

AUDIT REPORT

Solid Waste Management Division *Residential Trash, Recycling, and Compost Services*

NOVEMBER 2022



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City and County of Denver



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AUDITOR'S LETTER

November 17, 2022

We audited residential trash, recycling, and compost services provided by the Solid Waste Management Division of the Department of Transportation & Infrastructure. We assessed how well the city is ensuring timely service for residents and reducing illegal dumping in city neighborhoods. We also evaluated whether the city is achieving its environmental goals and improving recycling rates. I now present the results of this audit.

The audit found the Solid Waste Management Division lacks strategic guidance and quality data, has an aging fleet of waste collection trucks, and does not have enough staff for its current operations. Meanwhile, the department is about to switch to a volume-based pricing, or "pay as you throw," program in 2023 — where residents will pay for trash collection based on the size of their cart, with weekly recycling and compost service included. We found this new program was not effectively designed to ensure stable funding or to advance the city's environmental goals, and it may worsen existing service-delivery issues for residents.

By implementing recommendations for stronger policies, plans, and progress monitoring, the Department of Transportation & Infrastructure will be better able to provide reliable waste collection services to residents, address illegal dumping, and contribute to the success of the city's environmental goals.

This performance audit is authorized pursuant to the City and County of Denver Charter, Article V, Part 2, Section 1, "General Powers and Duties of Auditor." We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We appreciate the leaders and team members in the Department of Transportation & Infrastructure who shared their time and knowledge with us during the audit. Please contact me at 720-913-5000 with any questions.

Denver Auditor's Office

A handwritten signature in black ink, appearing to read "Timothy M. O'Brien".

Timothy M. O'Brien, CPA
Auditor



Residential Trash, Recycling, and Compost Services

NOVEMBER 2022

Objective

- To assess how efficiently and effectively the city is ensuring timely trash, recycling, and compost service for residents and is reducing illegal dumping in city neighborhoods.
- To evaluate how effectively the city is achieving its environmental goals and improving recycling rates.

Background

The Solid Waste Management Division provides trash, recycling, and compost pickup for about 180,000 Denver households. The division also responds to illegal dumping.

Our audit work occurred between February and July 2022, as the division sought City Council approval to change residential trash service to a volume-based pricing, or “pay as you throw,” model. In 2023, Denver households will pay for waste disposal based on the size of their trash carts. Recycling and compost will be included at no extra charge.

REPORT HIGHLIGHTS

The Solid Waste Management Division Lacks Strategic Direction and Quality Data to Inform How It Provides Services to Residents

The division does not have up-to-date strategic plans and written policies and procedures to support efficient and effective service to Denver residents.

The division cannot demonstrate how it changed service routes and pickup schedules in early 2022 – a change that was associated with a spike in resident reports of missed service. The division also uses flawed data to measure how well it responds to service requests.

The Solid Waste Management Division Has Insufficient Resources to Collect Residential Waste, Respond to Illegal Dumping, and Support Its Other Work

The division has unreliable and costly older trucks, with no systematic plan to replace them. Driver vacancies increased in 2020, the first year of the COVID-19 pandemic. The shortage has continued, even as the city will need to hire more drivers in 2023. Meanwhile, the division lacks enough inspectors and support staff to address improper recycling and composting and teach the public about correct practices.

Already these issues are resulting in unfinished routes, missed pickups, and other service-delivery issues.

The City Is Inadequately Prepared for Its New Volume-Based Pricing Program, which May Worsen Existing Service-Delivery Issues for Residents

Officials did not follow leading practices to design the program with informed knowledge about how prepared the city is to expand recycling and compost services. They received minimal input from residents, and officials cannot say whether they might have to raise fees to ensure the program is self-sustaining as they intend.

WHY THIS MATTERS

The Solid Waste Management Division does not serve residents efficiently and effectively at current service levels. Its trucks are aging, it is understaffed, and it does not have enough plans, policies, and resources to support its workload.

Therefore, it is ill-prepared to expand to a “pay as you throw” pricing model in 2023, which will put more demands on division staff. The division risks providing worse service to Denver residents, and the city also risks failing to achieve goals meant to address climate change.

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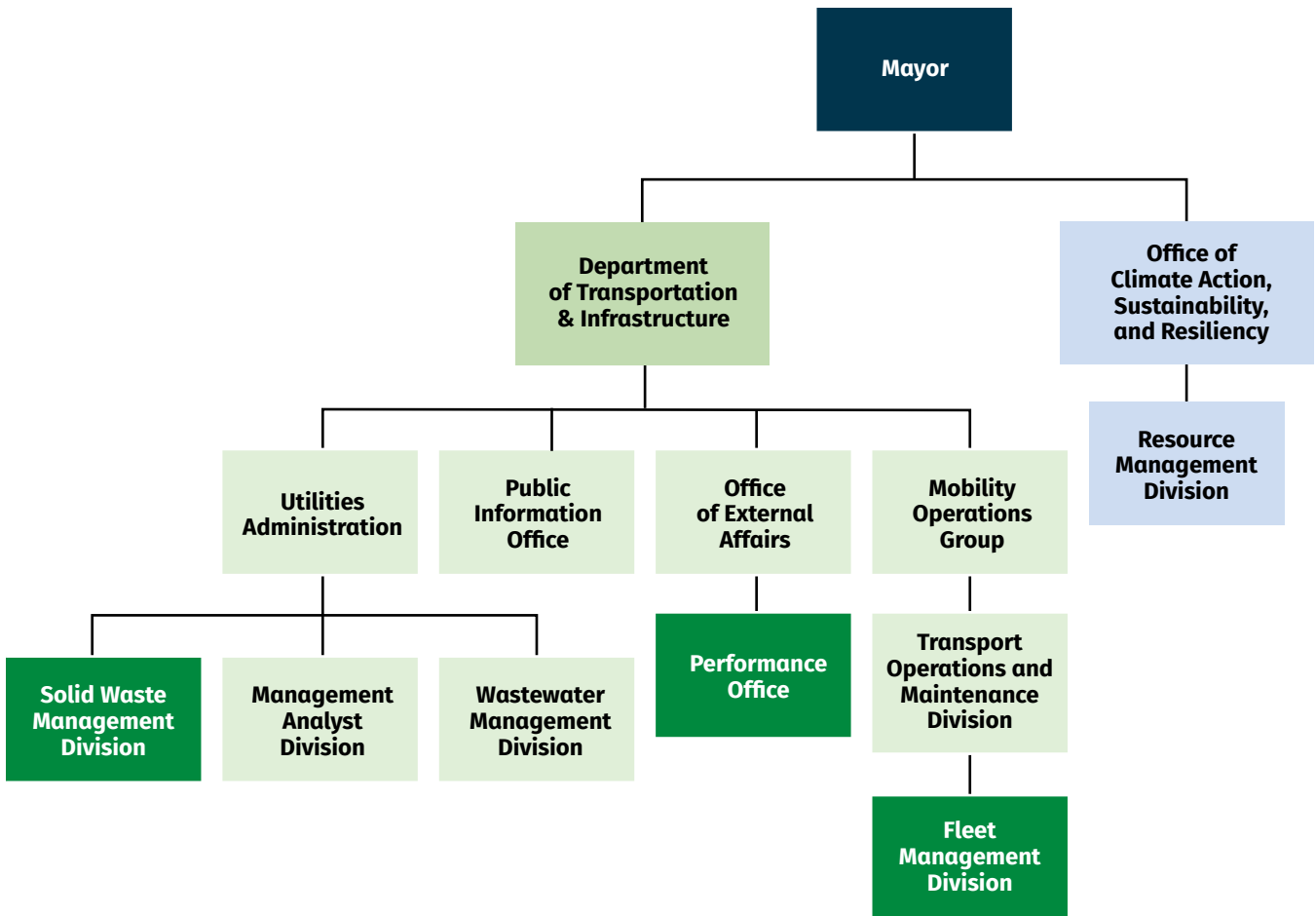
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BACKGROUND

Both the Department of Transportation & Infrastructure and the Office of Climate Action, Sustainability, and Resiliency have roles related to trash, recycling, and compost programs and waste diversion for the City and County of Denver. As shown in Figure 1, the two city agencies operate independently.

The Department of Transportation & Infrastructure’s mission is to deliver “effective, high quality, sustainable and equitable public infrastructure and services.”¹ Its Solid Waste Management Division provides trash, recycling,

FIGURE 1. Organizational Chart of City Agencies Involved in Denver’s Waste Management Efforts



Source: Created by Auditor’s Office staff using information from Workday, the city’s system of record.

¹ City and County of Denver, “Mayor’s 2022 Budget” (2021), accessed Feb. 18, 2022, <https://www.denvergov.org/files/assets/public/finance/documents/budget/2022-denver-budget-book-october-draft-final.pdf>.

and compost pickup services for many city households, and its Fleet Management Division oversees the trucks used for waste collection. The department's Performance Office uses data and analytical methodologies to aid leadership in assessing service delivery and promoting innovative ways to maximize performance.

Meanwhile, the city's climate action office tracks Denver's citywide goals to reduce waste and to divert recycling and compostable materials from the landfill.

WHAT IS WASTE DIVERSION?

"Waste diversion" refers to materials diverted from a landfill through recycling or composting discarded materials.

Solid Waste Management

Denver's Solid Waste Management Division provides pickup of trash, recycling, and compost for:

- Single-family homes.
- Apartment buildings and townhome complexes that have seven or fewer units.
- City-owned buildings.
- Denver Public Schools facilities.

Private companies provide waste pickup services for all other properties not serviced by the city — such as businesses and those apartment buildings and townhomes with eight or more units.

In all, the city provides trash and recycling services for about 180,000 households and collects compost for about 30,000 of those residences. Compost service is optional; it cost \$9.75 per month per household in 2022.²

The Solid Waste Management Division also responds to reports of illegal dumping in the city, among other duties.³ "Illegal dumping" is abandoned trash with no signs of nearby human activity. Other city agencies are responsible for addressing illegal dumping where human activity is present, such as at encampments of people experiencing homelessness.

As shown in Table 1 on the next page, the city budget set aside \$25 million for the Solid Waste Management Division in 2022, down from about \$26.9 million two years prior.⁴ The city's General Fund is the division's only source of funding for all its residential waste collection functions.

About 180,000 households benefit from the city's trash and recycling services and about 30,000 also opt for compost service.

² Denver Revised Municipal Code § 48-42.5.

³ The division's other duties include managing graffiti removal from homes, other private properties, and the city's rights of way.

⁴ City and County of Denver, "Mayor's 2022 Budget" (2021), accessed Feb. 18, 2022, <https://www.denvergov.org/files/assets/public/finance/documents/budget/2022-denver-budget-book-october-draft-final.pdf>.

TABLE 1. Overall Funding for the Solid Waste Management Division

General Fund	2020	2021	2022
Solid Waste Management Division	\$26.9 million	\$23.8 million	\$25 million

Source: The city's annual budgets for 2021 and 2022.

TRASH DISPOSAL – The city owns Denver’s landfill, which is operated by a contractor: Waste Management LLC. To move trash from the city’s waste collection trucks to the landfill, the division uses two transfer stations owned by Waste Management and one city-owned transfer station. Otherwise, trucks drive directly to the landfill.

RECYCLING COLLECTION – Another city contractor, GFL Environmental Inc., receives, sorts, and sells the city’s recyclable materials. City trucks haul recyclables directly to the company’s facility or from the city’s transfer station.

Materials the city’s processor generally accepts for recycling include aluminum, glass jars, cardboard, and paper. Materials like scrap metal, plastic foam, and plastic bags are not accepted.

WHAT CAN DENVER RESIDENTS RECYCLE?

See Appendix C for more information about what materials the city’s contracted processor does and does not accept for recycling.



SORTING RECYCLABLE MATERIALS |

At GFL Environmental Inc.'s materials recycling facility in Denver, materials are sorted both by machine and by hand.

PHOTO BY AUDITOR'S OFFICE STAFF.

When GFL Environmental makes a profit from selling the city’s recyclable materials, the company pays the city based on contracted rates for each type of material. Some recycled items are more valuable than others. Since February 2021, the city has reported making a profit from the sale of recyclable materials.

COMPOST COLLECTION – The Solid Waste Management Division’s composting program started as a pilot program in 2008. It officially launched in 2010.

The city’s trucks collect compostable material, move it to a transfer station, and then transport it in semitrucks to A1 Organics, a city contractor. The company processes the compost and sells the finished product through local vendors.

Compostable waste includes food scraps, coffee filters, tea bags, brown craft paper, paper napkins, paper towels, wooden chopsticks, and certain yard debris. Plastics, glass, metal, cardboard, and hazardous liquid cannot be composted.



COLLECTED COMPOST | A load of compost waits to be processed at A1 Organics’ facility. Machines remove prohibited items that cannot be composted, such as plastic bags, which would otherwise contaminate the compost.

PHOTO BY AUDITOR’S OFFICE STAFF.

Upcoming Changes to Denver’s Trash, Recycling, and Compost Pickup

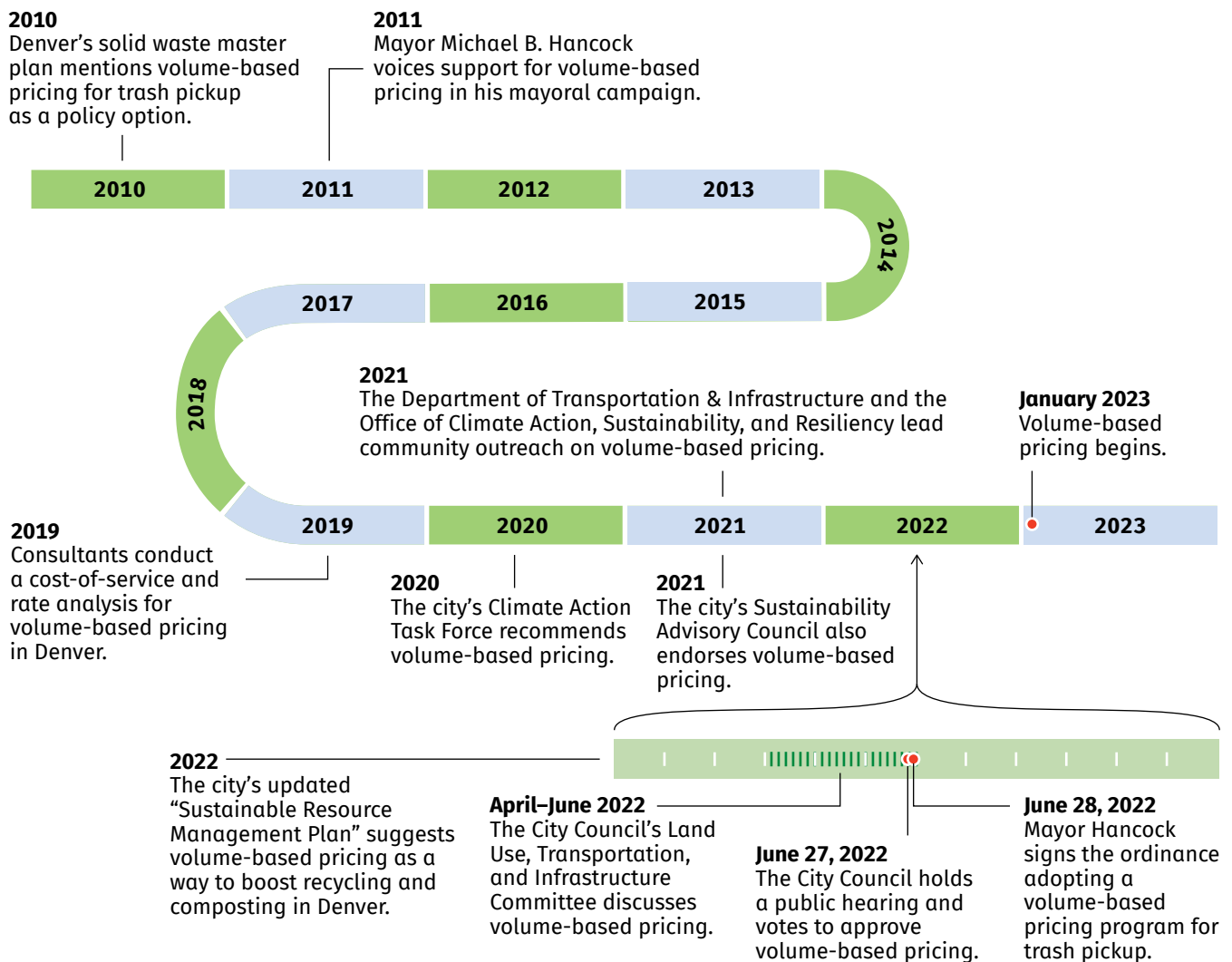
In June 2022, the Denver City Council passed an ordinance to begin “volume-based pricing” for trash pickup — also known informally as “pay as you throw.”⁵

Currently, the city provides recycling every two weeks and charges for optional, weekly compost pickup. While the city’s General Fund currently pays for these services, the Solid Waste Management Division’s volume-based pricing program is intended to be self-sufficient by collecting fees from residents and thereby freeing up General Fund dollars.

As shown in Figure 2, the City Council’s approval of volume-based pricing came after more than a decade of community discussion about implementing a waste collection fee for city residents.

FIGURE 2. Evolution of Denver’s Volume-Based Pricing Proposal

The program, which takes effect in 2023, is also commonly referred to as “pay as you throw.”



Source: Compiled by Auditor’s Office staff.

⁵ City and County of Denver, Council Bill No. 22-0685.

The program begins in January 2023 and will affect the 180,000 households serviced by the city.

Volume-based pricing shifts the cost of weekly trash pickup directly to residents based on how much they throw away, while recycling and composting services will be included at no extra charge. The city hopes this will incentivize residents to recycle and compost more.

Under the “pay as you throw” concept, residents can choose from one of three cart sizes, which carry incrementally higher monthly fees. The smaller the trash cart, the lower the fee. Specifically:

- A 35-gallon cart will cost \$9 per month.
- A 65-gallon cart will cost \$13 per month.
- A 95-gallon cart will cost \$21 per month.

To prepare for the change, the Solid Waste Management Division plans to send information to city residents and work with community organizations to educate residents about the new pricing model as well as proper recycling and composting practices. The Department of Transportation & Infrastructure and Denver Human Services are also developing an instant-rebate affordability program to help lower-income residents with the fees.

As mentioned, financially, the city intends for “pay as you throw” to eventually be a self-sustaining program. This would free up General Fund revenue for other city programs and services that benefit all residents. Transportation & Infrastructure’s finance staff said the program will likely use a special revenue fund for the first 10 years. This will allow the program to still receive support from the General Fund. Staff said the General Fund revenue is necessary for financial stability and because not all Solid Waste Management services are funded by waste collection fees.

VOLUME-BASED PRICING

“Volume-based pricing” is the technical name for “pay as you throw.” The program charges customers by the size of their trash cart: The smaller the cart, the lower the fee.

City officials see it as an effective tool to increase how much waste is diverted from the city’s landfill to recycling and composting facilities.

The Office of Climate Action, Sustainability, and Resiliency

Established by a city ordinance in November 2019, the Office of Climate Action, Sustainability, and Resiliency reports directly to the mayor and manages the city’s goals to address climate change. Its mission is to “enable a sustainable, resilient, climate-safe future for all of Denver in collaboration with fellow departments, other units of government, and community partners.”⁶

⁶ City and County of Denver, “Mayor’s 2022 Budget” (2021), accessed Feb. 18, 2022, <https://www.denvergov.org/files/assets/public/finance/documents/budget/2022-denver-budget-book-october-draft-final.pdf>.

The office's Resource Management Division collaborates across city agencies and with other stakeholders to set and track Denver's goals of reducing overall waste and of diverting recyclable and compostable material from the city landfill. The division also offers citywide education programs about composting and recycling.

FINDING 1 AND RECOMMENDATIONS

The Solid Waste Management Division Lacks Strategic Direction and Quality Data to Inform How It Provides Services to Residents

As the city prepares to implement its “pay as you throw” pricing model for trash pickup in January 2023, we found the Solid Waste Management Division is heading into this service expansion without adequate guidance, reliable data, or documented decision-making to support its current operations.

The division does not have a detailed strategic plan or written policies and procedures to support efficient and effective service to the 180,000 Denver households it serves.

Meanwhile, we learned Solid Waste Management officials did not keep important documentation that might explain why and how they designed new service routes and schedule changes in early 2022 that are associated with a surge of reports about missed pickup service. The division also relies on flawed data to measure how well it responds to residents’ complaints and service requests.

The U.S. Government Accountability Office says organizations should use and retain quality information — information that is accurate, accessible, and timely — to make informed decisions and evaluate performance.⁷ Federal guidance also says policies and procedures are an integral part of an organization’s operations, and strategic plans are needed to set goals and objectives that guide effective and efficient operations.⁸

Without these fundamental elements to guide its operations, Solid Waste Management lacks guidance or strategic direction for its day-to-day operations. The division also has no connection to any long-range goals and objectives it is meant to achieve, and officials may have difficulty in assessing the division’s effectiveness and maintaining continuity of operations.

⁷ U.S. Government Accountability Office, GAO-14-704G, “Standards for Internal Control in the Federal Government” (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para 13.05.

⁸ U.S. Government Accountability Office, “Standards for Internal Control in the Federal Government,” paras. OV2.02 and OV2.19.

City Priorities for Waste Diversion Shifted, Leaving the Solid Waste Management Division without Specific Strategic Guidance for City Services

In 2010, the city laid out its long-term vision for managing trash, recycling, and compost services in a plan that had strategies focused on the Solid Waste Management Division.⁹ Twelve years later, city officials updated that plan — but instead of maintaining a focus on strategies specific to the city services Solid Waste Management provides, the city broadened its priorities.

The 2022 plan speaks of a citywide approach to waste management that relies on community partnerships “to create economically viable waste diversion programs.”¹⁰ However, this left the Solid Waste Management Division without current operational guidance, goals, and objectives it needs to provide reliable and effective city services for the Denver residents it serves.

In addition to not having a strategic plan, the Solid Waste Management Division does not have active and current policies and procedures relevant to specific aspects of its operations — such as driver customer service and route responsibilities and procedures. Some policies the division provided to us date back to 1989, while others addressing worker safety and procedures were undated. This calls into question whether staff have the most up-to-date guidance they need to perform their duties.

Neither Transportation & Infrastructure nor the city overall require the division to have strategic plans or operational policies and procedures. The absence of these governing documents — and the lack of a requirement to have them — does not align with federal leading practices for effective governance.

The U.S. Government Accountability Office issues guidance to help government entities establish internal control systems to ensure efficient and effective operations, as well as compliance with laws and regulations. “Internal controls” are safeguards management should use to make sure a program operates as intended.¹¹ These can include:

- Strategic goals and plans.
- Written policies and procedures.
- Staff training.
- Succession and contingency plans for key roles.

Specific to waste management, the Environmental Protection Agency recommends that organizations responsible for managing waste collection have two sets of policies: “system policies” for the organization and

Undated policies call into question whether staff have the most up-to-date guidance they need to perform their duties.

⁹ City and County of Denver, “A Master Plan for Managing Solid Waste in the Mile High City” (2010), accessed July 8, 2022, https://www.denvergov.org/files/assets/public/doti/documents/plans/sw_master_plan_exec_summary.pdf.

¹⁰ City and County of Denver, “Sustainable Resource Management Plan” (2022), accessed April 20, 2022, <https://www.denvergov.org/files/assets/public/climate-action/documents/resource-management/swmp-2022-update.pdf>.

¹¹ U.S. Government Accountability Office, GAO-14-704G, “Standards for Internal Control in the Federal Government” (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para. OV1.03.

“operational policies” specific to routes, staffing, and management.¹²

System policies might address billing systems, levels of service such as where and how often pickups occur, and what services are available for older residents or those with disabilities. By contrast, operational policies might address vehicle routes and crew sizes, training and safety measures for staff, and how management handles requests, complaints, and program cost-accounting.

Without documented plans, policies, and procedures, the Solid Waste Management Division has no guidance or strategic direction for its day-to-day operations. It also has no connection to any long-range goals and objectives the division is meant to achieve. Furthermore, the absence of current, complete, and documented policies and procedures makes it difficult for the division to assess how effective it is, and it may face challenges in maintaining continuity in its operations especially when key staff leave.

1.1

RECOMMENDATION

Create a Strategic Plan

The Solid Waste Management Division should develop a strategic plan that identifies specific objectives, goals, and needs of the division with particular focus on its role to deliver services to residents.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – DEC. 31, 2023
SEE [PAGE 38](#) TO READ THE AGENCY’S RESPONSES.

1.2

RECOMMENDATION

Develop Internal Controls

The Solid Waste Management Division should develop an internal control framework that includes a comprehensive set of detailed and documented policies and procedures at both the system and operational levels. Such policies and procedures should include, at a minimum: level-of-service policies, route policies, and cost-accounting policies.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – DEC. 31, 2023
SEE [PAGE 38](#) TO READ THE AGENCY’S RESPONSES.

¹² Environmental Protection Agency, “Best Management Practices for Optimizing Waste Collection Routes” (2015), accessed July 11, 2022, <https://www.waste.ccacoalition.org/document/best-management-practices-optimizing-waste-collection-routes>.

The Solid Waste Management Division Cannot Support Recent Changes to Routes and Pickup Schedules, and It Uses Flawed Data to Measure Performance

In January 2022, the city made changes to trash collection routes for the first time in over 15 years.

The Solid Waste Management Division did not keep documentation to support how it changed service routes and pickup schedules earlier this year. While officials said the changes were intended to make waste collection services more reliable and consistent, the division could not provide information about its process to explain how it designed the new routes — and evidence shows the changes affected the consistency of residents' pickup services.

Meanwhile, the division does not have reliable data to track how well it responds to residents' complaints and service requests, so it lacks an accurate picture of its performance. As a result, leadership risks making important operational decisions using incomplete and inaccurate information that prevents a true assessment of whether the division is meeting service objectives. Furthermore, because division officials did not keep documentation about the design of the new routes, neither we nor the division can assess whether the right information is informing decisions and shaping service delivery.

UNSUPPORTED CHANGES TO SERVICE ROUTES – In January 2022, the Solid Waste Management Division changed residents' pickup schedules and added new routes — marking the first changes to trash collection routes in over 15 years. It said it did so to maintain the high level of service residents count on and to “move drivers through the city more efficiently, reduce the number of trucks needed to operate, reduce fuel use, and support Denver’s sustainability goals.”¹³

However, we found the Solid Waste Management Division cannot show it designed these new routes and schedules using data-driven methods or leading practices to achieve any of those stated goals. Instead, the changes might have had an opposite effect.

In evaluating data from Denver’s 311 information system, we found residents' reports of missed waste pickups spiked in January 2022 — when the new service routes and schedule changes began, as seen in Figure 3 on the next page.

At the time, the city advised Denver residents to wait 24 hours before reporting missed pickups. That policy decision — and not actual service needs — may have minimized the number of reported service requests after Solid Waste Management implemented the new routes and schedule. Reports of missed service have generally been on the rise since early 2021.

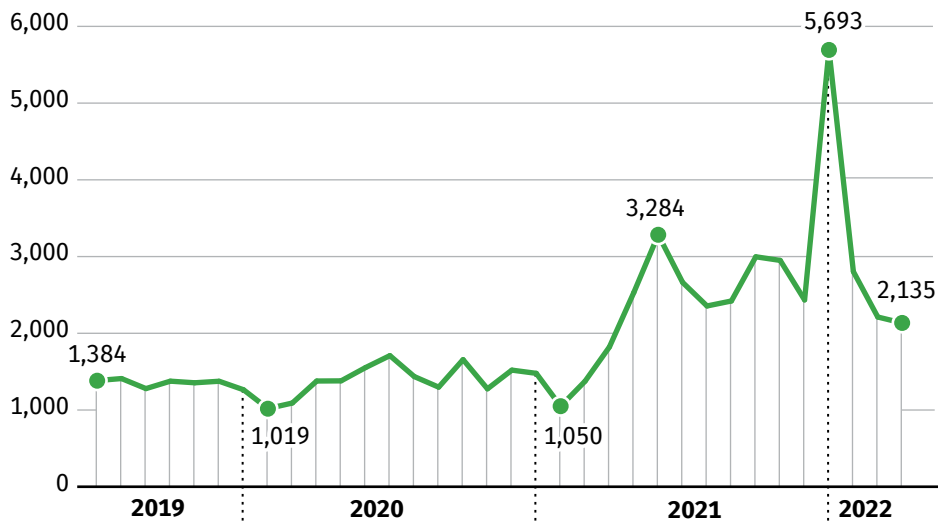
RESIDENT-REPORTED MISSED PICKUPS

See Appendix A for details on how we analyzed reports of missed pickup service, among other audit analysis we conducted for this report.

¹³ City and County of Denver, “Recycle, Compost, Trash: Collection Schedules and Reminders” webpage, accessed April 13, 2022, <https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Recycle-Compost-Trash/Recycle-Compost-Trash-Schedules-and-Reminders>.

FIGURE 3. Residents’ Service Requests to Report Missed Pickups, July 2019 through April 2022

The new trash collection routes the city implemented in January 2022 coincided with a significant increase in residents’ reports of missed service.



Source: Auditor’s Office staff analysis of Denver 311 data.

The EPA says the design of waste collection routes should use “knowledge, experience, and common sense to develop acceptable solutions to problems.”

Meanwhile, drivers told us the new routes are longer and less efficient than previous routes. Local news media also reported on the hurdles Solid Waste Management Division staff were facing amid the higher volume of calls about missed trash, recycling, and compost service.¹⁴

The Environmental Protection Agency says the process of designing and perfecting waste collection routes should use “knowledge, experience, and common sense to develop an acceptable solution to a problem.”¹⁵ Optimizing waste collection routes can help reduce costs related to staffing, operations, and transportation, as well as lessen the impacts to public health, safety, and the environment – because fewer vehicles on the road means less air and noise pollution in the community. In 2015, the EPA said governments can optimize their service routes using software applications or by hiring a consultant with expertise in waste collection and routing needs.¹⁶

Effective “performance management” is an ongoing effort to collect, analyze, and use information to compare actual performance against

¹⁴ Kyle Harris, “Staffing Shortages Mean Your Trash Might Not Be Collected On Time,” Denverite, Feb. 11, 2022, accessed Feb. 14, 2022, <https://denverite.com/2022/02/11/denver-trash-collection-lag-stagging-shortage>.

¹⁵ Environmental Protection Agency, “Best Management Practices for Optimizing Waste Collection Routes” (2015), accessed July 11, 2022, <https://www.waste.ccacoalition.org/document/best-management-practices-optimizing-waste-collection-routes>.

¹⁶ Environmental Protection Agency, “Best Management Practices for Optimizing Waste Collection Routes.”

established goals and objectives.¹⁷ Organizations can use ongoing data analysis to shape how a program or process is implemented, and they can use such analysis to identify lessons learned or assess whether the right data is being collected to inform decisions.

Solid Waste Management officials said they have considered collecting optimization data with their existing software, Salesforce. For instance, they could use geographic information systems data to map every pickup point on a driver's route and monitor each stop, but the division has not yet completed efforts to implement this technology.

Beginning in May 2022, we repeatedly asked Solid Waste Management officials, managers, and staff for the information and documentation the division used to design the new routes — including information that would speak to officials' decision-making and demonstrate the benefits of making the changes. Division leadership either did not answer our questions or provided us with only limited responses.

For instance, officials initially directed us to one staff member who could explain only that:

- The division divided the city into nine geographic areas, using major streets when possible.
- It then divided each region by the day each week that trash, recycling, and compost service was scheduled.
- Lastly, the division created routes based on the number of houses.

We later received a copy of the division's old service map and its new one (which is shown in Figure 4 on the next page) — but the division gave no detailed explanation of its methodology for the new routes.

It was not until the end of our audit work in July 2022 that division leadership told us they designed the new routes with software but that a recently retired employee had the information they used. The Solid Waste Management Division had not kept any related documentation.

Meanwhile, we could not identify any city staff or a hired consultant who is responsible for continuously evaluating the service routes' impact on the division's operational efficiency. The division itself also has no documentation to support such efforts.

Federal guidance says documentation should provide a means to retain organizational knowledge and reduce the risk of having key knowledge limited to only a few personnel. Documentation is also a way to communicate knowledge to other parties who might need it, such as new staff or those responsible for oversight of service delivery.¹⁸ Solid Waste Management officials knew about their former employee's retirement

¹⁷ U.S. Department of State, "Program Design and Performance Management Toolkit," accessed Aug. 23, 2022, <https://www.state.gov/wp-content/uploads/2018/12/Program-Design-and-Performance-Management-Toolkit.pdf>.

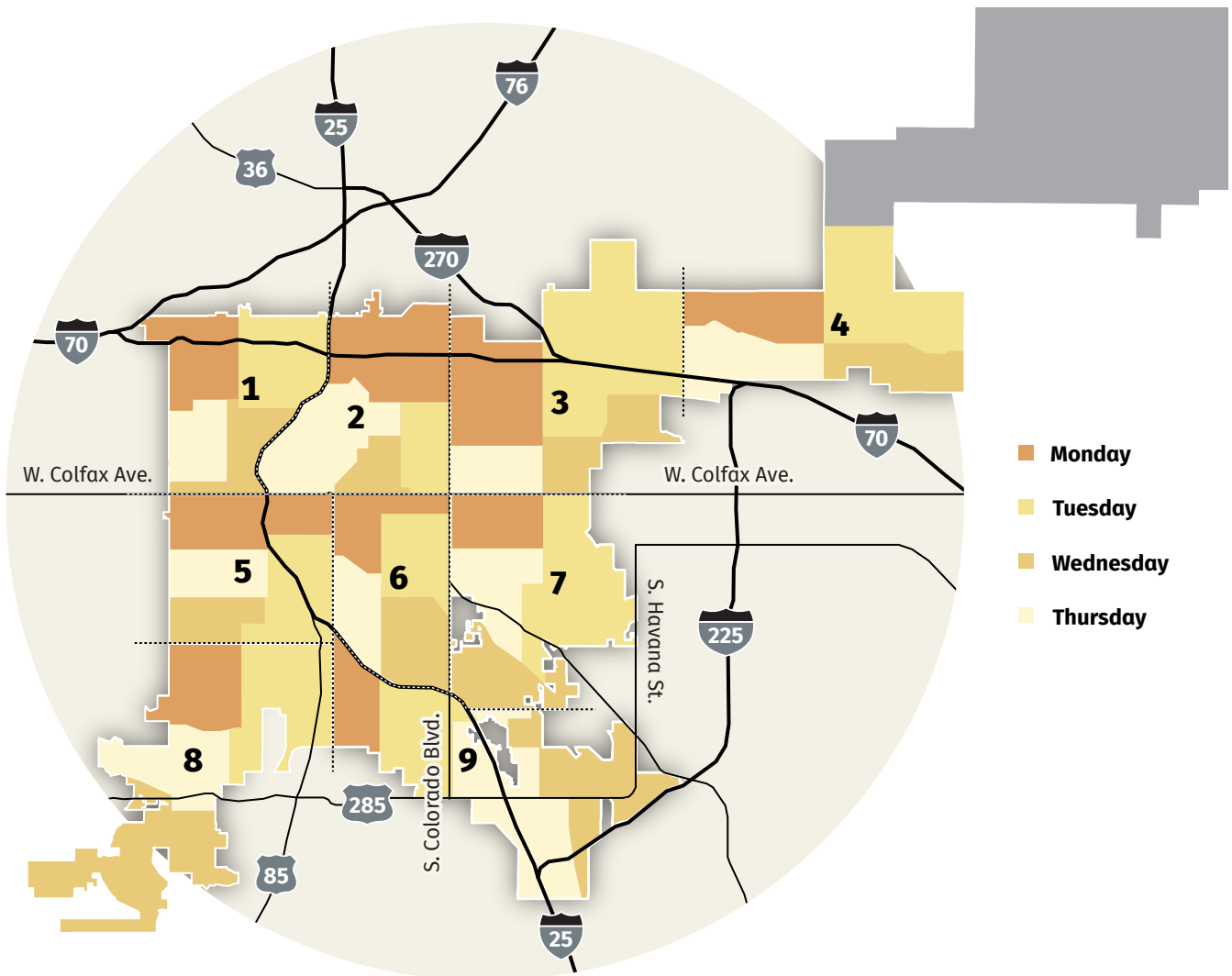
¹⁸ U.S. Government Accountability Office, GAO-14-704G, "Standards for Internal Control in the Federal Government" (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para. 3.10.

in advance but failed to ensure crucial documentation was kept in the division's possession.

By not keeping documentation used to design the new service routes and by not continuously evaluating this information for lessons learned, the Solid Waste Management Division is not making evidence-based decisions that help it achieve desired program outcomes – namely improved service to the 180,000 Denver households that rely on these necessary city services.

FIGURE 4. Denver's Service Regions for Waste Collection

These are the regions for service routes the Solid Waste Management Division began using in January 2022.



Source: The Department of Transportation & Infrastructure's Solid Waste Management Division.

INCONSISTENT PERFORMANCE METRICS – Aside from the Solid Waste Management Division not having documentation to support changes to service routes, we learned the division does not consistently or reliably track performance metrics related to how quickly it responds to residents’ requests or complaints.

The ‘level of service’ metric tracks the time it takes from when a resident makes a request or complaint and when the division resolves it.

The Department of Transportation & Infrastructure has a Performance Office that is meant to support the department’s executive director and senior leaders by providing snapshots of divisions’ or programs’ performance to inform decision-making. In 2020, the office worked with the Solid Waste Management Division to develop a performance metric to evaluate division services, called the “level of service.” This represents the time it takes between when a resident makes a request or complaint and when the division resolves it. The division implemented this metric in early 2021.

The “level of service” metric says 90% of complaints or requests — which the division records as “cases” — should be resolved within a certain number of days. The number of days varies depending on the type of request. For example, according to the “level of service” for missed pickups, the division is supposed to resolve a case within five days. Officials informed us that cases are generally assumed “open” until the service is completed.

However, we found the department’s dashboards that measure the Solid Waste Management Division’s performance do not consistently track resident reports for similar service requests. Service requests are not all grouped together in categories by the type of request. Instead, there are multiple “level of service” results based on how residents submit their requests.

Denver residents use various channels to ask questions or submit service requests to the Solid Waste Management Division. They can go on the city’s website and use tools like Denver Utilities Online or PocketGov, and they can call or email the Denver 311 information system. We found how a resident makes their request affects how it is categorized — and thereby, tracked — in the division’s performance dashboard.

COMMON RESIDENT SERVICE REQUESTS

The Solid Waste Management Division said the most common requests from residents are about:

- **Missed pickups.**
- **Illegal dumping.**
- **Cart maintenance.**

For example, for reports of a missed pickup, the performance dashboard displays four different categories and four different “level of service” results. For one category, the dashboard showed about 228,000 requests, with about 60% closed within the standard five days. In each of the three other categories, the dashboard showed about 2,000 requests, with more than 94% closed within five days. Because the same service request was measured separately with inconsistent “level of service” results, the

division does not have an accurate picture of how well it responds to residents' requests.

We found residents' requests to report illegal dumping were also labeled differently and resulted in inconsistent performance tracking of the division's response. For illegal dumping, the "level of service" says requests should also be closed within five days. We found a group of requests showed one was on average four and a half days old, but another grouping of the same request had an average of about 108 days old. A related performance dashboard showed a third grouping of cases for illegal dumping as 325 days old.

Just as we found with the missed pickup data, the requests to report illegal dumping were grouped based on the channel the resident used to submit their request.

Meanwhile, we identified other issues that further limit the accuracy and reliability of the data the Solid Waste Management Division uses. We found that in some instances of missed pickups when a resident's pickup service was expected soon, the division opened and closed the resident's request without knowing whether the issue had been addressed. Therefore, it is unclear whether these requests ever received a response or whether the division's response was delayed. This process conflicts with the general assumption from department officials that requests remain open until the service is completed.

The U.S. Government Accountability Office says unreliable data limits management's ability to accurately assess performance. It also reduces the effectiveness of management decisions to improve operations, because the ability to respond to unexpected events or poor performance typically depends on reliable data.¹⁹ Federal guidance describes "quality" information as being current, complete, accurate, accessible, and provided in a timely manner. Managers should use such quality information to make informed decisions and evaluate how staff are achieving key objectives and addressing risks.²⁰

Because it failed to retain crucial documentation of its decision-making and because it relies on flawed data to measure performance, the Solid Waste Management Division is not following governmental best practices for efficient and effective public service.

As a result, the division cannot monitor and evaluate performance to assess progress and make informed decisions to improve service delivery. These monitoring and evaluation activities provide value by informing decisions to change or eliminate practices that do not work and by strengthening practices that yield positive results. Such knowledge further aids stakeholders in minimizing the challenges and loss of knowledge

The U.S. Government Accountability Office says the ability to respond to unexpected events or poor performance typically depends on reliable data.

¹⁹ U.S. Government Accountability Office, GAO-20-283G, "Assessing Data Reliability," (2019), accessed Aug. 23, 2022, <https://www.gao.gov/assets/gao-20-283g.pdf>.

²⁰ U.S. Government Accountability Office, GAO-14-704G, "Standards for Internal Control in the Federal Government" (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para. 13.05.

from eventual staff turnover. It also supports accountability through regular process review, and it helps stakeholders identify ways to optimize service delivery.

1.3

RECOMMENDATION

Create and Maintain Documentation of Route Design Process

The Solid Waste Management Division should follow guidance from the Environmental Protection Agency and develop a standard process for routinely reviewing route efficiency. This should include documenting the data the division uses and the steps it takes to develop new route designs based on its review process.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – MAY 31, 2023
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.

1.4

RECOMMENDATION

Establish Consistent Data-Tracking

The Department of Transportation & Infrastructure should coordinate guidance and training across all customer service teams and systems — including Denver's 311 program, Denver Utilities Online, and PocketGov — to establish consistent data-entry and case management practices and ensure performance dashboards report accurate, reliable data for informed decision-making.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – SEPT. 30, 2023
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.

FINDING 2 AND RECOMMENDATIONS

The Solid Waste Management Division Has Insufficient Resources to Collect Residential Trash, Respond to Illegal Dumping, and Support Its Other Work

As the city agency responsible for providing trash, recycling, and compost collection services for many households in Denver, the Solid Waste Management Division has a critical role in serving the community.²¹ However, we found the Solid Waste Management Division operates with a fleet of unreliable, aging vehicles. The division also does not have enough drivers to run all pickup routes.

Meanwhile, the division does not have enough inspectors and support staff to respond to illegal dumping reports or to address improper recycling or composting and educate the public on how to do it properly.

Because of this lack of resources, drivers work mandatory overtime to complete their routes and they rely on equipment that is more costly to maintain — which hinders efficient service delivery to 180,000 Denver households.²² The division’s response to reports of illegal dumping relies on limited inspection and support staff, and the division has no staff assigned to teach residents about proper recycling and composting.

The Solid Waste Management Division’s Trucks Are Aging, Costly, and Unreliable

The Department of Transportation & Infrastructure estimates the “useful life” of the city’s waste collection trucks is eight years. The age and condition of the fleet is a concern because waste collection trucks are high-maintenance vehicles that incur expensive repair costs. An older fleet is less reliable and requires more maintenance hours, which results in more time when trucks are out of service.

As shown in Table 2 on the next page, we found that about 60% of the Solid Waste Management Division’s 159 waste collection trucks have about one-third or less left in their remaining estimated useful life. Sixteen of the city’s trucks — or about 10% of the fleet — have already met that limit, with one truck being 18 years old.

FOR MORE INFORMATION

See [Appendix A](#) for more detail on our audit analysis — including our calculations related to the waste collection trucks’ estimated useful life and recent years’ maintenance and repair costs.

²¹ City and County of Denver, “Mayor’s 2022 Budget” (2021), accessed Feb. 18, 2022, <https://www.denvergov.org/files/assets/public/finance/documents/budget/2022-denver-budget-book-october-draft-final.pdf>.

²² The households the division serves include all single-family homes and all apartment buildings and townhome complexes with seven or fewer units. The division also services city-owned buildings and Denver Public Schools facilities.

TABLE 2. Estimated Remaining Useful Life for Denver’s Waste Collection Trucks

Our calculations were based on the Fleet Management Division’s standard of the trucks having an eight-year estimated useful life.

Year	Number of Trucks	Percentage of Trucks by Year out of Total	Percentage of Useful Life Remaining	Percentage of Trucks with Less than 50% Remaining in Useful Life
2004	1	0.6%	-125%	59.8%
2013	1	0.6%	-12.5%	
2014	14	8.8%	0%	
2015	44	27.7%	12.5%	
2016	13	8.2%	25%	
2017	22	13.8%	37.5%	
2018	16	10.1%	50%	
2019	22	13.8%	62.5%	
2020	26	16.4%	75%	
Total	159	100%		

Note: Our calculations are based on data analyzed in August 2022.

Source: Auditor’s Office analysis based on the Solid Waste Management Division’s inventory of assets.

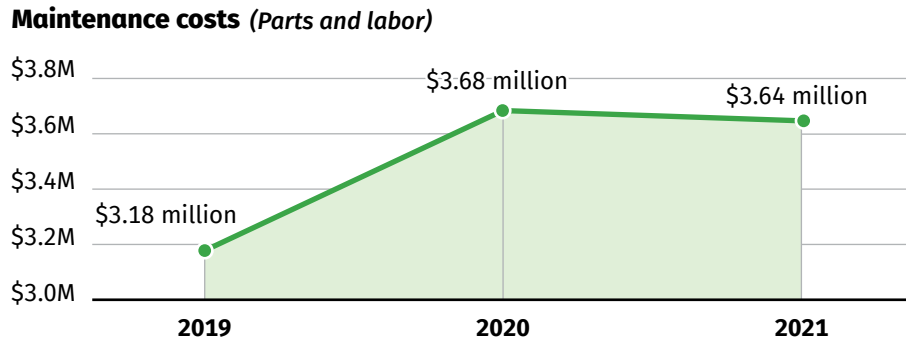
About 60% of the city’s waste collection trucks have about one-third or less left in their remaining estimated useful life.

Our analysis yielded results similar to the Department of Transportation & Infrastructure’s own understanding, which says nearly half the division’s fleet – including both waste collection trucks and other division vehicles – have only two years left in their remaining useful life.

In a presentation to the Denver City Council in May 2022, city finance and transportation officials described the waste collection trucks as being in “critical” need of replacement. They reported then that an aged fleet costs the city more money to maintain and it impacts operations. The average cost for one of the waste collection trucks ordered by the division in 2022 was about \$377,000.

We reviewed maintenance expenses by looking at three recent years’ worth of maintenance and repair data – from 2019 through 2021. As Figure 5 on the next page shows, we found the city spent about \$10.5 million in that time to maintain the waste collection trucks – or about \$3.5 million per year, on average.

FIGURE 5. Maintenance and Repair Costs for Waste Collection Trucks, 2019 through 2021



Source: Auditor’s Office staff using data from the Department of Transportation & Infrastructure’s Fleet Management Division.

Despite officials being aware of the extra costs to the city, they have no plan to replace the trucks through a documented, long-term fleet management strategy or regular replacement schedule. Transportation officials gave us no documentation to demonstrate how their current replacement planning or purchasing supports maintaining the city’s fleet within its useful life.

Department officials told us the city’s ability to replace its aging fleet is somewhat hindered by supply-chain interruptions related to the COVID-19 pandemic. However, other cities we spoke with — such as Salt Lake City and Loveland, Colorado — said they saw less of an impact from market fluctuations and supply-chain delays because they already had strong plans to replace their fleets of waste collection trucks.

OTHER CITIES WITH VOLUME-BASED PRICING PROGRAMS

See Appendix B for a full list of cities we researched and why we chose them to compare with Denver.

In the meantime, in addition to the city facing higher maintenance costs, some of Denver’s waste collection drivers told us the Solid Waste Management

Division does not have enough trucks in good operating condition to run all scheduled routes. These drivers said they each experienced at least one equipment failure in the last six months that prevented them from finishing a scheduled route. Some said they had had at least four such failures in that time — with some reporting having had 10 or more.

The other cities we spoke to confirmed that neglecting to replace waste collection trucks leads to higher operating costs. They said good-quality trucks also help create a good working environment for drivers.

Federal guidance says internal controls — like plans, policies and procedures — help management achieve desired results through the

effective stewardship of public resources.²³ Internal controls provide “reasonable” assurance that objectives will be achieved.²⁴ In the city’s case, a fleet replacement schedule is an example of a “preventative control” that would help the Solid Waste Management Division head off foreseeable problems that would otherwise prevent it from achieving its objectives.²⁵

Transportation & Infrastructure officials said the Fleet Management Division is responsible for replacement planning, in collaboration with Solid Waste Management — but other agencies, such as the city’s Finance Department and the Budget and Management Office also have a role in planning for and approving fleet purchases.

The number of trucks approved for purchase each year depends on the final budget that the Budget and Management Office proposes. We asked for previous budget requests that either the Fleet Management or Solid Waste Management divisions had submitted to the Finance Department to replace the aging waste collection trucks, but we received no response before we completed audit work in July 2022.

Officials attributed the backlog in replacing the trucks to budget cuts. We confirmed Transportation & Infrastructure officials told the Denver City Council in a 2014 presentation that the department was prioritizing fleet vehicles for replacement because of high maintenance costs and because they were “frontline, critical vehicles deemed essential to city operations.” The officials told the council then they needed a one-time capital lease for 43 waste collection trucks as a catch-up strategy to pay for vehicle purchases.

Eight years later, a similar presentation from department officials said a capital lease was approved in the 2022 city budget to help Denver continue catching up on previous years’ backlogs of vehicle replacements. That 2022 lease included 25 waste collection trucks.

Despite these presentations to the City Council, we identified no evidence to confirm the department is requesting funds to strategically replace its waste collection trucks on a more frequent basis.

The absence of any long-term fleet replacement strategy — along with the practice of requesting batch purchases of trucks through capital leases about every eight years — contributes to the city’s growing maintenance costs for its fleet.

According to department officials, the city faces a backlog of aged assets. Even if sufficient funding were available to replace all aged assets at once, this approach would perpetuate the same problem where the same number of trucks would again be due for replacement at the same time. Therefore, the city’s goal should be to spread out replacements using a

We found no evidence to confirm the department is requesting funds to strategically replace its waste collection trucks.

²³ U.S. Government Accountability Office, GAO-14-704G, “Standards for Internal Control in the Federal Government” (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para OV1.03.

²⁴ U.S. Government Accountability Office, “Standards for Internal Control in the Federal Government,” para. OV3.02.

²⁵ U.S. Government Accountability Office, “Standards for Internal Control in the Federal Government,” para. 10.04.

standard budget to replenish fleet assets periodically and prevent such a backlog.

Officials also explained that due to ongoing supply-chain issues, any waste collection trucks the city might buy now will not arrive for 10 to 14 months.

Because it lacks a fleet in good operating condition, the Solid Waste Management Division cannot complete scheduled routes and provide reliable service to the Denver households it serves.

Many of the waste collection drivers we heard from were concerned about the poor condition of their equipment. The lack of trucks in good condition leads to incomplete routes — and, therefore, an increasing number of missed pickups or other service issues that upset residents and damage the city’s reputation.

With Solid Waste Management transitioning to a special revenue fund and establishing a budget for truck replacements as part of the fees it will collect under the volume-based pricing model, the division should collaboratively develop a fleet replacement schedule to avoid a future backlog of trucks that would otherwise result in higher maintenance costs, increased downtime, and driver dissatisfaction.

2.1	RECOMMENDATION	Develop a Fleet Replacement Schedule
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The Solid Waste Management Division should work with the Department of Finance and the Fleet Management Division to develop a documented fleet replacement schedule that ensures long-term fleet reliability and regular, staggered replacement of aged trucks to ensure efficient delivery of waste collection services. Once it develops this schedule, Solid Waste Management should develop and implement procedures to follow it — including monitoring and oversight.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – JUNE 30, 2023
SEE [PAGE 38](#) TO READ THE AGENCY’S RESPONSES.

The Solid Waste Management Division Does Not Have Enough Drivers or Other Support Staff

The Solid Waste Management Division lacks sufficient staff for basic program operations — including enough drivers for its service routes. Such staff shortages affect waste collection services, the city’s response to illegal dumping, how well it can address contaminated materials caused by improper recycling and composting, and how well it can educate Denver residents about recycling and composting correctly.

WASTE COLLECTION DRIVERS – The division does not have enough drivers to complete all waste collection routes in Denver. As of June 2022, the division

had 26 vacancies among 125 positions — or a 21% vacancy rate among waste collection drivers.

The number of driver vacancies could nearly double next year, after the city implements its “pay as you throw” pricing model for trash pickup. In addition to the current vacant positions, the division will need another 24 drivers to meet the demands of expanded recycling and compost service under the new program. The additional positions will result in the division having 149 budgeted positions in 2023 — which is about 19% more driver positions than are budgeted for now.

VACANT DRIVER POSITIONS
See [Appendix A](#) for details on how we calculated the vacancy rates.

As shown in Table 3, the vacancy rate for drivers was only about 5% in 2019. But it increased to about 20% in 2020, where it has remained relatively consistent.

TABLE 3. Vacancy Rates for Waste Collection Drivers, 2019 through 2022

Year	Positions Open	Positions Filled	Total Positions Budgeted	Vacancy Rate
2019	6	124	130	4.6%
2020	31	122	153	20.3%
2021	26	105	131	19.9%
2022	26	99	125	20.8%

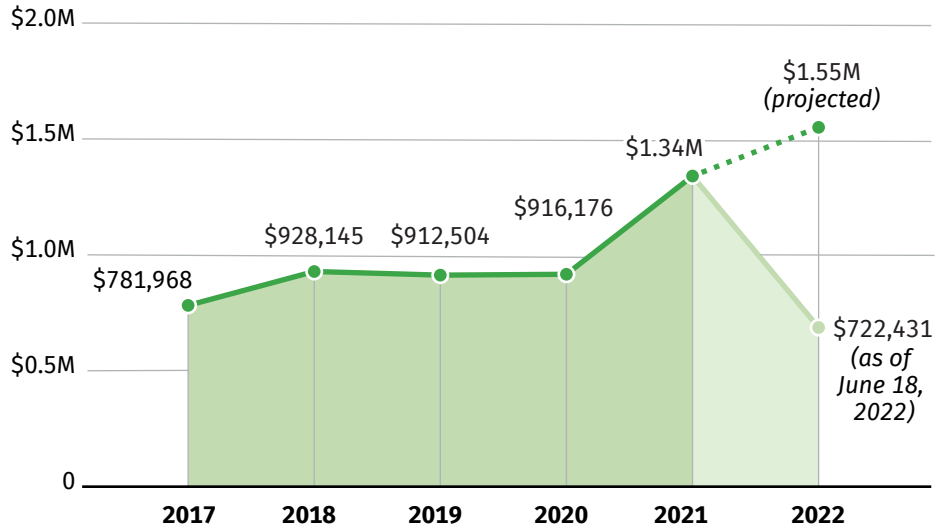
Note: The number of positions open and filled are based on June 1 of each calendar year.

Source: Auditor’s Office staff analysis based on information from the Office of Human Resources.

Because of the persistent staffing shortages, Solid Waste Management officials said that starting in October 2021, they made overtime mandatory for waste collection drivers when it was necessary to complete scheduled routes.

In analyzing the division’s overtime costs for trash and recycling services, we found these expenses have almost doubled since 2017 — from about \$782,000 in 2017 to more than \$1.3 million in 2021. As of mid-June 2022, the average monthly overtime cost was \$129,000 — putting the division on track for more than \$1.5 million in overtime costs by year’s end, as shown in Figure 6 on the next page.

FIGURE 6. Recycling and Trash Collection Overtime Costs



Note: Our analysis included reported costs from 2017 through 2021. The 2022 projected total is based on a \$129,000 monthly average as of mid-June. Staff overtime spent responding to illegal dumping is also included in these overtime costs.

Source: Auditor’s Office staff analysis using data from the Department of Transportation & Infrastructure’s finance team.

Having too few waste collection drivers and requiring them to work consistent overtime leads to dissatisfied workers and an inability to effectively service the community.

Adding to the demands on drivers, the division’s inspectors require the drivers’ help to clean up illegal dumping sites — a task the drivers complete outside their regular working hours.

Having too few waste collection drivers and requiring them to work consistent overtime leads to dissatisfied workers and an inability to effectively provide waste collection services in the community. Most of the drivers we heard from said they are looking to change jobs in the next 12 months — citing a desire for better pay and a dissatisfaction with management.

Without enough staff, the Solid Waste Management Division cannot fulfill its objective to provide reliable trash, recycling, and compost service across Denver at existing service levels.

Before changing service-delivery methods — as the city will do by moving to a volume-based pricing model in January 2023 — the Government Finance Officers Association recommends that governments carefully analyze all aspects of a service-delivery option, including levels of service, service quality, and expected performance.²⁶ However, we found the division did not conduct an analysis of its capacity to provide the additional services included in the new program.

²⁶ Government Finance Officers Association, “Evaluating Service Delivery Options” (2018), accessed July 15, 2022, <https://www.gfoa.org/materials/evaluating-service-delivery-alternatives>.

While the division was navigating the COVID-19 pandemic from 2020 through 2022, two factors have contributed to the city’s shortage of available drivers: a competitive labor market for individuals with a commercial driver’s license and higher wages that private companies often pay.

The Solid Waste Management Division acknowledged private competitors pay more than the city — but we found that, as of July 2022, the Office of Human Resources had not used private sector data when determining competitive pay for these important and difficult-to-fill positions.

To address the driver shortage, the city participates in career fairs and city events to recruit new staff and offers a \$5,000 bonus for new drivers when they complete a probationary period. To retain existing drivers, the department plans to leverage a June 2022 change in a city Career Service Rule designed to “temporarily assist agencies with staffing shortages occurring as a result of the COVID-19 pandemic” where the shortages may negatively impact “essential city services.” This rule change — in effect until Dec. 31, 2023 — allows agencies to offer retention bonuses of up to \$5,000.²⁷

Although other cities we spoke with experience similar pressures to hire and retain drivers, cities like Minneapolis and Austin, Texas, said they also offer benefits to help keep staff. For instance, Austin uses retention bonuses to keep existing drivers, while Minneapolis pays close attention to the amount of overtime staff work to avoid burnout.

By not yet having resolved the persistent 21% vacancy rate among its drivers, Denver’s Solid Waste Management Division is at risk for even more understaffing when it expands recycling and compost services in January 2023.

INSPECTORS – To address instances of both illegal dumping and contaminated recycling and compostable material, the Solid Waste Management Division has four city inspector positions meant to service all areas of the city. As of July 2022, only three of those positions were filled.

These inspectors rely on drivers to work overtime on Fridays to respond to the largest illegal dumping sites, and this delays them in responding to some other reports of illegal dumping because the needed equipment and staff are available only on an overtime basis. At the current workload and staffing level, it is difficult for the three inspectors to spend time on other

RELATED FINDINGS

In Finding 3 beginning on page 31, we discuss how the Solid Waste Management Division is inadequately prepared to switch to a volume-based pricing model in 2023. It has not assessed the division’s capabilities to provide expanded recycling and compost service, which will put more demands on the division’s understaffed workforce and aging equipment.

²⁷ City and County of Denver, Career Service Rules, “Rule 9 – Pay Administration,” § 9-101.

activities, such as addressing contaminated materials in waste carts and educating residents on how to properly recycle.

The U.S. Government Accountability Office says management should develop an organizational structure and assign responsibilities to discrete units to achieve objectives efficiently and effectively.²⁸ Taking quick action is particularly important when addressing illegal dumping because — as the Environmental Protection Agency explains — the associated health risks, including hazardous chemicals and sharp objects, are significant concerns for residents.²⁹

Illegal dumping can also expose residents to chemicals, and it can contaminate wells and surface water.³⁰ Furthermore, illegal dumping is a major contributor to urban blight and can worsen inequities, as dumping occurs more frequently in low-income neighborhoods or areas with higher concentrations of renters.³¹

Federal research says volume-based pricing models — like “pay as you throw” — may initially increase illegal dumping in the communities where these programs are started. Having maintained educational programs are important to inform the community about the new system and “avoid an ongoing problem.”³² Furthermore, this research shows effective illegal dumping programs require support from senior officials and sufficient resources for inspection, cleanup, and prevention.

Denver also risks seeing more contamination of recyclable and compostable material if the city does not adequately designate staff to teach the public about how to properly use these expanded services. Contaminated recycling and compost loads from the city might be rejected by the city’s contracted processors — resulting in more waste in the landfill, which contradicts the city’s goals for increased waste diversion under volume-based pricing.

ILLEGAL DUMPING

“Illegal dumping” is abandoned trash with no signs of nearby human activity. Other city agencies are responsible for addressing illegal dumping where human activity is present, such as at encampments of people experiencing homelessness.

The city identifies illegal dumping sites through city inspectors and reports residents make through Denver 311. These reports are important for identifying cases so the Solid Waste Management Division can clean up the debris.

²⁸ U.S. Government Accountability Office, GAO-14-704G, “Standards for Internal Control in the Federal Government” (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, paras. OV3.02 and OV3.03.

²⁹ Environmental Protection Agency, EPA905-B-97-001, “Illegal Dumping Prevention Guidebook” (1998), accessed Aug. 5, 2022, <https://nepis.epa.gov/Exe/ZyPDF.cgi/2000CNVU.PDF?Dockkey=2000CNVU.PDF>.

³⁰ Environmental Protection Agency, “Illegal Dumping Prevention Guidebook,” 7.

³¹ Environmental Protection Agency, “Illegal Dumping Prevention Guidebook,” 8; City of Los Angeles, Office of the Controller, “Piling Up: Addressing L.A.’s Illegal Dumping Problem” (2021), accessed April 11, 2022, <https://lacontroller.org/wp-content/uploads/2021/03/Piling-Up-Addressing-LAs-Illegal-Dumping-Problem-3.24.21.pdf>.

³² Environmental Protection Agency, “Illegal Dumping Prevention Guidebook,” 9.



ILLEGAL DUMPING IN THE CITY AND COUNTY OF DENVER |
Illegally dumped household items sit in a city alley (pictured at right) and at a large site with an abandoned camper among visible hazards like propane tanks (pictured above).

PHOTOS PROVIDED BY SOLID WASTE MANAGEMENT DIVISION STAFF.



SUPPORT STAFF – Previously, the Solid Waste Management Division had seven staff designated for “program support” — specifically to work closely with inspectors on efforts to address contaminated recycling and compostable material and to educate the public so they know how to recycle and compost properly. These staff members created marketing materials to promote recycling in the community, printed and handed out flyers, audited recycling bins to identify contamination, and left notes for homeowners and followed up with them.

But when city leaders created the Office of Climate Action, Sustainability, and Resiliency, those seven employees were transferred to that office. Without their own designated staff anymore, Solid Waste Management staff estimate only 1% of cart contamination in the city is being addressed.

Education and marketing will be necessary to ensure residents new to composting understand what is and is not compostable.

After the Denver City Council approved the city’s switch to “pay as you throw” pricing for trash services in 2023, the division made plans to hire an administrator for all communication and outreach activities. Beyond the administrator position, the division will contract with community organizations and leverage other city and Transportation & Infrastructure resources, such as staff in the department’s Office of Community and Business Engagement.³³ However, by the time we completed our audit work in July 2022, Solid Waste Management had yet to define the intended roles and responsibilities for these partners to include tasks associated with managing contaminated recycling or compost carts.

Furthermore, when the division hired consultants in 2019 to determine the total cost of providing solid waste services and to design rates for the new program, the study included no research — such as a staffing analysis — into how sufficient the division’s staffing levels were for its operations.

Officials with the city’s contracted compost processor shared that Denver’s compostable material is generally not overly contaminated because residents currently opt in for composting service, so those residents have a good understanding of what is compostable. However, those same officials are worried contamination will increase under Denver’s expansion to volume-based pricing. They told us education and marketing will be necessary to ensure residents new to composting understand what is and is not compostable.

Officials in the Solid Waste Management Division said waste collection drivers and inspectors are responsible for identifying contaminated material. But drivers and inspectors told us they are overwhelmed and not able to spend significant time looking out for contamination in residents’ recycling and composting carts.

When the City Council passed the “volume-based pricing” ordinance in June 2022, Transportation & Infrastructure became legally responsible for enforcing unlawful disposal of trash in recycling or compost carts.³⁴ However, department officials have told City Council members they prefer to educate residents first instead of penalizing them.³⁵

IDENTIFYING CONTAMINATION

When they see contaminated contents, inspectors or drivers can place an informational tag on a resident’s recycling or compost cart. These tags inform residents about what is and is not accepted for recycling and compost. A driver may refuse to pick up a contaminated cart, and if the problem persists, the city may remove the cart to prevent further misuse.

³³ The Office of Community and Business Engagement is a team within the Department of Transportation & Infrastructure that advises the department on building and strengthening relationships with community members and other stakeholders.

³⁴ City and County of Denver, Council Bill No. 22-0685.

³⁵ Denver Land Use, Transportation, and Infrastructure Committee meeting, April 26, 2022.

Leading practices support having robust public education efforts. Denver’s Climate Action Task Force recommended enforcement and one-on-one education to reduce instances of contamination.³⁶ The state Department of Public Health and Environment similarly says education and communication are key to managing contaminated material.³⁷

In a report produced for the Environmental Protection Agency, the Econservation Institute — a nonprofit organization dedicated to waste management education — found communities with volume-based pricing programs consistently report that education and outreach are crucial components of successful programs.³⁸ The institute also found that a lack of community education in one community in Maine was a major driver in the failure of a volume-based pricing program there.

When we spoke with officials in other cities that have similar “pay as you throw” programs — including Phoenix, Salt Lake City, and Seattle — they told us they have specific staff responsible for education and outreach. Some of their duties also include auditing waste carts to control contamination.

Without adequate education and communication efforts from the city, Denver’s new volume-based pricing model may lead to increased contamination in recycling and compost carts. As mentioned, contaminated recycling and compost loads from the city may be rejected — resulting in more waste in the landfill, which contradicts the city’s environmental goals. Without adequate resources, the division may not be able to provide the education necessary to achieve the highest possible amount of waste diverted from the landfill.

In general, these insufficient staff resources across the Solid Waste Management Division are already impeding the division’s ability to provide reliable and effective waste collection services to residents.

As we discuss in [Finding 3](#), these constraints are likely to worsen with the planned implementation of “pay as you throw” trash pickup and the expanded recycling and compost services that are part of that new program.

³⁶ Denver Climate Action Task Force, “Denver Climate Action 2020 Recommendations Report,” accessed Jan. 18, 2022, <https://www.denvergov.org/files/assets/public/climate-action/documents/climate-action-task-force/climateactionrecommendationsreport.pdf>.

³⁷ Colorado Department of Public Health and Environment, “Colorado Integrated Solid Waste & Materials Management Plan” (June 2016), accessed Feb. 8, 2022, <https://cdphe.colorado.gov/Integrated-Solid-Waste-Materials-Mgmt-Plan>.

³⁸ Econservation Institute, “Pay-as-You-Throw/Variable Rates for Trash Collection: 2014 Update” (February 2015), accessed July 8, 2022, http://www.paytnow.org/PAYT_EI_R9_v25_Vol1.

2.2**RECOMMENDATION****Conduct Staffing Analysis**

The Solid Waste Management Division should determine how many drivers, inspectors, and program support staff it needs to ensure continuity of operations and provide the additional services required by the city's new volume-based pricing model. Such an analysis should consider:

- How many staff are needed to complete all routes as scheduled.
- How many inspectors are needed to provide adequate coverage for all areas of the city.
- How many staff or contractors are needed to replace the efforts of staff who were transferred to the Office of Climate Action, Sustainability, and Resiliency in 2020 and to cover expanded service needs for education and outreach under volume-based pricing.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – DEC. 31, 2022
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.

2.3**RECOMMENDATION****Document Job Duties**

After implementing Recommendation 2.2, the Solid Waste Management Division should define and document roles and responsibilities for inspectors and program support staff related to addressing cart contamination and responding to illegal dumping.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – DEC. 31, 2022
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.

2.4**RECOMMENDATION****Create Memoranda of Understanding**

If the Solid Waste Management Division will rely on other city agencies or third-party contractors to provide program support for education and outreach related to the volume-based pricing program, the division should draft memoranda of understanding or otherwise document such agreements to define the roles and responsibilities to be carried out by such partners.

AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – DEC. 31, 2022
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.

FINDING 3 AND RECOMMENDATION

The City Is Inadequately Prepared for Its New Volume-Based Pricing Program, which May Worsen Existing Service-Delivery Issues for Residents

As we discussed, beginning in January 2023, Denver will charge residents a fee for trash pickup depending on the size of their trash cart — the smaller the cart, the less a resident pays. The program also expands compost service to over 140,000 additional residents, and the city will collect recycling more often: weekly, instead of every other week.

Volume-based pricing for trash collection is seen as the single-most effective and most cost-effective method for increasing the amount of waste diverted from landfills.

One study found volume-based pricing diverted 17% of waste from trash carts while increasing recycling tonnage by 50%.³⁹

However, before developing Denver’s upcoming volume-based pricing program, city leaders and solid waste management officials failed to fully assess:

- Whether the Solid Waste Management Division was prepared and adequately equipped to implement such a significant change.
- What trash, recycling, and compost services residents want and how much they are willing to pay.
- Whether the fees the city set were appropriate — both to help the program eventually become self-sustaining and to optimally influence residents to compost and recycle more in line with the city’s environmental goals.

Officials did not follow leading practices meant to proactively assess the city’s capabilities and help officials make informed decisions that would support the program’s long-term success.

VOLUME-BASED PRICING

“Volume-based pricing” is the technical name for the “pay as you throw” concept. Beginning in January 2023, the program will charge city residents by the size of their trash cart: the smaller the cart, the lower the fee. Recycling and composting service are included at no extra charge.

³⁹ Econservation Institute, “Pay-as-You-Throw/Variable Rates for Trash Collection: 2014 Update.”

City Officials Believe ‘Volume-Based Pricing’ Can Improve Denver’s Waste Diversion Rate

We learned that one of the motivations for the city to propose volume-based pricing for trash pickup is a desire to reduce local greenhouse gas emissions and increase how much waste the city diverts from the landfill through recycling and composting. Communities can measure this through a percentage called the “waste diversion rate.”

In 2020, the Solid Waste Management Division had a waste diversion rate of 26% based on what it collected from the 180,000 households it services. That same year, Denver’s citywide waste diversion rate was 35% — which factors in the waste picked up by private companies that service businesses and larger apartment buildings and townhome complexes, as well as the waste generated from construction and demolition sites.⁴⁰

Because larger apartment buildings and townhome complexes not covered by the division’s services represent more than a third of all Denver households, the Solid Waste Management Division has influence over only a fraction — about 18% — of the waste accounted for in the citywide diversion rate.

Nonetheless, although Solid Waste Management is not directly responsible for improving the citywide rate, the services it provides to residents influence how waste in Denver is managed. The impacts of individual consumption coupled with the city’s leadership on waste management influence local greenhouse gas emissions that cause climate change — and climate change harms the health of Denver’s residents and economy.

City officials want to improve Denver’s citywide waste diversion rate of 35%, as that percentage stands significantly below comparable cities. For example, Seattle reported a waste diversion rate of 54%, and Austin, Texas, reported a rate of 42%.⁴¹ Such cities with higher diversion rates often have policies like universal waste ordinances that require

Although Solid Waste Management is not directly responsible for improving the citywide waste diversion rate, the services it provides to residents influence how waste in Denver is managed.

WASTE DIVERSION RATES IN OTHER CITIES

A “waste diversion rate” measures the percentage of material that is recycled or composted and diverted from a landfill. In 2020, Denver’s citywide waste diversion rate was 35%.

By comparison, other cities we researched reported their waste diversion rates as follows:

- **Austin, Texas: 42%.**
- **Longmont, Colorado: 42%.**
- **Loveland, Colorado: 58%.**
- **Minneapolis: 36%.**
- **Phoenix: 36%-37%.**
- **Salt Lake City: 37%-39%.**
- **Seattle: 54%.**

⁴⁰ Larger apartment buildings and townhome complexes are those with eight or more units.

⁴¹ The cities we researched provided their rates to us. It is unclear to what extent their rates include all city households, businesses, or construction and demolition sites.

nonresidential construction and commercial properties to participate in recycling programs.

Taking action to require recycling throughout more of the city is on the minds of Denver residents. In November 2022, Denver voters passed a “Waste No More” initiative to require recycling and composting for larger apartment buildings and townhome complexes and at construction and demolition sites.

The City Used Limited Outreach to Gauge Residents’ Preferences and Could Not Provide Documentation to Support Policy Choices

Although city leaders have discussed a “volume-based pricing” option for more than a decade, we found the city collected minimal resident input before the City Council approved the program in June 2022.

The division worked with the Office of Climate Action, Sustainability, and Resiliency to hire a consultant that collected opinions from about 1,000 residents — or 0.6% of those who receive city waste collection services. Aside from the small sample size, the consultant’s report did not indicate that residents were given options to choose from in terms of what services or fees they might like so that they could provide objective feedback about potential program design. Instead, the selected residents were asked to give feedback on the service options for volume-based pricing that the division had already chosen.

According to the report, the small group of residents told the city they were excited for the proposed weekly recycling and that the proposed fee subsidy for lower-income neighbors was important.

City officials told us they had intended to collect more resident feedback for the volume-based pricing program, but the onset of the COVID-19 pandemic hampered their efforts, as did limited attendance at public meetings division staff attended. While low attendance may have been outside the division’s control, the same officials acknowledged that more time to conduct outreach about volume-based pricing would have been helpful.

Among the other cities we spoke with, officials in Phoenix said they set up rate committees to get community feedback and the city polls the public on potential service options before the city decides to change services. The city has given residents various options to choose from — such as asking them whether they want recycling every week or every other week and how often they want the city to pick up large trash items. The city also provided information about the fees associated with the service options.

In its guidance for evaluating service-delivery options, the Government Finance Officers Association recommends collecting customer feedback — as Phoenix has done. Feedback provides city management with the information necessary to identify what their residents value and then communicate how the city is recognizing those interests through the

services it provides and the fees it charges.⁴²

During committee meetings before the Denver City Council's vote in June, council members asked Solid Waste Management whether it had any data to support that Denver residents wanted weekly recycling versus other options that might also increase residential recycling, such as issuing residents larger carts or more than one cart. Solid Waste Management officials told the council members they had no such data.

Among the many requests for information we made during this audit, we asked Solid Waste Management officials for any environmental analysis or cost analysis they did to support their choice of service options like weekly recycling. While the division provided us a 2019 cost-of-service and rate study, that study did not include projections for the costs associated with increasing recycling pickup to every week. It had projections related only to expanding compost pickup.

The city's 2022 "Sustainable Resource Management Plan" mentions the need for a comprehensive infrastructure needs assessment, including for city-provided waste collection services.⁴³ We asked division leadership whether they conducted a needs assessment — in line with the city's own recommendation in the plan — to validate that the division has the capacity (i.e., staff, equipment, funding, and other resources) to support expanded recycling and composting services. Officials said they asked the city's contracted recycling and composting processors about whether they could take the additional material the city will collect.

The officials said there was "no need to waste" money on a needs assessment. But as we discussed in [Finding 2](#), the division is already understaffed and its aging fleet of trucks is not reliable to adequately service current routes. The completion of such an assessment may have served to support whether implementing volume-based pricing in January 2023 was something the division was properly prepared for.

Meanwhile, leading practices on program design say that when services change or new programs are created, government organizations should seek insight from similar cities to improve efficiency and effectiveness.⁴⁴ During our interviews with other cities, we learned Austin, Texas, did a cost analysis before deciding whether to move to weekly recycling from twice-per-month service. Based on the analysis they did, Austin officials deemed the proposal too costly to implement.

Local governments can also use a waste reduction modeling tool from the Environmental Protection Agency to assess alternative policy options and see high-level estimates of what impacts those decisions may have on

⁴² Government Finance Officers Association, "Evaluating Service Delivery Options" (2018), accessed July 15, 2022, <https://www.gfoa.org/materials/evaluating-service-delivery-alternatives>.

⁴³ City and County of Denver, "Sustainable Resource Management Plan" (2022), accessed April 4, 2022, <https://www.denvergov.org/files/assets/public/climate-action/documents/resource-management/swmp-2022-update.pdf>.

⁴⁴ Government Finance Officers Association, "Evaluating Service Delivery Options" (2018), accessed July 15, 2022, <https://www.gfoa.org/materials/evaluating-service-delivery-alternatives>.

local greenhouse gas emissions, energy savings, and the local economy.⁴⁵

Officials in the Solid Waste Management Division gave us information from the EPA’s tool to explain that the local greenhouse gas emissions that would be saved from expanded recycling service would outweigh the air and noise pollution created by having more waste collection trucks on the road, such as for the weekly recycling pickup. However, the division did not provide us with what details it used to populate the EPA’s tool, so we could not validate the division’s claim.

When we asked officials specifically for further documentation supporting how they determined weekly recycling was an efficient policy solution for Denver, they provided none. Because Denver’s waste management officials have not done sufficient proactive analyses, they risk running into potentially foreseeable problems or added expenses from implementing volume-based pricing.

Meanwhile, the new volume-based pricing ordinance requires division management to update the Denver City Council on the program’s operations beginning in February 2025.⁴⁶ This will be difficult to do without adequate analyses to support the division’s reports. Solid Waste Management also risks worsening known service-delivery issues — which staff are already grappling with and residents are already reporting problems with, as we discussed in earlier findings.

The Solid Waste Management Division Did Not Follow Leading Practices to Set New Trash Fees — which May Be Too Low to Sustain the Program Long Term or Incentivize Better Waste Diversion

City officials intend for the volume-based pricing program to eventually be self-sustaining — meaning all revenue collected from fees would cover the city’s cost to provide the services. However, Solid Waste Management officials are not sure whether the monthly fees they set will be sufficient to meet that goal nor can they say whether the city will need to increase its fees in the future in order to do so.

Denver’s fees for trash pickup will range from \$9 to \$21 per month, depending on the size of the cart a resident chooses. In researching other cities with similar volume-based pricing programs, we learned Denver’s fees are significantly less, while at the same time Denver will provide more frequent services — such as weekly recycling and monthly

FEES FOR TRASH PICKUP IN 2023

Beginning in January, the city plans to charge residents for waste collection based on the size of their trash carts:

- **\$9 per month for a 35-gallon cart.**
- **\$13 per month for a 65-gallon cart.**
- **\$21 per month for a 95-gallon cart.**

⁴⁵ “Waste Reduction Model (WARM),” Environmental Protection Agency, accessed Aug. 29, 2022, <https://www.epa.gov/warm>.

⁴⁶ City and County of Denver, Council Bill No. 22-0685.

collection of large trash items. More frequent service requires more staff and equipment, making these options more costly to the city than potential alternatives.

As shown in Figure 7, Austin, Texas, offers similar cart sizes to Denver while providing less frequent service: recycling only every other week and pickup of large items only twice a year. Yet that city’s monthly fees for residents range from about \$27 to about \$54 – two to three times higher than what Denver residents will pay, depending on the size of the trash cart. Likewise, Seattle’s monthly fees range from about \$33 to \$140, and it offers recycling only every other week and charges extra to dispose of all large items.

More locally, we found the Colorado cities of Longmont and Loveland charge similar fees to Denver – but neither city includes compost service for food waste and their recycling pickup is only every other week.

FIGURE 7. Comparison of Volume-Based Pricing Programs in Denver and Other Cities

✓ Yes ✗ No		Denver	Austin	Longmont	Loveland	Minneapolis	Phoenix	Salt Lake City	Seattle
SERVICES:	Compost <i>including food waste</i>	✓	✓	✗ Pickup with a fee	✗	✓ Optional	✗	✓	✓
	Large item	✓ Every 4 weeks	✓ Twice per year	✗ Pickup with a fee	✗ Pickup with a fee	✓ Two items per pickup	✓ Once every 3 months	✓ Twice per year	✗ Pickup with a fee
	Recycling	✓ Weekly	✓ Every other week	✓ Every other week	✓ Every other week	✓ Every other week	✓ Weekly	✓ Weekly	✓ Every other week
MONTHLY FEES		\$0	\$4.60	\$2.96	\$10.25–\$12	\$25.08	\$0	\$0	\$7–\$13.40
CART CHARGES:	Small 32–48 gallons	\$9	\$23.90	\$6.50	\$7	\$2	N/A	\$17.80	\$42.15
	Medium 48–65 gallons	\$13	\$29.05	\$12.90	\$14	N/A	\$31.48	\$22.75	\$84.20
	Large 90–96 gallons	\$21	\$49.50	\$24	\$21	\$5	\$34.48	\$27	\$126.40
RANGE OF TOTAL MONTHLY CHARGES		\$9–\$21	\$27.25–\$54.10	\$9.46–\$26.96	\$13.75–\$33	\$27.08–\$30.08	\$31.48–\$34.48	\$17.80–\$27	\$33.45–\$139.80

Note: Austin, Loveland, and Seattle also offer even smaller cart-size options. We did not list them as they are not comparable to what Denver offers. The range of total monthly charges includes the rates for the smallest carts.

Source: Auditor’s Office staff analysis using data from the Department of Transportation & Infrastructure and other cities researched for this audit.

Without sound data and information to support its fees, the Solid Waste Management Division cannot make informed decisions about the viability of the city's volume-based pricing program.

The U.S. Government Accountability Office says management should use quality information both to make informed decisions and to evaluate the organization's performance in achieving key objectives and addressing risks.⁴⁷ Without sound data and information to support its fees, the Solid Waste Management Division cannot make informed decisions about the viability of the city's volume-based pricing program.

We determined the incremental fees the city plans to charge based on the size of residents' trash carts — \$9, \$13, and \$21 — follow leading practices to the extent that the fees increase by 50% with each progressively larger cart size.⁴⁸ However, the Econservation Institute also says the fee differential should be 80% if the city wants to see the most significant changes in individuals' behaviors toward recycling and composting. Based on that guidance, if the fees started at \$9, they should increase to \$16 and then \$29 with each progressively larger trash cart.

We conclude that because the Solid Waste Management Division did not follow leading practices on program design or fee-setting, the volume-based pricing program may not be effective at achieving the city's goal to increase Denver's waste diversion rate. Meanwhile, more trucks on the road to accommodate weekly recycling will cause more pollution in the city, which the city may not offset.

Furthermore, because the division is already understaffed and does not have a reliable fleet of trucks as it is, expanding recycling and compost service in 2023 will increase demands on the division's staff and likely worsen the issues residents are already reporting, such as missed pickups.

3.1

RECOMMENDATION

Conduct Annual Performance Review

Within the first year of the volume-based pricing program, the Solid Waste Management Division should plan, document, and implement processes to regularly review the division's performance for service delivery and how well it is increasing waste diversion behaviors of the Denver households it serves.

Such review processes may include a cost-of-service rate analysis, a resident satisfaction and service preference survey, and an environmental cost analysis. The division should complete such reviews in the second year of program operations, which will help position the division to meet the program reporting requirement defined in city ordinance.

**AGENCY RESPONSE – AGREE, IMPLEMENTATION DATE – SEPT. 30, 2023
SEE [PAGE 38](#) TO READ THE AGENCY'S RESPONSES.**

⁴⁷ U.S. Government Accountability Office, GAO-14-704G, "Standards for Internal Control for the Federal Government" (2014), accessed May 24, 2022, <https://www.gao.gov/assets/gao-14-704g.pdf>, para. 13.05.

⁴⁸ Econservation Institute, "Pay-as-You-Throw/Variable Rates for Trash Collection: 2014 Update" (February 2015), accessed July 8, 2022, http://www.paytnow.org/PAYT_EI_R9_v25_Vol1.

AGENCY RESPONSE TO AUDIT RECOMMENDATIONS

The following agency narratives are reprinted verbatim from the agency's response letter.



RECOMMENDATION 1.1

**AGENCY RESPONSE:
AGREE**

**AGENCY'S TARGET DATE
FOR IMPLEMENTATION:
DEC. 31, 2023**

SWM recognizes the importance of a comprehensive strategic plan as it transitions to a volume-based pricing service model. The SWM Division will turn its current business plan into a more robust long-term strategic plan that defines specific objectives, goals, and needs of the division, including its role to deliver services to customers in the most efficient, effective ways possible.

RECOMMENDATION 1.2

**AGENCY RESPONSE:
AGREE**

**AGENCY'S TARGET DATE
FOR IMPLEMENTATION:
DEC. 31, 2023**

In conjunction with its strategic plan development, SWM will create and expand upon its internal control framework to mitigate risks that may impede strategic objectives. Control activities will include written policies and procedures, staff training plans, and succession and contingency plans for key roles. The policies and procedures will cover system and operational levels to ensure the efficiency and effectiveness of operations.

SWM has already made progress on this recommendation by adding staff to form the Office of Strategic Analytics and hiring a Senior Manager of Strategy and Policy. SWM is currently documenting new policies and procedures with the new billing system. SWM is also in the process of acquiring American Public Works (APWA) certification, which will demonstrate compliance with industry best practices.

RECOMMENDATION 1.3

AGENCY RESPONSE:
AGREE

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:**
MAY 31, 2023

SWM is currently in the process of implementing Rubicon’s routing software, which will increase the level of route efficiency reporting for Solid Waste. SWM will continuously monitor Rubicon reports and integrate recommended route improvements when practical.

RECOMMENDATION 1.4

AGENCY RESPONSE:
AGREE

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:**
SEPT. 30, 2023

SWM is in the process of consolidating the case data, working with the 311 and pocketgov teams who own these data sources. SWM will create policies and procedures to ensure timely and accurate data entry and case management practices. SWM will also create dashboards and metrics to monitor performance.

RECOMMENDATION 2.1

AGENCY RESPONSE:
AGREE

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:**
JUNE 30, 2023

With the implementation of the Volume-Based Trash Pricing Program in 2023, all trash, recycling, and composting costs will move to the new SRF, including fleet management costs. As a result, these fleet vehicles will no longer be part of the City’s centralized process, which will give SWM the ability to manage the fleet budget and fleet replacement schedule on its own. SWM will work with DOF and Fleet Management to develop a written procedure to create, update, and monitor its vehicle replacement schedule.

RECOMMENDATION 2.2

AGENCY RESPONSE:
AGREE

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:**
DEC. 31, 2022

SWM will update its written analysis to determine appropriate staffing levels for drivers, inspectors, and program support.

Solid Waste monitors its vacancy rate and is actively recruiting for those driver positions. The Division recently re-classified the driver positions to Solid Waste Collection Operators to be able to pay competitively with the private sector. The Division has identified that one inspector per district is the goal for adequate coverage. In addition to the 3 inspectors, they have today, Solid Waste received two new positions with the Volume-based Pricing implementation funds. The Division plans to grow their inspector team over the next two years to a total of 9 inspectors.

Through contracting with community-based organizations for outreach and establishing long term partnerships, Solid Waste will be able to reach more residents directly than it was able to with its previous Program staff. Solid Waste is actively recruiting a Waste Diversion and Recycling Manager, responsible for the Division’s Education and Outreach plan.

RECOMMENDATION 2.3

**AGENCY RESPONSE:
AGREE**

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:
DEC. 31, 2022**

SWM will clearly define roles and responsibilities for inspectors and program support in its written analysis from Recommendation 2.2. Solid Waste is growing its contamination auditing process with inspectors with help from the Office of Strategic Analytics.

RECOMMENDATION 2.4

**AGENCY RESPONSE:
AGREE**

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:
DEC. 31, 2022**

SWM will verify that SOWs exist for all contractors and community-based organizations performing outreach on DOTI’s behalf.

RECOMMENDATION 3.1

**AGENCY RESPONSE:
AGREE**

**AGENCY’S TARGET DATE
FOR IMPLEMENTATION:
SEPT. 30, 2023**

As part of Recommendations 1.1 and 1.2, SWM will define objectives, performance metrics, and procedures to regularly monitor performance. This will include service delivery performance, a cost-of-service rate analysis, customer surveys, and an environmental cost analysis. SWM will adjust the program as necessary as a result of these performance reviews.

Per the Ordinance, the program must perform a cost-of-service study no less than every 5 years.

OBJECTIVE

- To assess how efficiently and effectively the city is ensuring timely trash, recycling, and compost service for residents and is reducing illegal dumping in city neighborhoods.
- To evaluate how effectively the city is achieving its environmental goals and improving Denver’s recycling rates.

SCOPE

We conducted our audit work between February and July 2022. During this time, we reviewed the controls and processes that the Department of Transportation & Infrastructure’s Solid Waste Management Division had for providing residential trash, recycling, and compost services, as well as the division’s response to illegal dumping in the city. Other services provided by the division, such as waste collection for Denver Public Schools facilities and graffiti removal, were excluded from our audit scope.

We evaluated the division’s fleet resources, staffing levels, and related overtime costs, and we also evaluated how the division prepared for and communicated upcoming changes to its trash, recycling, and compost collection services, which begin in 2023.

METHODOLOGY

We used several methodologies to gather and analyze information related to the audit objectives. The methodologies included but were not limited to:

- Interviewing:
 - Personnel from various city agencies, including:
 - The Department of Transportation & Infrastructure and several of its divisions — including Solid Waste Management, Fleet Management, the Performance Office, accounting, and finance.
 - The Office of Climate Action, Sustainability, and Resiliency.
 - The Office of Human Resources.
 - The Denver Department of Public Health and Environment.
 - The Denver 311 program.

- Personnel from the Colorado Department of Public Health and Environment.
- Personnel from selected other cities' solid waste management agencies — Austin, Texas; Minneapolis; Phoenix; Salt Lake City; and Seattle, as well as the Colorado cities of Loveland and Longmont.
- Observing:
 - Three Denver City Council Land Use, Transportation, and Infrastructure Committee meetings.
 - The processes to open and close Denver 311 cases and Solid Waste Management work orders for residents' solid waste service requests.
 - The Solid Waste Management Division's performance dashboards of internal "level of service" results.
 - The Denver Arapahoe Disposal Site Landfill, which is the city's municipal landfill.
 - GFL Environmental Inc.'s recycling facility.
 - A1 Organics' compost processing facility.
- Reviewing:
 - Federal standards and frameworks, including:
 - The U.S. Government Accountability Office's "Standards for Internal Controls in the Federal Government."
 - The U.S. Government Accountability Office's "Assessing Data Reliability" guidance.
 - The U.S. Department of State's "Program Design and Performance Management Toolkit."
 - The Environmental Protection Agency's "Illegal Dumping Prevention Guidebook."
 - The Environmental Protection Agency's "Best Management Practices for Optimizing Waste Collection Routes."
 - The Environmental Protection Agency's waste reduction model.
 - The Colorado Department of Public Health and Environment's "Integrated Solid Waste & Materials Management Plan."
 - Denver City Council Bill 22-0685 to implement a volume-based pricing model.
 - The city's 2020, 2021, and 2022 budgets.
 - The city's 2020 Annual Comprehensive Financial Report.
 - Relevant city ordinances.
 - The city's Fiscal Accountability Rules.
 - The city's executive orders.
 - The city's 2010 solid waste master plan and the 2022 "Sustainable Resource Management Plan."
 - News articles related to the city's new waste service routes, waste service delays, proposed volume-based pricing, Colorado's low recycling rate, China's ban on recyclables, and trash at encampments of people experiencing homelessness.
- Reviewing and analyzing:
 - The Solid Waste Management Division's July 2022 performance dashboards.
 - The Solid Waste Management Division's June 2019 to June 2022 vacant positions report.
 - The Solid Waste Management Division's June 2019 to June 2022 turnover-by-job profile report.
 - The Solid Waste Management Division's 2021 driver pay-adjustment study.
 - The Solid Waste Management Division's recycling-, trash-, and illegal dumping-related overtime costs for 2017 through 2022.

- The Office of Human Resources’ flyers and events meant to recruit Solid Waste Management drivers.
- The Office of Climate Action, Sustainability, and Resiliency’s resource management plan.
- The Budget and Management Office’s 2014 “Fleet Capital Lease Overview” presentation to the Denver City Council.
- The Department of Transportation & Infrastructure and Department of Finance’s “2022 Capital Lease for Fleet Purchases” presentation to the Denver City Council.
- The Career Service Board’s change to Section 9-101 of Career Service Rule 9 (“Pay Administration”), related to retention bonuses.
- The Solid Waste Management Division’s inventory of waste collection trucks.
- The Solid Waste Management Division’s fleet maintenance and repair data for 2019, 2020, and 2021.
- The estimated remaining useful life for the Solid Waste Management Division’s waste collection trucks.
- The Fleet Management Division’s “Solid Waste Equipment Audit, 2022.”
- The Solid Waste Management Division’s contracts with GFL Environmental Inc., A1 Organics, Waste Management LLC, and ReCollect Systems Inc. related to solid waste services.
- The Solid Waste Management Division’s waste collection service-delivery map.
- The Solid Waste Management Division’s waste collection service routes and numbers of stops.
- The Solid Waste Management Division’s list of facilities.
- The Solid Waste Management Division’s website related to current solid waste services and upcoming changes associated with volume-based pricing.
- The city’s Climate Action Task Force’s “Denver Climate Action 2020 Recommendations Report.”
- The Solid Waste Management Division’s existing policies, procedures, and planning documents.
- Prior audits of the Denver Arapahoe Disposal Site Landfill conducted by the Denver Auditor’s Office.
- Audits of other governmental solid waste services and challenges in:
 - Los Angeles.
 - Chicago.
 - Maricopa County, Arizona.
- Eco-Cycle and CoPIRG’s “The State of Recycling and Composting in Colorado” report.
- Colorado Senate Bill 20-055, “Incentivize Development Recycling End Markets.”
- The Colorado Department of Public Health and Environment’s “Producer Responsibility Literature Review and Policy Recommendations.”
- The Colorado Department of Public Health and Environment’s “Colorado Material Recovery Facility Survey, Spring 2019.”
- The Colorado Department of Public Health and Environment’s 2020 Colorado waste diversion rates.
- The Solid Waste Management Division’s 2019 “Solid Waste Cost of Service and Rate Design Study.”
- Using city data to analyze the city’s inventory of waste collection trucks, the trucks’ maintenance and repair costs, their estimated useful life, vacancy rates for driver positions within the Solid Waste Management Division, and residents’ reports of missed pickup service — as discussed in [Appendix A](#).
- Researching other cities’ volume-based pricing programs for comparison to Denver’s, as discussed in [Appendix B](#).
- Evaluating materials accepted for recycling and potential end markets for the city’s recyclables, as discussed in [Appendix C](#).

APPENDICES

Appendix A – Discussion of Data and Audit Analysis Methods

This appendix discusses our data and audit analysis methods for the various calculations we did to support our audit findings related to:

- The city’s inventory of waste collection trucks.
- The trucks’ maintenance and repair costs.
- The trucks’ estimated useful life.
- Vacancy rates for driver positions within the Solid Waste Management Division.
- Residents’ reports of missed pickup service.

Inventory of Waste Collection Trucks

We received an inventory of capital assets from Solid Waste Management Division leadership. “Capital assets” are city-owned equipment that have a useful life greater than one year and a purchase value of at least \$5,000.⁴⁹

To separate the division’s waste collection trucks from other equipment in the list, we used each asset’s unique identifier and deleted all assets but those used for trash, recycling, or compost waste collection. The resulting list had 159 assets.

We used this list of 159 assets for our analysis of the maintenance and repair costs for the city’s waste collection trucks for 2019, 2020, and 2021 and to quantify the remaining estimated useful life of Solid Waste Management’s fleet.

Maintenance and Repair Costs for Waste Collection Trucks

The Department of Transportation & Infrastructure’s Fleet Management Division gave us its maintenance and repair expenses for 2019 through 2021 related to maintaining and repairing the Solid Waste Management Division’s equipment fleet.

We merged all three years’ expense data and used the waste collection trucks’ unique identifiers from the inventory list to match expenses to those trucks.

Next, we combined the parts and in-house labor costs, so we had a total cost for each service event for all waste collection trucks. This also gave us consolidated maintenance and repair costs for all 159 trucks across all three years. We excluded other costs — such as fuel — from our analysis, so the results are not representative of total annual fleet expenses for each truck, only parts and in-house labor costs.

Using the consolidated maintenance and repair costs, totaled the parts and labor costs by year. The results of our analysis are shown in [Figure 5 on page 20](#) of this report.

⁴⁹ City and County of Denver, “Mayor’s 2022 Budget” (2021), accessed Feb. 18, 2022, <https://www.denvergov.org/files/assets/public/finance/documents/budget/2022-denver-budget-book-october-draft-final.pdf>.

Estimated Remaining Useful Life of Waste Collection Trucks

To analyze the estimated remaining useful life of the Solid Waste Management Division's fleet of waste collection trucks, we used Fleet Management's asset year for the 159 trucks included in our inventory list and calculated the percentage of trucks by year.

We then calculated the percentages for how much of the fleet's estimated useful life had already been used as of August 2022 and how much was left. We based this on the Fleet Management Division's stated standard of an eight-year estimated useful life for the trucks. The results of our analysis are shown in [Table 2 on page 19](#) of this report.

Vacancies among Waste Collection Drivers

We requested position vacancy rates from the Office of Human Resources to understand how many waste collection driver positions in the Solid Waste Management Division are budgeted for hire but remain open. We received a report with the number of budgeted positions that were filled and open, as of June 1 of each year in 2019, 2020, 2021, and 2022.

For each of the four years, we determined the vacancy rate for the driver positions by dividing the number of positions that were filled by the total number of budgeted positions. The results of our analysis are shown in [Table 3 on page 23](#) of this report.

Resident-Reported Missed Pickups

We reviewed data from the Denver 311 system to evaluate the extent to which residents reported missed pickups of their trash carts from July 2019 through April 2022. We searched the 311 database using the key word "missed" and exported these results to remove service requests not within our scope. We further cleaned the data to eliminate duplicate entries resulting from the same resident reporting the same missed pickup via more than one channel in a 24-hour period, such as a phone call to 311 and an online submission through Denver Utilities Online.

Because of these exclusions, the results of our data analysis reflect the lower end of total possible cases. The results of our analysis are shown in [Figure 3 on page 12](#) of this report.

Appendix B – Research of Other Cities’ Volume-Based Pricing Programs

We researched practices at several other cities with municipal solid waste services to learn how they operate a volume-based pricing model, which Denver is implementing in January 2023. Our interest included the services provided, associated costs, and lessons learned from their experiences.

We also evaluated how these cities manage planning to replace their waste collection trucks and how they respond to filling driver positions that are in high demand.

We chose the selected cities based on recommendations from staff in the Colorado Department of Public Health and Environment, as well as cities identified in the state’s “Integrated Solid Waste & Materials Management Plan” or that were mentioned by officials in other cities we interviewed.

The cities we researched were:

- Austin, Texas.
- Longmont, Colorado.
- Loveland, Colorado.
- Minneapolis.
- Phoenix.
- Salt Lake City.
- Seattle.

Appendix C – Recyclable Materials and End Markets

The city’s recycling contractor, GFL International Inc., can accept only certain items at its facility.

Accepted materials include:

- Aluminum cans.
- Aluminum foil.
- Certain plastic bottles.
- Empty steel and aerosol cans.
- Newspaper, junk mail, and magazines.
- Broken-down cardboard boxes.
- Paper bags and cups.
- Glass jars.
- Steel or tin cans.

Materials not accepted include:

- Scrap metal.
- Fuel canisters.
- Drinking glasses and window glass.
- Ceramics.
- Foil-coated products, such as potato chip bags, yogurt lids, and paperboard.
- Waxed cardboard.
- Plastic bags and bubble wrap.
- DVDs and CDs.
- Garden hoses.
- Containers larger than 3 gallons.
- Plastic shrink wrap, K-cups, and plastic tubes.
- Plastic foam.
- Toys.

Management at GFL International said the company’s facility does not accept any material that does not have an “end market” — that is, someone willing to buy the recycled product. The following are the end markets for recyclables:

- Cardboard: Corrugated or liner board mills to make new boxes.
- White fiber: Tissue mills to make paper towels, toilet paper, and tissue products.
- Mixed fiber or mixed paper: Packaging producers to blend with cardboard and make product boxes (e.g., cereal boxes).
- Plastic #1: Textile industry, such as for yarn or polyester, or use in a bottle-recycling process.
- Plastic #2: Irrigation pipe producer or packaging producers.
- Plastics #3-7: Large processors to make widgets or to produce railroad ties.
- Aluminum cans: Make into new cans or send to the auto industry.
- Tin cans: Baling wire.
- Glass: Locally collected glass recyclables are cleaned and separated and sent to local brewers in Fort Collins and Golden, Colorado.

Office of the Auditor

The **Auditor** of the City and County of Denver is independently elected by the residents of Denver. He is responsible for examining and evaluating the operations of city agencies and contractors for the purpose of ensuring the proper and efficient use of city resources. He also provides other audit services and information to City Council, the mayor, and the public to improve all aspects of Denver's government.

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