Textile Waste Audit Report

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Introduction

The City of Los Angeles is a global leader in textile manufacturing, a status that results in significant textile waste generation. According to the Los Angeles Department of Sanitation (LASAN), the average annual commercial waste produced in Los Angeles (LA) from 2018 to 2021 reached an astonishing 1,204,087 tons, with textile waste accounting for 115,690 tons, or 7.7% of the waste stream. Textile waste presents significant environmental challenges; however, there may be diversion opportunities for Athens and their clientele.

***Figure 1**. CPSC and Athens staff on site characterizing textiles*

The California Product Stewardship Council (CPSC) and Athens Services collaborated on a textile waste assessment and recommendation plan as it pertains to Athens' recycLA accounts in the City of Los Angeles.

CPSC, a Sacramento-based nonprofit, collaborates with local governments and waste authorities to develop programs for hard-to-manage waste streams. Utilizing a Trinamix Near Infrared (NIR) device, CPSC conducts textile waste characterization studies to collect data on textile waste composition, fiber types, and material blends. The information collected is used to inform cities and waste management authorities about diversion strategies and provide CPSC with data to support policy development and educational curriculum. CPSC was the sponsor of SB 707 (Newman), the Responsible Textile Recovery Act of 2024, which creates a producer responsibility program to ensure textiles are designed for durability and recyclability while providing funding and market development for end-of-life recovery.

Athens Services (Athens) is a family-owned and privately held California company that collects and processes recyclables, organics waste, and unrecoverable waste for 2.3 million people in more than 50 cities and county areas.

recycLA is a public private partnership that provides recycling, organics, and waste collection and processing services to all commercial and industrial businesses, institutions, and large multifamily buildings. The City of Los Angeles franchise service areas are divided into 11 Franchise Zones. Athens Services is managing the East Downtown (EDT), Harbor (HB), North Central (NC), and West LA (WLA).

By understanding the composition of textile waste from recycLA accounts, Athens can identify targeted diversion opportunities that reduce landfill disposal, supporting LASAN's Zero Waste goals and fostering a more sustainable future.

LASAN Textile Pilot

CPSC is the primary contractor on the multi-phase textile pilot with LASAN. The LA Textile Recovery Pilot focuses on creating a model for textile circularity in Los Angeles that can be applied to cities nationwide. Accomplishments from Phase 1 (2020-2022) and Phase 2 (2022-2024) of the Pilot include:

- Collecting data of LA commercial textile waste totals,
- Creating a Textile Handlers Map to chart local diversion champions statewide, and
- Diverting discarded textiles into viable products for the City of LA.

Although Athens Services is not a direct partner in the pilot, relevant textile waste data from their service zones was gathered during recycLA audits conducted by LASAN as part of LA's Textile Pilot Phase 1. These audits revealed that Athens' zones contributed the following volumes of textiles waste during the years of 2018 - 2021:

Table 1. Average Annual Textiles in Commercial Waste Stream by recycLA Zone

recycLA Zone	Average Annual Reported Commercial Waste (Tons, 2018-2021)	Percent textiles based on characterization	Average Annual Textiles in the Commercial Waste Stream (Tons, 2018-2021)
F-EDT	24,824	20.30%	5,040
F-HB	62,832	4.61%	2,896
F-WLA	142,731	3.76%	5,371
Studio-F-WLA*	1,909	3.76%	72
F-NC	167,852	3.21%	5,389
Studio-F-NC*	3,966	3.21%	127
Totals	**404,114**	**4.68%**	**18,895**

**Large film & television studios are still included in the franchise agreement and are not designated as separate zones. However, their waste audits are conducted separately from the zone audits.*

Athens & CPSC Textile Audit

In support of the LASAN Textile Pilot research, Athens engaged CPSC to conduct a textile audit of their recycLA zones. The audit was conducted on September 5, 2024, at the Downey Area Recycling and Transfer Station (DART), which Athens operates.

Methodology

Sampling

As part of the annual waste audits mandated by the recycLA franchise agreement, Athens identified 795 lbs. of textile waste from their four recycLA franchise zones; EDT (158.9 lbs.), NC (83.6 lbs.), WLA (387 lbs.), HB (163.4 lbs.). This material was separated by zone, collection route, and stream type (recycling or landfill) and set aside for the CPSC audit.

Sorting

A team consisting of two CPSC staff members and two Athens representatives weighed each pile to determine the total weight collected from each zone. Notes on weights and findings:

- Of the total 795 pounds, 20% of each sample from the recycLA zones EDT, HB, and NC were randomly selected, scanned, and categorized for a detailed analysis.
- Due to time constraints, only one-eighth of the 20% textile material sample from the WLA zone was audited.

Scanning

Using a TrinamiX Near Infrared (NIR) device, the team scanned garments from each zone to automatically record fiber composition data. The fiber types analyzed were categorized according to what many textile recycling companies classify as “recyclable”. This designation typically applies to textiles where at least 90% of the material is composed of a single primary fiber type. Additionally, since cotton and polyester are the primary fibers with scaled textile recycling and end-markets, this report focused on those fiber categories.

Fiber Category	**Definition**
Cotton	Textiles that are > 90% cotton
Polyester	Textiles that are > 90% polyester
Cotton - Polyester	Textiles that are a blend of only cotton-polyester
Mixed/ Miscellaneous	Textiles that are: • not in the three categories above (such as Wool, Acrylic, Polyamide, Viscose, and Elastane); • composed of a combination of three or more different fiber types; or • materials not identified by the scanning device or garment tag.

Additionally, CPSC manually recorded qualitative data based on the following categories.

Qualitative Category	Definition
Soil Level	The assessment used a 0–5 scale, where 0 indicated completely clean textiles, and 5 represented heavily soiled textiles.
Stains %	The assessment used a 0–100% scale, where 0% indicated textiles that had no stains, and 100% represented textiles that were completely stained and unsalvageable.
Resellable	Textiles with dirt or stains that, with proper cleaning, can be restored to a condition suitable for resale.
Repairable	Textiles that cannot be sold in their current condition due to rips, stains, or other defects, but can be made suitable for resale through repair.
Repurposable	Textiles that may no longer serve their original purpose but can be transformed or upcycled into new products or uses.
Recyclable	Cotton and polyester are considered recyclable due to their widespread use in textiles and the availability of established recycling technologies. These include both mechanical and chemical processes, which recover and repurpose these fibers by breaking cotton down into reusable fibers and polyester into its base monomers for creating new product.

Observations

General Observations

- All sample materials were placed in labeled bags during the initial recycLA audit and some were stored for over a month in preparation for the CPSC textile audit, which resulted in conditions that promoted higher soil levels and contamination.
    - It was challenging to determine whether the clothing and other textiles were soiled prior to disposal or if they became soiled from mixing with other materials in the recycling or landfill containers (prior to being audited).
- Most items sampled included clothing, towels, bedding (sheets, blankets, pillows, and comforters), and fabric scraps.
- The most common non-clothing items included the following:


Sheets and Towels


Belts


Tote Bags


Plush Toys


Purses

Visual Assessment Observations

Athens conducted a visual assessment of all remaining bags not sampled by CPSC from each zone, resulting in the following observations:

- Many of the materials appeared to consist of clothing and bedding, suggesting most originated from multifamily residences or medical-related care facilities, as there was very little evidence of commercial fabric cuttings, scraps, or similar materials.
- There was one bag containing sheets and linens, potentially originating from a hotel.
- Several bags appeared as though they may have originated from a thrift store. Contents of these bags were higher quality and variety of textiles that were considered resellable.
- Some items, including certain types of clothing, bed pads, and materials with the occasional odor of urine, suggested potential origins from home health care or assisted living environments.
- Some disposed textiles had already been repurposed or upcycled, including a notable quilt made from patched-together shirts.
- Several bags indicated that textiles may have been discarded following an individual's passing. The clothing items appeared to belong to elderly individuals, consisting mostly of robes, sweatshirts, and sweatpants.

Findings

Table 2. Qualitative Overview of Textile Waste (by zone) from Athens on 9/5/24

	NC	WLA	HB	EDT	TOTAL
Male (count)	17	14	23	14	68
Female (count)	15	2	38	12	67
Unisex (count)	23	13	5	27	68
% of Item Stained (average)	21%	69%	10%	79%	45%
Rips (3” or larger) (count)	3	1	0	1	5
Wet (count)	0	1	0	0	1
Resellable (count)	34	7	48	3	92
Repairable (count)	6	0	2	0	8
Repurposable (count)	15	2	9	1	27
Soil Level (0-5; average)	2.39	4.21	2.24	4.64	3

*See Methodology section for definitions of qualitative categories.

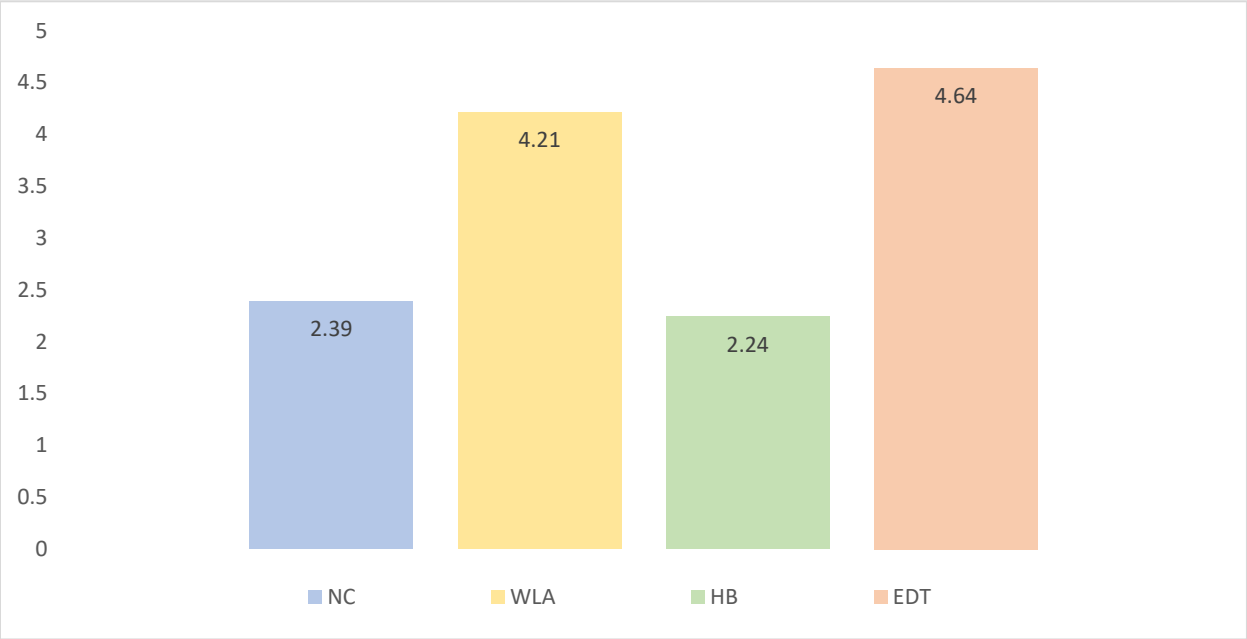
Table 3. Distribution of Weights (lbs.) by Fiber Type and Route from 20% Sample

	NC	WLA	HB	EDT	TOTAL
Cotton	12.3	2.9	10.5	10.6	36.3
Polyester	5.5	1.8	17.9	7.7	32.9
Cotton-Polyester	1.3	12.8	15.7	10.3	40.1
Mixed/ Miscellaneous	12.9	3.1	12.8	9.6	38.4
Total Weight Sampled by Zone	32	20.6	56.9	38.2	**147.7**

Soiled and Contaminated Materials

- Textile waste from all zones was observed to be moderately soiled, with an average soil level of 3.2 out of 5 (5 being extremely soiled), and approximately 45% of total items showed visible stains.
- EDT items averaged the highest soil level for zones sampled, with an average rating of 4.64 out of 5. Most of the textile waste was moldy and considered contaminated.
- The NC zone has the highest return value of textile waste. The items sampled had the lowest average of stains and soil levels.
- Significant soiling was likely due to the textiles being retrieved directly from the waste stream for auditing, rather than being source-separated.

Figure 2. Average *Soil Level Among Four Zones*



Resellable, Repairable, Repurposable, and Recyclable Materials Across All Zones

- Most items sampled did not fall into the categories of resellable, repairable, or repurposable and were instead evaluated as needing to be recycled.
- Of the items sampled from EDT, 93% were evaluated as recyclable.
- Of the items sampled from WLA, 69% were evaluated as recyclable.
- Of the 45% of items considered resellable, 52% of those items were from the HB zone followed by 37% from the NC zone.
- Of the 13% of items considered repurposable, 56% of those items were from the NC zone.
- All sampled zones contained textile waste that could not be resold, repaired, or repurposed. HB and NC textiles were found to be more resellable due to the low soil levels and fiber composition of the garments sampled. WLA and EDT had no repairable

items. They may qualify for recycling if fiber composition requirements are met since they cannot be resold.

- Over half of the items by count sampled (by count) across all zones had fiber types identified as Mixed/Misc.

***Figure 3**. Analysis of Qualitative Assessment by Item Count of All Items Sampled*

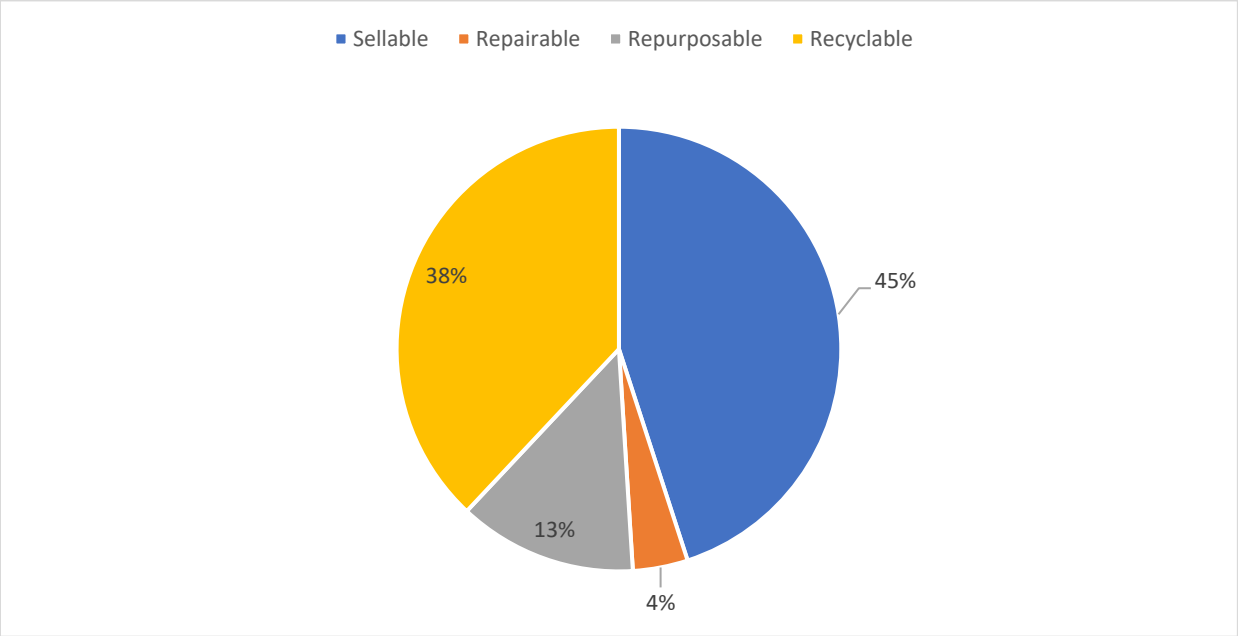
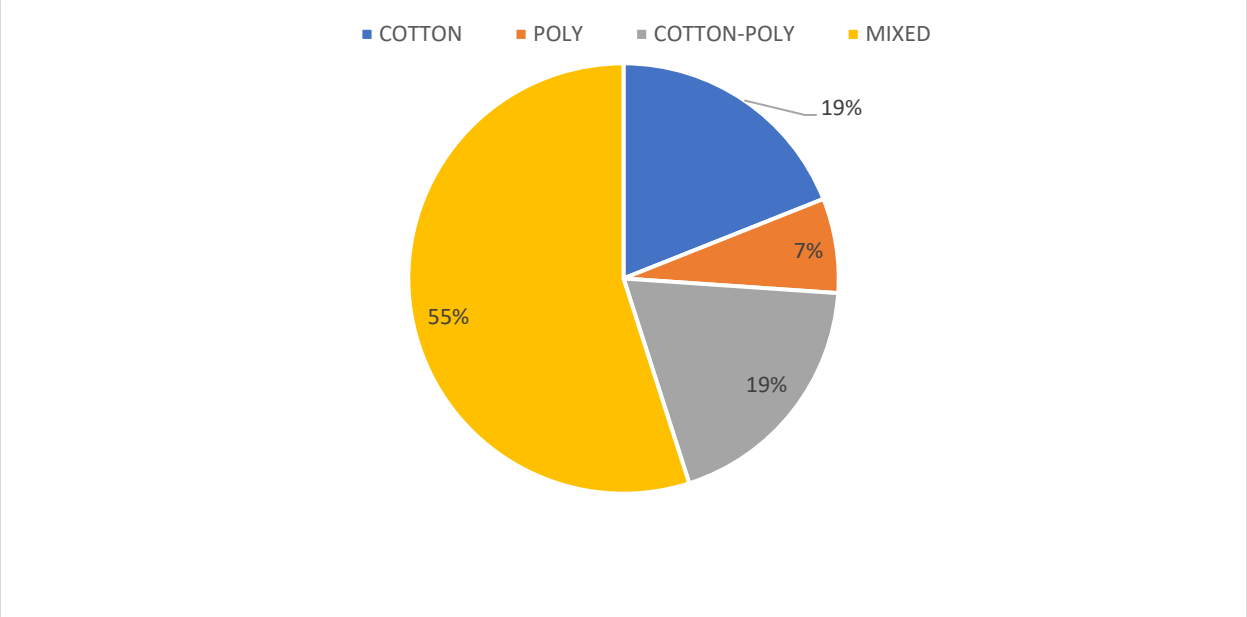


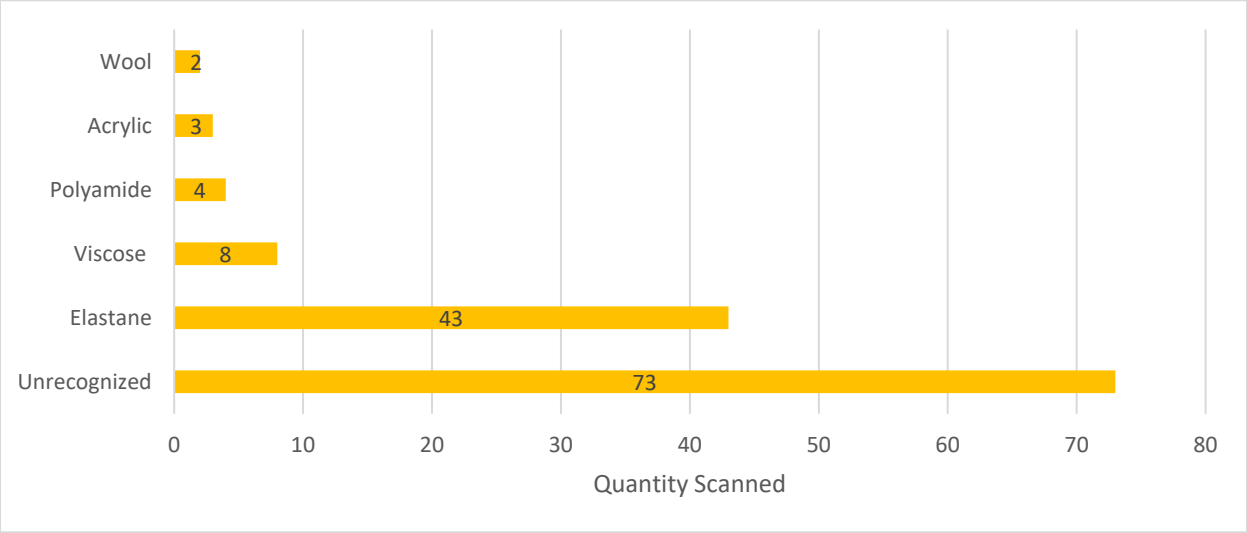
***Figure 4.** Material Composition by Item Count Across All Four Zones*



- The items categorized as “Mixed/ Miscellaneous” by the BASF TrinamiX by device were textiles that the scanner recorded as “unrecognized” due to technical limitations. This

category also included fiber types other than Cotton, Polyester or Cotton-Polyester - the primary fiber types with established end markets (reference Figure 5 for "Mixed/ Miscellaneous" fiber types).

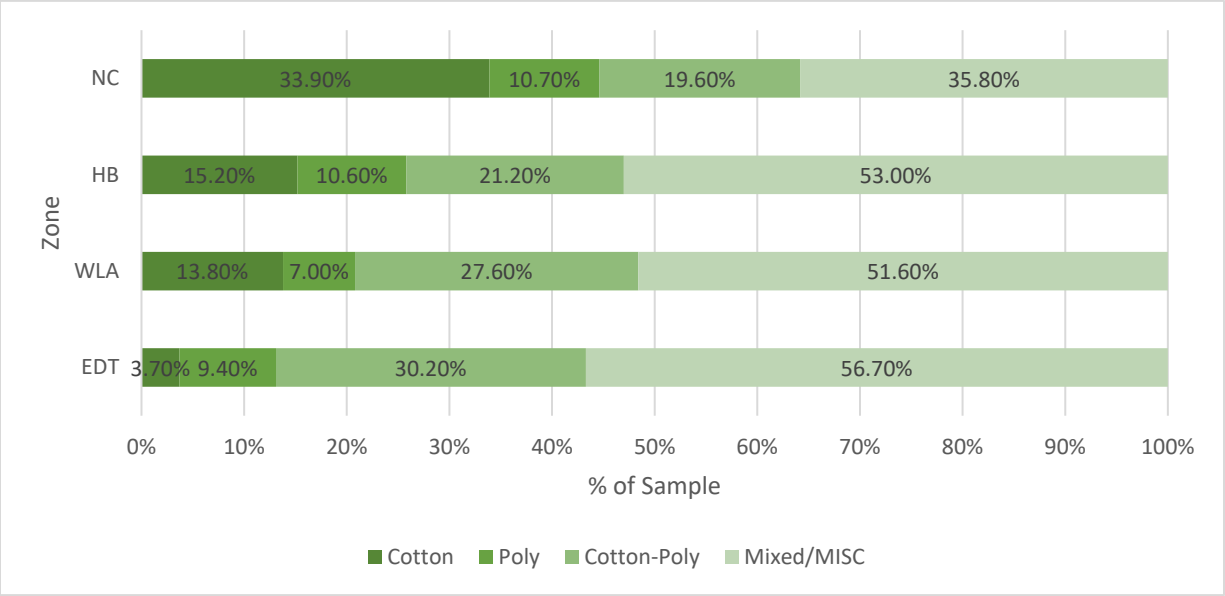
Figure 5. *Analysis of Items Scanned as "Mixed/Misc." from BASF's Trinamix*



Resellable, Repairable, Repurposable, and Recyclable Materials by Zone Route

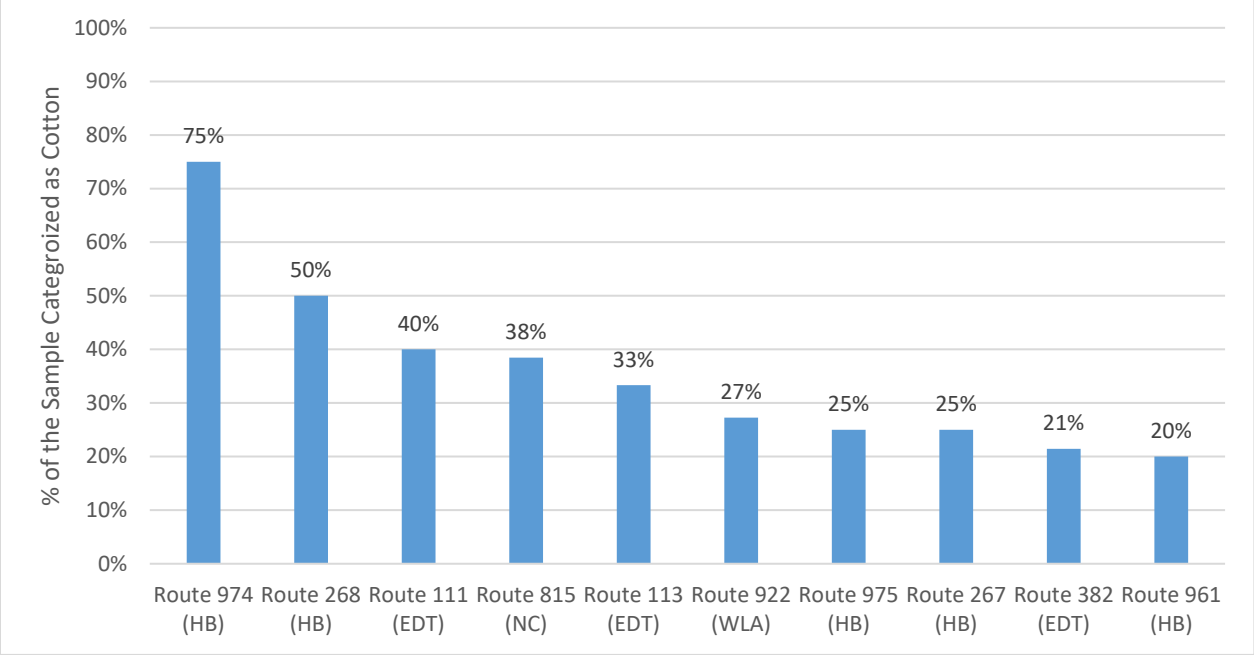
- The NC zone had the highest percentage (by item count) of cotton (33.9%) and polyester (10.7%) items.
- Over 50% of items sampled from WLA and HB were mixed/misc. fiber contents.
- Cotton-polyester blends made up 30% of the items from the EDT zone. EDT generated a minimal amount of cotton and polyester waste.
- The items sampled from EDT do not accurately represent the textile waste from this zone. Based on data collected by CPSC, this zone primarily consists of textile manufacturing businesses (including fabric mills, dye houses, cutting rooms, etc.)

Figure 6. *Fiber Composition of Sampled Textiles by Zone, Measured Using the NIR Device*



- The two collection routes with over 50% cotton items by count were HB's Routes 974 (75%) and Route 268 (50%). HB 974 and 286 are both landfill-bound routes.
- There were three routes that had between 30 and 49% cotton: EDT Route 111 (40%), NC Route 815 (38%), and EDT Route 113 (33%). NC 815 is a recycling route. EDT 111 and 113 are both solid waste routes.

Figure 7. *Routes with at Least 20% of Sampled Items Categorized as Cotton*



Projections

Conducting additional fiber identification audits will enable Athens to calculate the volumes of recyclable textiles and estimate future revenue from a source-separated textile collection program. The table below presents the ***Average Annual Reported Commercial Waste*** (in tons) from the four recycLA zones and their respective studios managed by Athens. It calculates the average annual textile tonnage within the commercial waste stream using the percentage of textiles identified in waste characterization studies, applied to the reported waste totals for each zone. To estimate the tonnage of specific fiber types within the textile waste, the percentages from the audit are multiplied by the totals in the ***Average Annual Textiles in Commercial Waste Stream*** column. The bottom three rows show the projected total textile tonnage by fiber type across all zones, using varying conversion rates for comparison.

Based on an estimated market value of $0.20 per pound for pure cotton waste and applying a 40% diversion rate for cotton-only materials, Athens has the potential to recover $2,816,985 from cotton waste currently sent to landfills with a source-separated collection program. This does not include the 100% polyester streams that also have markets and value. If Athens diverted 40% of the cotton-only materials into established textile recycling processes with end-markets, a total of 7,043 tons could be diverted annually.

Table 4. Projected Tonnage by Fiber Type

	LASAN TEXTILE PILOT FIGURES *This data was not collected for this audit and used only to calculate predicted outputs for Athens.*			**Athens & CPSC Textile Audit**			
recycLA Zone	Average Annual Reported Commercial Waste (Tons 2018-2021)	Percent textiles based on characterizations	Average Annual Textiles in the Commercial Waste Stream (Tons 2018-2021)	Average Annual Tons by Fiber Type (% of the textile waste stream) using Fiber Categories from this audit			
				Cotton	Polyester	Cotton-Polyester	Mixed/Misc.
				19%	7%	19%	55%
F-EDT	24,824	20.30%	5,040	957.56	352.78	957.56	2771.88
F-HB	62,832	4.61%	2,896	550.16	202.69	550.16	1592.58
F-WLA	142,731	3.76%	5,371	1020.49	375.97	1020.49	2954.04
Studio-F-WLA	1,909	3.76%	72	13.65	5.03	13.65	39.51
F-NC	167,852	3.21%	5,389	1023.95	377.24	1023.95	2964.06
Studio-F-NC	3,966	3.21%	127	24.20	8.91	24.20	70.04
Grand Total	**1,204,087**	**7.70%**	**92,664**	**17606.15**	**6486.48**	**17606.15**	**50965.16**
		Assuming 40% diversion of textiles	**37,065.57**	7,042.46	2,594.59	7,042.46	20,386.06
		Assuming 70% Diversion of textiles	**64,864.75**	12,324.30	4,540.53	12,324.30	35,675.61
		Landfill Ban leading to 90% Diversion of textiles	**83,397.54**	15,845.53	5,837.83	15,845.53	45,868.64

Recommendations

Below are recommendations for Athens on the next steps for textile recovery and management.

Overall Recommendations

To successfully divert textiles for resale, repair, repurposing, or recycling, materials must be source-separated before entering the waste stream. Textiles disposed of in regular waste containers risk contamination from food, liquids, and other putrescible matter. Even if recovered, textiles mixed with other waste can develop further contamination (e.g., mold) when stored or baled, as observed in the Athens textile audit. Contamination ultimately reduces reuse and recycling potential, as textile resellers or recyclers do not accept soiled or moldy items. Proper textile diversion requires source-separated collection, avoiding mixing with other waste streams like recycling, landfill, or organics. Further research and piloting will add information for Athens to profile commercial textile waste generators and explore opportunities for reuse and recycling of source-separated collected textiles.

Pilot Source Separated Collection within Athen's Zone(s)

- Research, identify, and collaborate with one to two high-volume textile waste generators within the Athens' recycLA franchise zones to establish on-site collection points. Conduct a two-day audit at the Athens facility to collect data on route number, sourcing zone, and fiber type, identifying opportunities for source-separated collection programs.
- Send collected textile feedstocks to recyclers for quality assessment and evaluation of outputs. This feedstock can support the LASAN design competition.
- Assess the difference between industrial and post-consumer textile feedstocks by analyzing types of businesses generating the waste, fiber composition, contamination levels, and recyclability at the point of waste generation.
- Develop and test efficient processes for source-separated collection, tracking, and transportation to reduce contamination of textiles and improve feedstock quality.
- **ACTION: Contract CPSC to develop textile specific sampling methods to recruit businesses to participate in a source separated collection pilot.**

Collaborate with LA Sanitation on Phase 3 of the LA Textile Recovery Project

- Distribute LASAN's waste generator survey within Athens' recycLA franchise zones to collect data about the practices, needs, and challenges faced by textile waste generators.
- Collaborate in the upcycling design competition with industry partners and major brands. The competition will feature pre-approved designers creating upcycled garments from materials selected from participating locations, which could include an Athen's site. The winner(s) receives a cash prize and an opportunity to collaborate with the LA28 Olympics.
- Co-sponsor the creation of a recycled cotton fabric for use in the LA28 Olympics. The LASAN Phase 3 pilot is starting in March 2025 and will be developing a recycled cotton fabric made from LA-sourced textile waste and milled in LA at Laguna Fabrics, who is

located in the Athens EDT zone. The goal is to model circular textile product(s) and use the LA28 Olympics to drive the market for recycled cotton.

- **ACTION: Collaborate with the LASAN Phase 3 Pilot by distributing the survey within each zone and financially co-sponsor the design competition and LA28 recycled-cotton fabric.**

Advocate for Policy at the State and Local Levels

- Maintain active participation in the Statewide Textile Recovery Act Taskforce (STRAT) and Collection and LA Working Groups ensuring Athens remains informed about SB 707 developments and position the organization to access Extended Producer Responsibility (EPR) program funds once available.
- Design a textile recycling or textile collection program that aligns with state and local policies:
    - **SB 707 (Newman)**: Extended Producer responsibility (EPR) law for textiles
    - **LA's Green New Deal**: initiative aimed at addressing climate change
    - **LA City's Textile Policy Goals**: policy requiring businesses to responsibly manage the disposal of unused textiles.
- Establishing a textile recycling or textile program that will follow the existing Waste Hauling Agreements.
- By aligning with the City of Los Angeles' goals, Athens will be well-positioned to help Los Angeles manage the anticipated increase in textile waste from major events such as the 2026 FIFA World Cup, Super Bowl LXI, and the LA28 Olympics.
- **ACTION: Athens to continue participating in the STRAT to advocate for haulers in the implementation of SB 707 and to present audit findings, sharing best practices for textile waste collection.**

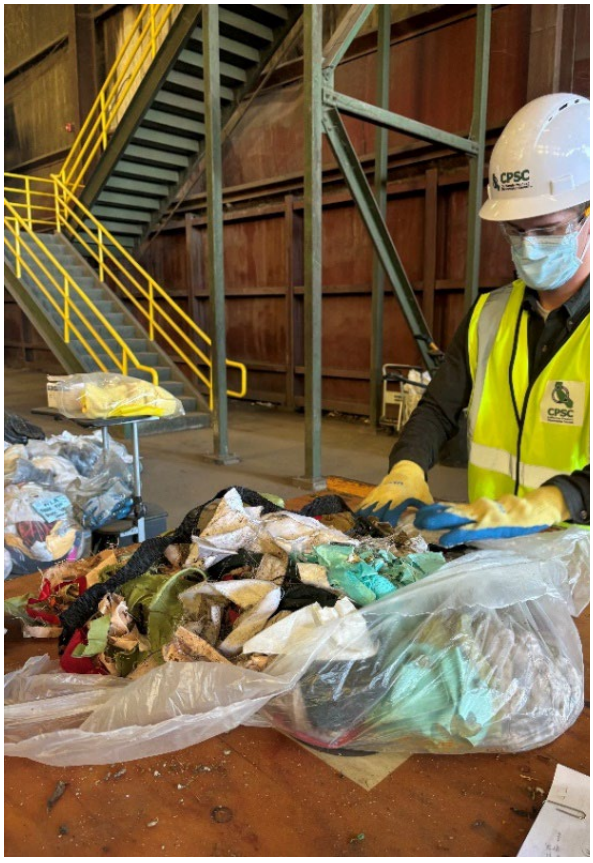
Appendix: Photo Records of the Audit

Note: Due to file corruption during transfer, only a limited number of photos are available in this report. While we initially photographed all sorted piles audited by CPSC and all contents of the visually audited bags, most images were unfortunately lost.

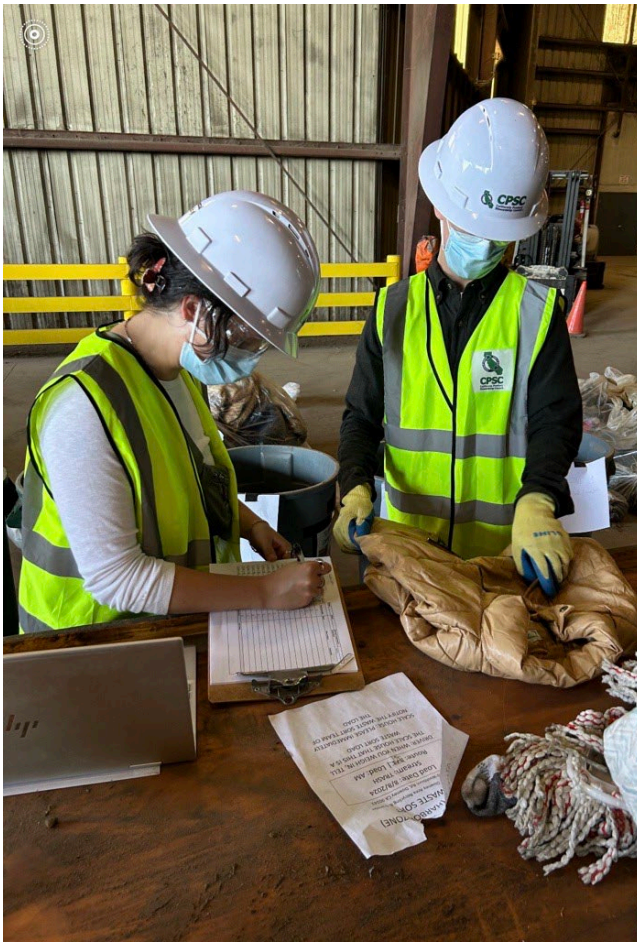
As part of the annual waste audits mandated by the recycLA franchise agreement, Athens set aside all captured textile waste for assessment by CPSC. Each bag was labeled with the route, bagging date, zone, and the waste stream (recycling or landfill) from which the textile was captured. The bags in this picture are from WLA. Only 20% of the textiles originating from WLA zone are shown in this image. These samples were not analyzed or characterized due to time constraints.

These pants, heavily covered with mold and/or fungus, were pulled from the EDT zone. As indicated in this report, most textiles in the audit were soiled, promoting mold growth and reducing diversion potential. This highlights the need for textiles to be source-separated and not mixed with other waste types to ensure proper diversion.

The total weight for each zone was recorded by weighing all bags from that zone prior characterizing and analyzing their contents. Pictured here are Ryan Klein of CPSC and Kikei Wong of Athens Services.



Each textile in the sample bags was characterized by intended wearer demographics (e.g., men, women, unisex); stain and soil level; presence of rips; moisture content; and diversion potential (sellable, repairable, repurposable, or recyclable). Pictured here is Ryan Klein of CPSC opening a sample bag before auditing contents.



The CPSC team used a Near Infrared (NIR) device (a TrinamiX) to scan the garments and characterize them by fiber type. They then visually assessed each garment for quality. Pictured here, CPSC staff analyze a vest from the EDT zone.

The sample bags that were not formally characterized by CPSC were assessed via a visual audit. Textiles were spread out and photos were taken to informally assess the items' origin (commercial vs. residential), fabric type, and condition. Unfortunately, most of the photos were corrupted during download, so the visual assessment relies on memory. In this EDT sample, the shirt, rag, and miscellaneous textiles were found in poor condition and showed high levels of mold.

This container held all 795 lbs. of textile waste collected from the four Athens recycLA franchise zones following the audit.

Appendix II: Detailed Route Data from the Audit

Figure 8. *Count of Items Sampled by Zone and Route*

NC

Route #	# of Items Sampled	Percent of Total Zone Sampled
245	1	2%
248	5	9%
815	39	70%
888	4	7%
996	2	4%
1115	5	9%

HB

Route #	# of Items Sampled	Percent of Total Zone Sampled
267	4	6%
268	2	3%
957	1	2%
961	15	23%
974	4	6%
975	40	61%

EDT

Route #	#of Items Sampled	Percent of Total Zone Sampled
111	20	38%
112	3	6%
113	3	6%
114	13	25%
382	14	26%

WLA

Route #	# of Items Sampled	Percent of Total Zone Sampled
895	4	14%
922	25	86%