxR or other multi-bin stations. Ensure funding to achieve ICAP goals related to indoor bin updates.	**CW**	**High**	**F&S Auxiliaries**
29	Education & Outreach	Improve student involvement as individuals, classes and organizations (e.g., sustainability-focused clubs, the Sustainability LLC, etc.) in raising awareness of and participation in campus	**CW**	**High**	**iSEE** **Housing**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		programs. Invite students to create resources, volunteer for programming, and put on events related to sustainable behaviors.			
30	Research	Work with the Green Research Committee to identify and develop sterilization and reuse protocols for common types of lab plastics (e.g. conical tubes, pipette tips, etc.) and promote these practices to campus labs. See the MyGreenLab Website for more information. Promote the existence of the Green Research Committee to key campus departments.	**ACL**	**High**	**F&S** **DRS**
31	Education & Outreach	Work with the Green Research Committee to compile information on recycling programs for various types of common lab plastics (e.g., relevant Terracycle programs, Mailthisback by Corning, Agilent instrument buyback, and MilliporeSigma recycling programs. Make this information available online and promote to key campus departments.	**ACL**	**High**	**F&S** **DRS**
32	Purchasing Education & Outreach	Foster lab plastic waste reduction by working with the Green Research Committee and Purchasing to identify reusable, non-plastic alternatives for common lab plastics as well as common lab consumables with reduced plastic packaging available through approved vendors. Make this information available online and promote to key campus departments via integration into iBuy as part of a larger sustainable purchasing policy for lab-related products.	**ACL**	**High**	**F&S** **Purchasing**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
33	Programming	Work with the Department of Chemistry to expand nitrile glove recycling via RightCycle to more of its labs and encourage labs in other departments to emulate their efforts.	**ACL**	**High**	**FMs**
34	Programming	Work with Housing to re-establish nitrile glove recycling, exploring the feasibility of alternatives to the Kimberly Clark RightCycle program, including Terracycle or Medline mail-in boxes	**SL**	**Medium**	**Housing**
35	Programming	Work with BSWs (F&S and auxiliary unit coordinated) to pilot recycling of the nitrile gloves they use when emptying building bins. Consider the use of a small bin (as in this example) hanging from Brute containers on BSW carts for glove collection.	**CW**	**Medium**	**F&S** **Auxiliaries**
36	Programming	Consider working with student organizations and/or iSEE to expand existing and pilot new Terracycle zero waste pallet bag collections for common wastes generated on campus (e.g., the Pens, Pencils, and Markers Zero Waste Pallet).	**CW**	**Low**	**F&S** **FMs**
37	Research	Consider additional campus building waste audits and stakeholder engagement (e.g. surveys, focus groups, etc.) particularly for auxiliary units and/or buildings not included in previously examined activity zones (e.g. athletic facilities/venues, libraries, theaters/performance venues, etc.). These audits could potentially be conducted by F&S staff and student interns to keep costs down.	**CW**	**Medium**	**F&S** **Auxiliaries**
38	Research	Create a list of all materials diverted from landfill by F&S (not just the five main recyclables, but all materials diverted, such as pallets, used motor oil, etc.). Create a map illustrating transportation of those	**CW**	**Low**	**F&S**

#	Strategy Type(s)	Strategy	Relevant Activity Zone(s)	Impact	Responsible Party(ies)
		materials from campus to processing sites and assess associated carbon emissions.			
39	Infrastructure Policy	For buildings at which dock space limitations currently necessitate the placement of flattened cardboard into landfill dumpsters for later reclamation on the WTS sorting line, work with building occupants and assigned BSWs to explore ways to keep source separated cardboard free of contamination. This might include instructing BSWs to place cardboard into blue bin liners before putting it into the landfill dumpster, to keep it clean and facilitate its removal from the WTS tip floor. Building occupants/departments/units might also be encouraged to use a separate toter inside the building to consolidate cardboard for delivery to the cardboard/newspaper drop off in Lot E14.	**CW**	**Medium**	**F&S** **Auxiliaries** **FMs**

Acknowledgements

The ISTC project team would like to recognize the support and contributions made by project partners and key stakeholders.

Facilities & Services, Waste Management, & Recycling Staff

Daphne Hulse*, Zero Waste Coordinator
Daniel Hiser*, Driver Foreperson
Macie Sinn, Office Manager
Shawn L. Patterson, Transportation Manager
Peter W. Varney, Director of Transportation & Building Services

* = Also volunteered as sorters

The entire crew involved in sorting and handling of materials at the campus Waste Transfer Station (WTS), and the drivers involved in transporting materials from campus buildings to the WTS. Thank you for all you do to keep our campus clean and to divert materials from landfills!

Waste Audit Volunteers

Sakshi Vaya, U. of I. student and F&S Zero Waste Intern
Owen McMahon, Technical Assistance Engineer, Illinois Sustainable Technology Center
Molly Boyd, Amane Hosono, & Jenna Schaefer, U. of I. students

Facility & Departmental Contacts

Thank you to all the **facility management staff, University Dining Services staff, and auxiliary unit BSW forepersons who assisted ISTC with building walkthroughs and audit sample collection logistics.** We also appreciate the insights offered by **various departmental contacts who responded to follow-up questions** from ISTC regarding general practices and special material collections at the Activities & Recreation Center (ARC), Allen Hall, Business Instructional Facility (BIF), Campus Instructional Facility (CIF), Illini Union, Lincoln Avenue Residence Halls, and Roger Adams Lab (RAL). This study could not have proceeded without you sharing your time, expertise, and enthusiasm for addressing waste management issues.

All Campus Building Service Workers (BSWs)

ISTC sincerely thanks all campus BSWs. Any efforts to reduce waste or improve collection of recyclables will depend upon the services you provide to campus every day. While your work often occurs “behind the scenes,” it is critical to the campus journey toward zero waste.

Anonymous Focus Group Participants & Survey Respondents

Thank you to all the campus community members who provided feedback via our focus group sessions and/or the companion Webtools survey.

Appendix A: Sorting categories

UIUC Waste Audit Sorting Categories – Landfill

Grey fill on this table indicates categories of materials currently recyclable through standard recycling bins or special campus or departmental programs or *potentially* recyclable materials present in the landfill-bound stream. These materials could be diverted from the landfill with improved collection or expanded programming.

Cardboard	Examples include corrugated cardboard containers (including waxed cardboard), such as shipping and moving boxes or produce boxes; computer packaging cartons; sheets or pieces of carboard; and unbleached paperboard or chipboard (e.g., the flat, stiff paper used for cereal boxes, shoe boxes, etc.).
Mixed Paper	"Acceptable materials" list for campus paper recycling bins. Examples include standard printer or copier paper, stationary, notebook/filler paper, newspaper, magazines, journals, envelopes of all types, junk mail, ream wrappers, books, phone books, manila or colored file folders.
Paper Towels	Bleached or unbleached, standard tear-off or tri-fold towels, including those from bathrooms.
Food Scraps	Examples include food prep trimmings, plate waste/uneaten foods, peels, shells, and bones.
Food-Soiled Paper & Compostable Service Ware	Examples include paper fast food bags, paper napkins, pizza boxes, paper coffee filters, paper tea bags, compostable bowls, plates, and cups, and wooden chopsticks or coffee stirrers. *
Landscape Waste	Examples include grass clippings, leaves, garden waste, brush, plants and trees. These materials are banned from landfills in IL.
Other Organics	Examples include cork, hemp rope, twine or cotton string, and hair/fur.
Aluminum Beverage Containers	Typical beverage cans or aluminum beverage bottles
Textiles	Examples include clothes, towels, bedding and bed sheets, fabric trimmings, draperies, bandanas, and all natural and synthetic cloth fibers.
Other Metal Scrap	Examples include human and pet food cans, clean aluminum foil, pie pans, loose metal jar lids and bottle caps, coat hangers, empty aerosol cans (no plastic caps), and other bulky metal scrap.
Plastic Beverage Bottles (#1 & #2)	Examples include beverage bottles for water, soda, fruit juice, sports drinks, tea, etc. and milk jugs. Caps are fine if attached to the bottle.
Plastic Film	Examples include plastic retail bags, produce bags, ice bags, bread bags, newspaper sleeves, and bubble wrap.

Glass Beverage & Food Containers (Bottles & Jars)	Examples include whole or broken glass soda bottles, fruit juice bottles, beer & other alcohol bottles, pickle jars, jam/jelly jars, peanut butter jars, salsa jars, and olive jars.
Other Plastic Containers (non-cup or beverage bottle) #1-7	Examples include detergent, cleaning supply, some takeout containers., reusable food containers, margarine tubs, yogurt, flowerpots, etc.
Batteries	All types of batteries, both single-use and rechargeable.
Light Bulbs/Lamps	All kinds of unbroken light bulbs or lamps
Disposable Plastic Gloves	This includes nitrile or latex gloves typically used in food service or laboratory settings.
Regulated Electronics	Devices banned from landfills in IL. Examples include computers and small-scale servers, computer monitors, electronic keyboards & mice, printers, fax machines, and scanners, televisions, DVD players, DVD recorders, and VCRs, digital converter boxes, cable receivers, satellite receivers, portable digital music players, and video game consoles.
Unregulated Electronics	Cords, headphones, small appliances, and other non-regulated items that operate using either a battery or power cord.
Bulky Items/Miscellaneous	Hard-to-handle items that are not defined elsewhere in the material types list, including furniture, mattresses, couches, tires, garden hose, binders, umbrellas and other large items.
Polystyrene #6 (rigid and Styrofoam	#6 plastic such as cookie trays and other rigid plastic containers. Foam meat, produce and pastry trays, foam packing blocks, packing peanuts, foam plates/bowls and other expanded polystyrene products.
Other Unrecyclable Paper	Examples include carbon copy paper, thermal fax paper, photographs, receipt paper, and blueprints.
Composite packaging	Examples include Tetra pack/aseptic cartons (e.g. milk, juice, broth, soup, etc.), candy wrappers, granola/energy bar wrappers, and chip bags.
Disposable Beverage Cups (Paper & Plastic) & Accessories	Examples include plastic-lined paper coffee-cups, fountain drink cold-cups, plastic cold drink cups, along with disposable lids & straws.
Unmarked Plastics	Plastic toys, some pieces of packaging, plastic strapping, non-compostable plastic utensils, and other plastic items with no number resin code.
Lab Plastics (non-glove)	Pipette boxes, conical tubes, microcentrifuge tubes, sample tubes, petri dishes, transfer pipettes, and other plastic lab items.

Composite Organics	These include organic materials mixed with plastics, or natural materials which may have been treated with chemicals, painted or varnished. Examples include leather items, rubber items, carpet padding, cigarette butts, diapers, feminine hygiene products, small wood products, K-Cups with grounds inside, vacuum bags.
Non-recyclable Glass	Glass not typically accepted in any municipal recycling program. Examples include drinking vessels, candle jars, cosmetic bottles, windows, shower doors, glass tabletops, Pyrex, Corningware, mirrors, windshields, laminated glass, and leaded glass.
Bin Liners	Bags used to contain waste materials, typical used for lining bins.
Liquids	All kinds of liquids, typically left as remnants in food and beverage packaging.
Fines	Small, unsortable remnants weighed after sorting of other categories is complete, typically consisting of dirt, sawdust, tiny scraps of food or packaging, lint, etc.

**Note that while many food-soiled papers are compostable, others are not, and it is very difficult to tell by sight alone, especially after these materials have been inside a trash bin mixed with other waste. For practical purposes, no distinction is being made during our sort. Recommendations may include the suggestion to move toward the use of as many compostable food service papers as possible within university operations and to require similar measures among external vendors operating in campus buildings or at campus events.*

UIUC Waste Audit Sorting Categories – Recycling

Grey fill on this table indicates categories of materials not currently accepted through standard recycling bins on campus, a.k.a contaminants. Their presence in the main building recycling stream may be indicative of confusion or lack of awareness related to acceptable materials. Some materials may be recyclable elsewhere in the broader community or state, while others would not be recyclable anywhere. Their presence in the campus recycling stream might also be examples of "wishcycling," in which individuals hope that a material is recyclable, so they add it to recycling bins and trust that waste management staff will find a way to keep it out of the landfill. Contamination suggests a need for additional education for campus community members or process modification through improved collection infrastructure or expanded programming. **Note that some of these materials are recycled through special campus or departmental programs. Such materials are indicated by a blue hashtag, #.** Very limited glass recycling occurs through University Catering but is not widespread on campus. It only involves wine & other liquor bottles, and thus a hashtag is not present next to "Glass Beverage & Food Containers (Bottles & Jars)"

Paper Towels	Bleached or unbleached, standard tear-off or tri-fold towels, including those from bathrooms.
Food Scraps	Examples include food prep trimmings, plate waste/uneaten foods, peels, shells, and bones.
Food-Soiled Paper & Compostable Service Ware	Examples include paper fast food bags, paper napkins, pizza boxes, paper coffee filters, paper tea bags, compostable bowls, plates, and cups, and wooden chopsticks or coffee stirrers. *
Landscape Waste	Examples include grass clippings, leaves, garden waste, brush, plants and trees. These materials are banned from landfills in IL.
Other Organics	Examples include cork, hemp rope, twine or cotton string, and hair/fur.
Composite Organics	These include organic materials mixed with plastics, or natural materials which may have been treated with chemicals, painted or varnished. Examples include leather items, rubber items, carpet padding, cigarette butts, diapers, feminine hygiene products, small wood products, K-Cups with grounds inside, vacuum bags.
Other Unrecyclable Paper	Examples include carbon copy paper, thermal fax paper, photographs, receipt paper, and blueprints.
Composite packaging	Examples include Tetra pack/aseptic cartons (e.g. milk, juice, broth, soup, etc.), candy wrappers, granola/energy bar wrappers, and chip bags.
Textiles	Examples include clothes, towels, bedding and bed sheets, fabric trimmings, draperies, bandanas, and all natural and synthetic cloth fibers.
Other Metal Scrap#	Examples include human and pet food cans, clean aluminum foil, pie pans, loose metal jar lids and bottle caps, coat hangers, empty aerosol cans (no plastic caps), and other bulky metal scrap.
Disposable Beverage Cups (Paper & Plastic) & Accessories	Examples include plastic-lined paper coffee-cups, fountain drink cold-cups, plastic cold drink cups, along with disposable lids & straws.
Plastic Film#	Examples include plastic retail bags, produce bags, ice bags, bread bags, newspaper sleeves, and bubble wrap.
Other Plastic Containers (non-cup or beverage bottle) #1-7	Examples include detergent, cleaning supply, some takeout containers., reusable food containers, margarine tubs, yogurt, flowerpots, etc.
Glass Beverage & Food Containers (Bottles & Jars)	Examples include whole or broken glass soda bottles, fruit juice bottles, beer & other alcohol bottles, pickle jars, jam/jelly jars, peanut butter jars, salsa jars, and olive jars.
Batteries#	All types of batteries, both single-use and rechargeable.

Unmarked Plastics	Plastic toys, some pieces of packaging, plastic strapping, and other plastic items with no number resin code.
Light Bulbs/Lamps#	All kinds of unbroken light bulbs or lamps
Bin Liners	Bags used to contain waste materials, typical used for lining bins.
Non-recyclable Glass	Glass not typically accepted in any municipal recycling program. Examples include drinking vessels, candle jars, cosmetic bottles, windows, shower doors, glass tabletops, Pyrex, Corningware, mirrors, windshields, laminated glass, and leaded glass.
Liquids	All kinds of liquids, typically left as remnants in food and beverage packaging.
Fines	Small, unsortable remnants weighed after sorting of other categories is complete, typically consisting of dirt, sawdust, tiny scraps of food or packaging, lint, etc.
Lab Plastics (non-glove)	Pipette boxes, conical tubes, microcentrifuge tubes, sample tubes, petri dishes, transfer pipettes, and other plastic lab items.
Disposable Plastic Gloves	This includes nitrile or latex gloves typically used in food service or laboratory settings.
Regulated Electronics	Devices banned from landfills in IL. Examples include computers and small-scale servers, computer monitors, electronic keyboards & mice, printers, fax machines, and scanners, televisions, DVD players, DVD recorders, and VCRs, digital converter boxes, cable receivers, satellite receivers, portable digital music players, and video game consoles.
Unregulated Electronics	Cords, headphones, small appliances, and other non-regulated items that operate using either a battery or power cord.
Bulky Items/Miscellaneous	Hard-to-handle items that are not defined elsewhere in the material types list, including furniture, mattresses, couches, tires, garden hose, binders, umbrellas and other large items.
Polystyrene #6 (rigid and Styrofoam	#6 plastic such as cookie trays and other rigid plastic containers. Foam meat, produce and pastry trays, foam packing blocks, packing peanuts, foam plates/bowls and other expanded polystyrene products.
Cardboard	Examples include corrugated cardboard containers (including waxed cardboard), such as shipping and moving boxes or produce boxes; computer packaging cartons; sheets or pieces of carboard; and unbleached paperboard or chipboard (e.g., the flat, stiff paper used for cereal boxes, shoe boxes, etc.).
Aluminum Beverage Containers	Typical beverage cans or aluminum beverage bottles
Mixed Paper	“Acceptable materials” list for campus paper recycling bins. Examples include standard printer or copier paper, stationary, notebook/filler paper, newspaper, magazines, journals, envelopes of

	all types, junk mail, ream wrappers, books, phone books, manilla or colored file folders.
Plastic Bottles (#1 & #2)	Examples include beverage bottles for water, soda, fruit juice, sports drinks, tea, etc. and milk jugs. Caps are fine if attached to the bottle.

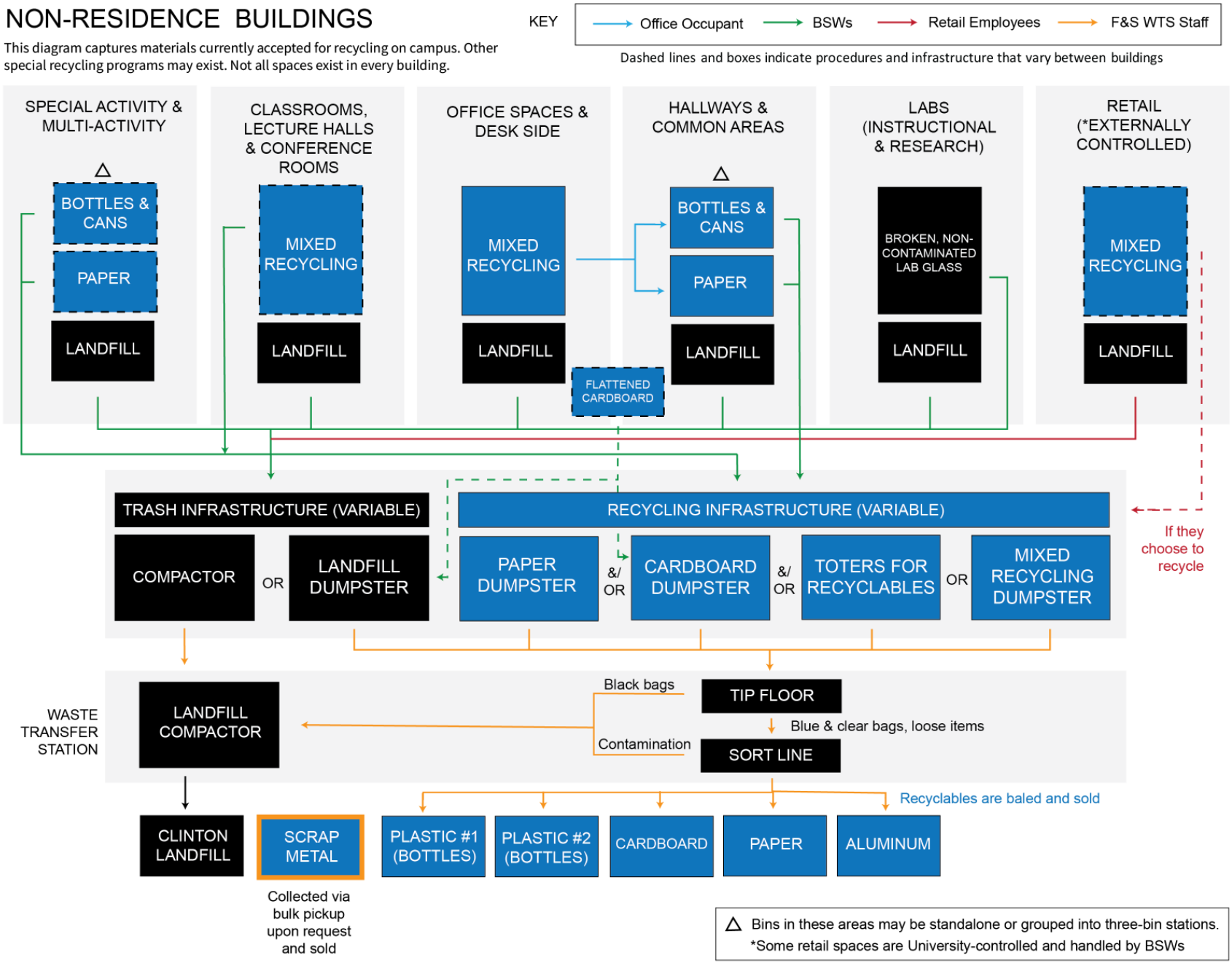
**Note that while many food-soiled papers are compostable, others are not, and it is very difficult to tell by sight alone, especially after these materials have been inside a trash bin mixed with other waste. For practical purposes, no distinction is being made during our sort. Recommendations may include the suggestion to move toward the use of as many compostable food service papers as possible within University operations and to require similar measures among external vendors operating in campus buildings or at campus events.*

Appendix B: Process Flow Diagrams

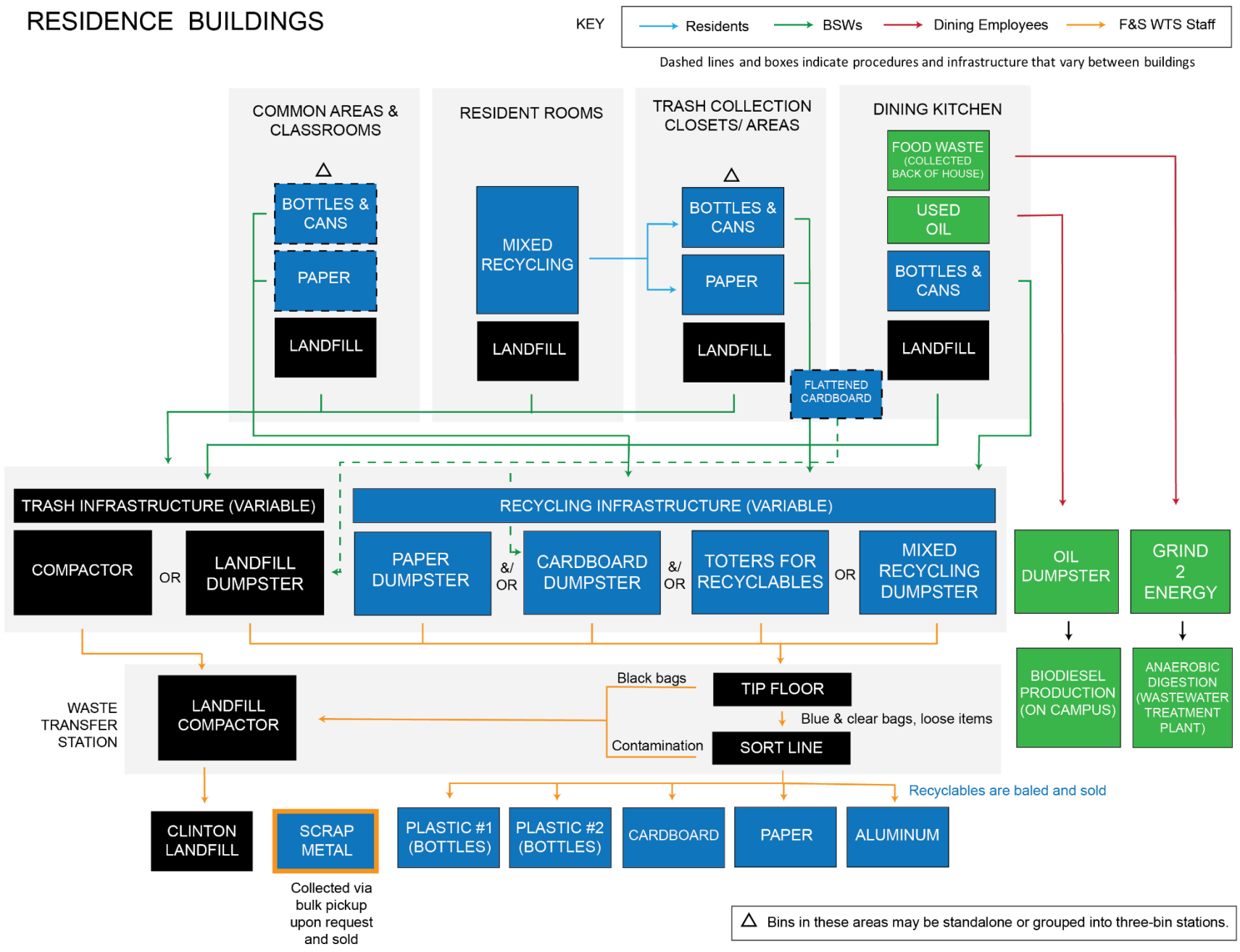
Process flow charts have been developed for each of the four activity zones to map the overall collection process of trash and recycling. Minor deviations from, or modifications to, these processes may occur from one building to another, or among different areas within the same building on campus, due to differences in building layout and/or distinct functions of spaces (e.g. classrooms, offices, student residential rooms, common areas, etc.). However, these figures provide a good general overview of building-level waste management.

NON-RESIDENCE BUILDINGS

This diagram captures materials currently accepted for recycling on campus. Other special recycling programs may exist. Not all spaces exist in every building.



RESIDENCE BUILDINGS



Summary of Waste Characterization Study Findings by Building

The pie charts below detail data for each of the eight buildings material was collected from during the waste characterization study. These are the Business Instructional Facility (BIF), the Campus Instructional Facility (CIF), Noyes Laboratory, Roger Adams Lab (RAL), The Illini Union, the Activities & Recreation Center (ARC), Lincoln Avenue Residence Halls (LAR) and Allen Hall.

Business Instructional Facility (BIF)

BIF is one of the two buildings that represent the academic activity zone in the waste characterization study. BIF has a mix of offices, classrooms and conference rooms. Café Kopi is a food service operation that exists in the building; small meetings for which external group may bring in food, as well as large catered events also occur.

Landfill Stream
A total of 247.6 pounds of material were collected and sorted from the Business Instructional Facility. The most common materials found in the landfill stream (by weight) were paper towels at 25.4%, food scraps at 12.7%, liquids at 10.3%, and bin liners at 7.0%, combining for 55.4% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	41.9%
Compostable	18.1%
Currently Recyclable	9.8%
Landfill	17.9%
Potentially Recyclable	12.3%

Table 18: Potential material fates for the landfill stream at BIF

* The potential material fate is determined by considering the best waste management solution for each material category.

Business Instructional Facility Landfill Material

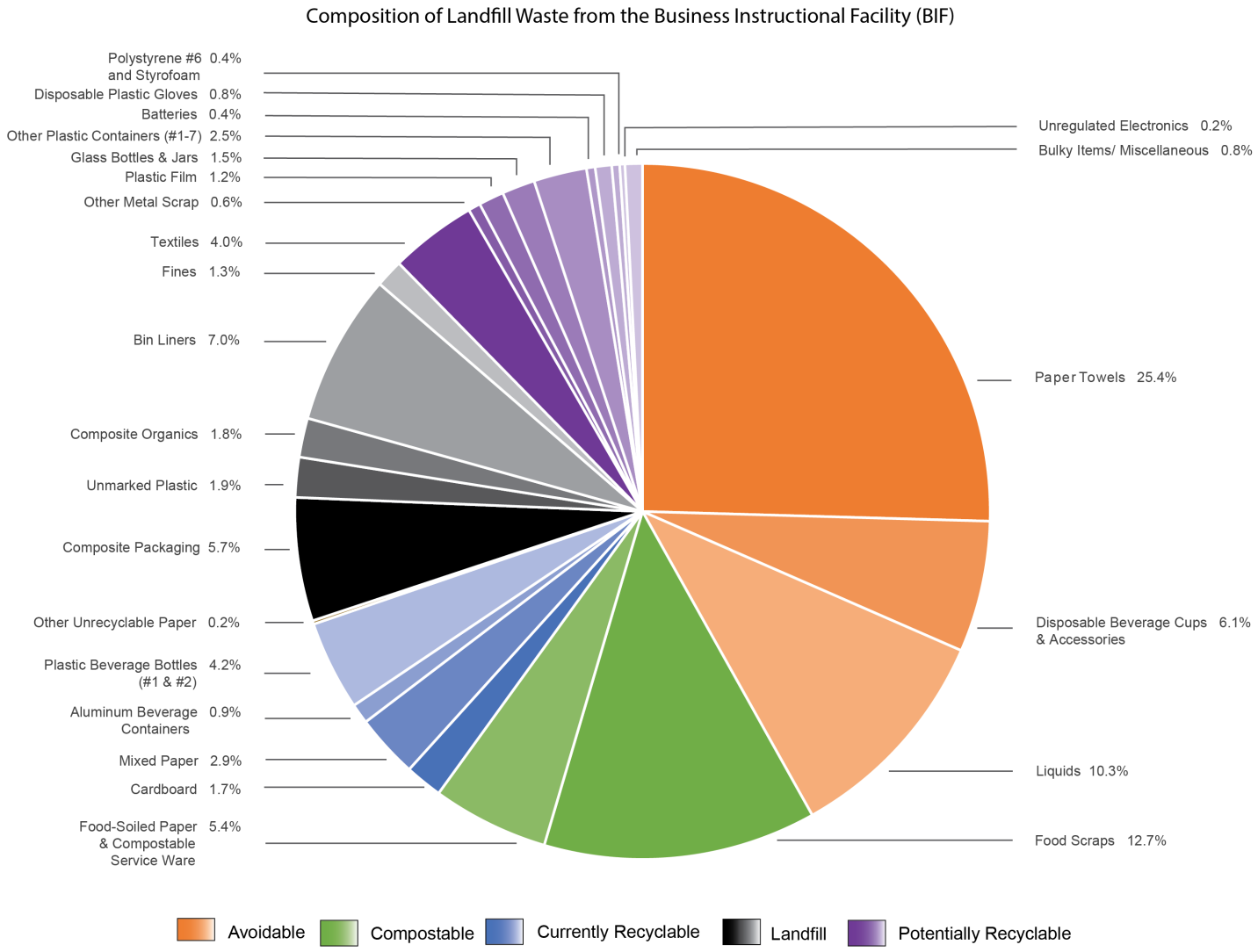


Figure 61: Material breakdown of audit findings for the landfill stream in BIF

Recycling Stream

A total of 69.8 pounds of material were collected and sorted from the Business Instructional Facility. The most common materials found in the recycling stream (by weight) were cardboard at 69.5%, bin liners at 5.4%, plastic beverage bottles at 4.2% and mixed paper at 3.3%, combining for 82.4% of all material sorted. A total of 20.8% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	5.6%
Compostable	2.3%
Currently Recyclable	79.2%
Landfill	7.3%
Potentially Recyclable	5.6%

Table 19: Potential material fate breakdown for the landfill stream at BIF

Top 5 Contaminants in Recycling Stream**	
Other Plastic Containers #1-7	2.9%
Dispoable Beverage Cups & Accessories	2.6%
Liquids	2.4%
Food Soiled Paper & Compostable Service Ware	1.4%
Glass Bottles & Jars	1.4%

Table 20: Top 5 contaminants in recycling stream for BIF exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Business Instructional Facility Recycling

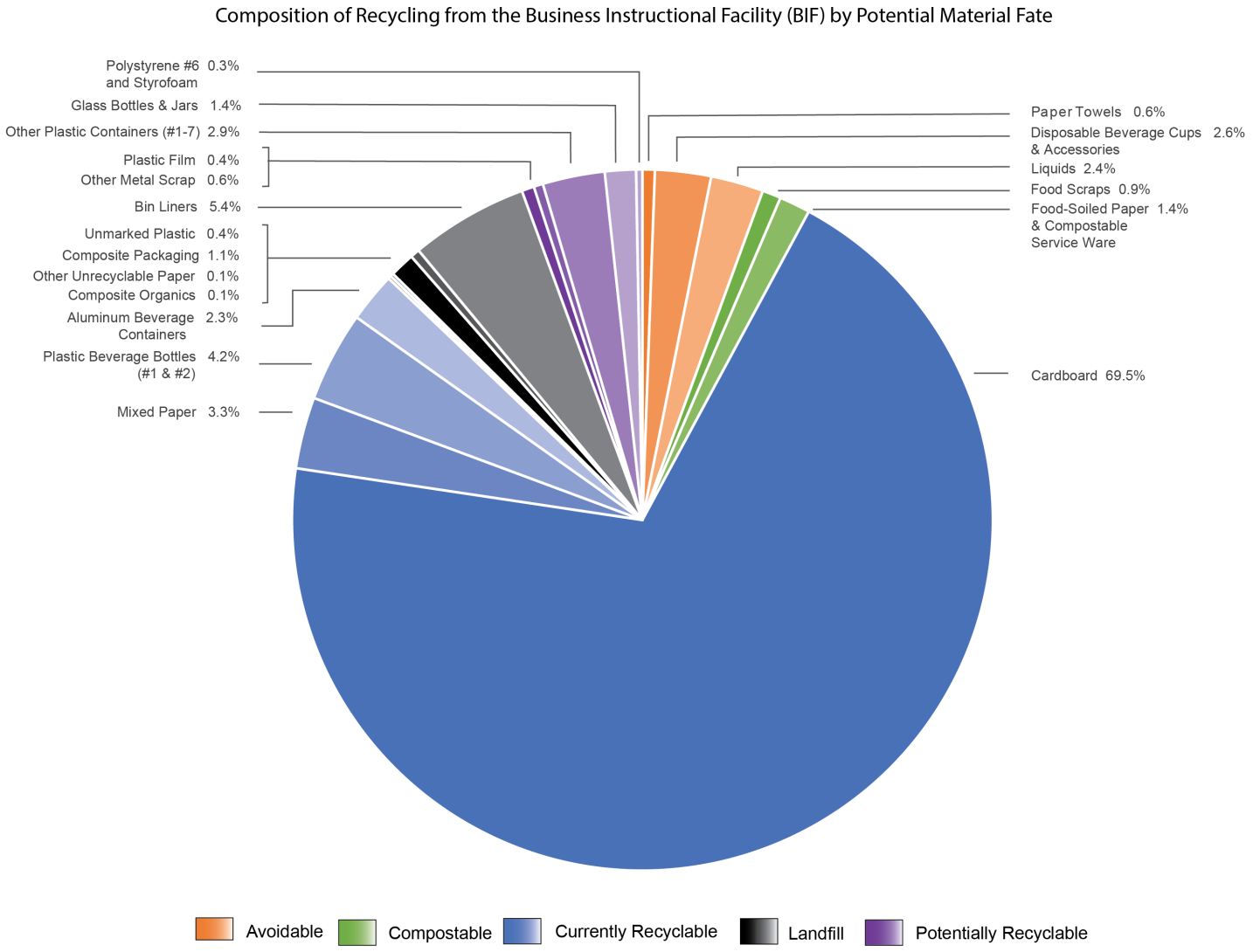


Figure 62: Material breakdown of audit findings for the recycling stream in BIF

Campus Instructional Facility (CIF)

CIF is one of the two buildings that represent the academic activity zone in the waste characterization study. CIF has a variety of classrooms, common areas, break rooms, and staging areas and very few offices. This building is almost exclusively classrooms. There is an Espresso Royale coffee shop located in the building, and catered events often occur.

Landfill Stream

A total of 279.9 pounds of material were collected and sorted from the Campus Instructional Facility. The most common materials found in the landfill stream (by weight) were paper towels at 35.6%, food scraps at 14.2%, bin liners at 8.4%, and liquids at 5.9%, combining for 64.1% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	49.3%
Compostable	18.7%
Currently Recyclable	6.2%
Landfill	17.5%
Potentially Recyclable	8.2%

Table 21: Potential material fates for the landfill stream at CIF

* The potential material fate is determined by considering the best waste management solution for each material category.

Campus Instructional Facility Landfill Material

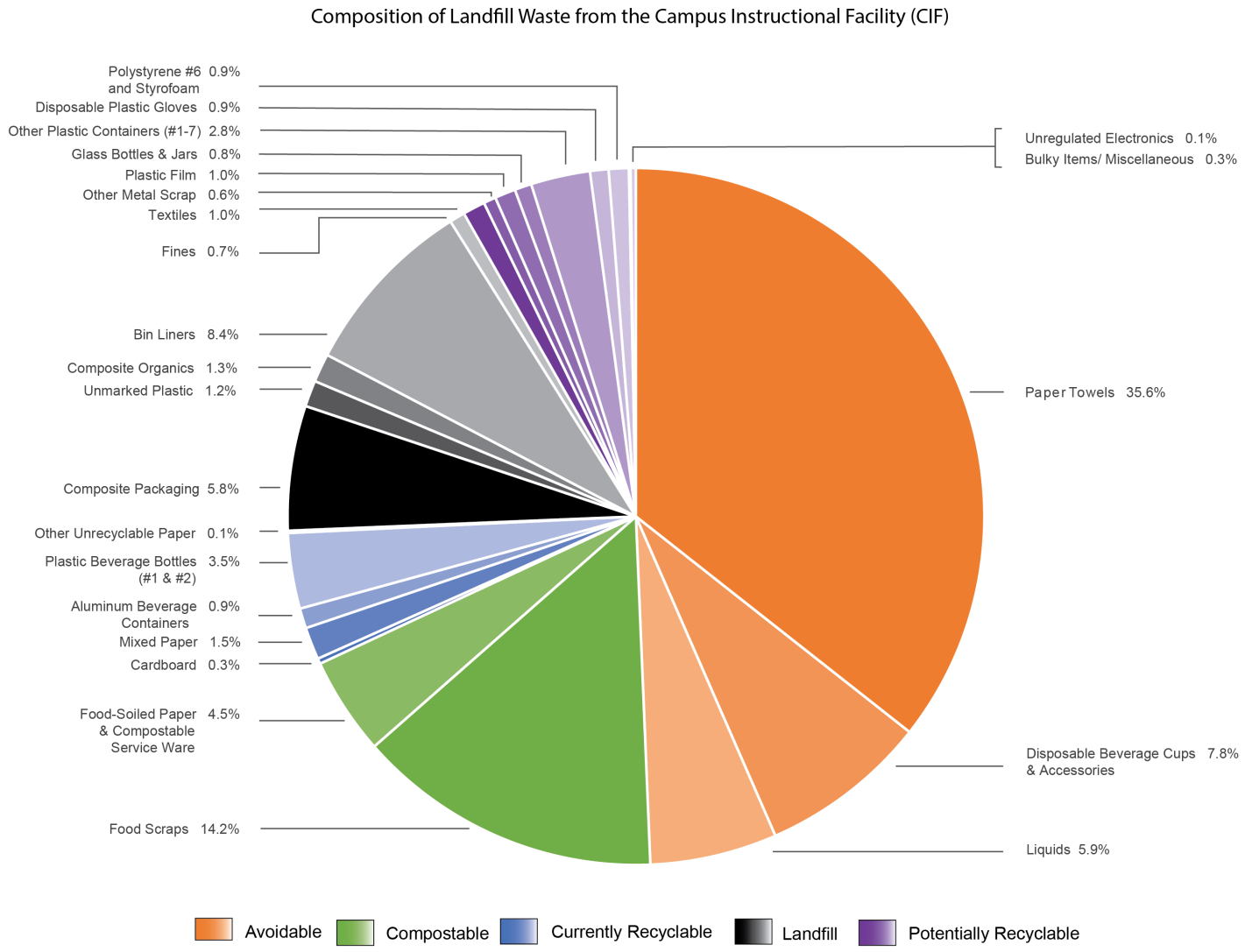


Figure 63: Material breakdown of audit findings for the landfill stream in CIF

Recycling Stream

A total of 105.4 pounds of material were collected and sorted from the Campus Instructional Facility. The most common materials found in the recycling stream (by weight) were cardboard at 69.4%, bin liners at 4.8%, plastic beverage bottles at 4.6% and disposable beverage cups and accessories at 4.3%, combining for 83.1% of all material sorted. A total of 19.2% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	6.3%
Compostable	2.2%
Currently Recyclable	80.8%
Landfill	6.2%
Potentially Recyclable	4.5%

Table 22: Potential material fate breakdown for the landfill stream at CIF

Top 5 Contaminants in Recycling Stream**	
Disposable Beverage Cups & Accessories	4.3%
Glass Bottles & Jars	4.0%
Food Soiled Paper & Compostable Service Ware	2.2%
Liquids	1.9%
Composite Packaging	0.9%

Table 23: Top 5 contaminants in recycling stream for CIF exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Campus Instructional Facility Recycling

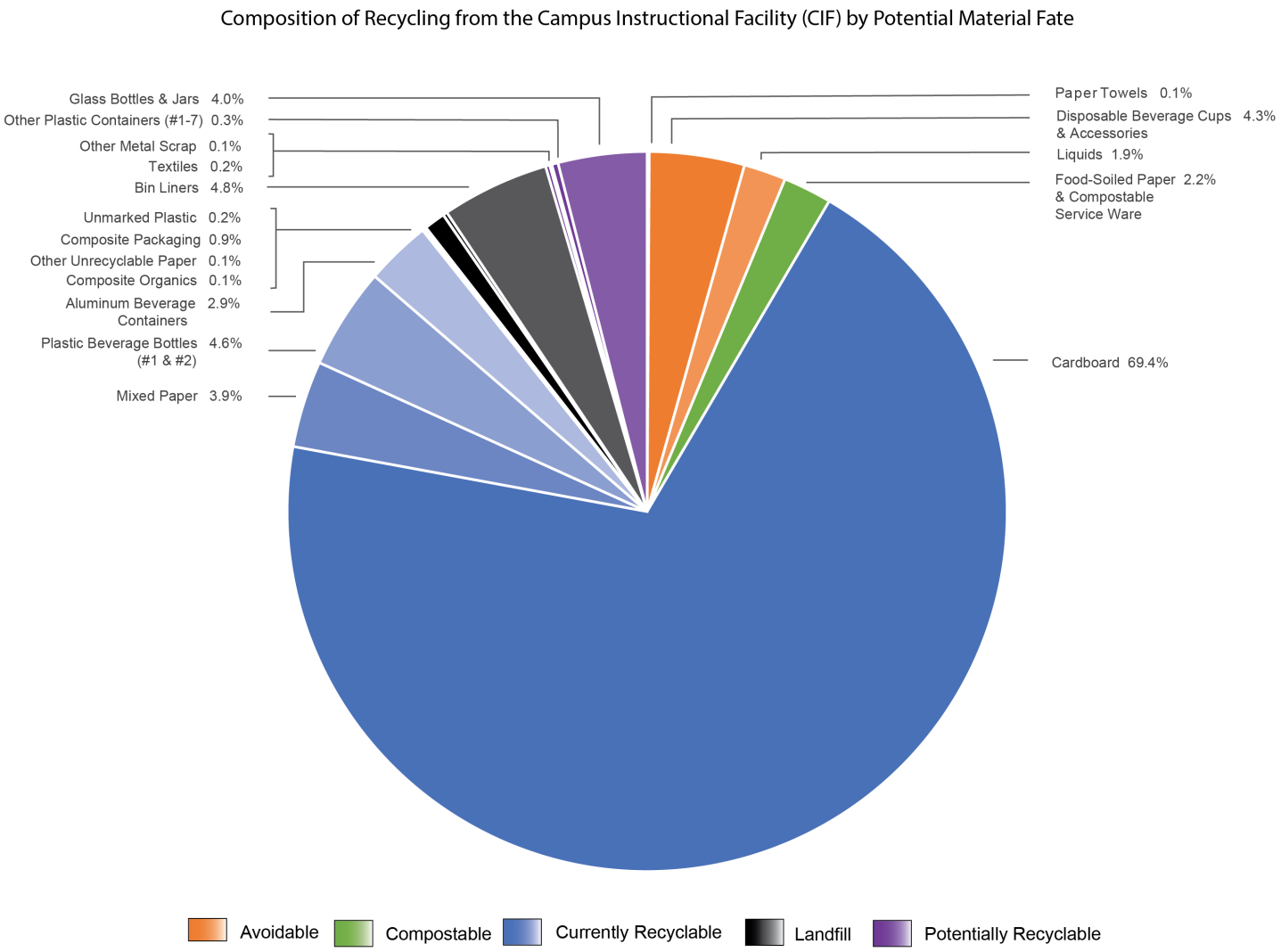


Figure 64: Material breakdown of audit findings for the recycling stream in CIF

Noyes Laboratory

Noyes Laboratory is one of the two buildings that represent the academic buildings with labs activity zone in the waste characterization study. Noyes lab consists of classrooms, labs, offices, a glass shop, a student lounge area and a library.

Landfill Stream

A total of 243.8 pounds of material were collected and sorted from the Noyes Laboratory. The most common materials found in the landfill stream (by weight) were paper towels at 24.4%, mixed paper at 12.7%, liquids at 9.1%, and food scraps at 7.7%, combining for 53.9% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	39.0%
Compostable	11.4%
Currently Recyclable	23.4%
Landfill	10.4%
Potentially Recyclable	15.7%

Table 24: Potential material fates for the landfill stream at Noyes

* The potential material fate is determined by considering the best waste management solution for each material category.

Noyes Laboratory Landfill Material

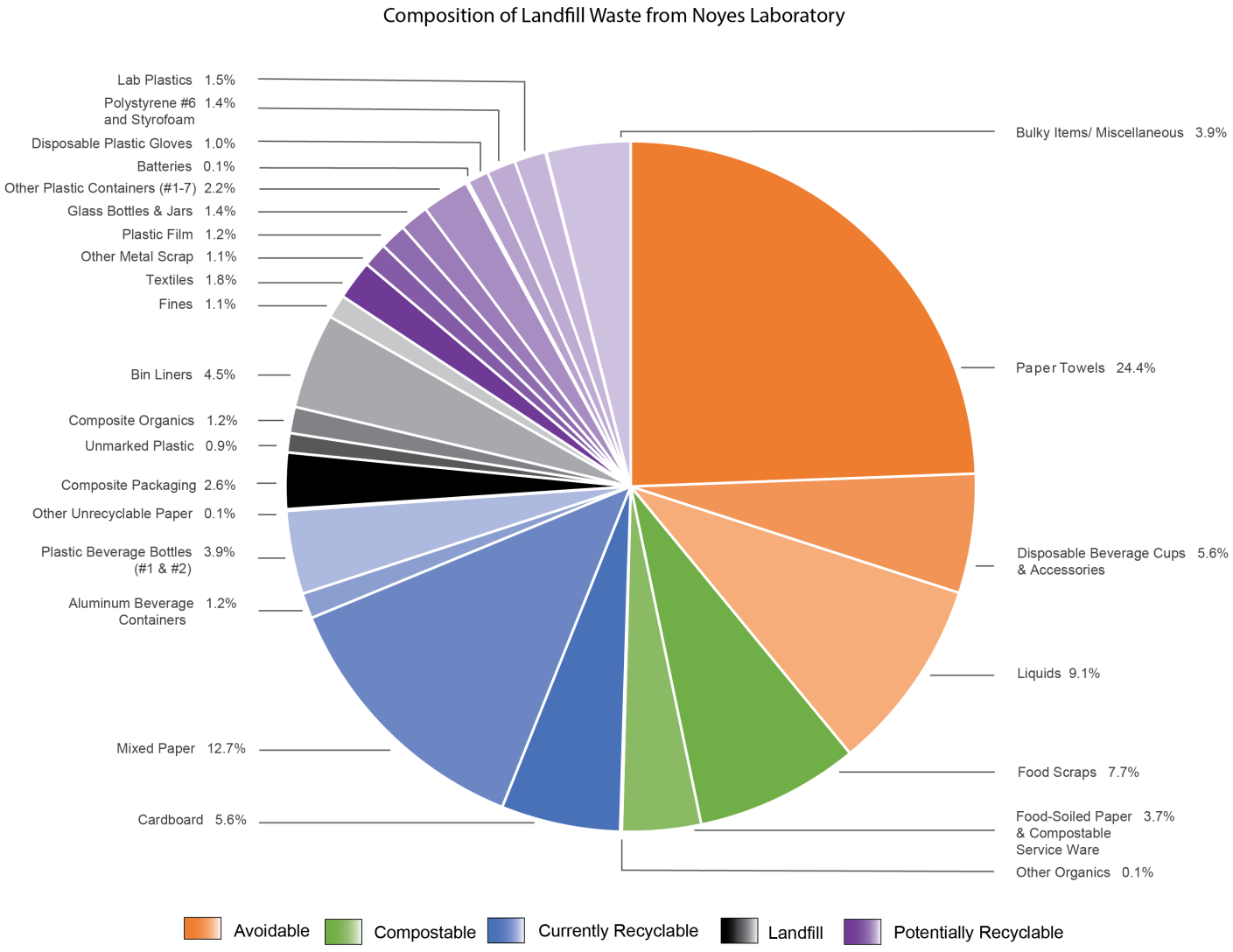


Figure 65: Material breakdown of audit findings for the landfill stream in Noyes

Recycling Stream

A total of 61.1 pounds of material were collected and sorted from Noyes Laboratory. The most common materials found in the recycling stream (by weight) were cardboard at 34.5%, mixed paper at 20.0%, plastic beverage bottles at 8.3% and liquids at 6.7%, combining for 69.5% of all material sorted. A total of 30.6% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	17.7%
Compostable	1.6%
Currently Recyclable	69.4%
Landfill	8.0%
Potentially Recyclable	3.3%

Table 25: Potential material fate breakdown for the landfill stream at Noyes

Top 5 Contaminants in Recycling Stream**	
Liquids	6.7%
Paper Towels	5.9%
Disposable Beverage Cups & Accessories	5.1%
Food Scraps	1.9%
Glass Bottles & Jars	1.3%

Table 26: Top 5 contaminants in recycling stream for Noyes exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Noyes Laboratory Recycling

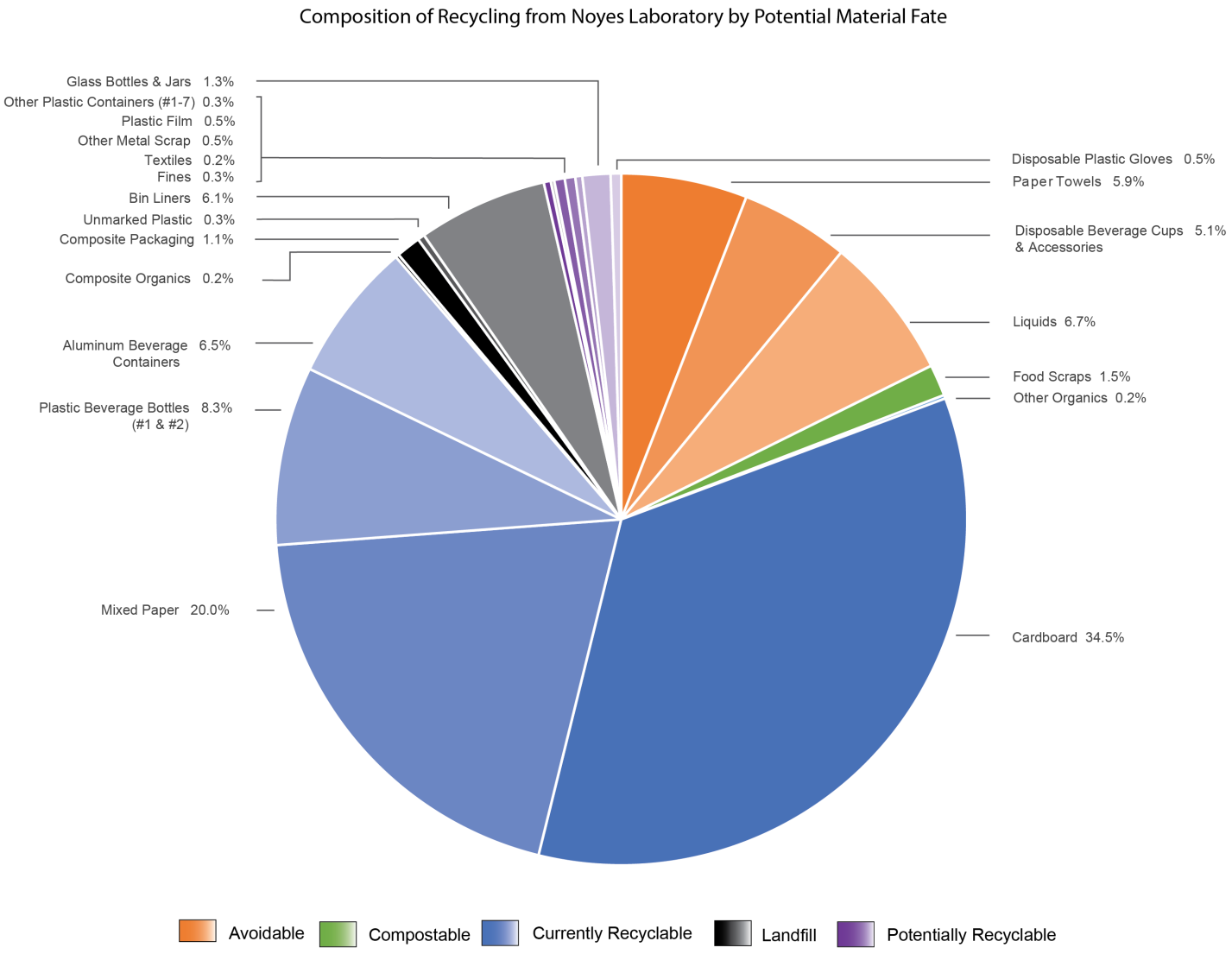


Figure 66: Material breakdown of audit findings for the recycling stream in Noyes

Roger Adams Lab (RAL)

Roger Adams Lab is one of the two buildings that represent the academic buildings with labs activity zone in the waste characterization study. RAL consists of offices, labs, classrooms and a receiving area.

Landfill Stream

A total of 243.3 pounds of were collected and sorted from Roger Adams Lab. The most common materials found in the landfill stream (by weight) were non-recyclable glass at 15.3%, mixed paper at 14.7%, autoclaved bio-hazard material at 11.8%, and paper towels at 11.5%, combining for 53.3% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	15.3%
Compostable	7.6%
Currently Recyclable	18.6%
Landfill	35.5%
Potentially Recyclable	23.0%

Table 27: Potential material fates for the landfill stream at RAL

* The potential material fate is determined by considering the best waste management solution for each material category.

Roger Adams Lab Landfill Material

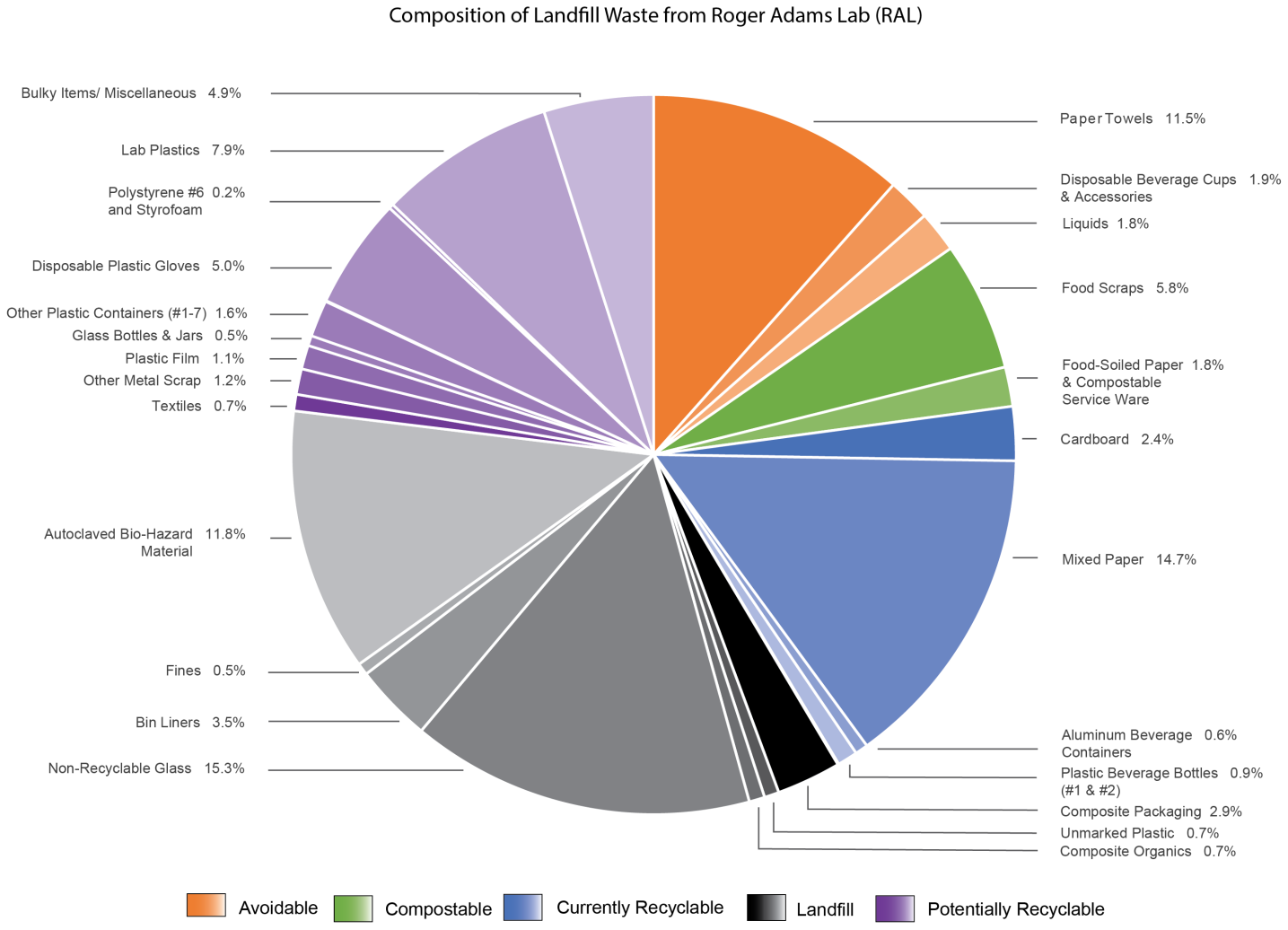


Figure 67: Material breakdown of audit findings for the landfill stream in RAL

Recycling Stream

A total of 142 pounds of material were collected and sorted from Roger Adams Lab. The most common materials found in the recycling stream (by weight) were cardboard at 67.3%, mixed paper at 23.1%, polystyrene #6 & Styrofoam at 2.2% and glass bottles & jars at 1.7%, combining for 94.3% of all material sorted. A total of 7.8% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	1.0%
Compostable	0.2%
Currently Recyclable	92.3%
Landfill	1.8%
Potentially Recyclable	4.7%

Table 28: Potential material fate breakdown for the landfill stream at RAL

Top 5 Contaminants in Recycling Stream**	
Polystyrene #6 & Styrofoam	2.2%
Glass Bottles & Jars	1.7%
Composite Packaging	0.9%
Liquids	0.8%
Other Plastic Containers #1-7	0.4%

Table 29: Top 5 contaminants in recycling stream for RAL exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Roger Adams Lab Recycling

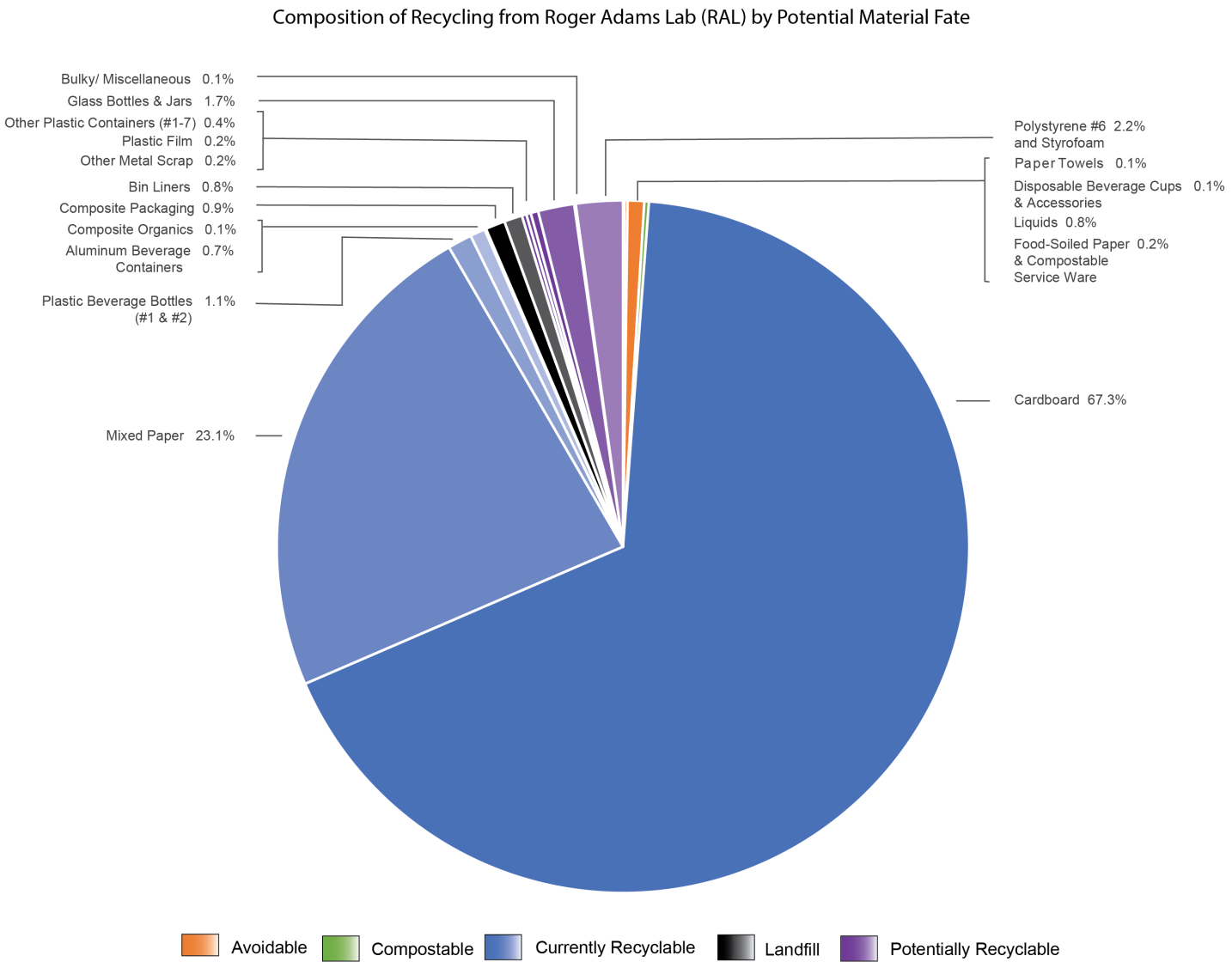


Figure 68: Material breakdown of audit findings for the recycling stream in RAL

The Activities & Recreation Center (ARC)

The Activities & Recreation Center (ARC) is one of the two buildings that represent the multi-activity activity zone in the waste characterization study. ARC consists of offices, fitness areas, sports courts, locker rooms, meeting rooms, an instructional kitchen and a pool. Large catered events occur at this facility occasionally, as do smaller meetings with outside food brought in. A food pantry that serves students operates out of the instructional kitchen with regular weekly hours.

Landfill Stream

A total of 255 pounds of material were collected and sorted from the Activities & Recreation Center. The most common materials found in the landfill stream (by weight) were paper towels at 36.1%, textiles at 23.9%, bin liners at 5.5%, and liquids at 5.1%, combining for 70.6% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	42.1%
Compostable	4.9%
Currently Recyclable	11.0%
Landfill	11.3%
Potentially Recyclable	30.7%

Table 30: Potential material fates for the landfill stream at ARC

* The potential material fate is determined by considering the best waste management solution for each material category.

Activities & Recreation Center Landfill Material

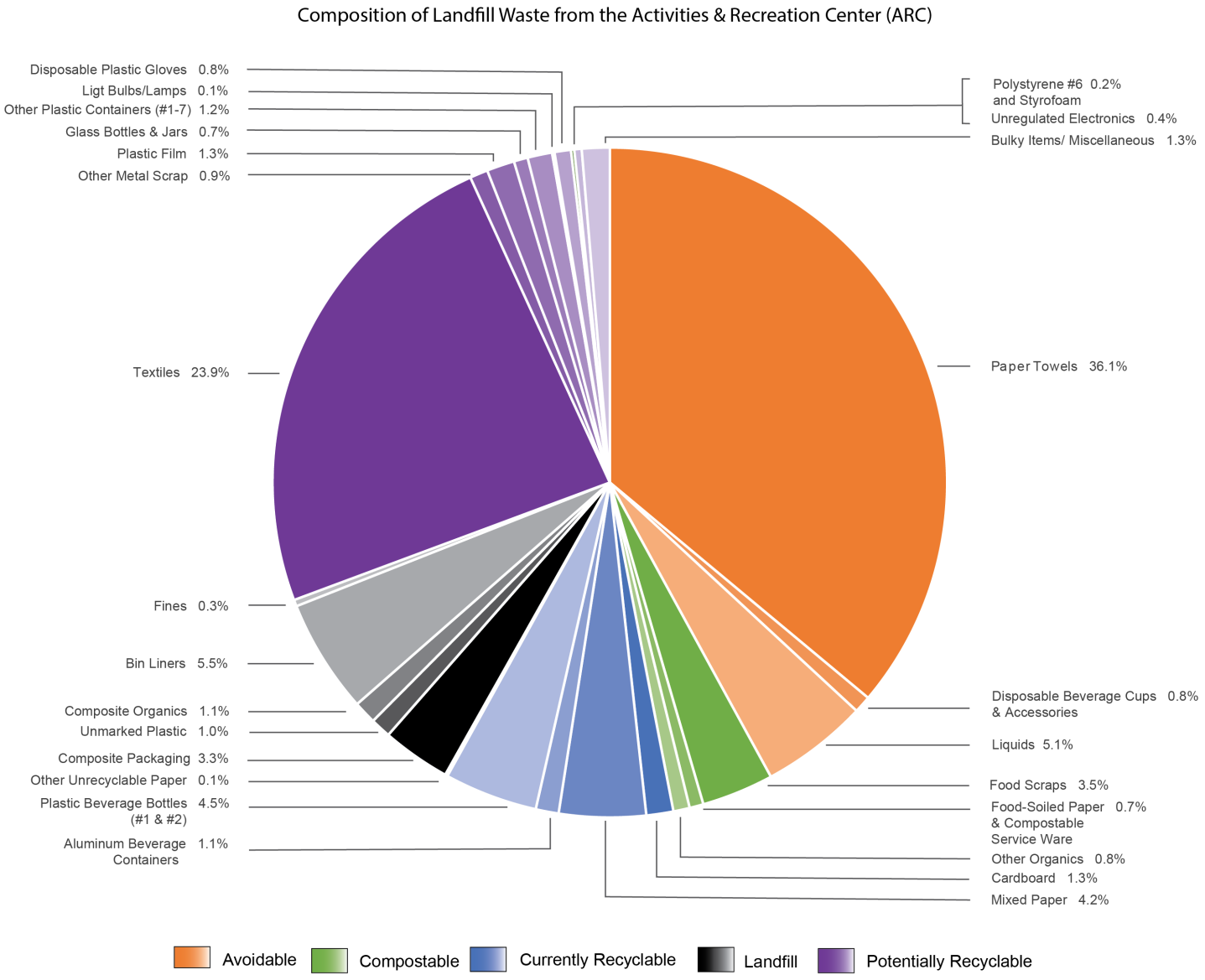


Figure 69: Material breakdown of audit findings for the landfill stream in ARC

Recycling Stream

A total of 116.7 pounds of material were collected and sorted from the Activities & Recreation Center. The most common materials found in the recycling stream (by weight) were cardboard at 82.3%, mixed paper at 10.6%, plastic beverage bottles at 3.9% and aluminum beverage containers at 1.0%, combining for 97.8% of all material sorted. A total of 2.1% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	0.0%
Compostable	0.1%
Currently Recyclable	97.9%
Landfill	0.7%
Potentially Recyclable	1.3%

Table 31: Potential material fate breakdown for the landfill stream at ARC

Top 5 Contaminants in Recycling Stream**	
Plastic Film	0.6%
Polystyrene #6 & Styrofoam	0.3%
Disposable Plastic Gloves	0.3%
Other Plastic Containers #1-7	0.1%
Food Scraps	0.1%

Table 32: Top 5 contaminants in recycling stream for ARC exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Activities & Recreation Center Recycling

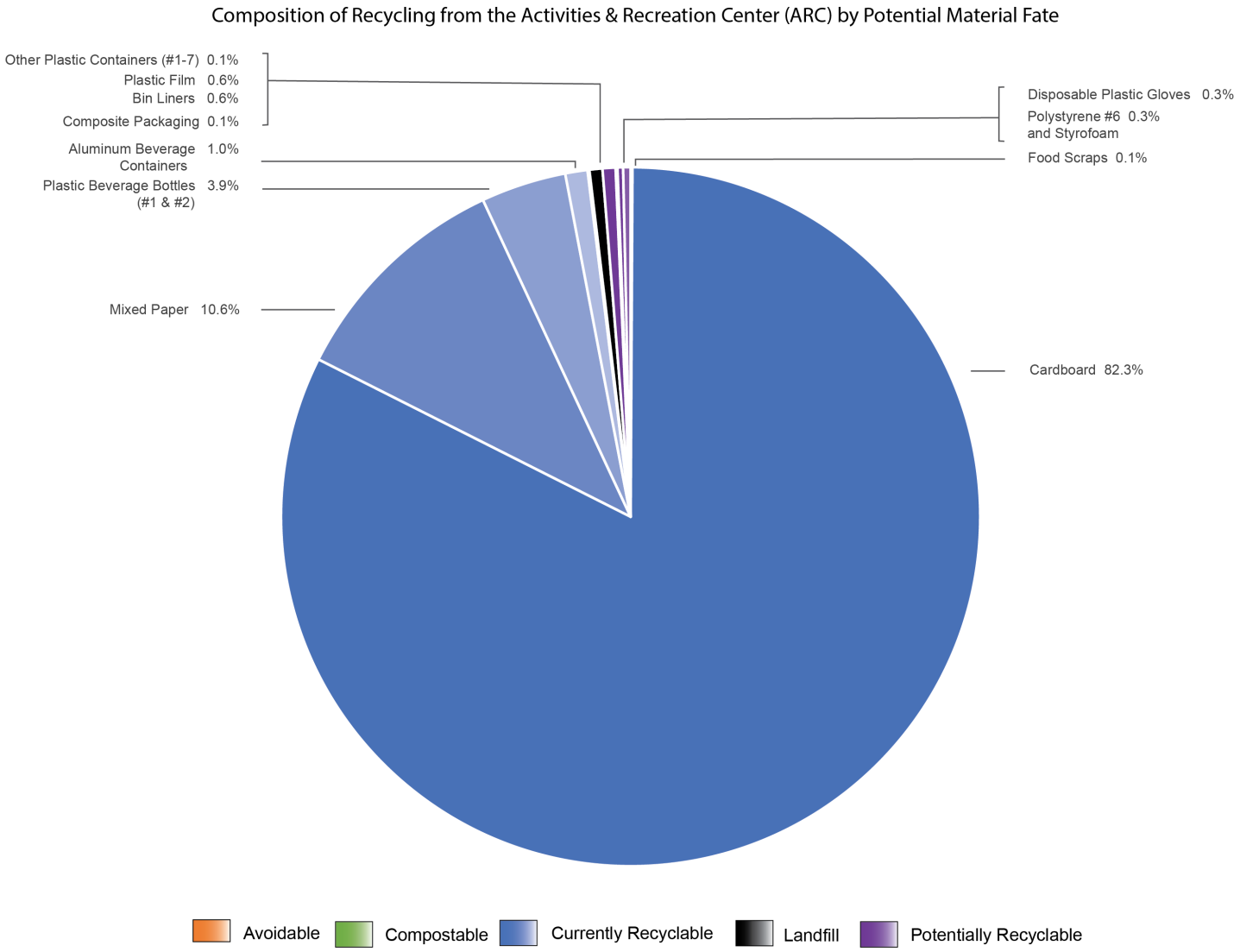


Figure 70: Material breakdown of audit findings for the recycling stream in ARC

Illini Union

The Illini Union is one of the two buildings that represent the multi-activity activity zone in the waste characterization study. The Illini Union consists of event spaces and conference rooms, student lounges, an electronics store/repair service, a food court with multiple dining facilities present, University Catering operations, a Starbucks coffee shop, seating area and a stage in the Courtyard Café, a few small food retailers on the first floor, a hotel, a recreation area (with a bowling alley and other games), a credit union, a computer lab, and offices.

Landfill Stream

A total of 209 pounds of material were collected and sorted from the Illini Union. The most common materials found in the landfill stream (by weight) were food scraps at 18.6%, paper towels at 12.0%, composite packaging at 8.2%, and liquids at 7.8%, combining for 46.6% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	26.6%
Compostable	27.4%
Currently Recyclable	9.0%
Landfill	22.0%
Potentially Recyclable	15.0%

Table 33: Potential material fates for the landfill stream at the Union

* The potential material fate is determined by considering the best waste management solution for each material category.

Illini Union Landfill Material

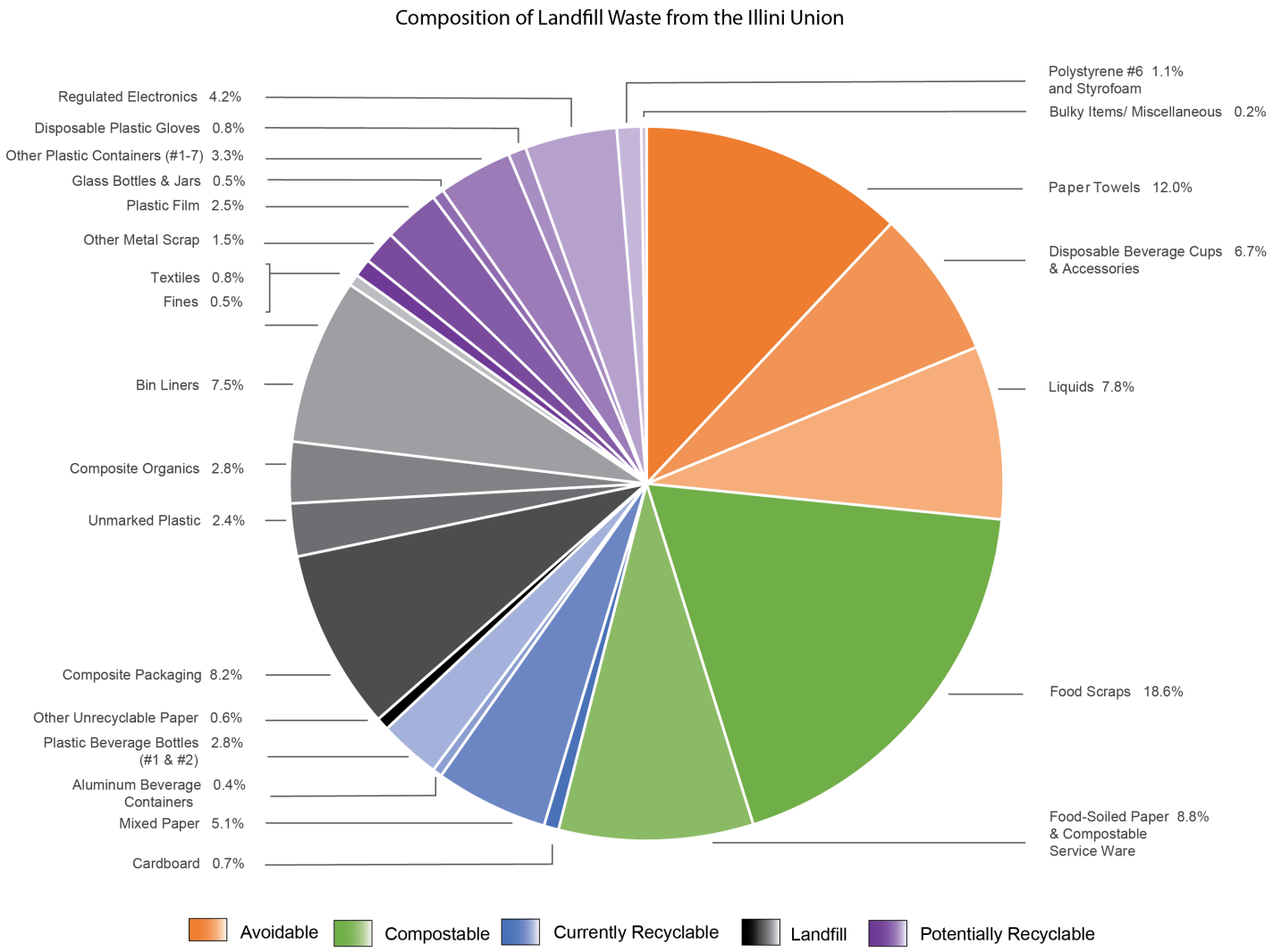


Figure 71: Material breakdown of audit findings for the landfill stream in the Union

Recycling Stream

A total of 276.1 pounds of material were collected and sorted from the Illini Union. The most common materials found in the recycling stream (by weight) were cardboard at 49.0%, liquids at 14.5%, plastic beverage bottles at 10.4% and mixed paper at 7.1%, combining for 81.0% of all material sorted. A total of 31.9% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	18.9%
Compostable	1.2%
Currently Recyclable	68.1%
Landfill	3.5%
Potentially Recyclable	8.3%

Table 34: Potential material fate breakdown for the landfill stream at the Union

Top 5 Contaminants in Recycling Stream**	
Liquids	14.5%
Disposable Beverage Cups & Accessories	4.4%
Glass Bottles & Jars	3.0%
Other Plastic Containers #1-7	2.9%
Plastic Film	1.6%

Table 35: Top 5 contaminants in recycling stream for the Union exculding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Illini Union Recycling

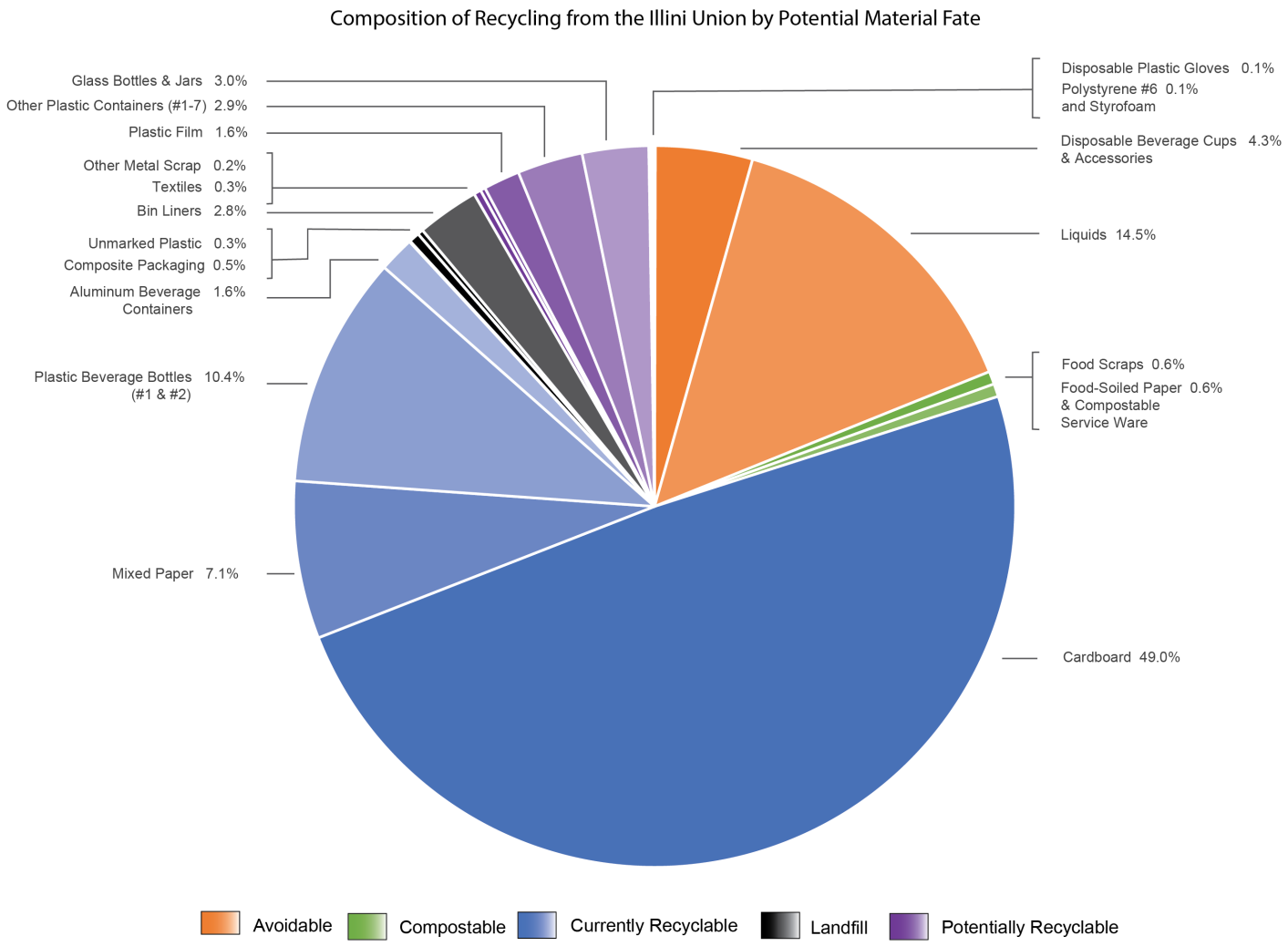


Figure 72: Material breakdown of audit findings for the recycling stream in the Union

Lincoln Avenue Residence Halls & Allen Hall

Lincoln Avenue Residence Halls (LAR) and Allen Hall are the two buildings that represent the student living activity zone. These two buildings share outdoor waste and recycling collection infrastructure, so data collected represents the conglomeration of that material. Allen Hall consists of student living, a dining hall that is shared with LAR, a ceramics lab, computer lab, music room and a fitness room. LAR consists of student living as well as the shared dining hall previously mentioned.

Landfill Stream

A total of 263.7 pounds of material were collected and sorted across these buildings. The most common materials found in the landfill stream (by weight) were food scraps at 26.0%, paper towels at 13.5%, composite packaging at 6.8%, and food service paper & compostable service ware at 6.3%, combining for 52.6% of all material sorted.

Potential Material Fate*	Percentage
Avoidable	21.1%
Compostable	32.2%
Currently Recyclable	12.8%
Landfill	19.0%
Potentially Recyclable	14.8%

Table 36: Potential material fates for the landfill stream at LAR & Allen

* The potential material fate is determined by considering the best waste management solution for each material category.

Lincoln Avenue Residence Halls & Allen Hall Landfill Material

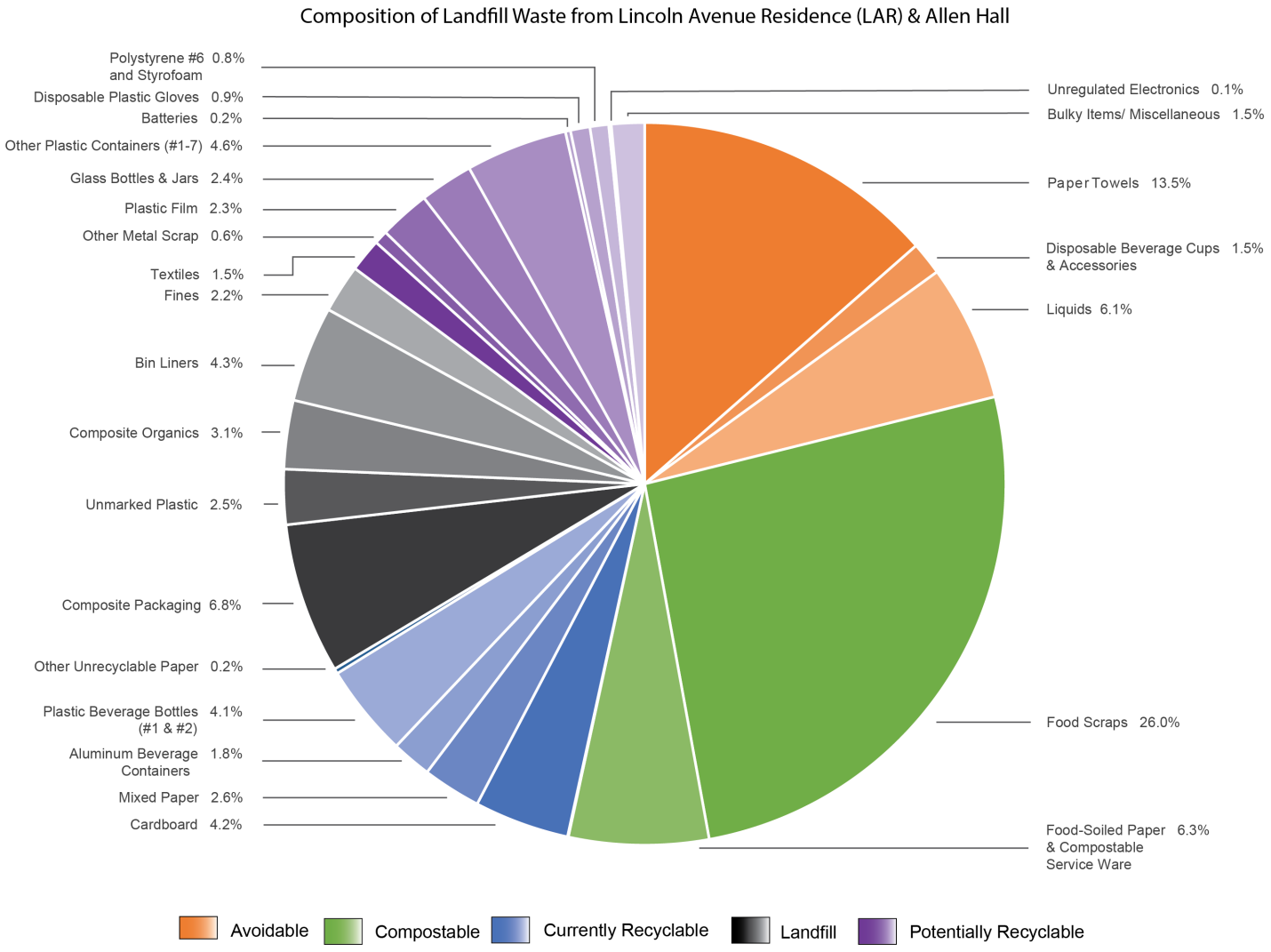


Figure 73: Material breakdown of audit findings for the landfill stream in LAR & Allen

Recycling Stream

A total of 293.6 pounds of material were collected and sorted across LAR and Allen Hall. The most common materials found in the recycling stream (by weight) were cardboard at 66.0%, plastic beverage bottles at 9.6%, mixed paper at 7.5% and paper towels at 4.0%, combining for 87.1% of all material sorted. A total of 14.7% of all material sorted was considered contamination, or material that is not accepted in the current recycling program.

Potential Material Fate*	Percentage
Avoidable	5.6%
Compostable	1.4%
Currently Recyclable	85.3%
Landfill	4.5%
Potentially Recyclable	3.2%

Table 37: Potential material fate breakdown for the landfill stream at LAR & Allen

Top 5 Contaminants in Recycling Stream**	
Paper Towels	4.0%
Liquids	1.3%
Composite Packaging	1.2%
Food Soiled Paper & Compostable Service Ware	0.9%
Plastic Film	0.9%

Table 38: Top 5 contaminants in recycling stream for LAR & Allen excluding bin liners

* The potential material fate is determined by considering the best waste management solution for each material category.

** Bin liners are not included in the above contaminants table because they are not being improperly disposed of. They are generated as part of the waste and recycling collection process.

Lincoln Avenue Residence Halls & Allen Hall Recycling

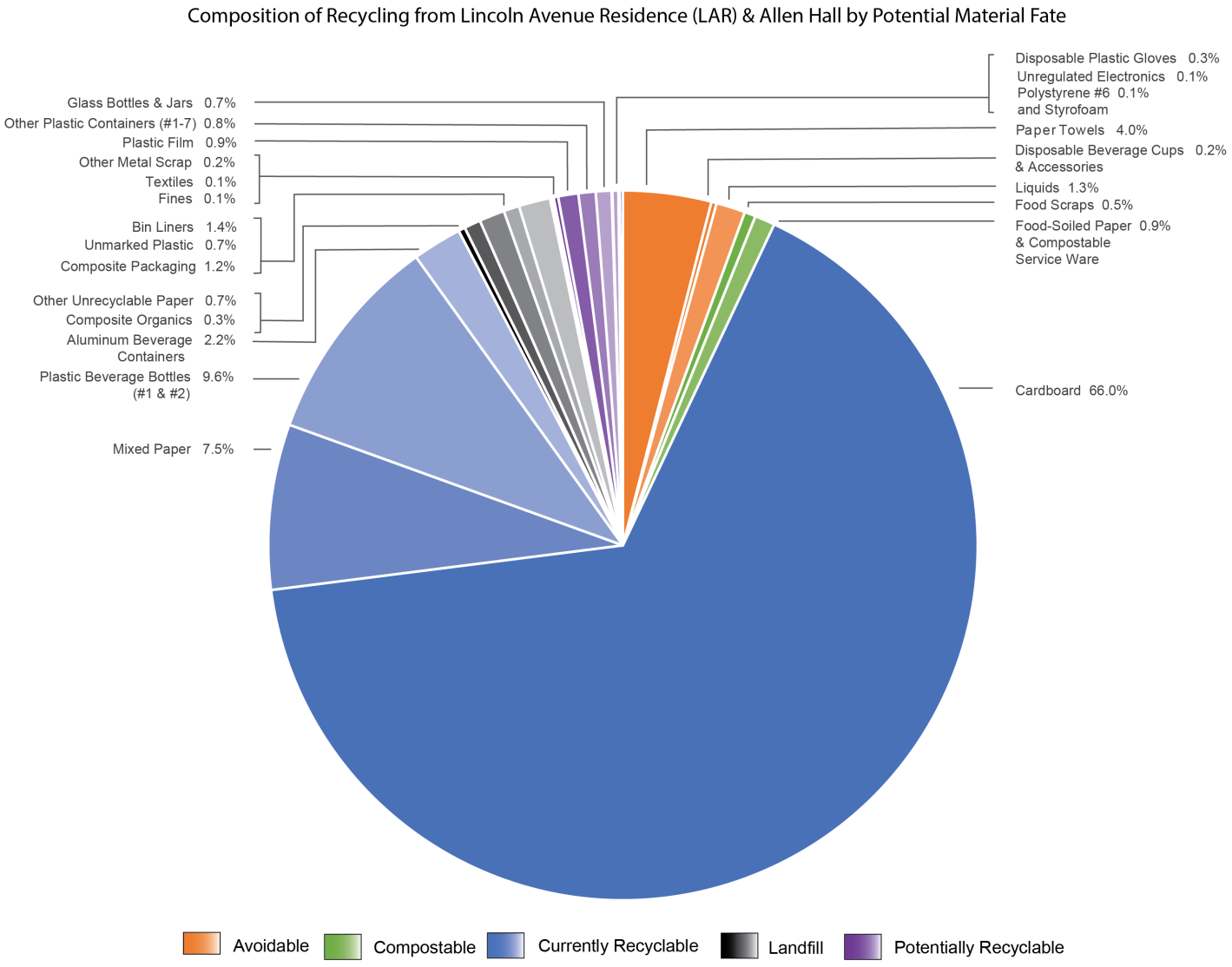


Figure 74: Material breakdown of audit findings for the recycling stream in LAR & Allen

Appendix D: 2023 Survey and Focus Group Questions

Items that were required on the WebTools survey form are marked with a red asterisk. Focus group facilitators asked these questions of participants. “UIUC” refers to the University of Illinois Urbana-Champaign, but is no longer an allowable acronym.

Q1. **I understand that my answers will be confidential and anonymous. I have been given the opportunity to read the full participant consent document, and voluntarily agree to take part in this study.**

☐ I understand and agree.

Q2. ***What is your role on campus?**

- Faculty
- Staff (Building Service Worker)
- Staff (Other)
- Undergraduate Student
- Graduate Student
- Other [space provided]

The following questions were asked of Faculty and Staff.

Q3. **What is your job title or position?**

Q4. ***How long have you worked at the University of Illinois Urbana-Champaign (UIUC)?** (Round up to the nearest year.)

Q5. ***In which of the following buildings do you typically spend your time? (Multiple selection)**

The following buildings were chosen by UIUC Facilities & Services to represent campus activity zones included in this study.
Select a building if you attend or teach class there at least once a week, work there, reside there (for the residence halls listed), use recreation facilities there, or visit the building regularly for other reasons.

- Business Instructional Facility (BIF)
- Campus Instructional Facility (CIF)
- Roger Adams Laboratory
- Noyes Laboratory
- Illini Union
- Activities and Recreation Center (ARC)
- Lincoln Avenue Residence Halls
- Allen Residence Hall

Q6. ***Are you aware of the UIUC Facilities and Services' standard procedure of coding different kinds of waste receptacles by their bag color?** By this standard, recycling bags are blue, lab and bathroom trash bags are black, and all other trash bags are clear.

- I am very familiar with this standard
- I am somewhat familiar with this standard
- I am not familiar with this standard

Q7. *__If your job involves handling waste and waste bags on campus, do you follow the bag color standard described above?__

- Yes, I always follow this standard
- I sometimes follow this standard
- No, I do not follow this standard
- Not applicable to my role

The following questions were asked of Graduate and Undergraduate students.

Q8. **What is your major of study?**

Q9. ***How long have you attended the University of Illinois Urbana-Champaign (UIUC)?**

Q10. ***In which of the following buildings do you typically spend your time?**

The following buildings were chosen by UIUC Facilities & Services to represent campus activity zones included in this study.
Select a building if you attend or teach class there at least once a week, work there, reside there (for the residence halls listed), use recreation facilities there, or visit the building regularly for other reasons.

- Business Instructional Facility (BIF)
- Campus Instructional Facility (CIF)
- Roger Adams Laboratory
- Noyes Laboratory
- Illini Union
- Activities and Recreation Center (ARC)
- Lincoln Avenue Residence Halls
- Allen Residence Hall

Q11. ***Are you aware of the UIUC Facilities and Services' standard procedure of coding different kinds of waste receptacles by their bag color? By this standard, recycling bags are blue, lab and bathroom trash bags are black, and all other trash bags are clear.**

- I am very familiar with this standard
- I am somewhat familiar with this standard
- I am not familiar with this standard

The remaining questions were asked regardless of an individual's role on campus.

Recycling Questions

Q12. *__How important do you find recycling?__

- Very Important
- Somewhat Important
- I am not sure
- Somewhat unimportant
- Very unimportant

Q13. *__How informed are you regarding campus recycling?__

- Very informed
- Somewhat informed
- Uninformed

Q14. *__How informed are you regarding campus waste management besides recycling efforts?__ This might include waste prevention/reduction efforts, reuse of materials, and what happens to collected materials that aren't recycled.

- Well-Informed
- Somewhat Informed
- Uninformed

Q15. *__Consider the study buildings you previously indicated spending time in regularly. Are you aware of any efforts on campus and/or in these buildings focused on waste prevention, including reuse? If so, please describe them. If not, please enter "not applicable."__ Please refer to specific buildings when writing your answer (eg. "In the Union, we...")

Q16. *__How informed are you regarding campus sustainability efforts in general (i.e., beyond waste-related efforts)?__

- Well-Informed
- Somewhat Informed
- Uninformed

Q17. *__Please consider the accuracy of the following statement: The materials in all of our campus building bins are sorted for recycling whether they are placed in the trash or recycling bin, so it doesn't matter what bins I use.__

- True, it does not matter which bin I use
- False, it does matter which bin I use
- I am not sure

Waste Streams On Campus

*UIUC has many waste streams, including recycling, landfill, and specialty recycling programs often facilitated by campus departments or organizations. Please indicate, to the best of your knowledge, where you personally would dispose of each of the following categories of items.

	Landfill (Trash)	Recycling Bin	I am aware of a special on-campus recycling program for this item.	I'm not sure

Q18. **Cardboard**				
Q19. **White office paper, newspaper, file folders**				
Q20. **Books, Magazines**				
Q21. **Aluminum Cans**				
Q22. **Tin Cans (Food Cans, Pet Food Cans, etc)**				
Q23. **Plastic 1**				
Q24. **Plastic 2**				
Q25. **Plastic 3**				
Q26. **Plastic 4**				
Q27. **Plastic 5**				
Q28. **Plastic 6**				
Q29. **Plastic 7**				
Q30. **Plastic Bags**				

Q31. *__If you have a plastic bottle or aluminum can you need to discard, how often do you use the building's recycling bin to recycle it?__

- Always
- Often (More than half the time)
- Sometimes (About half the time)
- Rarely (Less than half the time)
- Never

Q32. *__If you have paper you need to discard, how often do you use the building's recycling bin to recycle it?__

- Always
- Often (More than half the time)
- Sometimes (About half the time)
- Rarely (Less than half the time)
- Never

Q33. *__How convenient is recycling in your building?__

- Very convenient
- Somewhat convenient
- I am not sure
- Somewhat inconvenient
- Very inconvenient

Q34. *__Are the recycling bins easily distinguished from trash cans in your building?__

- Yes

- No
- Sometimes

Q35. *__You may have seen newer three-stream recycling collection stations on campus like the one pictured. When you dispose of trash or recycling at one of these stations, how easy (or difficult) is it to determine where to put different items?__

- Very Easy
- Somewhat Easy
- Somewhat Difficult
- Very Difficult

Q36. *__Please consider the accuracy of the following statement: When recycling bins are located next to trash bins, I recycle more materials.__

- True, I do recycle more
- False, I do not recycle more
- No impact on my recycling habits

Open-Response Section

Q37. *__UIUC's last waste audit of this scale occurred in 2014-15. Information about this audit is accessible through the Box folder below. What, if anything, did you find surprising or interesting about results from previous audits?__

(a link was provided to copies of previous audit reports)

Q38. *__Do you have any recommendations to reduce waste and/or increase recycling in the study building(s) you regularly spend time in (as indicated previously on this survey) or on campus in general?__

Q39. *__Do you have any concerns about the recycling system in the buildings included in the current waste audit or on campus in general?__

Q40. *__What drives you to recycle? If you do not currently recycle, how could you be supported in your journey to begin recycling?__

Q41. *__What are some examples of materials that are difficult to divert from the trash stream? These could be materials you generate a lot of, materials you think should be reused but aren't sure how/where to do that, etc.__

Q42. *__Thinking of any materials mentioned in response to the previous question, do you have suggestions for prevention or diversion of those materials? This could take the form of purchasing alternative products, creating a special reuse or recycling program, etc.__

Q43. *Do you have suggestions for educating the campus community on reuse and recycling?

Q44. *Would you be interested in answering some optional questions on "green purchasing" and recycling in the broader Champaign-Urbana area? (<5 min time commitment)

- Yes
- No, thanks

If yes to Q44, the following questions were asked. If not, the survey proceeded to Q49.

Q45. *"Green purchasing" refers to purchasing products or services that cause minimal negative environmental impacts when compared to their more traditional counterparts. Are you aware of any green purchasing efforts on campus and/or in this building? If so, please describe them.

Q46. *Are there waste reduction initiatives that you have seen on other college campuses or at other institutions that you think need to be pursued here at UIUC?

Q47. *How informed are you regarding sustainability and recycling efforts in the broader Champaign-Urbana community?

- Well-informed
- Somewhat informed
- Uninformed

Q48. If you are somewhat or well informed, do you have suggestions for ways that campus and the broader community could collaborate on recycling and sustainability efforts?

The final question was asked to all respondents:

Q49. **Additional Comments / Discussion**

Any comments and concerns on the state of waste management and recycling at UIUC are welcome, as are thoughts and ideas that didn't fit in anywhere else in the survey.