Table of Contents

TABLES

FIGURES

APPENDICES

Appendix A: City Council Resolution

Appendix B: Approval Letter from Maryland Department of the Environment

Appendix C: Zoning Regulations

Appendix D: Solid Waste and Recycling Vendors

Appendix E: School Recycling Programs

Appendix F1: Apartment Building and Condominium Recycling Plan

Appendix F2: List of Eligible Apartments and Condominiums

Appendix G1: Special Events Recycling Plan

Appendix G2: Special Event Location List

Appendix G3: Special Event Guidelines

Appendix G4: Special Event Applicant Checklist

Appendix H1: Office Building Recycling Plan

Appendix H2: Eligible Office Buildings

Appendix I: In-City Potential Diversion Partners

Appendix J: Out-of-City Potential Diversion Partners

Appendix K: Nearby Out-of-City Solid Waste Facilities

ABBREVIATIONS AND ACRONYMS

Formal names for offices, agencies, institutions, and programs are capitalized; technical terms are in lower case.

ABS	acrylonitrile butadiene styrene (e.g., Lego)
AD	anaerobic digestion; anaerobic digestor
AVAC	automated vacuum collection
BCAA	Baltimore Clean Air Act
BCCF	Baltimore City Compost Facility
BCPS	Baltimore City Public Schools
BCRP	Baltimore City Department of Recreation and Parks
BFWRS	Baltimore Food Waste and Recovery Strategy
BPPF	Baltimore Patapsco Pelletizer Facility
BOS	Baltimore Office of Sustainability
BRC	Baltimore Recycling Center
BRPF	Back River Pelletech Facility
BRWWTP	Back River Wastewater Treatment Plant
BRESCO	Baltimore Refuse Energy Systems Co. (now Wheelabrator)
BSP	Baltimore Sustainability Plan
BZWP	Baltimore Zero Waste Plan
CAP	Baltimore City Climate Action Plan
CAPEX	capital expenditure; capital costs
CASP	covered aerated static pile (composting)
CDL	container deposit law; bottle bill
C&D	construction and demolition
DBO	design-build-operate (contract)

DBFO	design-build-finance-operate (contract)
DHCD	Baltimore City Department of Housing and Community Development
DP3	Baltimore City Disaster Preparedness and Planning Project
DPW	Baltimore City Department of Public Works
EPR	extended producer responsibility
EPS	expanded polystyrene, Styrofoam
FDA	Food and Drug Administration
GHG	greenhouse gas
HDPE	high density polyethylene; no. 2 plastic
HFPA	Healthy Food Priority Area
HHW	household hazardous waste
ICI	industrial, commercial, and institutional (sectors)
ILSR	Institute for Local Self Reliance
LEED	Leadership in Energy and Environmental Design
LMO	last mile organization
LWBB	Less Waste, Better Baltimore (Plan)
L&J	L&J Waste Recycling, LLC
MDE	Maryland Department of the Environment
MDP	maximum diversion potential
MES	Maryland Environmental Service
MFD	multi-family dwelling
MRA	Maryland Recycling Act
MRC	mandated recycled content
MRF	materials recovery facility

MSW	municipal solid waste
SWMP	solid waste master plan

INTRODUCTION

Statement of Purpose

The intent of this Ten-Year Solid Waste Management Plan (Plan) is to provide an accurate description of the existing solid waste management system in Baltimore City and a ten-year outlook on planned solid waste and recycling activities, in compliance with Maryland regulations. The current Plan is for the period from 2024-2033 and is a replacement of the previous Plan adopted by the Mayor and City Council in December 2015. This Plan has been prepared in accordance with current state planning regulations (Code of Maryland Regulations, Title 26, Subtitle 03, Chapter 03, or COMAR 26.03.03), which requires the Plan to address waste management and recycling for a period of at least 10 years.

In this Plan, the capitalized term "City" refers specifically to City Government (including departments and offices) while use of the lower-case term "city" or "Baltimore" or "Baltimore City" all refer to the city in general.

Key updates to this Plan include the prioritization of waste prevention and diversion (recycling), sustainable materials management, and orienting solid waste disposal activities to serve the city's best interests and meet its sustainability goals. This Plan provides the residents of Baltimore with information on the current and future solid waste management system in Baltimore and also outlines ways in which the City can continue to successfully manage and reduce waste by meeting solid waste management goals.

Plan Organization

This Plan is divided into five chapters, the content of which is dictated by COMAR 26.03.03.03:

Chapter 1: "Goals and Regulatory Background" describes the legal and institutional framework for the City's solid waste management system, including City goals and objectives;

Chapter 2: "Background Information" describes relevant demographic and land use information in Baltimore;

Chapter 3: "Existing Solid Waste Management System" includes waste generation data, estimates for waste generation and characterization, and information on current waste management facilities in the city;

Chapter 4: "Assessment of Needs and Constraints" provides an evaluation of the current waste management system and its future potential; and

Chapter 5: "Plan of Action," establishes a plan for the City to achieve its solid waste management goals over the ensuing 10-year period.

Plan Approval Process

This Plan was prepared by Geosyntec Consultants, Inc. (Geosyntec) of Columbia, Maryland in coordination with the Bureau of Solid Waste, a unit of the Baltimore City Department of Public Works (DPW). Within DPW, the Bureau of Water and Wastewater was also asked to provide data and review the information contained in the Plan. Other entities contributing to the Plan were the Baltimore City Department of Planning, Office of Sustainability, Northeast Maryland Waste Disposal Authority, residents, and other local stakeholders.

A draft version of the Plan was submitted to Maryland Department of the Environment (MDE) for preliminary review and comment prior to developing the final Plan, which was later submitted to the Baltimore City Council. A series of public meetings and hearings were held during preparation of the draft Plan, in addition to City Council review. Final review was completed after receiving comments during the approval process. After addressing the comments received, the Mayor and City Council adopted the final plan on TBD. The adopting City Council Resolution is included in Appendix A. MDE's approval letter is included in Appendix B.

Professional Certification

I hereby certify that this document was prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, **License No. 57689** and **Expiration Date 06 June 2023**.

Sean T. O'Donnell, Ph.D., P.E.

Date

1. GOALS AND REGULATORY BACKGROUND

As required by state regulations, Chapter 1 discusses the City's goals regarding solid waste management, the City's administrative structure as it relates to solid waste management, and state, federal, and local laws and regulations which affect the planning, establishment, and operation of solid waste disposal systems.

1.1 Goals and Objectives

Since 1872, Baltimore City has provided solid waste collection and disposal services for its residents. While waste that once was collected in horse-drawn carts is now collected in trash compacting motor vehicles, the original purpose of the solid waste management system remains the protection of public health and the environment. Effective collection and disposal of solid waste is critical to public health, especially in high-density urban areas. To provide effective sanitation services to its residents, the City must use its limited financial resources efficiently to achieve the primary goal of cost-effectively providing and facilitating safe and proper sanitation, including the collection and disposal of wastes generated within the city, while prioritizing reuse, recycling, and recovery of waste.

The City's solid waste management system consists of a blend of public and private services. The City primarily provides collection of waste and recyclables from single-family residences and condominiums under contract with the City, while private contractors provide collection services to most multi-family residences, non-contract condominiums, and commercial and industrial establishments. The City believes it can collect and dispose of residential solid waste most effectively and efficiently through an integrated and comprehensive waste management system that prioritizes source reduction, reuse, and recycling while transitioning away from incineration processes and landfilling for waste disposal. To continue to provide efficient and effective solid waste services to the residents of Baltimore, the City has split its goals and objectives into two categories: goals specific to the planning period covered by this SWMP, and goals guiding overall solid waste management strategy.

1.1.1 Goals Specific to the Planning Period: 2024 to 2033

The City's goals for the ensuing ten-year planning period were developed by assessing the immediate needs of the solid waste management system. These goals are meant to achieve the City's primary solid waste management goal (to cost-effectively provide and facilitate safe and proper sanitation to city residents) while also complying with all relevant state and federal requirements. The City's goals for the planning period of 2024-2033 are to:

1. Change waste and recycling behaviors, increase recycling rates, and decrease contamination through education, outreach, and engagement;
2. Promote legislation that supports waste diversion and source reduction goals;
3. Explore opportunities to increase organics recycling in Baltimore and create local organics processing capacity;

4. Implement waste reduction and diversion strategies as outlined in the Less Waste Better Baltimore Plan, the City's long-term strategic master plan for improving solid waste management and recycling over the next 20-30 years;
5. Provide waste reduction and diversion opportunities, waste and recycling collection services, and waste disposal capacity to city residents;
6. Increase the efficiency and cost effectiveness of the City's solid waste program; and
7. Minimize improper waste disposal, illegal dumping, and littering.
8. Increase the amount of trash that is diverted from disposal at Quarantine Road Landfill (QRL) and WIN Waste Innovations (WIN Waste).
9. Achieve a 35% recycling rate, as defined and required under the Maryland Recycling Act, by 2027.

1.1.2 Goals Guiding Overall Solid Waste Management Strategy

The City's goals guiding overall solid waste management strategy are outlined in a number of planning documents produced by the City. While some of these planning documents are not focused solely on solid waste management, they all contain aspirations and goals related to public health and environmental sustainability in the solid waste sector. These goals provide long-term benchmarks to inspire ambitious solid waste strategy during the planning period. Many of these goals provide a roadmap to achieve zero-waste status in Baltimore by 2040. The City's goals guiding overall solid waste management strategy are summarized in the subsections below according to the planning document in which they appear.

Baltimore Sustainability Plan

The Baltimore Sustainability Plan (BSP) was published in 2019 by the Baltimore Office of Sustainability. The BSP outlines a zero-waste strategy for the City and presents three major goals, with associated action items:

1. Increase the amount of trash that is diverted from disposal to recycling programs. Specific action items include:
    a. Providing free recycling bins to all city residents;
    b. Launching an anti-litter, pro-recycling campaign;
    c. Creating and implementing a zero-waste plan.
2. Expand the City's Waste to Wealth Initiative (see below). Specific action items include:
    a. Implementing the Baltimore Food Waste and Recovery Strategy (BFWRS, see below);
    b. Siting a local compost facility;
    c. Revising codes and creating ordinances to eliminate waste and encourage reuse of deconstructed building materials.
3. Pursue legislative and policy changes to reduce the waste stream. Specific action items include:
    a. Imposing a fee for single-use plastic bags;
    b. Creating a City Government Procurement Committee to incentivize source reduction;
    c. Developing a plan for a "Save as You Throw" program.

Since the BSP's inception, the City has provided free recycling bins to all city residents and implemented a single-use plastic bag bill.

Less Waste, Better Baltimore Plan

In July 2020, the City issued the "Less Waste, Better Baltimore" (LWBB) Plan, a long-term solid waste management and recycling master plan that was informed by the goals of the BSP. The LWBB Plan was intended to:

1. Outline a clear and achievable vision for improving the solid waste and recycling system in Baltimore over both the near- and long-term, with the goal of maximizing waste reduction, reuse/repair, recycling, and sustainable management of materials;
2. Develop actionable strategies to achieve this goal; and
3. Identify potential impacts on existing solid waste management systems, including programmatic and infrastructure needs, investment challenges, and associated policy or regulatory initiatives.

Based on recommendations outlined in the LWBB Plan, the City now provides free recycling carts to all households, designated food waste drop-off locations, is planning for the development of local compost processing facilities, and is considering constructing a materials recovery facility (MRF) to increase diversion and reuse of construction and demolition (C&D) waste.

Waste to Wealth Initiative

The Waste-To-Wealth Initiative was developed by the Baltimore Office of Sustainability to help grow the business sector in Baltimore while reducing overall waste generation. The initiative seeks ways to support local businesses that are using waste (secondary materials) to make products rather than primary (virgin) materials. The initiative acknowledges that while several businesses in Baltimore have already engaged in innovative reuse and repurposing strategies for a wide variety of secondary materials, they need support from the City. By fostering businesses that seek to capture value from secondary materials before they enter the waste stream, it is hoped the City can stimulate job creation, combat urban blight, and encourage resident-led greening efforts to revitalize city neighborhoods. The initiative is designed to do this by targeting three high-value wastes that comprise a significant portion of waste generated in Baltimore:

1. Food waste, which constitutes approximately 13% of the overall waste stream;
2. C&D debris, which makes up over 40% of the overall waste stream; and
3. Wood waste, which makes up only 6% of the overall waste stream but offers significant potential for high value reuse.

Baltimore Food Waste and Recovery Strategy

The Baltimore Food Waste and Recovery Strategy (BFWRS) was published in 2018 by the Baltimore Office of Sustainability. In addition to presenting the reasons to reuse edible food and compost non-edible food waste, the BFWRS highlights seven local case studies and sets goals and strategies for recovering food waste in the city. The ten major goals outlined in BFWRS are as follows, with a target date of 2040 in each case:

1. Reduce commercial food waste by 50%;
2. Eliminate all food waste from higher education institutions;

3. Divert 90% of food and organic waste generated by City Government from landfill or incineration;
4. Reduce household food waste by 80%;
5. Ensure all city residents have access to organic waste collection at home or in their neighborhoods;
6. Divert 80% of residential food and organic waste from landfill or incineration;
7. Create composting and anaerobic digestion facilities capable of processing all the city's organic waste;
8. Support the food waste diversion market by ensuring an adequate supply of organic waste is being diverted to compost and anaerobic digestion facilities;
9. Attain 90% food and recyclable waste diversion in public K-12 schools; and
10. Create a supportive culture for food waste reduction and diversion in K-12 students, faculty, and staff.

To meet the above goals, BFWRS outlines over 60 short-, medium-, and long-term strategies to be implemented by the City, many of which will require significant funding to be approved by the Mayor and City Council.

Climate Change Adaptation and Resilience Planning

To mitigate the severity of future impacts due to climate change, and to adapt to known risks facing a low-lying coastal region, the City is working to instill resilience into vulnerable systems and infrastructure. In addition to a multitude of ongoing projects and initiatives, two plans have been created that focus on mitigation and adaption strategies:

1. Climate Action Plan (CAP). The CAP was originally developed by the Office of Sustainability in 2012 to reduce the city's greenhouse gas emissions through a range of strategies targeted at reducing consumption of fossil fuels. In 2022, new emissions reduction targets, including a cty-wide and municipal operations goal of achieving carbon neutrality by 2045, were set by the City. An updated version of the CAP will be released in 2023 and will serve as the city's roadmap to carbon neutrality. It will include environmental justice-focused climate actions as well as climate mitigation priorities. Solid waste management activities and their associated emissions contributions are included in the CAP along with identified climate mitigation actions.
2. Disaster Preparedness and Planning Project (DP3). The DP3 is Baltimore City's combined hazard mitigation and climate adaptation plan. It recognizes Baltimore's vulnerability to the impacts of severe climate hazard events and the need to increase the city's resilience to disaster. The DP3 was first produced by the Department of Planning in 2013 to not only address existing hazards but also future hazard risks that will be exacerbated by climate change. A FEMA-required 5-year update to the DP3 occurred in 2018 and another 5-year update will be completed by December 2023. Each DP3 update incorporates the latest climate data, highlights the most recent climate-related disasters the city has faced, addresses changes in priorities, and features updated strategies and actions to help Baltimore continue moving forward with hazard mitigation and resilience activities. Hazard Mitigation Plans (HMPs) are required by FEMA to be maintained and updated every 5 years to enable eligibility for certain pre-disaster mitigation and post-disaster recovery funds. Public services such as solid waste management can mitigate challenges created

by climate change, but can also be overwhelmed by fluctuating demands due to changing climate patterns.

Zero Waste Resolution

The Judiciary and Legislative Investigations Committee approved 17-022R, a resolution calling for City agencies and experts to meet and begin discussing "the development of a Zero Waste plan for Baltimore that will advance sustainability, public health, and job creation." The resolution was adopted June 2017. A follow-up resolution 18-0086R was adopted in May 2018. City Council resolutions are an expression of the Council's desires for the city but cannot be enforced through the law.

In April 2019, an advocacy group led by United Workers, a nonprofit organization based in Baltimore, worked independently with certain Council Members to "assist the City of Baltimore to develop a zero-waste scenario for the city's long-range recycling and solid waste management master plan." United Workers funded a consulting group to develop the Baltimore Zero Waste Plan (BZWP), which was presented to the City in April 2020. The BZWP aims to make zero waste a key priority in Baltimore to mitigate climate change, reduce climate emissions and other environmental and public health impacts, save money, support economic mobility, create good jobs and small businesses in all sectors of Baltimore, and sustain this work through culture change.

1.2 Circular Economy and The Waste Management Hierarchy

As outlined above, the City's goals reflect a desire to move toward a circular economy. According to the United States Environmental Protection Agency (EPA), "a circular economy keeps materials, products, and services in circulation for as long as possible" and "reduces material use, redesigns materials, products and services to be less resource intensive, and recaptures 'waste' as a resource to manufacture new materials and products."[1] As such, part of achieving a circular economy is developing methods to reduce, reuse, and recycle as much material as possible such that the amount of disposed material is minimized. This is defined further in the EPA's waste management hierarchy[2] which ranks waste management strategies from most to least favorable as follows:

1. **Source Reduction and Reuse**: Source reduction and reuse can take many forms including reusing or donating items, buying in bulk, reducing packaging, redesigning products, and reducing toxicity. Source reduction is the most environmentally preferred strategy for achieving a circular economy.
2. **Recycling and Composting**: Recycling includes collecting used, reused, or unused items that would otherwise be considered waste, sorting and processing the recyclable products into raw materials, and remanufacturing the recycled raw materials into new products. Composting is the controlled aerobic, biological decomposition of biodegradable materials, including food scraps and yard trimmings, to produce finished compost. Compost is a stabilized product beneficial to

[1] https://www.epa.gov/recyclingstrategy/what-circular-economy#:~:text=It%20is%20a%20change%20to,manufacture%20new%20materials%20and%20products.
[2] https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy

plant growth that has undergone mesophilic and thermophilic temperatures which significantly reduces the viability of pathogens and weed seeds.[3]

3. **Energy Recovery**: Energy recovery from waste is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion, and landfill gas recovery.
4. **Treatment and Disposal**: Treatment can include physical treatment (e.g., shredding), chemical treatment (e.g., incineration), and biological treatment (e.g., anaerobic digestion). Landfills are the most common form of waste disposal.

To move toward a circular economy, this plan uses this solid waste hierarchy and the definitions outlined above to prioritize source reduction, reuse, recycling, and composting options wherever possible.

1.3 Structure of Baltimore City Government

Within City Government, the Department of Public Works (DPW) is the primary agency responsible for planning and implementing solid waste management programs. However, several additional City departments also play a role in solid waste programs, including the Department of Planning (DOP), the Department of Water and Wastewater (DWW), the Department of Recreation and Parks (DRP), the Department of Health (DOH), the Department of Transportation (DOT), the Department of Housing and Community Development (DHCD), the Department of General Services (DGS), and the Department of Education (DOE). A more detailed description of the organization and structure of DPW is provided below; the role of other City departments in the solid waste system is highlighted in Section 3.

1.3.1 Department of Public Works

DPW is responsible for fulfilling the City's solid waste management obligations. Figure 1-1 below shows the DPW organizational structure.

[3] https://www.compostingcouncil.org/page/CompostDefinition

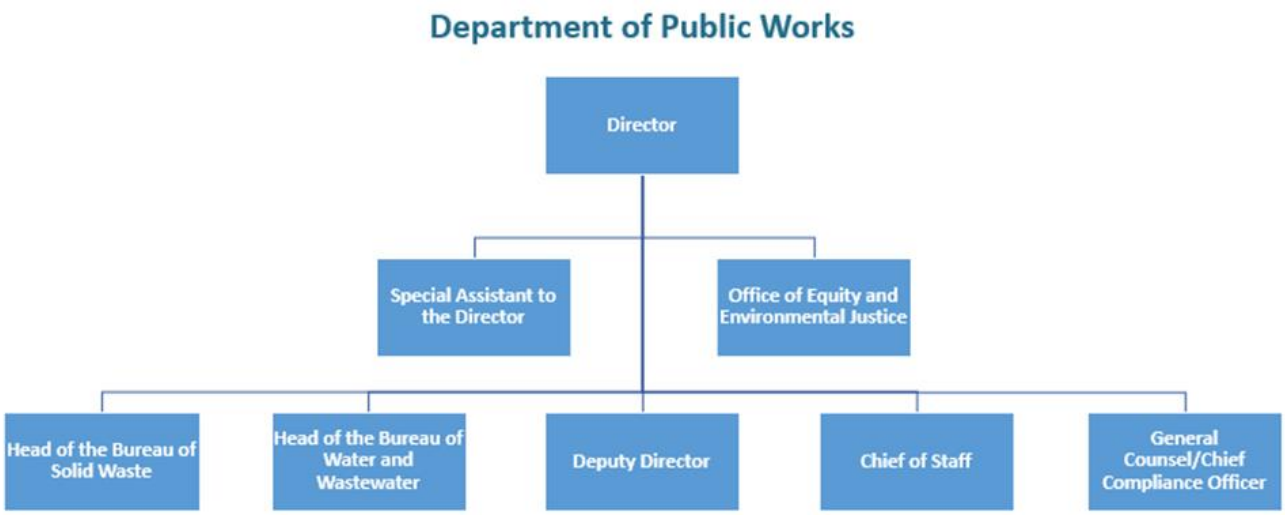


Figure 1-1. Baltimore City DPW

Within DPW, the Bureau of Solid Waste (BSW) is the entity that plans and implements solid waste management programs.

1.3.2 Bureau of Solid Waste

The Bureau of Solid Waste is comprised of eight divisions. Figure 1-2 below displays the organizational structure of BSW's leadership team. Thereafter, a brief description of each division is provided in the remainder of Section 1.2.

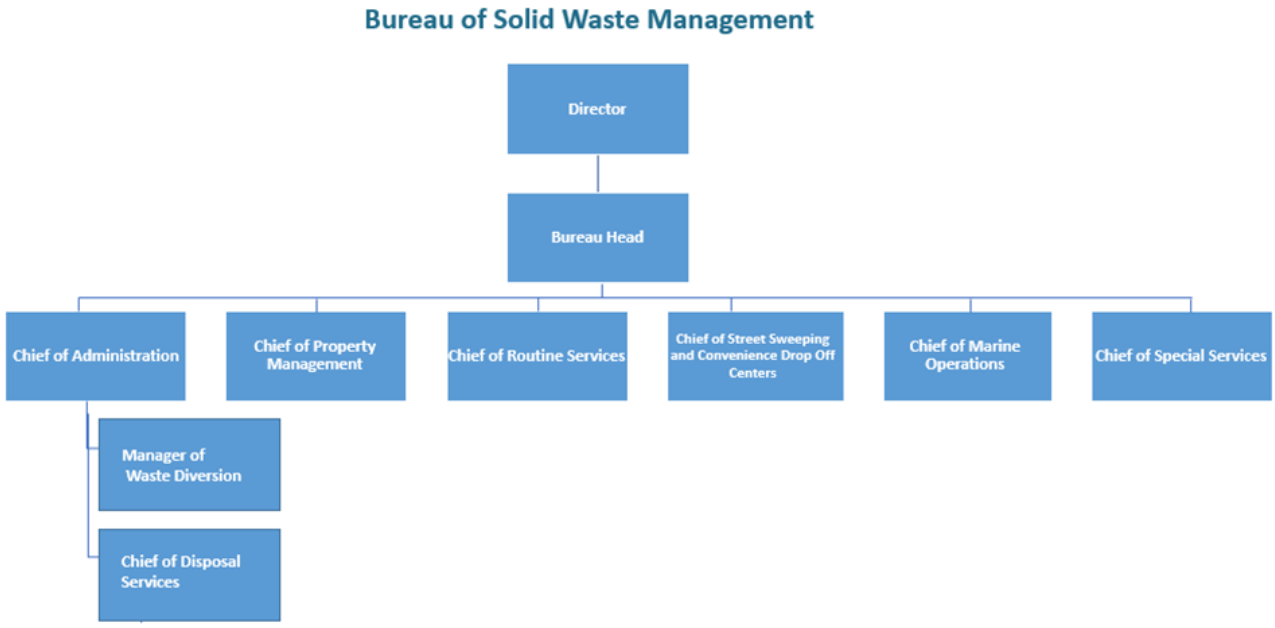


Figure 1-2. Bureau of Solid Waste Management Organizational Structure

1.3.3 Office of Administration

The Office of Administration provides administrative support to perform data compilation for reports, analyzes operations to maximize efficiency, manages solid waste contracts and works closely with internal and external stakeholders to create sustainable initiatives that correlate with disposal services, recycling, and zero waste education. Figure 1-3 below shows the organizational structure of the Office of Administration.

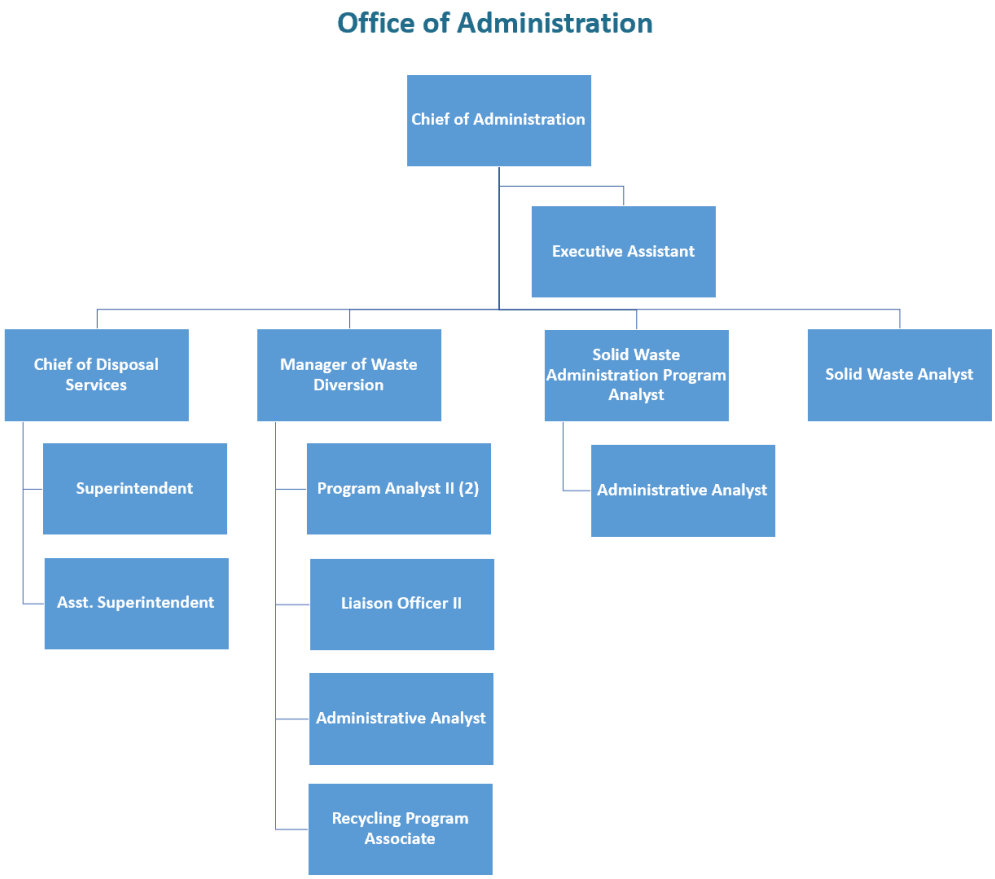


Figure 1-3. Office of Administration Organizational Structure

1.3.4 Office of Waste Diversion

The Office of Waste Diversion plans and manages initiatives and studies designed to advance zero waste and sustainable materials management efforts across BSW operations. They also provide administrative support for the City's recycling services and act as a resource for residents to find information about recycling, composting, and solid waste services.

The Office of Waste Diversion's responsibilities include:

1. Developing, implementing, and evaluating BSWs zero waste and waste diversion pilot programs;
2. Annual reporting, including a report on the City's efforts to remediate illegal dumping, Maryland Recycling Act compliance, and other reports;
3. Updating the City's 10-Year Solid Waste Management Plan;
4. Coordinating the Mayor's community-focused annual Spring and Fall litter cleanup events;
5. Providing administrative support for the City's Recycling Program;
6. Researching and pursuing industry best practices for advancing zero waste;
7. Providing feedback on proposed legislation pertaining to BSW operations;

8. Facilitating education and outreach initiatives with residents on waste diversion programs;
9. Managing BSW grants; and
10. Conducting research and extensive planning functions to develop and recommend capital improvements that prioritize sustainable materials management principles.

Figure 1-4 below shows the organizational structure of the Office of Waste Diversion.

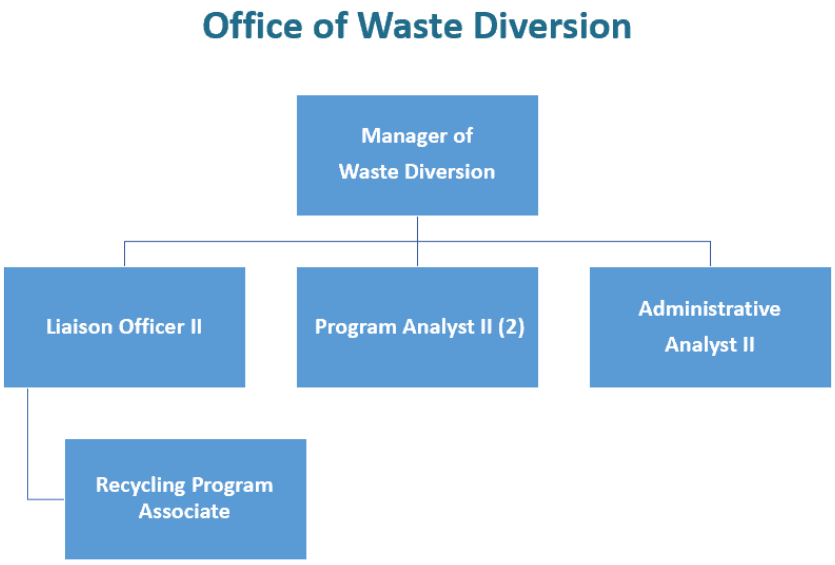


Figure 1-4. Office of Waste Diversion Organizational Structure

1.3.5 Disposal Services Division

The Disposal Services Division manages mixed refuse and recycling materials at Quarantine Road Landfill (QRL) and the Northwest Transfer Station (NWTS). The Disposal Services Division performs the following services:

1. Operating QRL and NWTS;
2. Managing the Small Hauler's Program at QRL and NWTS;
3. Maintaining all closed landfills owned by the City; and
4. Managing partnership with the U.S. Coast Guard to operate landfill gas collection system.

Figure 1-5 below shows the organizational structure of the Disposal Services Division.

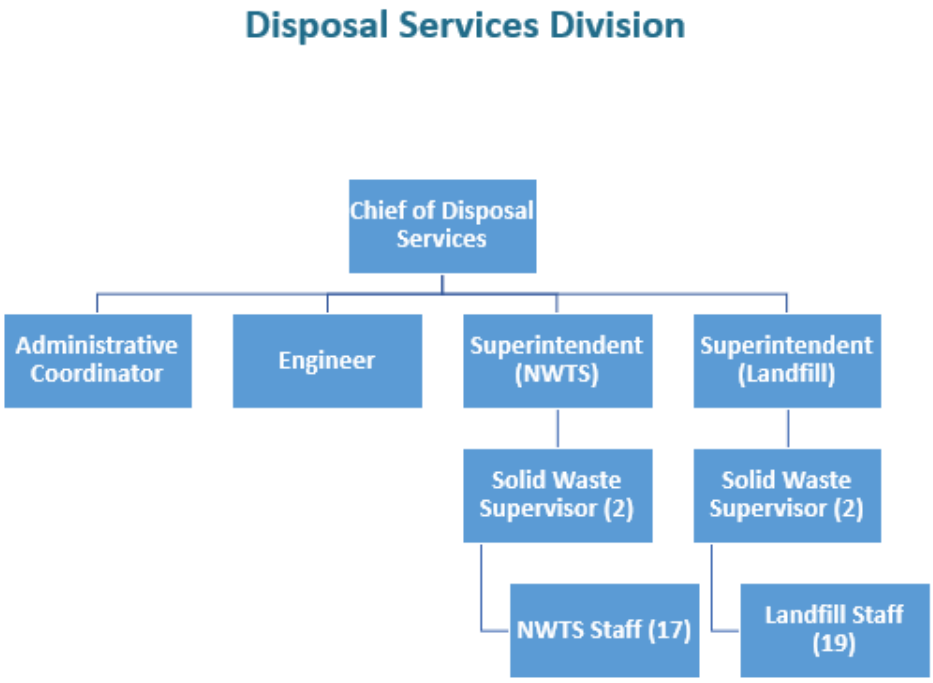


Figure 1-5. Disposal Services Division Organizational Structure

1.3.6 Property Management Division

The Property Management Division provides cleaning, waste removal, boarding, and mowing services to vacant and unoccupied properties. In addition to rodent control services to city residents as requested. The structure of the property management division is shown in Figure 1-6.

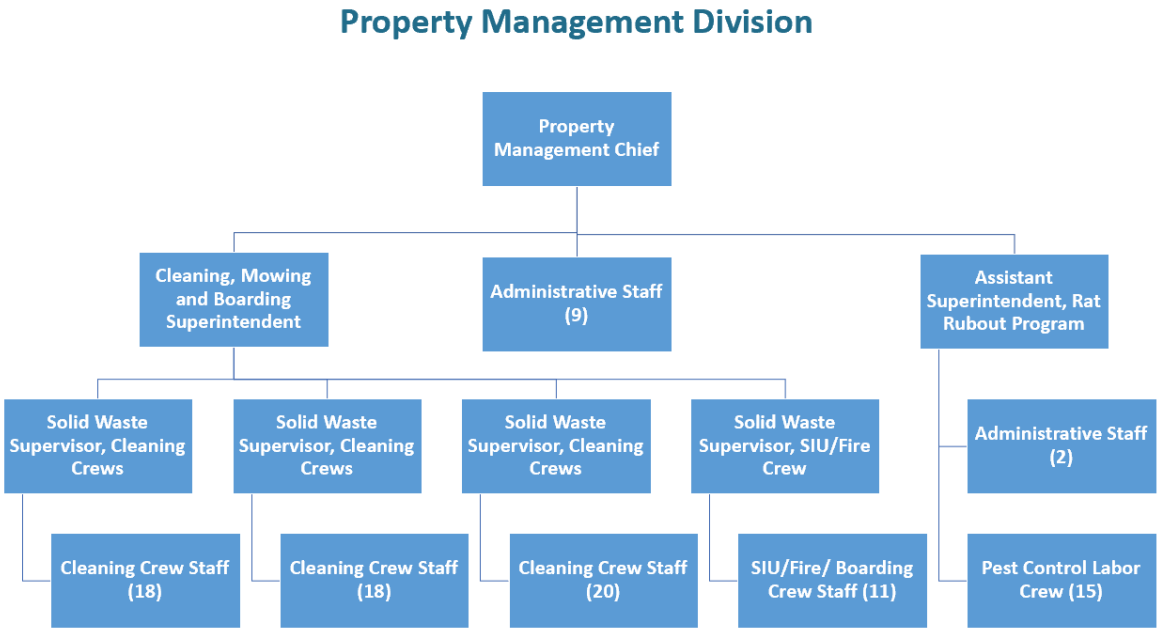


Figure 1-6. Property Management Division Organizational Structure

1.3.7 Routine Services Division

The Routine Services Division provides residents with waste and recycling pickup from households and multi-family dwellings. Routine Services also provides recycling administration and funding for household hazardous waste disposal services. The organization of the Routine Services Division is shown in Figure 1-7 below.

Figure 1-7. Routine Services Division Organizational Structure

1.3.8 Street Sweeping and Roll-off Division

The Street Sweeping and Roll-Off Division runs mechanical street sweeping operations. This division also oversees drop off centers and community pitch-in programs. The organization of the Street Sweeping and Roll-off Division is shown in Figure 1-8 below.

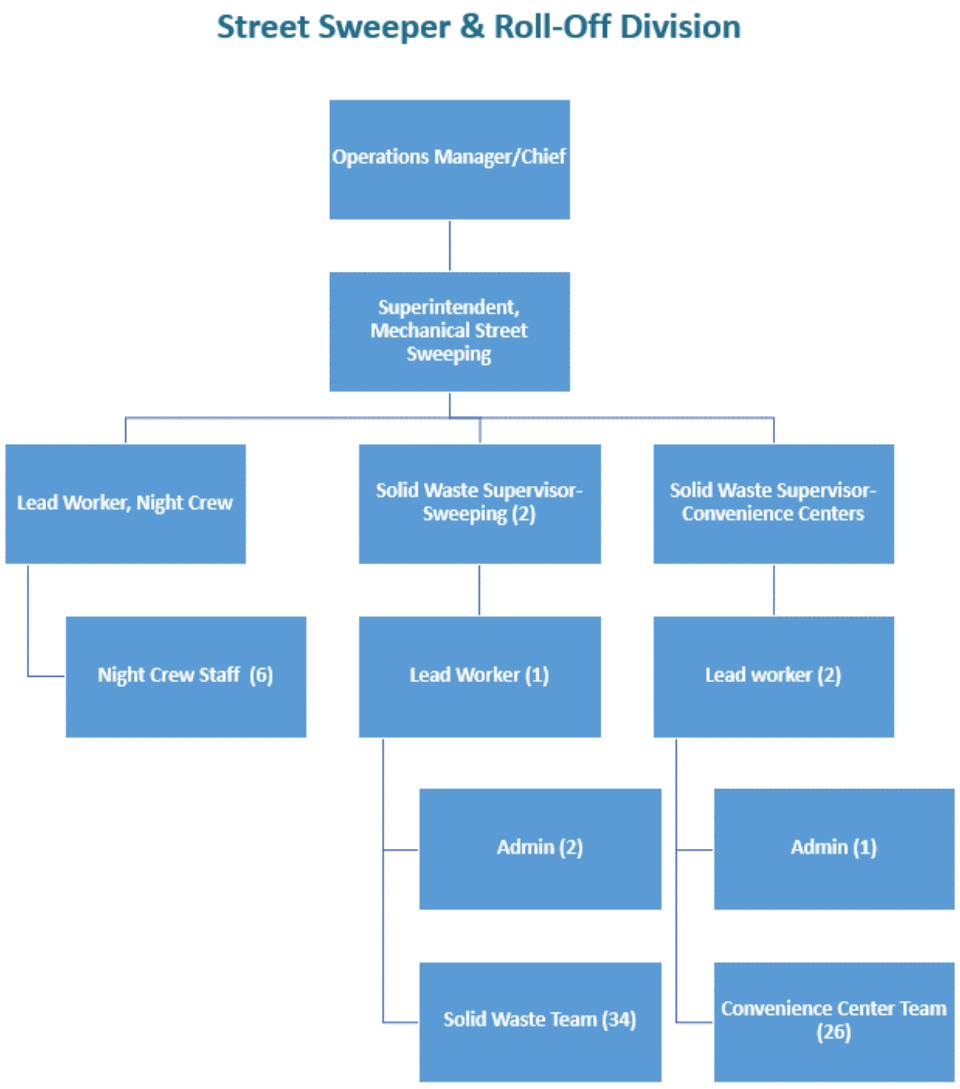


Figure 1-8. Street Sweeping and Roll- Off Division Organizational Structure

1.3.9 Marine Operations Division

The Marine Operations Division oversees collection and disposal of marine debris collected from the inner harbor and surrounding waterways, as well as condominium and public housing refuse collection. The division ensures the cleanliness of business districts, provides trash and recycling services for special events and clears debris away from storm drains to protect water quality. The Marine Operations Chief is also responsible for special waste collection services in the Central District (i.e., the downtown area).

Figure 1-9 below shows the organizational structure of the Marine Operations Division.

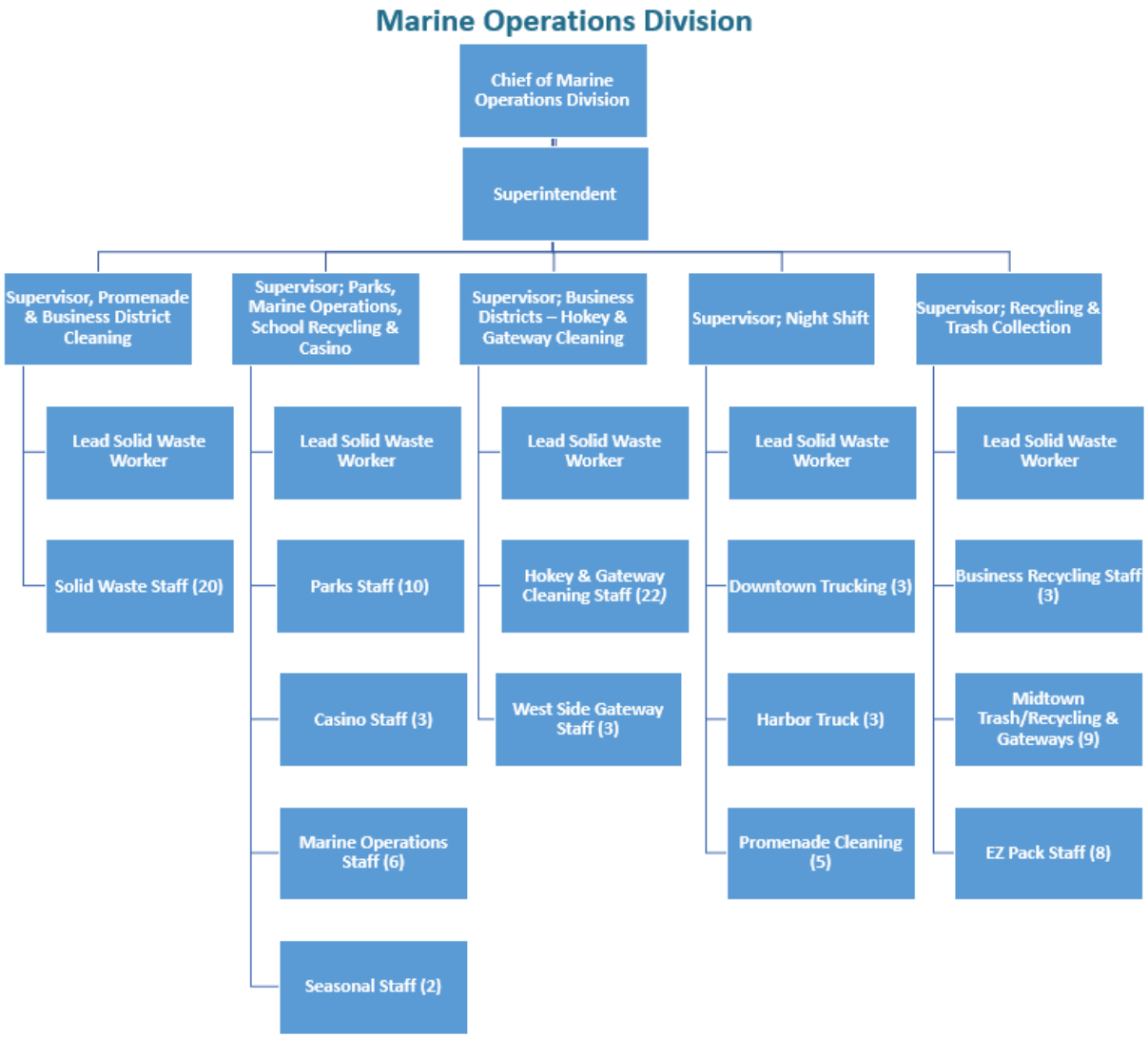


Figure 1-9. Marine Operations Division Organizational Structure

1.3.10 Special Services Division

The Special Services Division maintains the cleanliness of public rights-of-way by providing services including graffiti removal, dirty street cleaning, dirty alley cleaning, and bulk trash collection. The organization of the Special Services Division is shown in Figure 1-10 below.

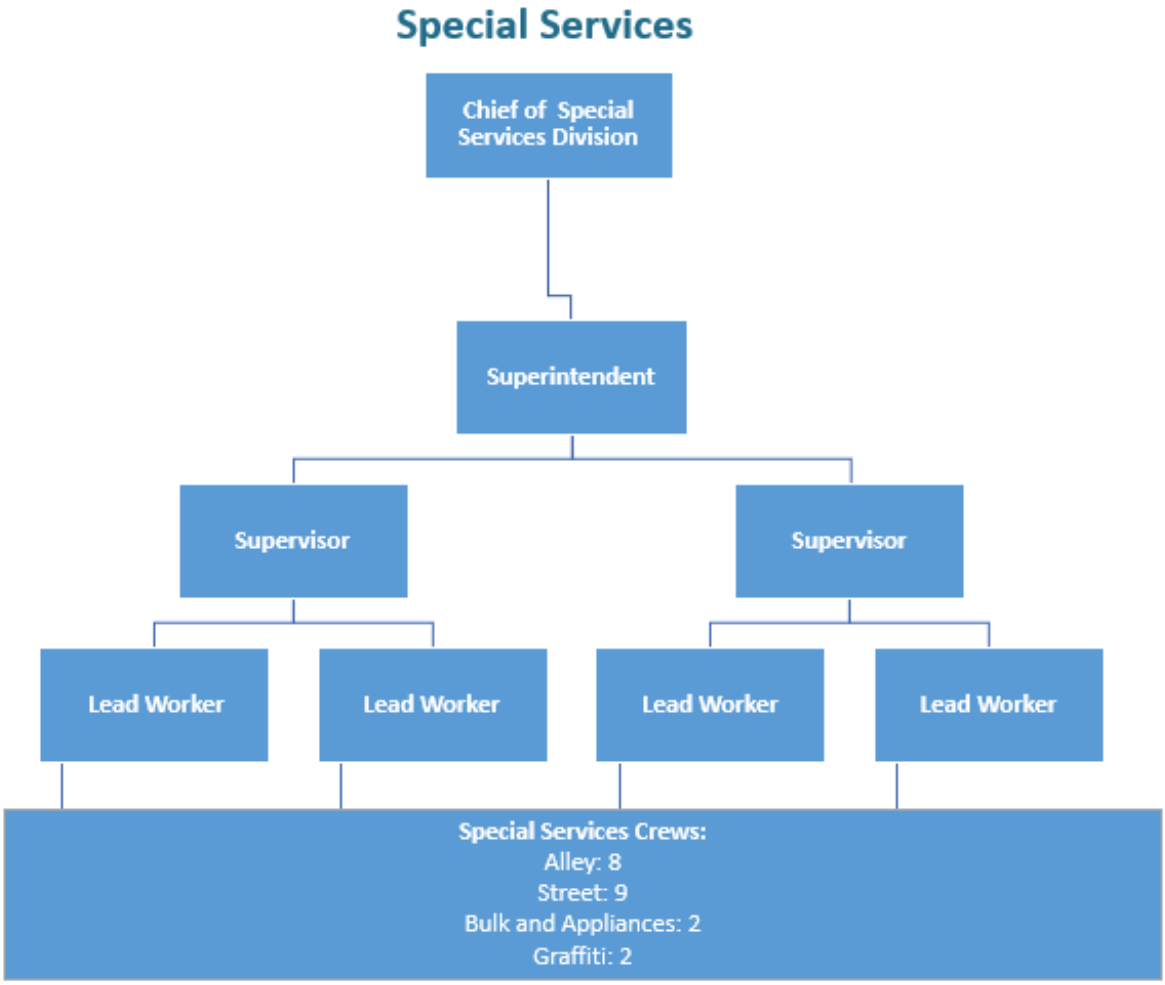


Figure 1-10. Special Services Division Organizational Structure

1.4 Regulatory Framework

Solid waste planning is a local responsibility, governed by federal and state laws that regulate local practices to protect public health and welfare. The major federal, state, and city laws and regulations related to solid waste management are listed below. The implications of these laws and regulations are discussed throughout this Plan. These laws and regulations have been grouped by level of application (federal, state, and local) below.

1.4.1 Federal Laws and Regulations

The federal laws, initiatives, and policies relevant to this Plan include those focusing on municipal solid waste (MSW), special and hazardous waste, air emissions, and water pollution. A summary of relevant federal legislation and guidance is provided below.

Federal Resource Conservation and Recovery Act

(42 U.S.C. 6901 et seq.)

In 1976, the Federal Resource Conservation and Recovery Act (RCRA) was passed to improve solid waste disposal methods. RCRA provides regulatory guidelines for solid waste collection, transport, separation, recovery, and disposal practices and systems." RCRA is divided into nine subtitles, A through I. RCRA subtitles C, D, and F provide specific guidance related to hazardous and municipal waste.

Subtitle C of RCRA established the hazardous waste management system, including identifying and listing hazardous wastes, established standards for generators and transporters, and for the management of hazardous wastes for the owners and operators of hazardous waste treatment, storage, and disposal facilities. The regulations require stringent administrative and record keeping practices by permitted facilities.

Under Subtitle D, municipal solid waste is regulated through technical standards for solid waste management facilities and a program under which states may develop and implement solid waste management plans. The federal regulations set forth minimum criteria for municipal solid waste landfills including location restrictions, operating requirements, design criteria, groundwater monitoring and corrective action protocols, closure and post-closure care requirements, and financial assurance requirements.

Subtitle F of RCRA requires the federal government to participate actively in procurement programs to promote the use of recycled materials. The role of the EPA in the Subtitle F program is to prepare guidelines for procurement of products made from recovered materials.

Federal Comprehensive Environmental Response, Compensation, and Liability Act

(42 U.S.C. 9601 et seq.)

In December 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly referred to as the "Superfund" Act. In contrast to RCRA, which generally regulates active waste handling and disposal, CERCLA focuses on both short-term and long-term remediation of past contamination. The federal government can use the Superfund trust fund to clean up a property and then sue the responsible parties for reimbursement, or the government may order responsible parties to clean up the site. Maryland has created a parallel State Superfund, the Hazardous Substance Control Fund. CERCLA identified in its National Priorities List (NPL) two sites in Baltimore as Superfund sites. One site at the intersection of Kane and Lombard streets used to contain nearly 1,200 drums of flammable solids, but has been converted to a golf driving range. The other location at 2001 and 2103 Annapolis Road was removed from the NPL in December 1982, and is now used by MDE as an Emergency Response Field Office.

Code of Federal Regulations

(Title 40, Subchapter 1)

Brief summaries of the regulations pertaining to solid waste management in Title 40, Subchapter 1 of the Code of Federal Regulations are provided below:

- Part 240: Guidelines for the Thermal Processing of Solid Wastes. Establishes minimum performance levels for MSW incinerators.
- Part 243: Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste. Establishes minimum performance levels for solid waste collection operations, and addresses issues including storage safety, collection management and frequency, and equipment management.
- Part 246: Source Separation for Materials Recovery Guidelines. Establishes the minimum actions recommended to recover resources from solid waste.
- Part 247: Guidelines for the Procurement of Products that Contain Recycled Materials. Establishes recommendations for procedures and specifications for procurement of recycled material products.
- Part 255: Identification of Regions and Agencies for Solid Waste Management. Establishes procedures for identification of regional solid waste management planning districts.
- Part 256: Guidelines for Development and Implementation of State Solid Waste Management Plans. Established guidelines for development and implementation of state solid waste management plans.
- Part 257: Criteria for the Classification of Solid Waste Disposal Facilities and Practices. Establishes criteria used to determine which solid waste facilities could adversely affect human health and the environment. Criteria under Part 257 do not cover municipal landfills, as these are covered under Part 258. Facilities found to violate Part 257 are considered “open dumps”.
- Part 258: Criteria for Municipal Solid Waste Landfills (Subtitle D Regulations). Establishes minimum national criteria for the design and operation of MSW landfills, including operating, closure/post-closure, corrective action, groundwater monitoring, financial assurance and design criteria, as well as location restrictions. Design standards under Part 258 apply only to new landfills and lateral expansions of existing facilities.
- Part 260: Hazardous Waste Management System – General. Establishes definitions and an overview of Parts 260 through 265.
- Part 261: Identification and Listing of Hazardous Waste. Provides identification of materials classified and regulated as hazardous wastes under Parts 270, 271, and 124.
- Part 264: Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. Establishes minimum national standards for the management, storage, and disposal of hazardous wastes.
- Part 265: Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal facilities. Establishes minimum national standards for management of hazardous wastes throughout periods of interim status, until the facility in question receives certification of post-closure or closure.
- Part 266: Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Disposal Sites. Establishes minimum national standards for recyclable materials used in a manner to constitute disposal, hazardous waste burned for energy recovery, used oil

burned for energy recovery, recyclable material used for precious metal recovery, and spent lead-acid batteries being reclaimed.

- Part 270: EPA Administered Permit Programs: The Hazardous Waste Permit Program. Establishes application requirements, standard permit conditions, monitoring, and reporting requirements for EPA permitting for the treatment, storage, and disposal of hazardous waste.
- Part 271: Requirements for Authorization of State Hazardous Waste Programs. Identifies the requirements for state programs to fulfill interim and final authorization, and the EPA procedures to approve, revise, and withdraw approval of state hazardous waste management programs.
- Part 272: Approved State Hazardous Waste Programs. Establishes existing approved and applicable state hazardous waste management programs.
- Part 273: Standards for Universal Waste Management. Establishes requirements for the management of universal waste, including batteries, pesticides, mercury-containing equipment, and lamps.
- Part 503: Standards for the Use or Disposal of Sewage Sludge. Establishes standards, including general requirements, pollutant limits, management practices, and operational standards for final use or disposal of sewage sludge generated during domestic sewage treatment.

Save Our Seas 2.0 Act

(Public Law 116-224)

In December 2020, the Save Our Seas 2.0 Act was signed into law. The Act contains three titles that enhance the United States' domestic programs to address marine debris, international engagement to combat marine debris, and domestic infrastructure to prevent marine debris. Among other actions, the Act authorized the creation of the Marine Debris Foundation to support the marine debris activities of the National Oceanic and Atmospheric Administration, established grant programs for studies of waste management and mitigation, and formalized U.S. policy on international cooperation with respect to marine debris.

Infrastructure Investment and Jobs Act

(Public Law 117-58)

The Infrastructure Investment and Jobs Act, also referred to as the Bipartisan Infrastructure Law, provides $275 million for Solid Waste Infrastructure for Recycling grants. This is allocated as $55 million per year from Fiscal Years 2022 to 2026 to remain available until expended. The EPA was provided an additional $2.5 million in Fiscal Year 2022 funding to implement the program. The Solid Waste Infrastructure for Recycling grant program is authorized by the Save Our Seas 2.0 Act.

The Solid Waste Infrastructure for Recycling program provides grants to implement recycling strategies to improve post-consumer materials management and infrastructure; support improvements to local post-consumer materials management and recycling programs; and assist local waste management authorities in making improvements to local waste management systems.

RECYCLE Act

(Public Law 117-58)

The Recycling Enhancements to Collection and Yield through Consumer Learning and Education (RECYCLE) Act was introduced in the U.S. Senate by Senator Rob Portman (R-OH) and was signed into law as part of the Bipartisan Infrastructure Law in November 2021. RECYCLE creates a program within the U.S. EPA to bolster recycling education and authorizes up to $15 million per year over five years in grants to states, tribes, nonprofits, public partnerships, and local governments to ramp up commercial and municipal recycling outreach and education. Under the law, the EPA is directed to develop a model recycling toolkit to bolster recycling participation and decrease contamination rates. Where appropriate, the act also tasks the EPA with updating guidelines for products containing recycled material more frequently, as well as recommending that federal agencies purchase those items.

Winning on Reducing Food Waste Initiative

On 9 April 2019, the U.S. EPA, U.S. Dept. of Agriculture (USDA), and Food and Drug Administration (FDA) issued a federal interagency strategy for reducing food waste, as part of the "Winning on Food Waste" initiative. The strategy includes six priorities to work towards a national goal of reducing food loss and waste by 50% by 2030. The priorities include improving interagency coordination; increasing education and outreach; improving guidance and collaboration with private industry; and encouraging food waste reduction within the federal government.

Federal Clean Air Act

(42 U.S.C. 7401 et seq.)

The Clean Air Act (CAA) Amendments of 1970 passed by Congress established the current framework for federal and State enforcement of air pollution standards. The Act authorizes the federal government, through the EPA, to set standards for the control of air pollution and directs the State toward achievement of these standards. Title I of the CAA relates to emissions from landfills and authorizes regulations on emission collection and control. Title V of the CAA addresses pollutants with potential to emit, and authorizes regulations related to permitting for polluters. Landfills are subject to Title I and must obtain a Title V permit, in addition to any other facility that is considered a "major source" of pollutants under the CAA. Federal New Source Performance standards under the CAA impose national emission standards for newly constructed or modified industrial facilities, by imposing limitations based on the pollution control technology available to each category of new sources. The EPA has published guidance for new source review to ensure that major new sources do not adversely affect states' attempts to achieve compliance with the national ambient standards. This program was designed to ensure that air quality would not significantly deteriorate in areas where the ambient standards are being met, primarily controlling new sources of pollution.

Federal Clean Water Act

(33 U.S.C. 1251 et seq.)

The Clean Water Act is the framework for federal and State enforcement of water pollution control laws. The Clean Water Act's objective is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Section 402 of this act establishes the National Pollutant Discharge Elimination System (NPDES) program to address the discharge of wastewater and runoff from solid waste

management facilities into surface waters. NPDES permits are now required for stormwater discharges associated with industrial activity and discharges from municipal separate storm sewer systems under 40 CFR 122.26. Among those entities considered to be engaging in industrial activity are landfills that receive or have received any industrial wastes, and facilities involved in the recycling of materials. The construction of facilities that may impact any rivers, lakes, marshes, swamps, or wetlands of the United States is addressed by Section 404, administered by the Army Corps of Engineers. Section 405 addresses the disposal of wastewater treatment biosolids.

Safe Drinking Water Act

(42 U.S.C 300f et seq.)

The Safe Drinking Water Act established regulations to protect human health from contaminants in drinking water. This Act established maximum contaminant levels for parameters included in groundwater monitoring programs.

EPA Actions to Address Per- and Polyfluoroalkyl Substances (PFAS)

The EPA has recently taken several steps to reduce PFAS contamination in the environment. For example, in December 2022, EPA issued guidance for states and municipalities to use the most current sampling and analysis methods in their NPDES programs to identify known or suspected sources of PFAS and to take actions using their pretreatment and permitting authorities. EPA has also proposed to designate the most widely used PFAS substances under CERCLA. Additional information can be found here.

Federal Emergency Management Act

The Federal Emergency Management Act (FEMA) prohibits landfill siting within 100-year floodplain areas. Subtitle D of this act provides exceptions for units not preventing or restricting flows on the 100-year floodplain, reducing the temporary or permanent storage capacity of the 100-year floodplain, or resulting in washout of solid waste.

Public Utilities Regulatory Policies Act

Encourages co-generators and small power producers, such as municipal solid waste combustors, to supplement their existing electrical utility capacity. The Federal Energy Regulatory Commission is responsible for implementing regulations and setting limits on the power output of these facilities.

Break Free from Plastic Pollution Act (Introduced)

U.S. Senator Jeff Merkely (D-OR) and U.S. Representative Alan Lowenthal (D-CA) introduced the Break Free from Plastic Pollution Act in March 2021 to tackle the plastic waste crisis. The full text of the bill can be found here.

Despite having 128 co-sponsors in the House and 15 in the Senate, the legislation stalled in 2022 and has not moved forward as of January 2023.

1.4.2 Maryland State Laws and Regulations

The state laws, initiatives, and policies relevant to this Plan include those focusing on MSW, special and hazardous waste, air emissions, and water pollution. The Annotated Code of Maryland, as amended, includes all state laws passed by the legislature. Laws addressing solid waste management are included in the Environment Article, which contains many of the laws affecting the location, design, and operation of solid waste disposal facilities. Under the authority of Title 9, Subtitle 5, MDE is the State's principal regulatory agency with respect to solid waste management and serves as the State's lead agency for implementation of RCRA. State regulations are compiled into a document entitled Code of Maryland Regulations (COMAR). A summary of relevant state legislation and guidance is found below.

Maryland Solid Waste Management Regulations

(COMAR 26.04.07)
This chapter of COMAR includes permitting requirements, operating procedures, closure requirements, and post-closure monitoring requirements for sanitary, rubble, land clearing debris, and industrial landfills. This chapter also describes permitting and operating procedures for processing facilities, transfer stations, and incinerators. In addition, this chapter provides guidelines and requirements for construction plans, specifications, and operation procedures for waste acceptance facilities.

Development of County Comprehensive Solid Waste Management Plans

(COMAR 26.03.03 and Environment Article, Annotated Code of Maryland § 9-503)
These chapters require that each county adopts and submits to MDE a 10-year comprehensive Plan that deals with solid waste management. After submission to MDE for review, public hearing, and adoption of any required changes, the Plan is revised as necessary and resubmitted to MDE for approval. Approved Plans are required to be reviewed at least every three years and updated or amended as necessary. Plans are required to undergo comprehensive revision at least every ten years.

Storage, Collection, Transferring, Hauling, Recycling, and Processing of Scrap Tires

(COMAR 26.04.08)
This section of COMAR establishes a regulatory system for proper management of scrap tires. MDE authorizes scrap tire facilities and haulers by issuing licenses and approvals for facilities. The regulations provide general technical and operational standards for scrap tire facilities including storage procedures, closure procedures, and financial assurances. The system is funded by a recycling fee of $0.80 for each new tire sold in the State.

Natural Wood Waste Recycling Facilities

(COMAR 26.04.09)
Management of natural wood waste recycling facilities is regulated under this part of COMAR. Permitting requirements for processing facilities are established and general operational requirements and procedures are prescribed.

Rubble Landfill Regulations

(COMAR 26.04.07.13-26.04.07.18)
These regulations require liners and leachate collection systems for any new rubble facilities or new cells at existing facilities.

Hazardous Materials and Hazardous Substances

(Environment Article of the Annotated Code of Maryland §§ 7-101 through 7-516)
This part of the Environment Article defines controlled hazardous substances, establishes requirements for facility permits, imposes obligations on transporters, and provides for appropriate enforcement actions.

Maryland Used Oil Recycling

(Natural Resources Article of the Annotated Code of Maryland § 8-1401)
In this subtitle, the Maryland Legislature expressed its desire that used oil be collected and recycled to the maximum extent possible. The Department of Natural Resources is required to develop a public education program and to designate used oil collection facilities. The Act prohibits disposal of used oil into sewers, drainage systems, natural waters, by incineration, or as refuse.

Maryland Hazardous Waste Regulations

(COMAR 26.13)
These rules concern the disposal of Controlled Hazardous Substances. Included are definitions of what is hazardous waste; standards applicable to generators of hazardous waste; and standards for owners and operator of hazardous waste treatment, storage, and disposal facilities.

Management of Special Medical Wastes

(COMAR 26.13.11 through 26.13.13)
The definition of special medical wastes is set forth and standards for generators are established including a manifest system to track the transportation of special medical wastes. Standards for transport vehicles are established. Special medical wastes include anatomical material and blood-soiled articles.

State Laws Governing the Construction and Operation of Solid Waste Acceptance Facilities

(Environment Article of the Annotated Code of Maryland §9-101 through §9-229)
Subtitle 2, Part II of the Environment Article, establishes permit requirements to construct and operate refuse disposal systems (sanitary, rubble, and industrial landfills; transfer stations; solid waste acceptance facilities; solid waste processing facilities; and incinerators) as part of the State's overall power to regulate water supply, sewerage facilities, and refuse disposal systems. It sets forth requirements for public hearings for waste disposal facilities; landfill permit provisions (issuance, denial, revocation, term); security requirements for landfills, incinerators, and transfer stations; prohibitions on locating and accepting waste; and financial assurance requirements for sanitary landfills.

Under § 9-228, scrap tires may not be stored longer than 90 days, and a Statewide scrap tire recycling system is established. The material from scrap tires is to be recovered and reused; or, if this is impractical, the tires may be incinerated. Scrap tires may not be disposed of in a landfill.

Under §§ 9-1701 and 9-1708, a system for wood waste recycling activities is established. Recycling of tree debris, grass clippings and other natural vegetative matter is regulated under COMAR 26.04.09.

State Laws Affecting Recycling and Composting

A summary of the state laws affecting recycling and composting that are of specific relevance to preparation of this Plan is as follows:

1. Maryland Recycling Act (1988): The Maryland Recycling Act (MRA) established a requirement for Maryland counties, based on a population of less than or exceeding 150,000, to reduce the County's waste stream by 15% or 20%, respectively;
2. Sludge Application (1993): Regulates land application of sludges to protect the public health;
3. Electronic Waste Recycling (2005): Requires computer manufacturers to pay an annual fee to fund local computer recycling programs;
4. Public School Recycling Plans (2010): Requires Counties to revise their Plans to address collection, processing, marketing, and disposition of recyclable materials from public schools;
5. Fluorescent and Compact Fluorescent Light Recycling (2011): Requires Counties to revise their Plans to include a strategy for collection and recycling of fluorescent and compact fluorescent lights that contain mercury;
6. Recycling – Apartment Buildings and Condominiums Act (2012): Requires Counties to revise their Plans to address collection and recycling at apartment buildings and condominiums as well as a method for implementing a reporting requirement, and requires building owners, managers, and councils with ten or more dwelling units to provide for recycling for residents on or before 1 October 2014;
7. Recycling Rates and Waste Diversion – Statewide Goal Act (2012): A revision to the 1988 MRA, this act requires Counties to revise their Plans to achieve an increase in the countywide recycling rate to 20% (counties with populations below 150,000) or 35% (counties with populations above 150,000) of the county's solid waste stream by 1 July 2014, with full implementation by 31 December 2015; and
8. Recycling – Special Events Act (2014): Requires Counties to revise their Plans to address collection and recycling by organizers of certain special events, with implementation required before 1 October 2015;
9. Environment – Recycling – Office Buildings Act (2019): Requires Counties to revise their Plans to include an Office Building Recycling Program (OBRP) to address recycling from office buildings with 150,000 square feet of office space or greater;
10. Organic Waste – Organics Recycling – Collection and Acceptance for Final Disposal (2019): Prohibits the owner or operator of a refuse disposal system from accepting loads of separately collected organic waste for final disposal unless the owner or operator provides organics recycling;
11. Expanded Polystyrene Food Service Products Ban (2020): Imposes a ban on the sale and use of food service products composed of expanded polystyrene;

12. Food Scraps Management (2021): House Bill 264 (HB264) requires large food waste generators to divert food waste from disposal if those generators are located within 30 miles of an organics recycling facility with capacity and willingness to enter into a contract.
13. Maryland Recycling Act – Recyclable Materials and Resource Recovery Facilities – Alterations (2021): House Bill 280 (HB280) altered the definition of "recyclable materials" under the Maryland Recycling Act to exclude incinerator ash and repealed the authority of a county to utilize a resource recovery facility to meet 5% of the waste reduction required to be achieved through recycling in the county's recycling plan.

State Ambient Air Quality Control Laws

(Environment Article of the Annotated Code of Maryland §§ 2-101 through 2-614)
This title of the State Code authorizes the regulation for the construction, modification, operation, and use of sources and controls over emissions. It authorizes the adoption of rules and regulations for air pollution control including testing, monitoring, recordkeeping, and reporting. It allows for the identification of air quality control areas and mandates that MDE set emission and ambient air quality standards for air quality control areas. Training for municipal solid waste incinerator operators is required under these provisions of the law.

Control of Incinerators

(COMAR 26.11.08)
Air emissions and operation of incinerators, which thermally destruct municipal solid waste, industrial waste, special medical waste, and sewage sludge, are regulated by this section of COMAR. The regulations require continuous monitoring of air emissions. Incinerators must also comply with general emission standards in COMAR 26.11.06.01 – 12 and 40 CFR § 60.

Voluntary Cleanup Program

(Environment Article of the Annotated Code of Maryland §§ 7-501 through 7-516)
One problem arising from CERCLA was the extreme difficulty involved with the redevelopment of "Brownfields". Brownfields are abandoned or underutilized properties where redevelopment is complicated by real or perceived environmental contamination. Recognizing this problem, EPA devised the *Brownfields Economic Redevelopment Initiative*. This program is designed to empower states to assess, safely cleanup, and vitally reuse brownfields. From this initiative, the State of Maryland established its Voluntary Cleanup Program which provides a streamlined remediation approval process, changes the liability scheme for prospective developers, and clarifies liability for all participants in the program.

Maryland Water Pollution Control Regulations

(COMAR 26.08)
These regulations contain:

1. Water quality standards that specify the maximum permissible concentrations of pollutants in water, the minimum permissible concentrations of dissolved oxygen and other desirable matter in the water, and the temperature range for the water;
2. Effluent standards that specify the maximum loading or concentrations and the physical, thermal, chemical, biological, and radioactive properties of wastes that may be discharged into the waters of the State;
3. Procedures for water pollution incidents or emergencies that constitute an acute danger to health or the environment; and
4. Provisions for equipment and procedures for monitoring pollutants, collecting samples, and logging and reporting of monitoring results.

As part of this regulatory scheme, these regulations require a discharge permit for discharges of wastes, wastewater, and stormwater into the waters of the State. Sanitary landfills and incinerators receive special attention to determine whether they contribute pollution to stormwater runoff.

Legislation Not Passed or Repealed

The State Legislature has previously considered, but not passed, bills related to recycling of solar photovoltaics; prohibiting restaurants from providing single-use plastic straws to customers; recycling/diversion of paint; and encouraging recycling of mattresses and box springs. These are listed here as a reminder that they may remain in consideration in upcoming sessions.

In December 2014, MDE published a guidance document titled "Zero Waste Maryland: Maryland's Plan to Reduce, Reuse, and Recycle Nearly All Waste Generated in Maryland by 2040," which set an overall 80% recycling goal and 85% waste diversion goal by 2040. Although the Zero Waste Plan was subsequently repealed in 2017, it may be reissued in the future.

1.4.3 City Codes and Ordinances

The City has enacted several ordinances and codes pertaining to solid waste management, recycling, air quality, and water quality.

Septage Management

Article 25 of the Baltimore City Code provides the mechanism for the City's Waste Hauler/Scavenger Program. Under the program, any company wishing to dispose of septage to the City wastewater system must first apply for and obtain a Scavenger Vehicle Permit Tag for each vehicle and pay an annual permit and tag fee.

Health Code of Baltimore City, Title 7

Title 7 of the Health Code deals directly with the handling and transportation of solid waste by private enterprises that choose to do so in the City of Baltimore. Synopses of the more pertinent subtitles in this article are listed below.

- **Subtitle 2: Solid Waste Collection** - Requires the Commissioner of Health to issue permits for private parties engaged in the collection and disposal of solid waste. City collection activities are exempt. These sections also regulate collection methods and times and provide for inspection of vehicles.
- **Subtitle 4: Landfills** - Requires private landfill operators to obtain an operating permit, obtain City approval of engineering plans, and post security against hazardous or unsafe operation. However, the City zoning laws do not permit anyone to operate a sanitary landfill except City government.
- **Subtitle 7: Littering-** Provides a penalty for the disposal of trash in other than a proper receptacle or a manner approved by the City. It provides for the issuance of citations by police or an enforcement officer.

Mayor, City Council, and Municipal Agencies, Article 1, Baltimore City Code, Subtitle 40

Subtitle 40 establishes an Environmental Control Board to adjudicate civil citations issued for violations of City Code provisions pertaining to sanitation.

Baltimore Clean Air Act

The Baltimore Clean Air Act (BCAA), introduced as Council Bill 18-0306, was approved by the City Council on 11 February 2019 and signed by then Mayor Pugh on 7 March 2019. The BCAA requires commercial solid waste incinerators in Baltimore to conduct continuous monitoring of multiple pollutants, including dioxins, furans, nitrogen oxides (NOx), sulfur dioxides (SOx), particulate matter, polycyclic aromatic hydrocarbons, and several heavy metals. It also establishes significantly stricter emission limits for mercury, NOx, SOx, and dioxins/furans than are required under Maryland regulations. A ruling by a U.S. district judge in 2020 found that some components of the BCAA were in conflict with state laws. As such, it has not been enforced.

Expanded Polystyrene Foam Ban

Baltimore City Council passed ordinance 18-0125 in April 2018 banning expanded polystyrene (EPS) foam food containers. The law prohibits the use of EPS (or Styrofoam) as disposable food serviceware or packaging. Items such as foam cups, clamshells, bowls, and plates are no longer allowed in Baltimore. The ban went into effect on 19 October 2019 and applies to all food service facilities, including restaurants, grocery stores, hospital cafeterias, mobile food carts, bars/taverns, market stalls, public and private schools, caterers, special event food vendors, summer camps, bakeries, and congregation kitchens.

Single-Use Plastic Bag Bill

The City Council passed ordinance 19-0401 on 18 November 2019 (signed 13 January 2020) to ban the distribution of single use plastic bags at the point of sale, and place a fee of a nickel for any other type of single use bag, including paper and compostable bags. The program went into effect on 1 October 2021.

John F. Chalmers Sr. Act

In June 2022, the Baltimore City Council passed Ordinance 22-133 (The John F. Chalmers Dr. Act) which requires certain holders of permits issued by the Department of Housing and Community Development to submit a disposal plan with the permit application, requires permit holders to submit proof of disposal

to the Department within a certain period of time after the permit work has concluded, and establishes citation amounts.

Net Zero Operations Bill

Mayor Brandon Scott signed the Net Zero Operations Bill into law on The City Council passed Ordinance 22-131 on 22 April 2022, which requires City operations to achieve net-zero emissions of greenhouse gases by 2045.

2. BACKGROUND INFORMATION

Population and land use practices are key influences of solid waste planning. Population trends are indicative of growth rates in consumption and waste generation. Likewise, land use practices and conditions affect waste streams and waste facilities. Chapter 2 of this Plan provides estimates of Baltimore City's present and projected population, identifies federal facilities in Baltimore City, and discusses zoning codes and the City's comprehensive land use plan as they pertain to solid waste management.

2.1 City Population

Table 2-1 below summarizes actual and projected population and household estimates in Baltimore City from 2020 – 2045, based on Maryland Department of Planning and U.S. Census Bureau data.

Table 2-1. Baltimore City Population Projections

Year	Population (ppl)	Number of Households (hh)
2020*	585,708	236,600
2025	594,530	240,300
2030	596,390	245,175
2035	596,920	248,775
2040	599,220	251,725
2045	603,440	253,475
AVERAGE ANNUALIZED GROWTH	0.12%	0.28%

*Actual data.

According to the U.S. Census Bureau, Baltimore's population was 585,708 in 2020. The Maryland Department of Planning projects that the city's total population will increase by 0.3% between 2020 and 2025, by 0.06% from 2025 to 2030, and by 0.02% from 2030 to 2035. The overall average annualized growth rate from 2020 through 2045 is projected to be 0.12%.[4]

The Maryland Department of Planning also developed household projections over the period covered by this Plan.[5] The number of households for 2020 was 236,600 while the projected number of households for 2035 is estimated to be 248,775.

[4] https://planning.maryland.gov/MSDC/Documents/popproj/PreliminaryTotalPopProj2050.pdf.
[5] https://planning.maryland.gov/MSDC/Documents/popproj/HouseholdProj.pdf

2.2 Federal Facilities in the City

There are eight major federal facilities located in Baltimore City, the largest and only incorporated municipality in Maryland that is also a designated subdivision. These facilities are shown on the map in Figure 2-1.

Figure 2-1. Major Federal Facilities in Baltimore City

As indicated in Figure 2-1, the major federal facilities located within the city are:

1. G.H. Fallon Federal Building
2. Garmatz Federal Courthouse
3. Federal Reserve Bank of Richmond
4. U.S. Veterans Medical Center
5. U.S. Post Office: Baltimore City Main
6. U.S. Customs and Border Protection
7. U.S. Coast Guard Yard

8. Fort McHenry National Monument and Historic Shrine

Other federal agencies with facilities in Baltimore include the Department of Treasury, the Department of Labor, the Army Corps of Engineers, the Veterans Administration, the General Services Administration, the Office of Personnel Management, the Federal District Court, the Bankruptcy Court, the Social Security Administration, the Department of Agriculture, and the Department of Commerce- International Trade Administration.

Private contractors collect solid waste generated at all federal facilities in Baltimore City.

2.3 Zoning Requirements

This plan shall not be used to create or enforce local land use and zoning requirements. Baltimore City zoning regulations dictate the permitted location of solid waste management facilities, including composting facilities, materials recovery facilities, transfer stations, incinerators, and landfills. Typically, solid waste facilities are confined to industrial and commercial districts and designated as a conditional use. Each proposed facility site must be considered individually either by the City's Board of Municipal and Zoning Appeals or City Council. The zoning code referenced for the sake of this plan was last enacted and corrected in June 2017 and last amended in 2022.

A summary of the zoning for solid waste facilities, recycling facilities, and organics management facilities under the current zoning code can be found in Table 2-2. As indicated in Table 2-2, commercial or municipal incinerators are prohibited in all zoning districts. Baltimore City zoning code prohibits construction of any new sanitary landfills or incinerators, but allows landfills and incinerators constructed prior to 5 June 2017 to be classified as "lawful nonconforming structures". As lawful nonconforming structures, existing landfills can pursue expansions of no more than 35% in additional land area if expanding onto property that is no more than 750 feet from the landfill's property line, and onto the portion of that property closest to the existing use. Prior to 5 June 2017, a City ordinance was required for approval of a new commercial or municipal incinerator.

Table 2-2: Summary of Zoning for Solid Waste Facilities

Solid Waste, Recycling, and Organics Management Facilities	Permitted Zones	Code	Condition
Incinerators (Commercial or Municipal)	Prohibited in all zoning districts	1-209	"Lawful nonconforming" if constructed before 5 June 2017; SWMP; Applicable Permits; Zoning Board Approval
Sanitary Landfill (Accepting Mixed Refuse)	Prohibited in all zoning districts	18-310	"Lawful nonconforming" if constructed before 5 June 2017; SWMP; Applicable Permits; Zoning Board Approval

Landfill: Industrial	I-2	14-318	SWMP, Applicable Permits, Zoning Board Approval
Recycling Collection Station	All Zones	15-515	Zoning Board Approval
Materials Recovery Facility	I-2	14-324	Applicable Permits
Recyclable Materials Recovery Facility	I-1, I-2	14-333	Applicable Permits
Recycling and Refuse Collection Facility	IMU-2, I-1, I-2	I-312	None
Resource Recovery Facility	I-2	14-335	Applicable Permits
Commercial Composting Facility	IMU-2, I-1, I-2	14-305	Applicable Permits

To operate in Baltimore, solid waste facilities must:

- Obtain zoning approval;
- Obtain a relevant permit from MDE; and
- Be amended into the Ten-Year Solid Waste Management Plan via legislation passed by the Baltimore City Council.

Industrial landfills must follow the above rules for solid waste facilities and may not accept residential or municipal solid waste, or rubble or land-clearing debris. Industrial landfills are allowed in I-2 industrial districts.

Recycling collection stations are conditionally allowed in all zones throughout the City, with Zoning Board Approval. Stations are defined as portable receptacles, usually trailers or roll-offs, for the collection of paper, cans, aluminum scrap, other non-ferrous metal scrap, glass bottles, and plastics. Larger processing centers are conditionally allowed in industrial areas to facilitate recycling.

Materials recovery facilities are conditionally allowed in the I-2 industrial district with all applicable permits. All loading and unloading at a materials recovery facility must be screened from public view, and all other operations must be performed within an enclosed building.

Recycling and refuse collection facilities are facilities whose primary purpose is the collection, storage, and transference of solid waste, yard waste, or recyclables. Recycling and refuse collection facilities do not include incinerators, junk, scrap, or storage yards, sewage treatment sites, landfills, or vehicle dismantling facilities.

Resource recovery facilities are defined as facilities that process solid waste to produce valuable resources, such as steam, electricity, or refuse-derived fuel, and achieve a volume reduction of at least 50% of the waste that is being processed. Resource recovery facilities do not include any facilities that process hazardous materials, any facility that is licensed by the State or City as a junk dealer, scrap metal processor, or scrap metal dealer, or any junk or scrap storage yard.

Commercial composting facilities performing indoor methods of composting (such as in-vessel methods) are conditionally allowed in the Waterfront Industrial Area outside the buffer. All commercial composting facilities must be operated and maintained in a manner that protects adjacent properties from nuisance odors and the attraction of rodents or other pests.

Composting is allowed on areas permitted under open-space farm and urban agricultural districts as long as the compost piles are located at least three feet away from any lot line, adjacent properties are protected from odors and the attraction of pests, and the resulting organic product is not sold. Bin composting is allowed within residential rear-yards, if kept at least three feet from lot lines.

The City's Critical Area is defined as a 1,000-foot-wide strip measured adjacent to the mean high tide around the Chesapeake Bay and its tributaries. No solid waste facilities, including recycling facilities, are permitted in the Critical Area. In Baltimore City, the Patapsco River, Gwynns Falls, Jones Falls, and Colgate Creek tributaries contribute to the Critical Area.

The City's comprehensive zoning regulations also accommodate facilities for managing special categories of solid waste. For example:

- Management, discharge, and disposal of radioactive and hazardous waste is conditionally allowed, with Zoning Board approval, in compliance with all applicable federal, state, and local laws, and regulations that generally govern such waste. Composting of sewage sludge or yard waste is also an industrial use. These facilities require MDE and City Council approval.
- Dismantling, processing, and storing of scrap metal and discarded automobiles are conditionally allowed, with a pollution prevention plan approved by the City and MDE. These uses are distinguished from materials recovery facilities because they require outdoor storage of large quantities of materials.

A summary of the City's zoning regulations is included in Appendix C.

2.4 Comprehensive Planning and Land Use

Because Baltimore is Maryland's premier metropolitan area and presents unique land use challenges, the City, in its entirety, is designated as a Priority Funding Area by the State. The revitalization of the City's neighborhoods and preservation of their unique community character are major policies of the City, as articulated in the City's Comprehensive Plan. Implemented in 1976 and most recently revised on September 9, 2009, the City's Comprehensive Plan provides the policy basis for guiding redevelopment and revitalization of the City's developed neighborhoods. Many other programs and urban renewal plans have been adopted and are *de facto* components of the plan. The City is currently in the process of creating a new Comprehensive City Plan ("Our Baltimore").

3. EXISTING SOLID WASTE MANAGEMENT SYSTEM

This chapter analyzes the solid waste generation, import and export of waste, source reduction, diversion, collection, and disposal systems for the City of Baltimore. Existing facilities and methods for solid waste reduction, diversion, collection, and disposal in Baltimore are presented, and regional facilities are discussed. Impacts of the COVID-19 pandemic on existing solid waste management systems are also presented.

3.1 Overview of Existing Solid Waste Management System

The key characteristics of the existing solid waste management system in Baltimore City are its mixed public/private system and its regional scope. Through DPW, the City primarily provides collection of waste and recyclables from single-family residences and condominiums under contract with the City as well as waste disposal, while private contractors provide collection services to most multi-family residences, non-contract condominiums, and commercial and industrial establishments. A summary of the existing solid waste stream in the City is depicted graphically in Figure 3-1 on page xx, separated into waste managed by the City and waste managed by the private sector.

3.1.1 Solid Waste Management System Provided by the City

The City utilizes both public and private facilities for transfer/disposal of waste and recyclables collected by DPW. A summary of the disposal, transfer, and residential drop-off centers operated or used by DPW, and the recycling contracts held by DPW for the handling, recycling, and disposal of waste and recyclables, are presented below.

WIN Waste

DPW contracts with WIN Waste, a privately operated waste incinerator located in the southwest of the city, for disposal of mixed refuse. Under the current contract with WIN Waste, which runs through 2031, DPW disposes of most of its acceptable waste (generally mixed refuse, excluding hazardous waste and non-burnable waste) at WIN Waste, who delivers post-processing ash materials to the Quarantine Road Landfill. WIN Waste recycles back-end scrap metal collected after incineration of waste.

Quarantine Road Landfill (QRL)

Mixed refuse collected by DPW but not sent to WIN Waste is sent to QRL for disposal. QRL also accepts waste from other City agencies, commercial waste from licensed large haulers, mixed refuse and C&D waste from small haulers registered with the City's Small Hauler Program, grit screenings from the City's wastewater treatment plants, and incinerator ash from WIN Waste. Soil, including repurposed soil accepted for disposal, is used for daily and intermediate cover at QRL. A residential drop-off center is also sited at QRL, which provides free disposal and recycling services to Baltimore City residents.

Northwest Transfer Station (NWTS)

DPW operates NWTS for transfer of mixed refuse and single-stream recycling. NWTS serves as the disposal facility for licensed small haulers and as a residential drop-off center, which provides free disposal and recycling services to Baltimore City residents. Collected waste is transferred to WIN Waste or QRL, while recycling is sent to private recycling facilities.

Residential Drop-off Centers

DPW operates a total of five residential drop-off centers throughout the City where residents may dispose of various materials, including MSW, bulk trash, single-stream recycling, rigid plastics, scrap metal, scrap tires, household appliances, waste oil and antifreeze, household hazardous waste (HHW), electronics, and oyster shells.

Mixed Recyclables

DPW contracts with private companies for processing of single stream recyclables, hard plastic, and mixed recyclables collected curbside by DPW and at residential drop-off centers. A full list of the vendors with whom the City contracts for recycling is included in Appendix D.

Other Recyclables

The following targeted recyclables collected as part of the bulk collection program and at residential drop-off centers are sent to private companies for processing: scrap metal, scrap tires, electronics, waste oil, HHW, and oyster shells. Appendix D contains a full list of vendors that provide recycling services for the City.

Sewage Treatment Plant Sludge

Sewage treatment plant sludge (biosolids) from wastewater and drinking water treatment facilities in the City are sent to the Baltimore City Composting Facility (BCCF) in Hawkins Point, the Baltimore Patapsco Pelletizer (BPP), and the Back River Pelletech Facility (BRPF) for processing.

Food Waste

In July 2021, Baltimore City staff launched a pilot food waste drop-off program for residential food scrap collection at the five residential drop-off centers. The pilot was funded by a grant agreement between the National Resources Defense Council (NRDC) and Baltimore City as part of the Food Matters regional initiative.

Wood Waste and Brush

Wood waste and brush collected from City parks and street right of ways are sent to the Camp Small facility for sale and reuse. The facility is operated by the Baltimore City Department of Recreation and Parks (BCRP).

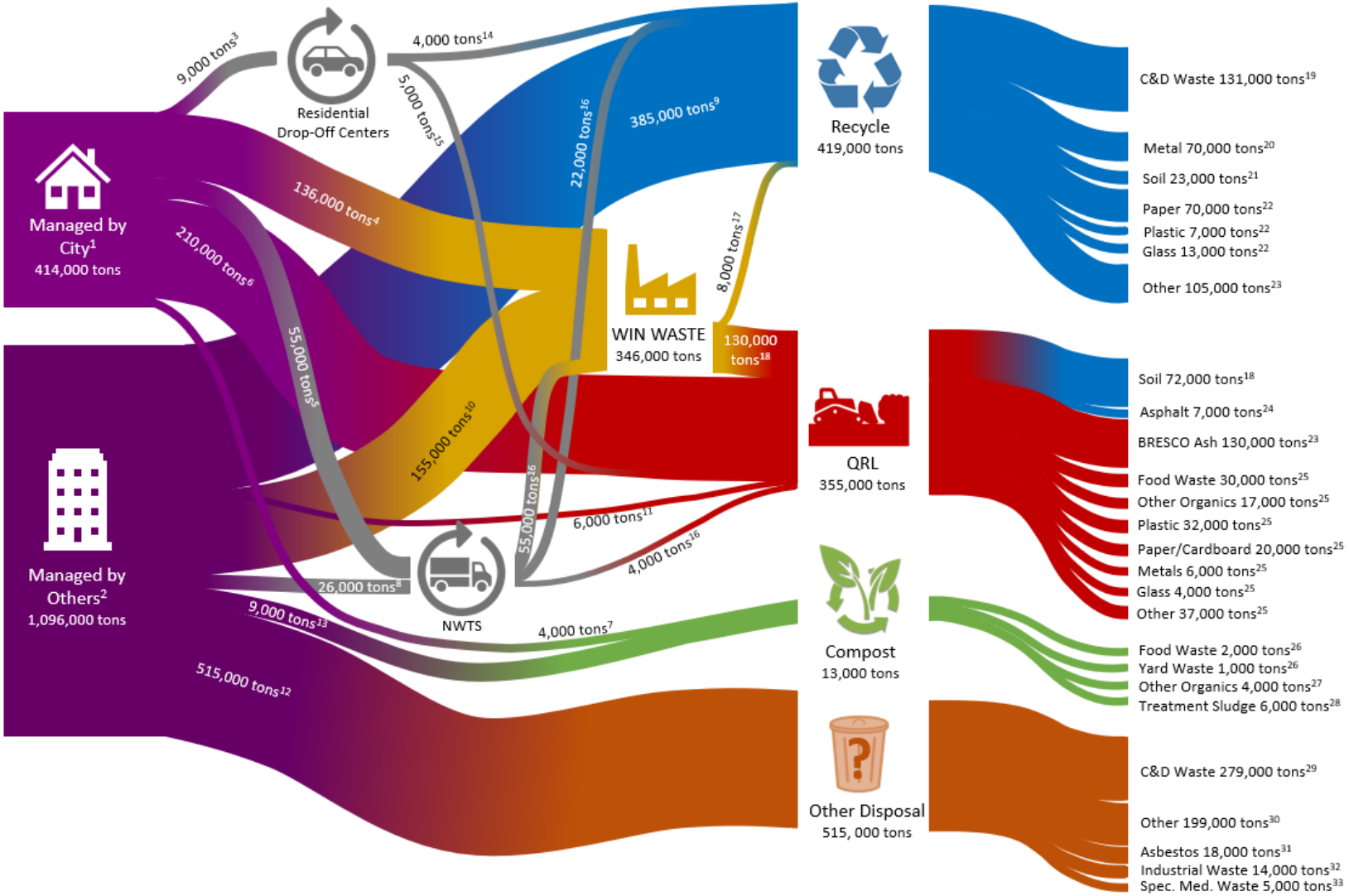


Figure 3-1. 2021 Baltimore City Waste Stream Flow Diagram (Reproduced from the LWBB Report)

Notes for flow diagram on previous page:

1. Waste managed by the City includes residential waste, waste from government buildings, and waste from some small businesses.
2. Waste managed by others includes commercial, industrial, and institutional waste not collected by the City.
3. Waste flow to residential drop-off centers is calculated as the sum of MSW and recyclables collected at residential drop-off centers.
4. Residential waste flow to WIN Waste is calculated as the difference in total residential waste sent to WIN Waste (2021 WIN Waste tonnage report) and waste sent from NWTS to WIN Waste (2021 NWTS tonnage report).
5. Residential waste flow to NWTS is calculated as the total waste flow to NWTS (2021 NWTS tonnage report) minus the waste hauled by small haulers to NWTS in 2021 (see also Note 8).
6. Residential waste flow to QRL is calculated as the sum of soil sent to QRL (presumably as daily and intermediate cover), MSW sent to QRL (2021 QRL tonnage report), and asphalt sent to QRL (for temporary road construction) minus MSW sent from NWTS to QRL (2021 NWTS tonnage report, Note 16).
7. Residential organics tonnage includes recycled brush/branches, food waste, and wood materials as reported in 2021 Baltimore City MRA Report.
8. Commercial waste flow to NWTS is calculated from small hauler data (2021 Small Hauler report).
9. The quantity of commercial recyclables is derived from the 2021 Baltimore City MRA report (non-MRA recyclables, MRA recyclables) and includes all recyclables (MRA and non-MRA) not included in the organics waste stream (i.e., yard waste food waste, other organics, and treatment plant sludge). See also Note 13.
10. Commercial waste flow to WIN Waste is derived from the 2021 WIN Waste tonnage report.
11. Commercial waste flow to QRL is calculated from small hauler data (2021 Small Hauler Report).
12. Most commercial waste is hauled by private haulers and the City has no way to track this waste. It is assumed that many of these haulers take waste to private facilities not included in this diagram (e.g., rubble landfills outside the City).
13. Commercial organics tonnage is derived from the 2021 Baltimore City MRA report and includes treatment sludge, yard waste, food waste, and other organics (e.g., wood waste).
14. The quantity of recyclables from residential drop-off centers is calculated from the 2021 Baltimore City MRA report.
15. Waste outflows from residential drop-off centers are calculated from 2021 waste tonnages collected in roll-off containers by the City. While some of this material is sent to WIN Waste, for this analysis, it is assumed that the majority is sent to QRL for final disposal.
16. Material outflows from NWTS to recyclables, WIN Waste, and QRL are derived from the 2021 NWTS tonnage report.
17. The quantity of recyclables recovered at WIN Waste is back calculated from total metals reported in 2021 MDE Solid Waste Management and Diversion Report and other metals reported in Baltimore City MRA Report. This value represents back-end scrap recovered from incineration of waste generated within the City.
18. The quantity of incinerator ash and soil landfilled at QRL is from the 2021 QRL tonnage report.

19. Recycled C&D tonnage is from the 2021 Baltimore City MRA Report.
20. Recycled metals tonnage is from the 2021 Baltimore City MRA Report (scrap metal and automobiles) and 2021 MDE Solid Waste Management and Diversion Report (all other metals, including back-end scrap from WIN Waste)
21. Recycled soil tonnage is from the 2021 Baltimore City MRA Report (commercial soil only, which does not include soil used as daily and intermediate cover at QRL).
22. Recycled paper/cardboard, plastic, and glass tonnages are from the 2021 MDE Solid Waste Management and Diversion Report.
23. Other recyclables include non-MRA recyclables (waste oil, antifreeze, oil filters, etc.) and MRA recyclables (tires, batteries, furniture, etc.) that do not fall in other recyclable categories.
24. The quantity of asphalt reused at QRL for road construction is from the 2021 QRL tonnage report.
25. Tonnages for MSW components are derived from the Baltimore City Winter 2019 waste sort conducted by Geosyntec and the total MSW tonnage reported for QRL (2021 QRL tonnage report).
26. Food and yard waste tonnages are from the compostables category in the 2021 Baltimore City MRA Report.
27. Other organics tonnage is from 2021 Baltimore City MRA Report and includes wood materials and other compostables.
28. Treatment sludge tonnage is from the non-MRA recyclables category in the 2021 Baltimore City MRA Report.
29. C&D waste tonnage provided by MDE from tonnage reports for permitted facilities in the City
30. Other waste tonnage back-calculated from total waste generation in the city (from 2021 MDE Solid Waste Management and Diversion Report)
31. Industrial waste tonnage provided by MDE from tonnage reports for permitted facilities in the City.
32. Special medical waste tonnage provided by MDE from tonnage reports for permitted facilities in the City.

3.1.2 Solid Waste Management System Provided by Others

Private haulers can dispose of waste generated in the city at any permitted disposal facility. This is one element of the regional solid waste management system. A second element allows private haulers to dispose of wastes generated outside the city at waste acceptance facilities located within the city limits, such as WIN Waste and QRL. The constraints for importing solid waste into the city (as for exporting wastes out of the city) are the capacities of acceptance facilities and market considerations, including tipping fees and hauling costs. Because WIN Waste is privately owned and operated, as are most of the other waste acceptance facilities in and around the city, they are free to compete in the marketplace to provide waste disposal services in response to demand from their customers.

The private component of the solid waste management system operates regionally and independently of City government. Private companies perform the same basic waste collection and management functions as the government without conflict.

The fact that so much solid waste management is independently and privately handled has implications for the City's solid waste planning. The ability to quantify or precisely describe this privately managed solid waste and to determine how all of the solid waste within the City's boundaries is generated, is limited to available data. Nonetheless, in an effort to comply with state regulations on comprehensive solid waste planning, this Plan has attempted to include regional considerations for privately collected waste generated within the City's boundaries and solid waste from outside its boundaries disposed of at solid waste facilities within the City.

3.1.3 Impacts of the COVID-19 Pandemic

The COVID-19 pandemic exacerbated already-steep competition for solid waste workers, particularly CDL drivers and machine operators. It also led to temporary staffing shortages as infected or exposed personnel quarantined for ten to fourteen days during the pandemic. Staffing challenges continue to impact the Bureau, more than three years after the start of the pandemic. This increased scarcity forced Baltimore City to focus on trash pickup and temporarily suspend curbside recycling collection. When curbside recycling returned in 2021, the Bureau rolled out a new program with 170,000 65 gallon blue bins for every single-family household, in place of the former 40,000 14 gallon yellow bins provided to single-family households who requested them. Shortly after rolling out the new program the Bureau reduced single-stream recycling collection service levels from weekly to once every two weeks to answer staffing shortages and increased recycling. The City also suspended street and sidewalk sweeping services in 2020 due to staffing shortages, and returned to quadrant sweeping first in 2022 and regular sweeping late in 2022. The City plans to return to pre-pandemic levels of collection service as soon as possible.

Worker safety is paramount to DPW, and the measures implemented during the height of the pandemic continue to model the procedures that will be used moving forward. Testing locations were set up exclusively for solid waste workers, vaccines were required and encouraged, and leadership was able to prioritize services to complete the most critical tasks. Crews were required to wear appropriate PPE to prevent COVID transmission. The Bureau was held accountable by City Council, which initiated quarterly

legislative oversight hearings and monthly reports addressing the return to weekly recycling pickup. These steps towards transparency and preparedness planning will make DPW more resilient to future challenges.

3.2 Existing and Projected Waste Generation

COMAR 26.03.03.03 (D) requires that Chapter 3 contain a table that shows existing and projected annual generation of specified categories of waste within the city. Further, the basis for the data presented in the table must be discussed. COMAR 26.03.03.04 (B) states that projections shall be given for the succeeding ten-year period at intervals of not more than five years.

The last year from which complete waste generation data were available is 2021. As such, 2021 is used as the baseline for this analysis. In compliance with the requirements of COMAR, waste generation projections in Baltimore City for 2024, 2027, 2030, and 2033 are presented in Table 3-2 on page XX.

3.2.1 Sources of Solid Waste

A simplified graphical illustration of the existing waste streams in Baltimore is shown in Figure 3-1 on page xx. Approximately 414,000 tons of waste was managed by the City and 1,096,000 tons of was managed by others in Baltimore in 2021 (1,510,000 tons in total). Of the total waste generated, approximately 432,000 tons (29%) was diverted from final disposal (either reused, recycled, or composted), 338,000 tons (22%) were incinerated at WIN Waste (not including the approximately 8,000 tons of back-end scrap recovered and diverted following incineration), 225,000 tons (15%) were landfilled at QRL (not including the approximately 130,000 tons of ash from WIN Waste), and 515,000 tons (34%) were otherwise disposed by commercial haulers in the private system.

The primary sources of solid waste generation in Baltimore are detailed below. In each category, it is indicated whether this waste is handled primarily by DPW or the private sector. Tonnages presented for each waste category are generally sourced from DPW or MDE. The most recent calendar year for which complete records are available is 2021.

Residential MSW

Residential MSW includes household trash, recyclables, and compostables generated by Baltimore residents. In Baltimore, DPW collects residential MSW from single family households and some multi-family units alongside waste generated at City-owned or City-leased properties and condominiums under contract with DPW. As such, residential MSW is reported as Mixed MSW by the City. For this plan, residential MSW tonnages are included in the Mixed MSW category.

Commercial MSW

Commercial waste includes all recyclables, compostables, and trash generated by the private sector in Baltimore. This waste is almost exclusively collected by private haulers rather than DPW, so precise

information on tonnages generated are not available. Further, as private haulers also collect waste from multi-family dwellings, much of the commercial MSW in the city is co-collected with residential MSW and is therefore classified as Mixed MSW. However, based on available data, an estimated total of 80,400 tons of commercial material was disposed in the city in 2021. It should be noted that this value is a "best guess" estimate and may not represent the true amount of commercial waste generated in the city.

Mixed MSW

Mixed MSW is a mixture of residential, commercial, and institutional MSW and is collected by DPW and private haulers in the city. Based on available data, the total amount of Mixed MSW disposed in the city in 2021 is estimated to be 540,000 tons.

Industrial (Non-Hazardous) Waste

Industrial (non-hazardous) wastes are solids, liquids, and sludge generated by manufacturing or industrial processes that are not regulated under Subtitle C of RCRA. In general, the City does not collect information on the character and quantity of this waste from the generators. Several industries dispose industrial non-hazardous waste in Baltimore. In 2021, 13,700 tons of industrial, non-hazardous waste was disposed within the city.

Institutional Waste

Institutional waste includes all waste generated by institutions (e.g., schools, hospitals, and government buildings) in Baltimore. Most of this waste is collected by private haulers in the City (except for waste generated at government buildings, which is collected by DPW alongside residential waste). As such, exact tonnages are not well quantified. For this plan, institutional waste tonnages are included in Mixed MSW tonnage projections.

Land Clearing Debris

Land clearing debris is refuse generated from clearing of sites to prepare them for new construction, rehabilitation, street improvements, or utility installation, as well as debris from natural disasters. This category of waste is generally small enough to be included in C&D tonnages and is assumed to be zero for the period covered by this Plan.

Construction and Demolition Debris

Construction and demolition (C&D) debris is refuse generated from demolishing buildings, streets, and other improvements and clearing of sites to prepare them for new construction, rehabilitation, street improvements, or utility installation. This refuse is primarily inorganic, consisting of concrete, brick, bituminous paving material, lumber, drywall, plaster, roofing material, and insulation. No data is available for the exact amount of C&D waste generated in the City, as large private C&D contractors often find it more economical to use private rubble landfill facilities outside the city to dispose of such debris. However, based on tonnage reports filed by permitted facilities in 2021, it is estimated that 279,000 tons of C&D waste generated in the City was disposed. An additional 131,000 tons of C&D waste was recycled in 2021 and 7,000 tons of asphalt were reused for road construction at QRL.

Wood Waste

Wood tonnages are considered recyclable MRA materials. Per Baltimore City MRA reports, 3,000 tons of wood waste was recycled in the city in 2021.

Rubble

Rubble is included with C&D Waste for this plan.

Electronics

Electronic waste is considered a recyclable MRA material. Electronic waste includes screens, monitors, lamps, mobile phones, printers, and other discarded electrical and electronic devices. In 2021, approximately 600 tons of electronics were recycled in the city.

Motor Oil, Antifreeze, Cooking Oil, Vinyl, and Medical Equipment

Motor oil, antifreeze, cooking oil, vinyl, and medical equipment are considered non-MRA materials. In 2021, approximately 100 tons of antifreeze, 1,900 tons of waste oil, and 2,600 tons of cooking grease were recycled in the city.

Vehicle Tires

Vehicle tires are considered a recyclable MRA material. There were approximately 900 tons of tire waste generated in the city in 2021. This number is largely representative of tires that have been recovered by City forces at residential drop-off centers and collected by City forces at illegal dumping locations. Tires collected by the City are currently sent to a facility for processing and recycling.

Commingled Recyclables

Commingled recyclables, also known as single stream recyclables (SSR), include cardboard, paper, plastic bottles, glass bottles, tin/steel cans, and aluminum cans collected together in one location. Commingled recyclables are collected curbside and at residential drop-off centers by DPW. Commingled recyclables are also collected by the private sector. In 2021, approximately 26,400 tons of commingles recyclables were recycled in the city.

Special Medical Waste

Special medical waste generated within Baltimore City is generated by the private sector and disposed of via incineration. Approximately 5,700 tons of special medical waste was disposed in the city in 2021.

Bulk or Special Waste

Bulk or special wastes as cited in the state regulations include automobiles, scrap metal, large furniture, and large appliances. DPW collects bulk and special waste at residential drop-off centers and through 311 collection requests. Based on reported recycling tonnages from the residential and commercial sectors, it is estimated that 53,200 tons of bulk or special waste were generated and recycled in the city in 2021.

Asbestos

Materials containing asbestos are not permitted to be disposed of at QRL. However, in 2021, other facilities in the City reportedly disposed approximately 18,000 tons of asbestos.

Soil

In 2021, approximately 72,000 tons of soil were used as daily cover at QRL. The 2021 MRA report included an additional 23,000 tons of recycled soil from commercial sources. Altogether, 95,000 tons of soil were recycled in Baltimore City in 2021.

Controlled Hazardous Substances

Controlled hazardous substances are those wastes whose disposal is regulated under Subtitle C of RCRA (see Section 1.3). Local governments in Maryland have not been granted authority to enforce federal or State regulations on the disposal of hazardous wastes. MDE, however, compiles information on the generators and the amounts of hazardous wastes being handled within Baltimore City limits and reports this information to EPA.

Each generator/facility is responsible for proper handling and disposal of its hazardous waste. These firms are required to use out-of-state processing plants or emplacement facilities. Though there are several closed hazardous waste landfill cells within Baltimore City, there is no landfill currently accepting hazardous waste within the city limits.

Dead Animals

Since Baltimore City is fully urbanized, most animal carcasses requiring disposal in the City are those of stray or unwanted cats and dogs. The division of Animal Control under Baltimore City's Department of Health is responsible for removing animal carcasses from public property and for removing live animals that are defined as strays under the law. Animal carcasses are currently collected for disposal by private companies under contract with the City. In 2022, it is estimated that the City collected and sent approximately 38 tons of animal carcasses to incineration.

Treatment Plant Sludge

Treatment plant sludge is the solids remaining after wastewater and raw drinking water treatment. Two treatment plants are located in the city as described below. Both accept sanitary wastewater from surrounding counties as well as the city.

In 2021, the Back River Wastewater Treatment Plant (BRWWTP) generated approximately 63,000 wet tons of sludge (or approximately 13,000 dry tons). Through City contracts, private firms utilize the majority of the sludge for horticultural compost, a pelletized product for fertilizer, and as soil amendment. Any remaining sludge is sent to QRL for disposal. As of 2022, the BRWWTP is conducting a set of digestor cleanout projects which has resulted in the production of higher than normal sludge volumes (roughly 25,000 dry tons produced in 2022). This has resulted in approximately 12 loads of sludge per day being sent to QRL for disposal. These elevated tonnages are expected to continue through 2026 before reducing back to normal levels (approximately 13,000 dry tons per year).

The Patapsco Wastewater Treatment Plant (PWWTP) generated approximately 410,000 wet tons of sludge in 2021. All of the wet sludge from PWWTP is heat dried for stabilization, pelletized, and sold as fertilizer.

The City operates three water treatment plants: Montebello I, Montebello II, and Ashburton. In 2011, the facilities generated approximately 2,200 tons of sludge. Sludge production at the three water filtration plants is not expected to increase appreciably.

Septage

Septage is only accepted at the BRWWTP. The septage discharge becomes part of the plant flows and is subject to the same treatment processes. The solids also become part of the overall sludge production and are subject to the same solids processing and disposal.

Any company wishing to dispose of septage into the city wastewater system must obtain a waste hauler permit, vehicle permit tag for each vehicle, and pay annual permit and vehicle tag fees. The program is regional in scope, recognizing programs developed cooperatively with the City program in Baltimore, Howard, and Anne Arundel Counties. The program dictates the types of wastes to be accepted, allows for city sampling of the septage, and reserves the city's right to refuse acceptance of any load. Any violation of the program conditions can result in fines, revocation of permits, and/or prosecution of the permit holder.

3.2.2 Waste Classification in Maryland

Under Maryland law, solid waste generated in Baltimore is broken down into different categories by type based on classification under the Maryland Recycling Act. The Maryland Recycling Act (MRA) requires each jurisdiction in Maryland to develop and implement recycling programs. Since December 2015, Baltimore City, and all counties with a population greater than 150,000, are required to attain a 35% recycling rate, which is calculated by dividing the tons of material recycled by the tons of materials generated, which in turn is defined as the tons of material recycled plus the tons of material disposed.

To allow fair comparison between different jurisdictions, only certain materials can be included when calculating a county's MRA recycling rate, which must be reported to MDE each year. These include paper, plastic, glass, metal, compostables, and a broad category of miscellaneous materials (in 2021, the miscellaneous materials reported by the City as part of its recycling rate included electronics, vehicle tires, textiles, pallets, toner cartridges, and batteries). Specific materials that are excluded from the calculation of the recycling rate include antifreeze, asphalt, concrete, coal ash, C&D debris, land clearing debris, scrap automobiles, scrap metal, sewage sludge, soils, waste oil, and a host of other materials. Although the tons of these materials recycled are not counted when calculating the county's MRA recycling rate, they are still reported to MDE each year. This division of waste and recyclables into MRA and non-MRA materials is important in the context of understanding the reported recycling and waste diversion rates in this Plan and in comparing rates between different counties in Maryland.

In addition to the MRA recycling rate, the City reports a waste diversion rate to MDE on an annual basis. The waste diversion rate includes the calculated MRA recycling rate plus up to 5% credit for specific source reduction activities (the City's source reduction activities are discussed in Section 3.3).

The composition of MRA and non-MRA waste and recyclables reported by the City in 2021 is detailed below. Figure 3-2 and Table 3-1 overleaf contain a summary of the City's MRA and Non-MRA waste generation and composition by sector in 2021.

MRA Waste

MRA waste includes MSW and industrial waste from non-private, industrial waste landfills. It does not include recycled or disposed MSW ash or backend scrap metal recovered at WIN Waste. A total of approximately 756,000 tons of MRA waste was generated in Baltimore in 2021. Of this, approximately 130,000 tons of material was recovered (MRA Recyclables) while 626,000 tons were sent for disposal.

MRA Recyclables

MRA recyclables include compostables (yard waste and other organics), paper, plastic, metal, glass, and other materials recovered or diverted from the waste stream prior to disposal. MRA categories are summarized below.

Paper and Cardboard

Recycled paper includes corrugated cardboard, newspaper, mixed paper, magazines, and office/computer paper diverted from the waste stream.

Plastic

Recycled plastic includes Polyethylene Terephthalate (PET/PETE) and High Density Polyethylene (HDPE) bottles and containers, film plastics, and other mixed plastics diverted from the waste stream. Note that PET/PETE and HDPE are classified as No. 1 and 2 plastics, respectively.

Metal and Glass

Recycled metal includes aluminum cans, tin/steel cans, and metal household appliances (e.g., washers, dryers, refrigerators, etc.) diverted from the waste stream. Recycled glass includes glass bottles and containers of various colors.

Yard Waste and Other Organics

Yard waste includes brush, branches, grass, and leaves diverted from the waste stream and composted. Other organics diverted from the waste stream mainly include food waste, wood materials, and donated food. This material may be composted, donated, or recycled by other means (e.g., anaerobic digestion, mulching, etc.).

Other

This is a broad category of materials that count towards MRA recycling, including animal proteins/fats, electronics, textiles, tires, toner cartridges, batteries, and furniture.

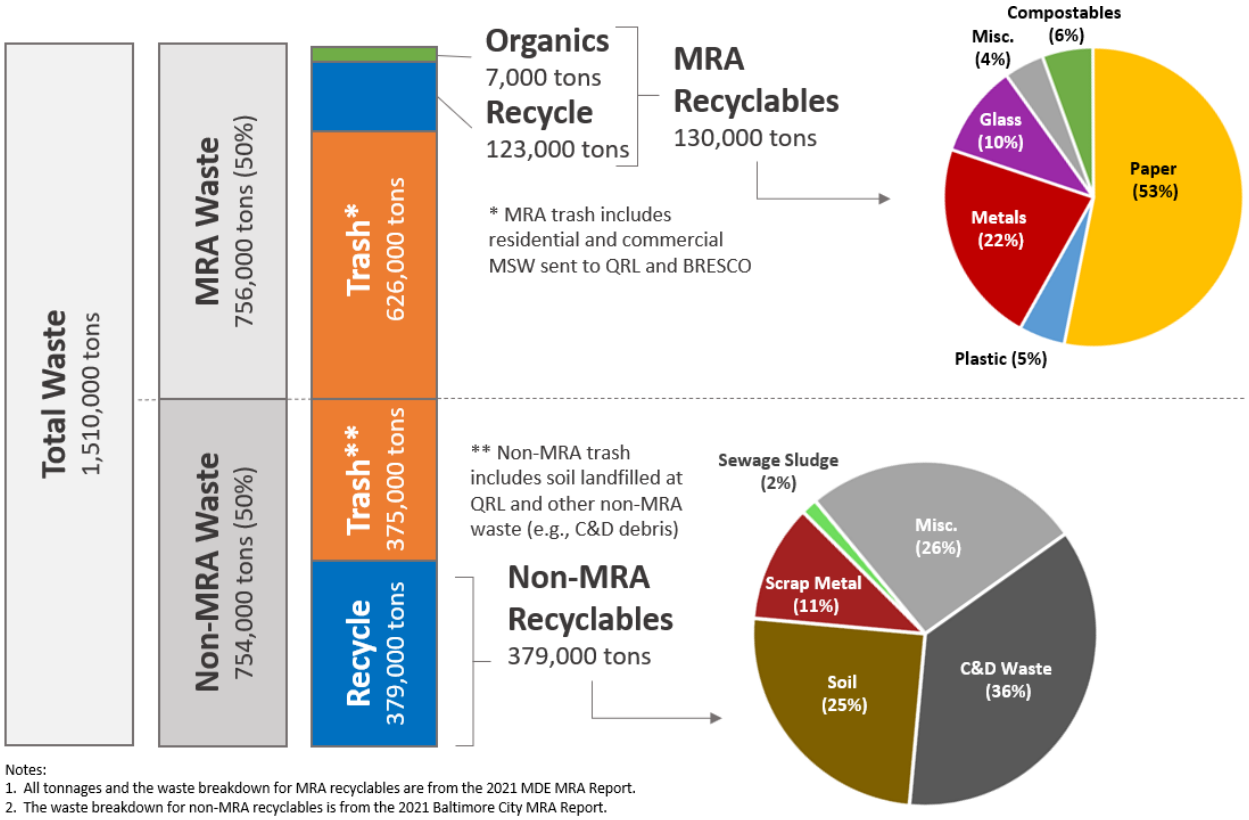


Figure 3-2. Total MRA and Non-MRA Waste Generated in Baltimore City in 2021

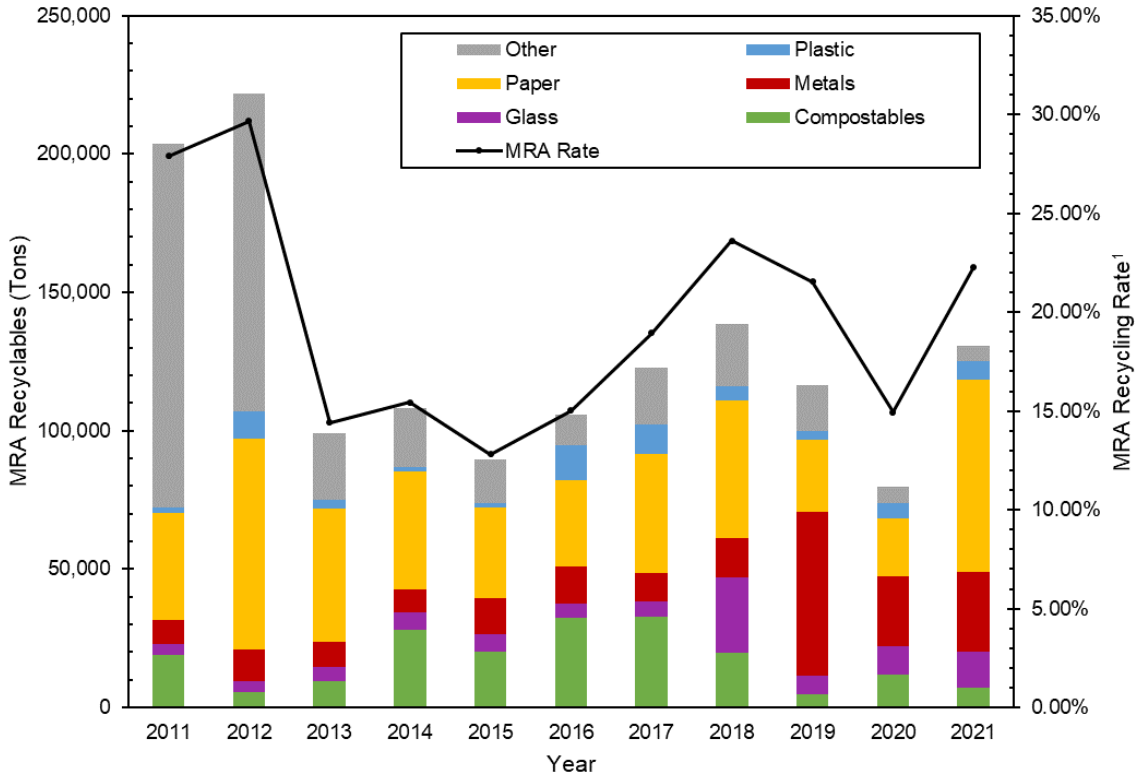
Table 3-1. MRA and Non-MRA Recyclables Composition by Sector in 2021

Category	Residential (tons)	Commercial (tons)	Total (tons)
MRA Recyclables			
Compostables	4,000	3,200	7,200
Paper	0	69,600	65,600
Plastic	5,100	1,400	6,500
Metals	7,600	21,200	28,800
Glass	11,700	1,400	13,100
Miscellaneous	0	5,700	5,700
Non-MRA Recyclables			
C&D Waste	6,900	130,700	137,600
Soil	71,800	22,900	94,700
Scrap Metal	1,500	40,400	41,900
Sewage Sludge	0	5,800	5,800

Miscellaneous	0	99,200	99,200

MRA Recycling Rate

The City's historic MRA recycling rate as well as the composition of MRA recyclables from 2011 through 2021 is shown in Figure 3-3. Note that prior to 2013, ash from WIN Waste landfilled at QRL was counted as a recyclable material and the MRA recycling rate for all years includes a 5% recycling credit for recovering energy from waste (considered resource recovery). Beginning in 2022, this credit will no longer be awarded.



1. MRA recycling rate includes 5% recovery credit (this will not be offered beginning in 2022)
2. Prior to 2013, ash from WIN Waste landfilled at QRL counted as an MRA Recyclable

Figure 3-3. Baltimore City Historic Trends in MRA Recycling (2011 – 2021)

As indicated above, the City's MRA recycling rate was 22% in 2021. In addition to the MRA recycling rate, the City reports a waste diversion rate to MDE on an annual basis. The waste diversion rate includes the calculated MRA recycling rate plus up to 5% credit for specific source reduction activities (the City's source reduction activities are discussed in Section 3.3). In 2021, the City did not earn a source reduction credit (although it has earned one in the past and will likely earn one in the future). As such, the City's waste diversion rate for 2021 was reported to be 22%, the same as its MRA recycling rate. Both the City's MRA recycling rate and its waste diversion rate are below the statewide average MRA recycling rate of 42% and waste diversion rate of 46%. More importantly, the MRA recycling rate is below the 35% required for

Maryland jurisdictions with a population over 150,000. The MRA recycling rate is projected to increase over the planning period as the City is committed to meeting the state mandated 35% recycling goal (see Section 5.2, which includes the City's interim plan to achieve a 35% MRA recycling rate).

Non-MRA Waste

Non-MRA waste includes MSW collected from commercial sources as well as C&D debris, soil, and a wide range of other materials that are ultimately diverted for recycling.

The vast majority of non-MRA waste in Baltimore is collected by private haulers. As such, limited information is available for generation of this material. The quantities of non-MRA waste listed below include recycled non-MRA waste reported in the 2021 MRA report for the city (including non-MRA recyclables as well as soil disposed at QRL) as well as other non-MRA waste generated in the city (e.g., C&D waste). A total of 754,000 tons of non-MRA material was generated in Baltimore in 2021, of which about 375,000 tons was sent for disposal.

Non-MRA Recyclables

Approximately 379,000 tons of the 541,000 tons of non-MRA materials generated in the city in 2021 were reported to be recycled. The predominant categories of non-MRA recyclables include C&D debris, soil, sewage sludge, and scrap metal.

Construction and Demolition Debris

This category of materials includes asphalt, concrete, bricks, drywall plaster, siding, wood pieces, and roofing, as well as general land clearing debris generated in Baltimore.

Soil

Recycled soil includes soil that has been put to beneficial reuse by DPW (i.e., as fill material in City projects). However, soil used as daily and intermediate cover material at QRL is not included in this category in this Plan.

Scrap Metal

Recycled scrap metal includes materials left over from product manufacturing and consumption such as vehicle parts, building supplies, and surplus metals. DPW provides scrap metal recycling at five of the residents' drop off facilities.

Sewage Sludge

Sewage sludge is the semi-liquid waste obtained from the processing of municipal wastewater sewage. In Baltimore, this material is composted or converted into a pelletized soil amendment or fertilizer by private companies.

Other

Other types of recycled non-MRA waste in Baltimore include antifreeze, waste oil, oil filters, industrial fluids, millings, and a host of miscellaneous materials.

3.2.3 Projected Waste Generation

The projections for 2024, 2027, 2030, and 2033 in Table 3-2 were derived from 2021 waste collection data recorded by the City and waste growth projections derived from the population data detailed in Section 2. Specifically, an average annual growth rate of 0.12%, the same as the expected population growth rate between 2020 and 2045, was used to estimate waste generation for 2024, 2027, 2030, and 2033.

Table 3-2. Annual Waste Generation in Baltimore City 2021 – 2033

Waste Category	Annual Generation (Tons)				
	2021	2024	2027	2029	2033
Residential MSW	0	0	0	0	0
Commercial MSW	80,400	80,700	81,000	81,300	81,600
Mixed MSW	540,000	541,900	543,900	545,900	547,800
Industrial (Solids, liquid, etc.)	13,700	13,700	13,800	13,800	13,900
Institutional (schools, hospitals etc.)	0	0	0	0	0
Demolition Debris (C&D)	279,000	280,000	281,000	282,000	283,000
Land Clearing	0	0	0	0	0
Controlled Hazardous Substance (CHS)	0	0	0	0	0
Asbestos	18,000	18,100	18,100	18,200	18,300
Soil	72,000	72,300	72,500	72,800	73,000
Special Medical Waste	5,700	5,700	5,700	5,800	5,800
Septage	0	0	0	0	0
Total MRA Waste Generation	**626,000**	**562,700**	**495,400**	**451,300**	**422,200**
Total Non-MRA Waste Generation	**375,000**	**351,800**	**330,300**	**308,600**	**286,800**
Total MRA Waste Recycled[1]	**130,000**	**196,700**	**266,800**	**313,600**	**345,500**
Total Non-MRA Waste Recycled[2]	**379,000**	**404,700**	**429,000**	**453,400**	**478,000**
Total Waste Generation	**1,510,000**	**1,516,900**	**1521,400**	**1,526,900**	**1,532,400**
MRA Recycling Rate[3]	**17%**	**26%**	**35%**	**41%**	**45%**

1. MRA Recyclables include compostables, paper, plastic, metals, glass, and miscellaneous materials as described above. The plan to increase MRA recycling tonnages (particularly for SSR and organics) is presented in Section 5.2, including estimates for diversion potential.
2. Non-MRA Recyclables include C&D waste, soil, scrap metal, sewage sludge, and miscellaneous materials as described above. The plan to increase non-MRA recycling tonnages (particularly for C&D and bulk waste) is presented in Section 5.2, including estimates for diversion potential.
3. MRA recycling rate does not include resource recovery credit as this credit was discontinued beginning in 2022 (although it was awarded in 2021).

3.3 Existing Waste Reduction and Diversion Programs

Waste reduction and diversion efforts in Baltimore exist in both the system operated by DPW and the private system. This section describes both public and private source reduction, reuse, and diversion programs in the city.

3.3.1 Single Stream Recyclables

The City has undertaken many recycling programs to improve participation in curbside recycling programs, comply with state law (e.g., by monitoring recycling efforts in office and apartment buildings), and educate constituents on the importance of recycling.

Curbside Recycling Program

DPW provides curbside SSR collection once every two weeks, Tuesday through Friday, to each single-family residence located in Baltimore. There is no maximum amount of recyclable material that can be collected from each residence. Materials accepted in the SSR collection program include aluminum and steel/tin cans, cardboard, glass containers, mixed paper, and plastic bottles and jars. A full listing of acceptable and unacceptable materials is available here. The City is currently trying to return to once weekly SSR collection as soon as is feasible. DPW drivers do not currently have capacity to provide once-weekly collection due to staffing shortages, equipment breakdowns and an increase in the number of residences recycling and recycling tonnage since the roll out of 170,000 65 gallon blue bins in 2021 (in comparison to the 40,000 14 gallon yellow bins DPW serviced before the Covid 19 Pandemic) .SSR collected from the curbside program is sent to a private out-of-City processing facility for recycling (see Appendix D).

Public Education and Outreach

The City provides information about waste disposal and recycling programs, what materials can be recycled, locations of residential drop-off centers, disposal of household hazardous waste, and source reduction initiatives on the City's website (www.baltimorecity.gov) and on DPW's social media outlets (Facebook, Instagram, LinkedIn, NextDoor, and Twitter). Waste reduction and reuse is promoted at City-organized spring and summer festivals and at special events throughout the year. DPW also places recycling memos and information in monthly newsletters sent to all residents. More information on specific education and outreach programs is provided below.

Source Reduction Programs

According to the 2020 Source Reduction Report published by MDE, Baltimore participated in the following source reduction initiatives:

1. Conducting an ongoing, multi-faceted public education program promoting grass-cycling and/or home composting of yard trimmings;

2. Distributing publications exclusively promoting and describing how to utilize grass-cycling and/or home composting of yard trimmings to at least 30% of single family households within the last three years;
3. Conducting an ongoing multi-faceted, public education program promoting food donation and food composting;
4. Hosting a source reduction event for the general public;
5. Incorporating source reduction information into a county website;
6. Promoting source reduction in schools on an ongoing basis;
7. Including a source reduction curriculum or ongoing activity in schools;
8. Integrating source reduction into ongoing county employee training and education programs;
9. Distributing source reduction materials to at least 30% of residents within the last three years;
10. Distributing source reduction materials to at least 30% of businesses within the last three years;
11. Developing or updating a solid waste reuse directory within the last three years;
12. Conducting a focus group or a survey of residents about source reduction within the last three years;
13. Developing or maintaining a system for referring people to a materials exchange program;
14. Working with a targeted sector of the business community to achieve source reduction;
15. Conducting a source reduction training session, workshop, or presentation at a business, institutional or community event;
16. Conducting workshops demonstrating proper food composting techniques;
17. Developing or maintaining permanent food composting demonstration sites;
18. Operating a program to promote pallet reuse;
19. Establishing or maintaining a City procurement policy advancing the purchase of materials that result in reduced waste generation;
20. Incorporating green building codes/requirements in City construction, remodeling, and maintenance bid specs and contracts; and
21. Holding team meetings, at least quarterly, that included representatives from major City departments, in which source reduction was discussed as a formal part of the agenda.

Recycle Right and Social Media

The Office of Waste Diversion is investigating using and improving digital technologies to help educate the public about solid waste management and recycling in Baltimore. In addition to utilizing DPW's social media accounts to promote source reduction, the Office of Waste Diversion developed a "Recycle Right" webpage that gives guidance on recycling and promotes source reduction. Waste diversion and recycling messaging and materials are created and managed in coordination with the City's Communications Office.

Polystyrene Ban

Under Ordinance 18-125, food service facilities in Baltimore are prohibited from using disposable food service ware made from polystyrene (Styrofoam). This law does not apply to food or beverages packaged outside of the city, such as butchered meat and eggs. The ban is intended to force businesses in the City to replace polystyrene containers with recyclable or compostable alternatives. The Department of Health enforces the bill, issuing fines beginning at $200 for retailers that do not comply with the polystyrene ban..

Plastic Bag Ban

On October 1, 2021, the Comprehensive Bag Reduction Act, also known as the Plastic Bag Ban, went into effect. The Act prohibits grocers and other retailers from supplying customers with plastic bags at point of sale, pickup, or delivery. It specifically applies to plastic "check out" bags that have a thickness of less than 4 mils. Paper bags and compostable plastic bags are permitted. However, compostable plastic bags must be recognized as meeting ASTM D6400 standards, as well as capable of biological decomposition. The use of any accepted single use bags is accompanied by a fee of at least five cents charged to the customer. Of these five cents, one cent is paid to the city of Baltimore, with the rest retained by the business. The City has also distributed more than 55,000 free reusable bags to residents. Baltimore's bag ban is critical to solid waste management because: (i) plastic bags are not accepted in curbside recycling as they can damage MRF machinery; and (ii) plastic bags and bagged materials are the largest contributors to contamination in single stream recycling. The comprehensive bag reduction act assists with the removal of plastic bags from the recycling stream, as well as decreasing plastic pollution in the city's streets, parks, and waterways.

Based on data collected from the Baltimore City bag surcharge portal, 20 million alternative bags (paper, compostable, or thicker plastic) were sold in the City during the first year of the ban. Assuming that each purchased alternative bag was used in place of one thin plastic bag, it is estimated that at least 20 million thin plastic bags were prevented from entering the city's solid waste stream. Note that this is a conservative assumption as it does not account for customers who changed behaviors to consistently use reusable bags or other methods for transporting purchases.

Using a weight conversion factor of 0.77 pounds per 100 bags (from the US EPA), it is estimated that approximately 154,000 pounds, or roughly 77 tons of plastic bags were diverted from disposal during the first year of the plastic bag ban.

Electronic Timekeeping System

In 2020, the city implemented an electronic timecard system, called Workday. This citywide system eliminated the need for paper time sheets, overtime slips, and leave slips. It has reduced vast quantities of timekeeping paperwork.

Electronic Invoice Processing System

DPW, the Department of Transportation, and the Department of General Services, which are the three largest City agencies that work with consultants and contractors, are using an electronic, paperless invoice review and approval process.

Municipal Can Program

In 2016, the City provided every household subject to trash collection by DPW with a 65-gal. wheeled trash can specifically for mixed refuse. By providing all households with a trash can with a tight-fitting lid, the City aimed to reduce wind-blown litter, prevent rodents and other animals from foraging in trash cans,

and standardize trash collection in the city to reduce the strain on trash collection workers. The program was also launched with the intent of reducing total trash generation in the city by providing all residents with a standardized bin size that is considerably smaller than the maximum collection volume of 96 gallons.

Recycling Can Program

In September 2021, the City launched delivery of 65-gallon curbside recycling carts to more than 190,000 city households. This initiative was conducted in coordination with the Recycling Partnership, the American Beverage Association's Every Bottle Back Initiative, Closed Loop Partnership, Dow, the Baltimore Civic Fund, and Rehrig Pacific. The goal of this initiative was to increase access to curbside recycling and improve recycling participation. Delivery of recycling carts was completed in February 2022, and DPW is monitoring the impacts of the rollout through reporting required through the agreements with the program's lending partners.

Recycling Partnership Grant for City-Recycling Campaign

Baltimore City received a cash grant of $250,000 from the Recycling Partnership in May of 2020 to support resident engagement in curbside recycling and improved quality of materials. In addition, the Recycling Partnership provides access to campaign materials, staff time, and other in-kind services with a total estimated value of $125,000.

Residents may not know which materials are recyclable and how to properly prepare recyclables for collection. In response, the City seeks to provide targeted, specific outreach to residents to encourage recycling, provide guidance about what can be recycled, and implement other programmatic elements with the goal of decreasing the contamination rate of curbside recycling.

Campaign elements included an informational card mailed to all households in Baltimore in order to make sure each household receives current, accurate information about the recycling program. Supportive messaging and campaign materials were placed throughout communities on various structures. In addition to providing outreach directly to households and in public spaces, City staff hand out informational items and discuss the proper way to recycle at various community events. Social media advertisements are also used to help increase reach and to engage with residents. Outreach materials promote the city's "Recycle Right" webpage. Targeted recycling routes with high levels of contamination receive extra outreach. Recycling crews place "oops" tags on recycling that is contaminated or set out in a plastic bag. This helps remind residents of the opportunity to recycle right.

Recycling Initiatives in City Schools

DPW participates in multiple school initiatives to encourage and promote recycling. These include:

1. The Eco Warriors Challenge, a competition among city schools for students and families in which students earn badges and service learning hours. The top three elementary, middle, and high schools with the most badges win a cash reward.
2. Conducting recycling presentations in schools that discuss waste reduction and reuse, what is and is not recyclable, and recycling at home;

3. Providing schools that recycle properly and consistently with 65-gallon recycle bins (this program is planned); and
4. Designing school specific recycling posters.

Additional information on the Baltimore public school recycling program can be found in Appendix E.

Apartment Building and Condominium Recycling Program

Per Maryland Code, Environment Article 9-1711, each property owner or manager of an apartment building or a council of unit owners of a condominium that contain 10 or more dwelling units shall provide recycling collection and removal for the residents of the dwelling units. The apartment building and condominium recycling plan is provided in Appendix F1, and a list of all eligible apartment buildings and condominiums is provided in Appendix F2.

Baltimore City provides recycling roll-off container collection for condominiums with 50 tenants or more, but recycling collection is provided at the discretion of the condominium owners. Recycling roll-off container collection is also provided for apartment buildings, regardless of tenant size, at the discretion of the property owner or apartment manager.

Special Events Recycling Program

Per Maryland Code, Environment Article 9-1712, all special event organizers are required to provide recycling at special events that meet the following criteria:

- Includes temporary or periodic use of a public street, publicly owned site or facility, or public park;
- Serves food or drink; and
- Is expected to have 200 or more persons in attendance.

In addition, special event organizers are required to provide all labor or equipment necessary to facilitate recycling, place recycling bins adjacent to each trash can, ensure recycling bins are easily distinguishable from trash receptacles, ensure recyclable materials are collected and processed for recycling, and pay any costs associated with recycling at the event. When applying for a permit, event organizers are required to provide a recycling plan to be reviewed by the Office of Waste Diversion. Organizers that do not submit a recycling plan that meets the aforementioned requirements will not receive a special event permit. The Special Events Recycling Plan is provided in Appendix G1, the special events location list is provided in Appendix G2, special events guidelines are included in Appendix G3, and a special events checklist is included in Appendix G4.

The City provides recycling receptacles and collection for eligible special events if the special event organizer requests them. Otherwise, special event organizers hire private haulers to provide recycling services.

Office Building Recycling Program

During the December 2019 legislative session, the Maryland General Assembly passed Senate Bill 370, Environment – Recycling – Office Buildings which requires the County Recycling Plan to address the collection and recycling of recyclable materials from buildings that have 150,000 square feet or greater of office space. Owners of office buildings that meet the criteria are required to provide recycling receptacles for the collection of recyclable materials. The office building recycling plan is provided in Appendix H.

Owners of buildings that have 150,000 square feet or greater of office space are responsible for providing all containers, labor, and equipment necessary to fulfill recycling requirements, either directly or through contracting with a private sector company. The office building owners and tenants shall recycle corrugated cardboard, mixed paper, acceptable plastic bottles and jugs, and tin/aluminum beverage containers.

Monitoring of the recyclable material collection in office buildings will be conducted by the owner, corporate management company, or tenants of each applicable office building. The city requests office building owners to submit an annual Maryland Recycling Act (MRA) report detailing the recycling tonnages removed from the office building(s), but there is currently no enforcement mechanism in place to require reporting.

Cigarette Butt Recycling

In 2016, fifteen cigarette butt recycling receptacles were installed near bars, restaurants, movie theaters, and coffee shops in the Harbor East neighborhood of the City. A reported 55,000 cigarette butts were collected within the first six months of the initiative. The cigarette butts were processed into compost and shipping pallets. Although the City received a grant in 2018 through BMore Beautiful, the City's peer-to-peer beautification program, to install 90 new urns and provide marketing outreach on cigarette recycling, the cigarette butt recycling program has since ended.

In addition to the cigarette butt recycling program, the City of Baltimore and Baltimore Mayor Brandon Scott filed a joint lawsuit in November 2022 to hold cigarette manufacturers accountable for cleanup costs associated with tobacco product litter.

Paper Shredding

To promote paper recycling with residents and businesses in the City, DPW holds shredding events three to four times per year. During these and all other DPW events, educational materials on recycling and source reduction are provided to participants. In 2022, Shred Events collected over 19.5 tons of recyclable paper, and averaged more than 200 cars per event.

3.3.2 Organics

Currently, there is no centralized large-scale organics diversion program in Baltimore. Organics diversion (mostly composting) is available through local community collectives, small-scale farm-based initiatives, small-scale privately contracted collection, or personal backyard compost systems. In a 2018 survey of stakeholders reported in the LWBB Plan, 7% of respondents stated they perform some form of backyard composting while 8% participate in a community composting initiative. However, these rates are unlikely

to represent citywide averages as survey takers were self-selected and thus more likely to be interested/involved in waste reduction initiatives.

Food Matters Program

In September 2018, the City began working with the Natural Resources Defense Council (NRDC) and the Rockefeller Foundation to implement strategies laid out in the BFWRS by establishing the Food Matters pilot food waste management project. NRDC provided technical support in the form of professional training peer learning opportunities and contributed over $800,000 to support food waste reduction planning and implementation (including funding for staff positions and small grants to nonprofit organizations to support the City's goals of reducing food wastage). Through 2022, roughly $100,000 in grants have been awarded to eleven applicants. Other notable achievements of the Food Matters program include the creation of a support network for community composting sites which has allowed providers to explore different types of in-vessel systems and the creation of additional educational materials targeting source reduction, which has led to an awareness of the connection between compost and local food provision systems.

The Food Matters program also included implementing the "Save The Food Campaign" in Baltimore City. The "Save The Food Campaign" is a large-scale consumer campaign targeted at food waste prevention at the household level. The campaign was launched with an event series consisting of five events focused on food waste issues, including a movie screening about food waste reduction. Ten food waste reduction community sessions were held across the city to connect with key community stakeholders, in order to promote in-home composting. These community gatherings were integral to raising awareness of food waste challenges. In addition to these events, the campaign has a video and website. The website includes tips on how to store food to preserve it longer, recipes for utilizing parts of produce that is often discarded, information on the harm of food waste, and more. The project is also working with institutions on food waste prevention and compost, supporting enhanced community composting, educating the public about food waste prevention, and is supporting the Maryland Food Bank in food rescue options.

Other City Initiatives to Combat Food Waste

The City has implemented a free food scrap drop-off program for residents. Collection bins are placed at DPW's five residential drop-off centers, the downtown farmer's market and bazaar, and the Waverly farmer's market. Food scraps collected at the two farmer's markets is donated to local farmers, who use it for compost and animal feed. At the two farmer's market locations, the program makes a consistent effort to educate the public on strategies relating to food waste reduction and broader environmental stewardship. Each person is invited to weigh their scraps and offered the opportunity to provide information about their housing type and location, as well as participate in a short survey.

Additionally, the NRDC issued a Food Scrap Recycling 2019 Landscape Assessment for the City which evaluates opportunities to leverage financing and/or funding strategies to support the food waste reduction strategies laid out in BFWRS.

Donation and Food Rescue Organizations in Baltimore

Major food rescue and donation organizations in Baltimore and the surrounding region are listed in Appendices I and J. As a result of these food rescue/donation organizations, it is estimated that 5,750 tons of food was distributed to food insecure Baltimore residents in 2018 (NRDC 2019).

In addition to major food rescue organizations, there are some other establishments offering possible synergies regarding food waste work in the Baltimore region. These include:

1. Center for Eco Technology: A national non-profit supporting food waste prevention and diversion at the local and state level. They support the development of a wasted food diversion marketplace.
2. Food Rescue US/EAT Management: Operated by a former chef/restaurateur turned food waste consultant. Currently supporting the advancement of the Food Rescue US platform designed to increase food rescue efforts with volunteer support.

Grass-cycling

The City provides comprehensive information that encourage residents to practice Grass-cycling and on-site composting of yard trim materials. Educational efforts to promote Grass-cycling and composting include:

- Grass-cycling presentations provided during community association meetings;
- Distribution of informational flyers and pamphlets during free city-wide festivals, like the African American heritage festival, Artscape, Book Festival, and Ecofest;
- Inclusion of grass-cycling tips in the DPW calendar, which is mailed to all city residents; and
- Distribution of educational materials on DPW social media accounts.

Community Composting Programs

Baltimore is home to many community composting initiatives and programs. These include non-profit food scrap collection services, community gardens, and several small local private companies that service households for waste management solutions for compost, recyclables, and residual waste. Some of these providers also engage with Baltimore area restaurants to help reduce their waste stream through composting and recycling. Lists of the community composting programs available both in and near the City are included in Appendices I and J.

3.3.3 Construction and Demolition Debris

The City currently does not offer any formal C&D recycling opportunities. However, several reuse and repurposing facilities in the city provide residents and businesses with opportunities to reduce the amount of C&D material sent into the solid waste system. These facilities focus on both deconstruction for salvage of valuable materials from homes and structures that are to be demolished, as well as donation of unused building materials like paint, lumber, plumbing fixtures, appliances, doors, cabinets, and windows. Lists of in- and near-city C&D reuse and repurposing facilities are included in Appendices I and J.

3.3.4 Durable Medical Equipment

Durable Medical Equipment (e.g., wheelchairs, walkers, scooters, etc.) is collected at the residential drop-off centers at NWTS and QRL through a partnership with the Maryland Department of Aging. These materials are refurbished and reused.

Appliances are collected curbside via 311 or at residential drop-off centers and recycled as scrap metal.

3.3.5 Other Waste Reduction and Diversion Programs

Other private and non-profit waste reduction and diversion facilities in and near the City are listed in Appendices I and J. These facilities donate and reuse textiles, clothing, shoes, eyeglasses, vehicles, books, musical instruments, and other items.

3.3.6 Litter Reduction and Cleanup Programs

The City has several community-based programs designed to reduce litter generation, promote litter cleanup, and educate constituents on the importance of litter reduction.

Community Pitch-In Program

The Community Pitch-In Program empowers residents to tackle the trash problems in their neighborhoods. Community associations can request up to four roll-off dumpsters yearly to aid in such cleanup efforts. The Mayor's Annual Spring and Fall Cleanups are multi-agency, citywide events that encourage residents to clean up their communities. DPW offers bags, roll-off dumpsters, and same-day bag collection to participating community organizations and business organizations.

BMORE Beautiful Program

The BMORE Beautiful Program, introduced as the Clean Corps program in 2015, is a collaboration between the Mayor's Office, Office of Sustainability, DPW, Department of Housing and Community Development, the Environmental Control Board, and non-profit partners including Baltimore Green Works and the Waterfront Partnership. It utilizes the core principles of community-based social marketing and peer-to-peer networking to engage, educate, and motivate residents, businesses, schools, and neighborhood associations to change their behavior toward litter, trash, and proper waste disposal. The goal of the program is not only to change behaviors and attitudes toward the beautification of the city, but also to encourage residents, businesses, and organizations to become directly involved in activities and projects that will keep their neighborhoods clean. To meet this goal, the City works closely with neighborhoods on their unique beautification projects and cleanliness challenges, and provides educational literature, outreach materials and other resources. A resident in each piloted neighborhood volunteers to be the block captain, following the role model of engagement. They are responsible for recruiting neighbors to sign the pledge and participate in the program, organizing ongoing beautification and cleaning activities, leading others to change their negative behaviors regarding neighborhood cleanliness, and educating their

neighbors on how to comply with City Code requirements and how they can keep their neighborhoods beautiful through simple, easy-to-follow behaviors.

Additionally, BMORE Beautiful supports community beautification goals by offering small and innovative grant programs that address an array of neighborhood beautification and engagement needs. Current grant opportunities include Love Your Block, Say YES! (Youth Environment Stewardship) Program, Care-A-Lot Grant, and Activate Your Space Grant. Love Your Block is a mini-grant program that provides funding for small community led beautification efforts. Care-A-Lot is grant program that provides funding for communities and organizations to mow and maintain vacant lots in the city. SAY YES! Program is an opportunity for youth to become actively involved in the cleaning and greening in their communities. Activate Your Space Grant is a grant program that provides design assistance, consultation and funding to neighborhood organizations utilizing crime prevention through environmental design (CPTED) strategies to transform blighted vacant lots into safe community assets.

Baltimore Clean Corps Initiative

The Baltimore Clean Corps Initiative, a partnership between the City and local nonprofit and community based organizations, provides grants to hire unemployed or underemployed residents to clean and care for community-selected sites. Cleaning activities may include maintaining vacant lots, cleaning alleys, and maintaining trash receptacles in specific neighborhoods. Clean Corps grantees will support the City to provide services in thirty-three eligible neighborhoods that have been hit particularly hard by the COVID-19 pandemic and resulting economic crisis until January 2025.

DPW Volunteer Network

DPW launched the Volunteer Network in December 2022 wherein individuals and groups (including but not limited to K-12 schools, colleges, universities, businesses, nonprofits, faith-based institutions, and community associations) are encouraged to join DPW's efforts to keep the city clean and healthy. Specific initiatives may combat illegal dumping, promote anti-littering and proper trash disposal, conserve water, minimize food waste, or promote recycling.

Smart Cans

Solar powered trash compactors fitted with sensors and communications devices that let DPW know when they need to be emptied have been deployed in the City and have been in service in the Inner Harbor for several years. In 2018, 64 Smart Cans were deployed in South Baltimore in conjunction with attached recycling cans. Smart cans help reduce litter in the city by avoiding instances where litter cans are full and excess material gets piled upon or around the can, where it is more susceptible to being spread by wind and vermin.

3.4 Existing Residential Drop-Off Centers

City residents may drop off waste and recycling for free at the residential drop-off centers located at QRL or NWTS as well as three other full-service residential drop-off centers – Western Sanitation Yard (Reedbird Avenue Drop-off Center), Eastern Sanitation Yard (Bowleys Lane Drop-off Center), and Sisson Street Drop-off Center. These facilities provide additional disposal capabilities to city residents and accept bulk trash, commingled recycling, rigid plastics, scrap metal, scrap tires, appliances, waste oil and

antifreeze, electronics, and oyster shells on a year-round basis. In addition, the Baltimore Department of General Services (DGS) operates three drop-off centers that only accept commingled recyclables – York Road Substation, Calverton Road Substation, and Lewin Substation. A listing of acceptable materials at each drop-off center is available here. Figure 3-4 shows the locations of the residential drop-off centers.

Recyclable materials collected at residential drop-off centers are sent to various private recycling companies for processing. A full list of the City's current recycling vendors is provided in Appendix D.

Baltimore City Residents can dispose of their Household Hazardous waste (HHW) on designated collection dates (about 14 per year) at the Sisson Street Drop-Off Center on 2849 Sisson Street. Accepted materials include automotive fluids, batteries, glycols (e.g., Antifreeze), household cleaning products, insecticides/pesticides, thermometers, florescent light bulbs, solvents, fire extinguishers, oil-based paint, varnishes and stains. A private company exports Baltimore City HHW for proper processing and disposal.

Figure 3-4. Map of Residential Drop-off Centers

3.5 Existing Waste Collection System

This section includes a description of existing solid waste collection systems, including service areas. The description is presented below, with more detail provided on the services provided by DPW than on private collection services.

Under Article 23 of the Baltimore City Code, the City is responsible for collecting all "mixed refuse" from dwelling houses, apartment houses, tenant houses, boarding houses, hotels, restaurants, hospitals, and other places where such refuse is accumulated. Residential waste collection services are offered to over 210,000 homes in Baltimore. These services include curbside collection as well as access to five residential drop-off centers.

Property owners whose accumulated solid waste is not collected by the City are served by private waste haulers who contract individually with property owners to provide collection services (and who also may contract with waste acceptance facilities). However, a small amount of commercial recycling in the City is handled by DPW. As the City is largely uninvolved in the management of waste collected by private haulers, its discussion is limited in scope in this Plan.

Collection services run seven days a week, excluding holidays, and residential collections occur Tuesday through Friday.

While the BSW is primarily responsible for trash collection in the city, agencies such as the Department of Housing and Community Development and the Department of Education collect waste from their respective facilities.

3.5.1 Mixed Refuse

Residential mixed refuse collection is provided by BSW's Environmental and Routine Services Division to over 210,000 homes. Since July 2009, regular mixed refuse collection services are provided once a week by the City to each location served, Tuesday through Friday with Saturday being a make-up day for missed holiday collections. The maximum waste volume limit of mixed refuse per household per week is 96 gallons.

The City's Routine Services Division collects all mixed refuse generated at City parks, single-family residences, and City litter baskets.

The Marine Operations Division provides mixed refuse collection services for those multi-family residences (generally condominiums) that the City is obligated to service. The Special Services Division provides regularly scheduled cleaning of business districts, streets and alleys, and some City-owned lots and parks. These operations are coordinated by the same borough supervisors responsible for the residential mixed refuse operation.

The amount of residential mixed refuse collected by City crews varies by season. Generally, collected waste tonnage is higher in spring and summer compared to the winter season, with the largest amounts collected in May and July.

DPW will only collect waste from addresses that generate less than 96-gal. weekly. As a result, commercial mixed refuse is predominantly collected via the private system, with individual waste haulers contracting directly with businesses and institutions in the city.

DPW and MDE have few means of determining the exact types, quantities, and disposal fate of all mixed refuse collected in the private system. However, it is estimated that roughly half of commercial mixed refuse collected in the City is disposed at WIN Waste.

3.5.2 Single-Stream Recycling

The City's residential curbside recycling program is described in Section 3.3.

Most commercial recycling occurs through the private system, however, DPW provides curbside recycling to some Baltimore businesses. Most participating businesses set out recyclables for once-a-week pickup. As of 2022, about 800 recycling containers are on the recycling business collection route serviced by the City. However, the exact number of businesses that participate in the City's recycling program is unknown as many businesses set out more than one container per address, have different levels of collection frequency per container, or simply place their recycling container out with residential recycling carts for curbside pickup.

3.5.3 Bulk Waste

Collection of bulk items in Baltimore is coordinated once per month at residential locations that have scheduled for bulk waste pickup. To arrange for bulk waste collection, residents must make a service request to 311 two to three months prior to their desired collection date, although pickup can happen faster depending on availability. Pickup may not be available on the requested date depending on the backlog of pickup requests. Materials accepted for bulk collection include furniture, appliances, and tires (without rims). Bulk waste is either recycled (e.g., appliances are drained and recycled as scrap metal) or disposed (e.g., furniture). C&D debris (e.g., drywall concrete, siding, wood pieces, and roofing) is not eligible for bulk trash collection.

3.5.4 Yard Waste and Leaves

Residential yard waste is collected by load packers along with mixed refuse on trash collection days throughout the City. Residents may place as many as five bags of leaves per household for curbside collection each week. Additionally, from October through January, residents may make a service request to 311 for special Monday pickups of as many as 20 bags of yard waste. Yard waste is disposed at WIN Waste. Leaves on City streets and other lots are collected using mechanical sweepers and load packers (although the sweepers are not specifically designed for this purpose) and disposed of at WIN Waste or QRL.

3.5.5 Rodent Eradication

DPW has operated the Rat Rubout Program in Baltimore since 2010. The goal of the program is to reduce the rat population in the City to prevent property damage and to limit the spread of disease. Under the program, City pest control workers inspect and bait active rat burrows at residential properties as a result of either a citizen complaint (via a service request to 311) or as a proactive blitz. In 2022, the City performed approximately 135,943 proactive inspections and 5,488 inspections as a result of citizen complaints. In addition to inspecting and baiting active rat burrows, City pest control workers in the program educate residents on how to keep their properties free of the trash and debris that attract rats.

3.5.6 Christmas Trees

In December and January, the City collects trees in curbside collection of mixed refuse. Trees collected curbside are sent to QRL or WIN Waste for disposal. During this period, the City also allows residents to drop off Christmas trees at multiple locations throughout the City where they are given the option to mulch their trees and collect the mulch. Any mulch not taken by residents is disposed at QRL or WIN Waste.

3.5.7 Waste from City Parks

DPW services the trash cans from 262 parks and 43 recreation centers on a weekly basis. Parks and recreation centers are also able to schedule bulk trash pickup by request. Waste from the parks and recreation centers is included in the residential waste stream.

3.5.8 Animal Manure and Carcasses

The main producer of animal manure is the Maryland Zoo in Baltimore. The City collects manure from the zoo multiple times each week. Approximately 850 tons of manure is removed from the zoo annually and sent to QRL for disposal. Most animal carcasses collected in the City are those of stray cats, stray dogs, and deer. The Health Department collects animal carcasses for incineration.

3.5.9 Cleanup of Illegal Dumping

Illegally dumped waste remains a persistent issue in Baltimore with an estimated 10,000 tons of waste illegally dumped annually. DPW responds to 311 service requests to investigate and clean up illegal dumping. However, dedicated alley and lot cleaning crews have recently been able to address illegal dumping "hot spots" without relying solely on 311 complaints. According to the December 2022 Illegal Dumping Remediation report published by DPW, the City's cyclical response to illegal dumping incurred costs of over $26.7 million in FY 2022 on right-of-way cleaning services, which includes street and alley cleaning, mechanical street sweeping, marine operations, and cleaning of business districts. DPW's Office of Communications and Community Affairs is actively engaged in educational outreach to engage residents in preventing and reporting illegal dumping. DPW tracks and reports illegal dumping across the city and uses targeted marketing strategies to deter unwanted behaviors in high-incidence areas.

3.5.10 Marine Debris

The City provides cleaning services for the inner harbor and surrounding waterways via DPW's Marine Operations Unit, which operates seven days a week. The Marine Operations Unit uses multiple skimmer and bass boats to remove debris from harborways. Skimmer boats are designed to skim the waterways for debris and store the debris on-board while bass boats are smaller boats that are used by operators to

remove debris using a net. Baltimore was the first city in the nation to use skimmer boats for debris removal.

The City also receives assistance from Waterfront Partnership and their trash wheels (e.g., "Mr. Trash Wheel") to collect marine debris. Trash wheels are solar-powered watercraft that intercept trash at the end of a river, stream, or other outfall. There are trash wheels installed at several key waterway locations that have historically funneled trash into the harbor.

3.5.11 Street and Sidewalk Sweeping

The City operates a fleet of mechanical street sweepers in addition to human sidewalk sweepers to collect litter and dirt from the main streets and sidewalks in Baltimore. Mechanical sweepers operate 74 routes on a weekly basis while sidewalk sweepers and all terrain ride on vacuum sweepers operate daily primarily within the business district and gateway areas. About 9,000 tons of dirt and debris is collected by street and sidewalk sweepers annually.

3.5.12 Cleanup and Trash Removal at Encampments

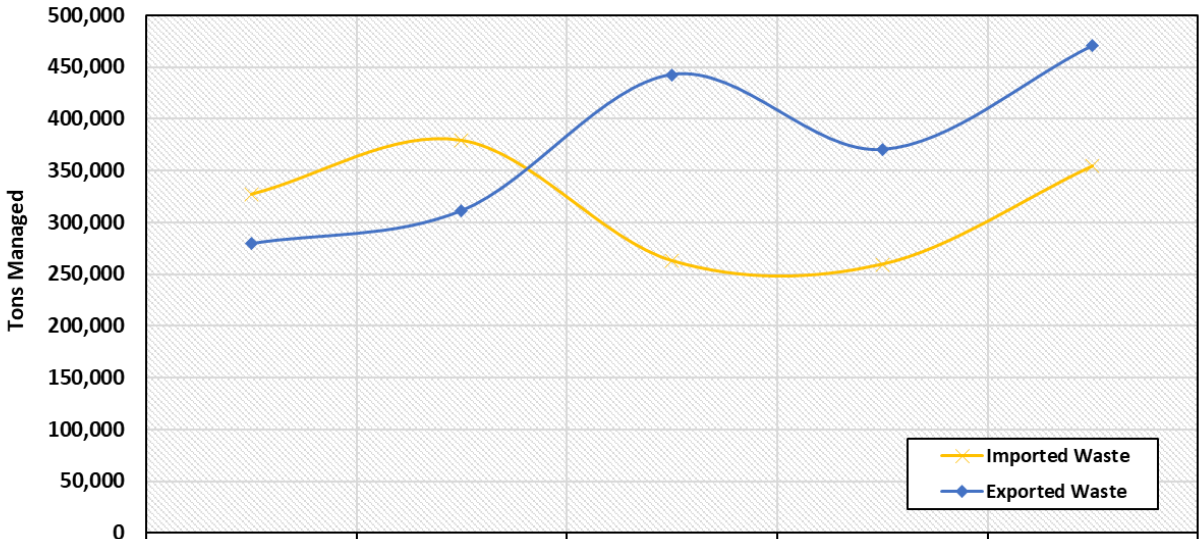
While residents remain at a homeless encampment, DPW will remove trash from the site until the Department of Health can provide residents with temporary housing. DPW also provides cleanup services to areas used as homeless encampments after residents have been provided alternative housing.

3.5.13 Small Hauler Program

In April 2017, the City extended the successful Small Hauler Program at QRL to allow small haulers to also use NWTS. Small commercial waste haulers include those who contract with others for collection, transportation, or disposal of solid waste; or engage in the collection, transportation, or disposal of solid waste. The program was designed to encourage small haulers to apply for a City permit, reduce instances of illegal dumping, and allow for more efficient disposal of commercial waste. Small haulers may dispose of their loads at NWTS and QRL for a disposal fee of $20 per load up to 7,000 pounds and $3.38 per 100 pounds above 7,000 pounds. In 2021, approximately 32,600 tons of waste was delivered to NWTS and QRL under the small hauler program.

3.6 Import and Export of Solid Waste

The types and quantities of solid waste imported into the city for disposal that are known to be significant are discussed below. These wastes include residential mixed refuse, commercial/institutional mixed refuse, scrapped automobiles, special hospital waste, and wastewater treatment plant sludge. Wastes believed to be exported are also listed; however, the City has very little information concerning exported waste amounts. Figure 3-5 contains an estimate of imported and exported waste quantities from 2017 through 2021.



	2017	2018	2019	2020	2021
Imported Waste	326,900	378,900	262,700	259,200	354,100
Exported Waste	279,900	311,700	442,700	370,500	470,500

Figure 3-5. Estimated Quantities of Imported and Exported Waste, 2017-2021

3.6.1 Types and Quantities of Waste Imported

Mixed Refuse

In addition to Baltimore City, WIN Waste accepts waste from Baltimore County, Howard County, Anne Arundel County, Montgomery County, Saint Mary's County, and Prince George's County in Maryland as well as from several other states including New York, Ohio, Pennsylvania, Virginia, and North Carolina. In 2021, WIN Waste accepted approximately 700,200 tons of commercial and residential refuse. Roughly half of this waste, 346,100 tons, is mixed MSW from Baltimore City. The majority of the ash produced by processing the waste at WIN Waste is delivered to QRL. In 2021, WIN Waste disposed of approximately 130,000 tons of ash at QRL. Approximately 37% of the net weight of 335,000 tons of material disposed at QRL was WIN Waste-produced ash.

Scrap Automobiles

Scrapped automobiles from wrecking yards throughout the metropolitan area are imported to the multiple licensed automobile scrap processors and recyclers located in the city. Although metal from these automobiles is ultimately reused inside or outside the city, processing also generates 0.3 tons per automobile of non-recycling material (fluff) that requires disposal. Fluff is no longer accepted at QRL.

Scrap Tires

Emanuel, the major tire recycler in the city, has the capacity to process six million scrapped tires annually. Approximately half of the scrap tires that Emanuel processes are non-Maryland scrap tires.

Special Medical Waste

Special medical waste and mixed refuse from area medical facilities is imported to the City's medical waste facility for incineration. The ash residue remaining after incineration is exported for disposal.

Household Hazardous Waste

Household hazardous waste collected across the region is imported to a City vendor for proper processing and disposal. The treatment facility accepts a variety of industrial wastewater and acts as a transfer station for other industrial waste including flammables, oxidizers, poisons, and reactive agents.

3.6.2 Types and Quantities of Waste Exported

Although the exact types of exported waste are unknown, it is clear that waste is leaving the City. While the destinations for this waste are also unknown, Appendix K contains a list of nearby waste disposal, processing, and transfer facilities where waste is likely to be taken.

Residential, Commercial, and Mixed MSW

Most of the City's exported waste is collected and hauled by private waste collectors. This is based on the limited number of disposal facilities available within the city and the amount of waste collected by private haulers.

C&D Waste

It is assumed that the majority of C&D waste generated in the City is exported to nearby C&D landfills in Baltimore County.

Residential Recyclables

All residential recyclables collected by the City are exported to a private MRF (see Appendix D). In 2021, the City collected and exported 23,700 tons of recyclables. Recyclables collected by private haulers within the city are also exported.

Scrap Tires

Scrap tires collected by the City are exported to a company in Harford County for recycling and disposal.

Electronics

Electronics collected at residential drop-off centers are exported for recycling.

Controlled Hazardous Substances

Controlled hazardous substances generated within the city are exported for processing or disposal.

Animal Carcasses

Animal carcasses collected by the City are exported for incineration.

Special Medical Waste

Some special medical waste is exported for processing or disposal.

3.7 Permitted Waste Transfer Facilities

Figure 3-6 contains a map showing the location of all permitted solid waste transfer stations in the city.

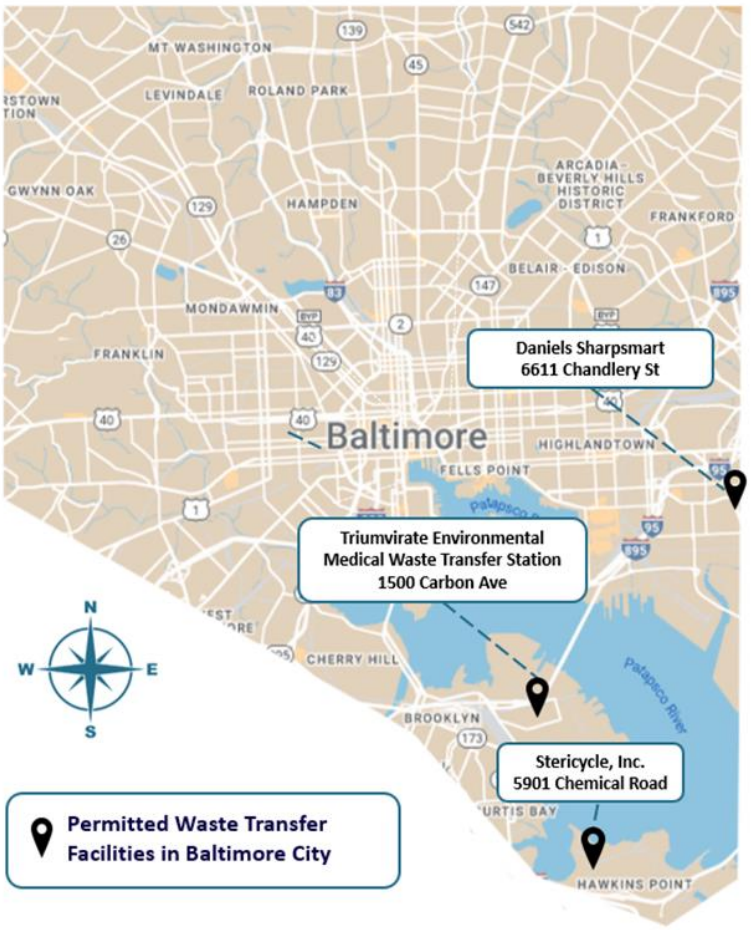


Figure 3-6. Permitted Waste Transfer Stations in Baltimore City

3.7.1 Northwest Transfer Station (NWTS)

(N 549,500; E 890,000)

The 6.595-acre NWTS at 5030 Reisterstown Road is owned and operated by the City. The station's design capacity is 600 tons of mixed refuse per day. In 2010, the City renewed the facility permit for the NWTS with a capacity of 150,000 tons per year. In 2021, the facility accepted and transferred approximately 81,400 tons of material. The current permit for this facility expires in 2026.

To assure the long-term vitality of this solid waste institution, improvements to NWTS were completed in 2020. This project was primarily focused on the exterior walls of the facility and the roof. The facility has an anticipated service life of more than 20 years.

3.7.2 Triumvirate Environmental Medical Waste Transfer Station

(39.2397°N; 76.5821°W)

This environmental and medical waste acceptance facility, located at 2300 Sun Street in Curtis Bay, accepted and transported 182 tons of waste in 2021. The facility is located on 20 acres and its permit expires in 2025.

3.7.3 Stericycle, Inc.

(N 500,000; E 921,500)

This autoclave facility is located on a 2.4-acre site at 5901 Chemical Road. The facility has an annual capacity of 22,800 tons[6]. The site accepts chemotherapeutic, pharmaceutical, and pathological waste, however that waste is then shipped to its facility in Haw River, North Carolina where it is incinerated.[7] The facility accepted approximately 21,500 tons of waste in 2021. The facility has an anticipated remaining service life of over 20 years.

3.7.4 Daniels Sharpsmart

(39.2701°N; 76.5305°W)

The facility is located at 6611 Chandlery Street. In 2021 this 0.939 acre site accepted approximately 2,400 tons of medical waste. The facility's current permit expires in 2024 and its anticipated remaining service life is at least 20 years.

3.8 Permitted Waste Processing and Recycling Facilities

Figure 3-7 contains a map showing the location of permitted solid waste processing and recycling facilities in the city.

[6] Medical Waste in MD, 2004 http://www.policyarchive.org/handle/10207/bitstreams/5161.pdf
[7] Stericycle Inc, http://www.chwmeg.org/asp/search/detail.asp?ID=6071

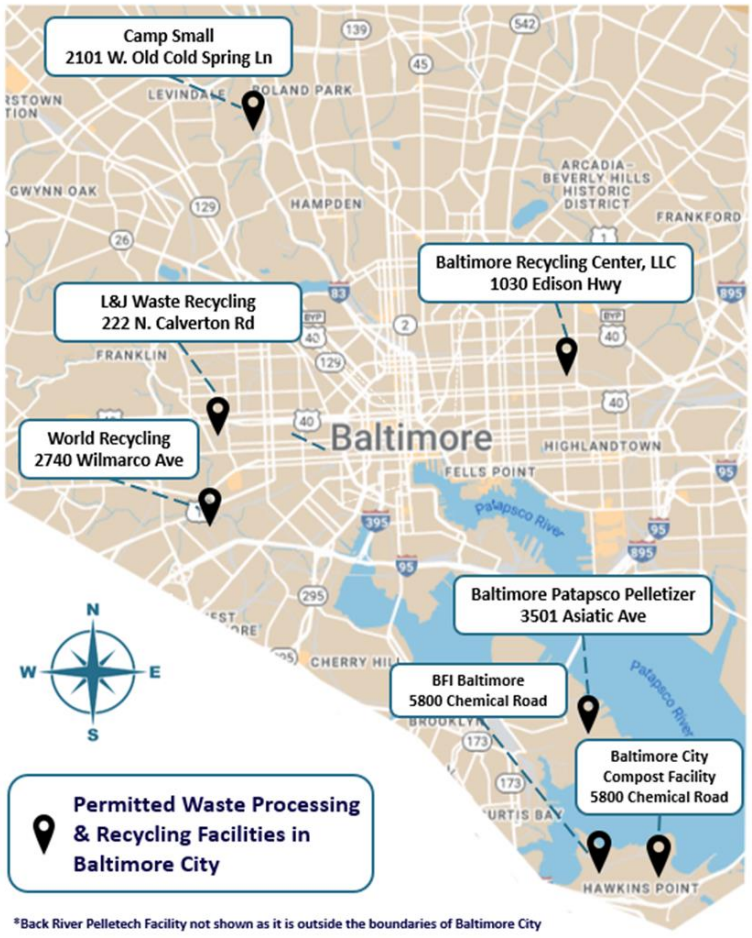


Figure 3-7. Permitted Waste Processing and Recycling Facilities in the City

3.8.1 BFI Baltimore Processing and Transfer Center

(N 500,000; E 920,500)

The facility is located at 5800 Chemical Road. The processing center is both a materials recovery center and a waste transfer station located on 15.6 acres. The facility accepted approximately 176,600 tons of waste in 2021. The facility's permit expires in 2024 and its expected service life is unknown.

3.8.2 World Recycling Company

(39.2732°N; 76.6584°W)

The facility is located at 2740 Wilmarco Avenue and accepts recyclables for processing. The City contracts with this facility to accept mixed recyclables and hard plastic. However, the facility often does not have capacity to accept loads from the City.

3.8.3 L&J Processing Facility

(*39.1727°N; 76.3938°W)*

The facility is located at 222 North Calverton Road, on a 0.932-acre site. The facility accepts and processes C&D waste for reuse. The facility started accepting waste in October 2011, and in 2021 it accepted approximately 32,500 tons of waste. The facility's permit expires in 2022.

3.8.4 Baltimore Recycling Center, LLC

(N 535,000; E 920,000)

The facility is located at 1030 Edison Highway. This 12.5-acre site accepts only construction and demolition debris. The facility's permit expires in 2024 it and accepted 186,500 tons of waste in 2021. The Baltimore Recycling Center is currently pursuing additional permitting approval via MDE to accept Municipal Solid Waste. The anticipated remaining service life of the facility is over 20 years.

3.8.5 Camp Small

(39.3482°N; 76.6478°W)

Camp Small is a natural wood waste processing yard run by the Baltimore City Department of Recreation and Parks (DRP). The 5-acre site is located in the Jones Falls Valley just north of Cold Spring Lane. All logs, branches, wood chips, leaves, and brush collected from City parks and street right of ways are brought to Camp Small for processing. Approximately 2,100 tons of wood chips and 1,300 tons of logs were processed at Camp Small in 2021.

In early 2016, the DRP Forestry Division, in collaboration with the Baltimore Office of Sustainability, began the Camp Small Zero Waste initiative in an effort to sort and distribute the variety of wood products at the site. Under the Camp Small Zero Waste Initiative, prime logs, wood chips, and brush are sorted and made available for purchase by city residents and businesses.

3.8.6 Baltimore City Compost Facility

(N 501,000; E 928,000)

This facility is located at 5800 Quarantine Road on seven and a half acres of the 157-acre QRL site. The composting facility is privately owned and permitted to receive sewage sludge generated at the City's Back River and Patapsco Wastewater Treatment plants. The plant has a design capacity of 200 wet tons per day. The sludge is mixed with wood chips and aerated to produce 75,000 cubic yards/year of biosolids compost that is marketed in the Mid-Atlantic region to landscapers, nurserymen, contractors, topsoil manufactures, golf courses, and commercial growers.8 In 2021 the facility accepted 28,100 wet tons of bio-solids. The facility could potentially provide twenty-plus years of additional service.

3.8.7 Back River Pelletech Facility

(39.29701°N; 76.4964°W)

[8] Baltimore City Composting Facility http://www.orgro.cc/about/index.html

The Back River Pelletech Facility (BRPF) is located at the BRWWTP for processing sewage treatment sludge generated at BRWWTP. BRPF is a heat drying and pelletization facility that processes liquid and semi-liquid treatment sludge into a pelletized product that is marketed as a fertilizer and soil conditioner. In 2021, BRPF processed 5,400 wet tons of bio-solids into pellets.

3.8.8 Baltimore Patapsco Pelletizer

(39.2324°N; 76.5668°W)

The Baltimore Patapsco Pelletizer (BPP) facility is located at the Patapsco Wastewater Treatment Plant (PWWTP) for processing sewage treatment sludge generated at PWWTP. BPP is a heat drying and pelletization facility that processes liquid and semi-liquid treatment sludge into a pelletized product that is marketed as a fertilizer and soil conditioner. BPP processes all of the treatment sludge generated at PWWTP on a wet and dry weight basis.

3.8.9 Other Recycling Companies and Facilities

MDE does not require recycling facilities in Maryland to be permitted as waste acceptance facilities. As such, it is difficult to determine exactly how many recycling facilities exist in Baltimore City. A list of city-based recycling facilities and programs is included in Appendix I.

3.9 Permitted Waste Disposal Facilities

Figure 3-8 contains a map showing the locations of all permitted waste disposal facilities in the city.

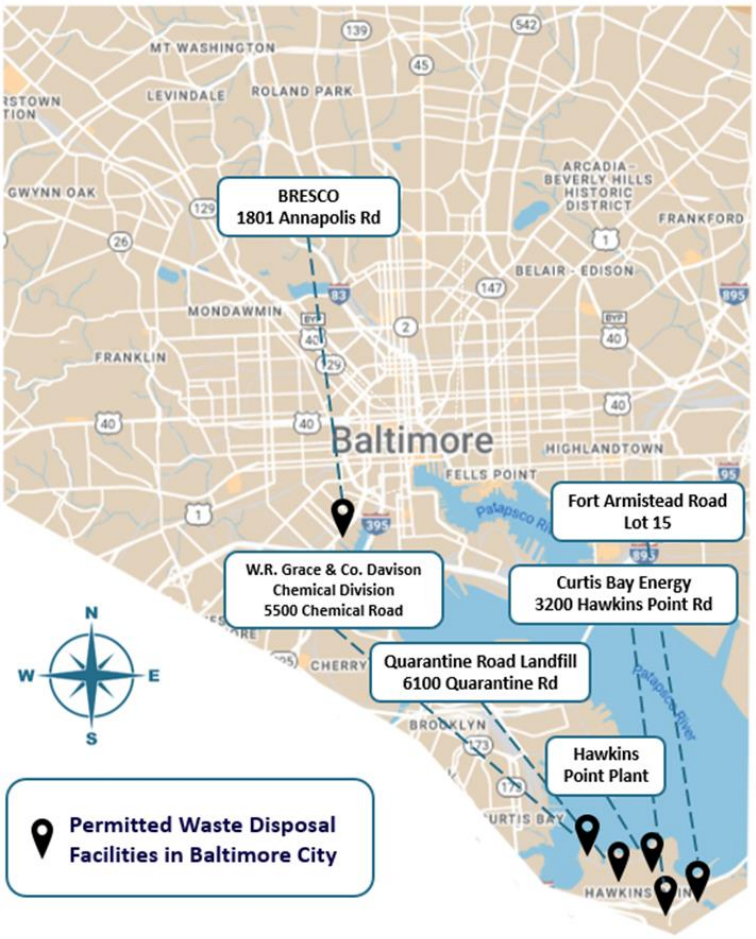


Figure 3-8. Permitted Waste Disposal Facilities

3.9.1 Quarantine Road Landfill (QRL)

(N 500,000; E 925,000)

QRL is located at 6100 Quarantine Road on a 153-acre site in Hawkins Point, 126 acres of which is utilized as a landfill. It is owned by the City and operated by the BSW.

The first cell of the landfill was constructed and began accepting waste in August 1985. Originally, the landfill was designed as six cells surrounding a central core that was to remain in place. The design capacity was approximately 11.2 million cubic yards with an expected 9.1 million cubic yards or approximately 5.4 million tons allocated for waste. The remaining volume was allocated for cover material.

In August 1994, the City performed a series of life expectancy studies which determined that the industry standard of 1.67 cubic yards/ton should not be applied at QRL due to the high percentage of ash accepted at the facility (ash is considerably denser than MSW). Actual operations indicated that 1 ton of QRL debris was occupying 1.12 cubic yards of volume and in 2010, an aerial life-expectancy study was performed that

indicated that 1.18 tons of debris was occupying one cubic yard of volume. According to the tonnage report produced for the landfill in 2021, the landfill is currently expected to reach its permitted capacity in 2028.

A lateral expansion of QRL onto the adjacent Millennium Landfill is currently planned, with submission of the Phase III permit application report to MDE occurring in October 2022. Based on the Phase III report, the lateral expansion will increase the landfill's total capacity by 5.7 million cubic yards and extend its service life through 2035.

In 2021, QRL accepted approximately 355,000 tons of waste. This included 146,800 tons of mixed MSW, 130,000 tons of MSW ash from WIN Waste, 72,000 tons of soil, and 6,900 tons of asphalt. The facility also accepts waste from small haulers and sewage sludge from BRWWTP (limited to twelve truckloads per day).

Table 3-3 below summarizes the types of customers that can deposit waste at the QRL, current fees paid, and the locations they can utilize.

Table 3-3. QRL Waste Acceptance Criteria and Tipping Fee Schedule (2022)

Customer Type	Yearly Permit Fee	Tipping Fee	Fee Per Load	Drop-Off Center?	Working Face?	Restrictions
Resident	None	None	None	Yes	No	Valid ID; Max. 1,500 lbs./load Max. 2 loads/day Max. 5 loads/week
Small Hauler	$35	None up to 7,000 lbs.	$20	No	Yes	Small Hauler Permit; Additional $3.38 charged per 100 lbs. over 7,000 lbs.
Large Hauler	$100	$67.50 per ton	None	No	Yes	Large Hauler Permit

QRL currently does not assess or advertise fines for residential or commercial clients caught illegally dumping or misplacing materials at the DOC or working face. However, QRL does enforce bans on residents or permit holders who are caught violating posted guidelines.

3.9.2 WIN Waste

(N 523,500; E 905,000)

The WIN Waste plant is located at 1801 Annapolis Road on 15 acres of City-owned land. It was constructed in 1984 and became fully operational in 1985. The WIN Waste plant is structured around three mass-burning, water wall furnaces. These furnaces can burn up to 2,250 tons of refuse per day at temperatures between 2,400- and 2,800-degrees Fahrenheit. This combustion process generates heat that is used to convert water into steam. Operating at full capacity, WIN Waste can produce as much as 500,000 pounds of steam per hour. The steam is used to drive turbines and generate up to 64 MW of electricity. Residual steam is sold to the district heating and cooling system in downtown Baltimore.

In 2022, as a result of a lawsuit regarding the BCCA, WIN Waste began upgrading its emissions technology to reduce air pollution. The upgrades are expected to be completed in late 2023. As a result of these upgrades, the anticipated remaining service life of the plant is at least ten years.

During optimal operating conditions, approximately ten percent of the raw incoming waste by volume and 27 percent by weight remains in the form of ash residue after combustion, from which ferrous and non-ferrous materials are recovered and sold to a scrap metal dealer.

Currently, the City disposes most of its solid waste at WIN Waste pursuant to a contract with the Northeast Maryland Waste Disposal Authority. The WIN Waste facility has contracted with the City to dispose of their ash residue at QRL. In 2021, WIN Waste accepted 700,200 tons of total waste, including 191,100 tons of residential Baltimore City waste collected by DPW and 155,000 tons of commercial Baltimore City waste collected by private haulers. The facility sent 130,000 tons of ash to QRL in 2021.

3.9.3 Fort Armistead Road – Lot 15 Landfill

(39.2057°N; 76.5462°W)

The Fort Armistead Road – Lot 15 Landfill is a private 32-acre permitted industrial waste landfill located on a 65-acre site that currently accepts coal ash and other residues from the Brandon Shores, H.A. Wagner, and C.O. Crane coal power plants. In 2021, Lot 15 accepted 55,800 tons of material. The facility's permit expires in 2023 and its total permitted capacity is 6.3 million cubic yards. The expected service life of the facility is greater than 20 years.

3.9.4 Hawkins Point Plant Landfill

(39.2079°N; 76.5577°W)

The Hawkins Point Plant Landfill is a private industrial waste site consisting of two parcels. The first parcel contains a 28-acre industrial waste landfill which accepted approximately 35,900 tons of material in 2021. The second parcel is permitted for industrial waste, but no landfill has yet been constructed. Constellation Energy has plans to develop 29 acres of this undeveloped parcel for use as a landfill for coal combustion residuals (ash) from its Brandon Shores, H.A. Wagner, and C.O. Crane coal power plants.

3.9.5 W.R. Grace and Co. – Davison Chemical Division Landfill

(39.2142°N; 76.5703°W)

The W.R. Grace and Co. landfill is a private 10.7-acre industrial waste landfill located on a 157-acre site which solely accepts waste generated at the W.R. Grace and Co. manufacturing facility located on the

same property. W.R. Grace is a major chemical manufacturer of silica-based absorbents, hydro-processing catalysts, polyolefin catalysts used in plastics and packaging, and fluid catalysts used in petroleum refining. In 2021, the facility accepted 13,700 tons of material. The facility is expected to run out of permitted capacity in 2029. However, the facility recently submitted a design modification for a new Refuse Disposal Permit that would vertically expand the facility and extend its service life.

3.9.6 Curtis Bay Energy Facility

(39.2026°N; 76.5553°W)

Curtis Bay Energy is also known as Curtis Bay Medical Waste Services (and used to be called Baltimore Regional Medical Waste Facility). Curtis Bay Energy is a 4-acre privately-owned medical waste incinerator with energy recovery (the nation's largest) located in Hawkins Point. The facility has a capacity of 62,050 tons of waste per year and accepted approximately 26,400 tons of material in 2021. Ash generated at Curtis Bay is shipped to North Carolina for landfill disposal.

4. ASSESSMENT OF NEEDS AND CONSTRAINTS

Chapter 4 assesses Baltimore City's need to alter, modify, or add to existing solid waste disposal systems throughout the planning period. Specifically, the following components of the City's solid waste disposal systems are assessed:

1. Source reduction and reuse programs;
2. Waste diversion and recycling programs;
3. Waste collection systems;
4. Waste transfer facilities;
5. Waste processing and recycling facilities; and
6. Waste disposal facilities.

The assessment of each component of the solid waste management system contains input from DPW (driven predominantly by data collected and recorded by the City), and the public (received predominantly in the form of comments collected at public meetings and hearings conducted as part of the development of this Plan).

4.1 Diversion Goals

This section provides an assessment of the City's progress toward meeting its short and long-term diversion goals. Specifically, this section compares the City's short-term MRA recycling goal of 35% and the City's long-term zero waste goals (as laid out in the BSP, the BFWRS, the LWBB Plan, and other City planning documents) against the City's existing diversion rates.

4.1.1 Waste Composition and Diversion Rates

Based on the information presented in Sections 3.1 and 3.2, it is estimated that approximately 1,001,000 tons of waste were disposed in Baltimore in 2021, including 305,400 tons of MSW managed by the City, 320,600 tons of MSW managed by the private sector (including 32,600 tons of waste received from small haulers), 279,000 tons of C&D waste, 13,700 tons of industrial waste, 18,000 tons of asbestos, and 5,700 tons of special medical waste. Also shown in Section 3.2, it is estimated that approximately 381,400 tons of materials were diverted in 2021, including 53,200 tons of bulk or special waste, 900 tons of vehicle tires, 138,000 tons of C&D material, 95,000 tons of soil, and 3,000 tons of wood.

Estimates for the composition of disposed MSW are shown in Table 4-1. The estimates in Table 3-2 are sourced from the LWBB project and include data from the 2019 waste sort performed for the city.

Table 4-1. Summary of Disposed MSW Composition in Baltimore

Category	Sub-Category	City-Managed MSW		Other MSW	
		%	Tons	%	Tons
Organics	Food Waste	21%	63,700	21%	66,200

	Yard Waste	12%	35,300	7%	22,800
	Mixed Organics	<1%	0	1%	3,500
Single Stream Recyclables	Cardboard	8%	23,900	15%	48,600
	Mixed Paper	6%	18,200	8%	26,400
	HDPE/PET	4%	12,400	4%	11,300
	Mixed Plastic	18%	53,600	14%	44,800
	Aluminum Cans	1%	3,900	1%	3,800
	Steel Cans	2%	7,400	4%	13,500
	Mixed Metals	<1%	200	<1%	500
	Glass	3%	9,100	4%	13,800
Non-Traditional Recyclables	Bulk Waste	1%	2,400	1%	3,800
	Textiles/Carpet	<1%	200	<1%	400
	Other	<1%	0	<1%	100
Unclassified	-	24%	75,000	19%	61,400
TOTAL		100%	305,400	100%	320,600

Using information from the city's MRA reports, the diversion rates for each general waste category in 2021 were calculated in Table 4-2 below.

Table 4-2. Summary of Diversion Rates by Waste Type and Sector

Waste Sub-Category	Disposed			Diverted			Diversion Rate		
	City	Other	Tot.	City	Other	Tot.	City	Other	Tot.
Food Waste	63,700	66,200	129,900	400	1,400	1,800	0.6%	2.1%	1.4%
Yard Waste	35,300	26,300	61,600	3,400	1,800	5,200	8.8%	6.4%	7.8%
Paper	42,100	75,000	117,100	0	69,600	69,600	0.0%	48.1%	37.3%
Plastic	66,000	56,100	122,100	5,100	1,400	6,500	7.2%	2.4%	5.1%
Metals	11,500	17,800	29,300	7,600	21,200	28,800	39.8%	54.4%	49.6%
Glass	9,100	13,800	22,900	11,700	1,400	13,100	56.3%	9.2%	36.4%
C&D	0	279,100	279,100	78,700	153,600	232,300	100.0%	35.5%	45.4%
Bulk	2,400	3,800	6,200	1,600	51,700	53,300	40.0%	93.2%	89.6%
Other	75,200	61,900	137,100	0	99,400	99,400	0.0%	61.6%	42.0%

4.1.2 MRA Recycling Rate

This section contains an assessment of the City's current MRA recycling rate, barriers to achieving the state mandated 35% MRA rate, and opportunities to improve its MRA recycling rate.

Barriers to Achieving 35% MRA Recycling Rate

The MRA recycling categories included in Table 4-2 include compostables (food waste and yard waste), paper, plastic, metals, and glass. As indicated in the table, the total diversion rates in the city for metals, glass, and paper are estimated to be above the 35% goal, while the diversion rates for compostables and plastic are below the 35% goal. Looking at only waste collected by the City, the diversion rates for compostables, paper, and plastic are especially low (less than 10%). For waste collected by others, diversion rates associated with compostables, plastic, and glass are also below 10%. As such, the primary barriers to achieving a 35% recycling rate in the City appear to be:

1. Low diversion Rates for Food Waste (for waste managed by both the City and others)
2. Low Diversion Rates for Yard Waste (for waste managed by both the City and others)
3. Low Diversion Rates for Paper (particularly for waste managed by the City)
4. Low Diversion Rates for Plastic (for waste managed by both the City and others)
5. Low Diversion Rates for Glass (particularly for waste managed by others)

Factors potentially contributing to these low diversion rates include:

1. Lack of education about what is and is not recyclable
2. Reduced curbside collection schedule (once every two weeks rather than weekly)
3. Lack of a separate yard waste collection program
4. Lack of organics processing facilities in the city
5. Lack of residential food waste diversion initiatives
6. Lack of reporting of recycling tonnages from the commercial sector

Additional detail on these and other barriers to waste reduction and diversion is provided in Section 4.2.

Opportunities for Improving MRA Recycling Rate

The primary opportunities for improving MRA recycling rate in the city are listed below:

1. Improve education and outreach: Based on diversion rates, it appears that residents are aware that glass and metal cans are recyclable in the curbside program, but not paper products or plastics. As such, an educational campaign educating residents about what can and cannot be placed in the curbside recycling bins could help improve diversion.
2. Reinstate weekly curbside SSR collection: Reinstating weekly curbside collection of SSR would likely boost diversion of SSR materials (including paper and cardboard, plastic bottles and containers, metal cans, and glass bottles).
3. Implement a yard waste collection program: Currently, the City collects yard waste with residential trash and sends it to WIN Waste for incineration. If yard waste were collected separately and composted, it could significantly improve diversion.

4. Improve residential food waste diversion outreach and initiatives: Currently the City collects food scraps at residential drop-off centers and local farmers markets. However, tonnages collected at these facilities are small. If the City were to increase outreach to inform residents about these food waste diversion initiatives, it could help improve diversion. Additionally, the City could implement larger scale food waste diversion initiatives (e.g., a pilot curbside food waste collection program) to increase diverted tonnages.
5. Construct (or support construction) of an in-city composting facility: Currently, there are no composting facilities (or other organics processing facilities) accepting food and yard waste in the city. Constructing a composting facility would provide both the City and the commercial sector with a location to send compostables (food waste and yard waste). This opportunity is described in greater detail in Section 4.6.
6. Improve reporting from the commercial sector: Relatively low diversion rates from the commercial sector are likely due to a lack of reporting. The City could support legislation to require reporting of recycling tonnages from the commercial sector or work to improve enforcement of existing statewide recycling mandates in order to improve reporting from the commercial sector.

Additional detail on these and other opportunities to improve waste reduction and diversion can be found in Section 4.2.

4.1.3 Progress Toward Achieving Long-Term Solid Waste Management Goals

The calculated diversion rates for 2021 are compared against the City's stated long-term diversion goals from the BSP, the LWBB Plan, and the BFWRS in Table 4-3 below. More detail on the City's long-term goals is provided in Section 1.1. As previously discussed, the City collects waste from the residential, commercial, and institutional sectors. However, for the remainder of this Plan and for comparison with City diversion goals, waste collected by the City will be deemed "residential" while waste collected by others will be deemed "commercial." As indicated in the table, the City has not achieved the majority of its diversion goals. The waste streams with the greatest opportunity for improvement appear to be food waste, yard waste, SSR, and C&D. The City is meeting its goal for commercial bulk waste diversion as well as residential C&D diversion.

Table 4-3. Comparison of Diversion Rates with Long-Term City Goals

Waste Category	Sector	2021 Diversion Rate[6]	City Reduction Goal	City Diversion Goal
Food Waste	Residential	0.6%	80%	80%[1]
	Commercial	2.1%	50%	50%[2]
Yard Waste	Residential	8.8%	N/A	80%[1]
	Commercial	6.4%	N/A	50%[2]
SSR	Residential	15.9%	N/A	90%[3]

	Commercial	36.5%	N/A	90%[3]
C&D	Residential	100.0%	N/A	90%[3]
	Commercial	35.5%	4%[5]	90%[3]
Bulk and Special Waste	Residential	40.0%	50%	60%[4]
	Commercial	93.2%	50%	60%[4]
Other Waste	Residential	0.0%	N/A	90%[3]
	Commercial	61.6%	N/A	90%[3]

1. From BFWRS – this diversion goal is on top of an 80% food waste reduction goal. The same goal was applied to yard waste in LWBB
2. From BFWRS - this is a reduction goal, not a diversion goal
3. The BSP calls for 90% diversion from the landfill – this diversion rate is applied where a specific diversion rate is not provided in the other plans.
4. From LWBB – based on diversion rate measured in San Francisco in 2015
5. The reduction target for C&D materials from LWBB includes only scrap metal, clay bricks, and lumber.
6. Diversion rates shown in red are below long-term goals. Those shown in green are above long-term goals.

Barriers to Achieving Long-Term Solid Waste Management Goals

As indicated in Table 4-3, the City has not achieved most of its long-term solid waste management goals, with the exception of residential C&D waste (where asphalt millings generated from repaving public roads are reused as road base material at QRL) and commercial bulk and special waste (where scrap metal and white goods are nearly universally recycled due to their high commercial value). Also indicated in Table 4-3, the waste types with the lowest diversion rates include organics (both residential and commercial food and yard waste), SSR (both residential and commercial), commercial C&D waste, and other residential waste. As such, the primary barriers to achieving the City's long-term goals include:

1. Residential habits and behaviors that are not aligned with waste reduction and diversion goals;
2. Lack of organics collection and processing opportunities (particularly for yard waste);
3. Lack of legislation enforcing or enticing recycling from the commercial sector; and
4. Lack of legislation requiring and enforcing C&D diversion and reuse from the commercial sector.

Additional detail on these and other barriers to waste reduction and diversion are included in Section 4.2.

Opportunities for Improvement

On a quantitative basis, the City has a tremendous opportunity to improve waste reduction and diversion to meet long term solid waste management goals. Based on the tonnages listed in Table 4-2 and the diversion goals listed in Table 4-3, the maximum reduction and diversion potential for each waste category was calculated. These values are shown in Table 4-4.

Table 4-4. Maximum Reduction and Diversion Potentials Associated with Long-Term City Goals

Waste Category	Maximum Reduction Potential			Maximum Diversion Potential		
	Residential	Commercial	Total	Residential	Commercial	Total
Food Waste	51,300	33,800	85,100	9,900	15,500	25,400
Yard Waste	0	0	0	27,600	12,300	39,900

SSR	0	0	0	113,400	137,100	250,500
C&D	0	17,300	17,300	0	220,300	220,300
Bulk	2,000	27,800	29,800	0	0	0
Other	0	0	0	67,700	45,800	113,500

Detail on specific opportunities to achieve the maximum reduction and diversion potentials presented in Table 4-4 is provided in Section 4.2. In Section 5, these values are used to estimate the potential reduction and diversion associated with the specific action items included in the City's plan of action.

4.2 Waste Reduction and Diversion Goals and Programs

Waste reduction and diversion programs coordinated by the City are described in Section 3.3 and evaluated below.

4.2.1 Single Stream Recyclables

SSR includes paper, cardboard, many types of plastic, metal cans, and glass bottles. Based on a waste sort performed for the LWBB Plan, it is estimated that SSR constitutes approximately 32% of the City's disposed waste stream. Waste diversion data from 2021 indicates that approximately 118,000 tons, or 29% of SSR generated in the City, is currently recycled. Single stream recyclables are targeted by many existing reduction and diversion programs in the City (described in Section 3.3).

Barriers to SSR Diversion

The assessment of the City's single stream recycling programs identified the following primary barriers to improved reduction and diversion of SSR:

1. Collection Schedule: Due to staffing issues during the COVID-19 pandemic, the City reduced SSR collection to once every two weeks. This not only discourages some residents from participating in the curbside SSR collection program, but it also leads to longer workdays for SSR collection personnel, as the volume of recyclables collected is greater. In fact, some personnel have reported working as much as fourteen-hour days.
2. Lack of Incentive: Many single use materials are extremely cheap to produce. As such, there is little incentive for businesses and consumers in the City to stop using them.
3. Lack of Access to Reusable Materials: Some City residents may not have easy access to re-useable bottles or bags, leaving them dependent on single-use materials.
4. Lack of Education and Communication around Recycling: Education and communication around recycling is difficult because the materials accepted at City-contracted MRFs change with time. Further, many materials which contain recycling symbols, or which contain wording like "fully recyclable" on the packaging are not accepted by City-contracted MRFs. As such, it can be

confusing for people to determine which materials are recyclable and which are not acceptable. Due to this confusion, some City residents choose not to recycle at all and others place non-recyclable items into their recycling carts, contributing to contamination.

5. Social and cultural barriers to recycling: In some City neighborhoods, recycling is seen as something that "other people" do. As such, some City residents are not interested in participating in the City's SSR programs.
6. Lack of Trust in the Recycling Process: When the recycling markets collapsed in 2017 due to China's National Sword Policy, news reports showing truckloads of SSR being dumped at landfills or waste incinerators caused many City residents to lose faith in the recycling system. A similar phenomenon occurred during the COVID-19 pandemic, when supply chain issues and equipment shortages caused many MRFs to stop accepting recyclables. While recyclables collected in the City were never sent to QRL or WIN Waste, some City residents lost faith that SSR would be properly recycled and stopped participating in City recycling programs.
7. Contamination: Since the City stopped collecting trash twice per week and provided free recycling bins to City residents, some residents have begun using their recycling bin as a second trash bin (i.e., they do not separate recyclables from trash). This has led to a serious contamination issue in City collected SSR.
8. Lack of School Recycling: City schools are served by private haulers to collect recyclables. Payment for these hauling services comes from school budgets. Many Baltimore schools have a limited budget and, although they are legally obligated to provide recycling collection, choose to reallocate funds to other priorities. As such, many City schools do not offer recycling programs.
9. Inconsistent Collection from Apartments and Condominiums: Apartment buildings and condominiums largely hire private haulers to provide SSR collection. However, due to contamination issues in the recycling stream, many private haulers refuse to collect from these locations, leading to inconsistent SSR collection.
10. Lack of Enforcement: There is a general lack of enforcement of existing state-mandated recycling programs (e.g., for apartments and condominiums and office buildings).
11. Lack of Public Recycling Bins: There are limited public recycling bins in many neighborhoods.
12. Lack of Reporting: Currently, commercial recyclers are not required to report their recycling tonnages to the City. As such, these tonnages often do not appear in the City's official recycling data that is reported to the state.
13. Economics of Recycling: Recycling markets are always changing, and private haulers may reduce or completely eliminate SSR collection when recyclable prices are low. As an example, the price of recyclables plummeted following China's National Sword policy in 2017. This led to many private haulers ceasing SSR collection in the City.

Opportunities for Improvement

The LWBB Plan details several opportunities to improve SSR diversion in the City. These include:

1. Improved education and outreach: By improving education and outreach, the City could encourage additional residents to participate in SSR reduction and recycling programs and also reduce contamination levels in the SSR stream. Education and outreach programs could be

designed to teach residents what is and is not recyclable, encourage people to overcome social and cultural barriers to recycling, and teach residents about the economic, environmental, and social benefits of recycling.

2. Providing cash or rewards for recycling: The City could participate in national recycling rewards programs, such as verde or recyclebank, to reward residents and businesses that participate in curbside SSR collection programs or complete education and outreach programs.
3. Payment for goods or services using recyclables: The City could implement discount programs for public transportation tickets to residents that provide recyclables at the time of purchase. The City could also consider providing reverse vending machines that provide residents with cash or vouchers when they deposit recyclable materials, such as cans or bottles.
4. Revise bin size and allocation: By reducing the size of the trash bin from 96 gallons to 35 gallons, the City could encourage people to reduce the amount of waste they generate and improve their recycling habits. The City already offers free 65-gallon trash bins to all single family households (which was also recommended in the LWBB plan). [Downside is potential for overflowing trash bins leading to additional litter.]
5. Implement dual or multi-stream recycling: Switching from single stream to dual or multi-stream recycling has the potential to reduce contamination levels in collected recyclable streams and will reduce the amount of processing required at a downstream MRF (e.g., WMRA). However, switching to multi-stream recycling may actually decrease recyclable diversion as some City residents may be unwilling to sort their recyclables into multiple bins.
6. Implement Save as You Throw (SAYT) program: A SAYT program would involve assessing a monthly charge to residents for their trash bin, with higher charges associated with bigger bins. As such, a SAYT program could encourage residents to reduce the amount of trash they generate by increasing participation in SSR recycling programs. However, SAYT programs have been associated with increased contamination in the recycling stream, so the City may have to consider increasing educational outreach as well as enforcement/citations for residents who do not properly recycle. Further, SAYT programs may be seen as a regressive tax that unfairly burdens low income residents and they may result in increased illegal dumping as residents seek to avoid paying for their disposal.
7. Revise collection frequency: By increasing the frequency of residential curbside SSR collection and reinstating weekly collection, the City could improve participation in the curbside recycling program.
8. Extend curbside collection to multi-family dwellings (MFDs): Currently, residents in MFDs rely on private haulers contracted by landlords for trash and recycling services. Reportedly, private haulers periodically reject recycling loads from MFDs and/or stop services altogether due to contamination issues (generally, because they may be fined or have their loads rejected at receiving MRFs if contamination is too high). This leads to inconsistent collection and contributes to low participation in recycling programs among MFD residents. By extending recycling services to MFDs, DPW could improve collection by creating a more stable recycling environment.

9. Design guidance/codes for multi-family dwellings: To improve recycling collection from MFDs, the City could issue guidance on how new developments or redevelopments must consider design of waste collection areas, including provision for diversion capacity and placement of waste containers. These design guidelines could provide direction to property developers and owners on how to incorporate recycling collection infrastructure into multi-family developments to make recycling as easily accessible to residents as trash receptacles.
10. Improve recycling in public spaces: Some stakeholders requested that more public trash and recycling cans be provided on streets, in parks, and in other public areas. In this regard, rather than simply provide a larger number of cans in more places, all of which would require additional emptying by collection crews, DPW could look for ways to embrace the smart transformation of waste operations in public spaces that many other U.S. cities have implemented. Not only does this keep streets noticeably cleaner, streets are calmer as fewer collection events mean less trash truck congestion and vehicle emissions.
11. Special event recycling: While DPW currently provides cleaning services, trash removal, and recycling services to qualifying events (if their services are requested), there is a range of additional support that DPW could provide to event organizers. This includes providing advice on setting up a recycling plan, provision of bins and containers, or developing self-assessment guides to help organizers manage and minimize waste generated at events (e.g., by requiring that food and drink vendors minimize single use serviceware).
12. Expand recycling services to the commercial sector: The City could improve diversion of SSR by expanding collection services to the ICI sector. Collection could be achieved either through DPW (public service) or through a franchising agreement with a private hauler. However, due to staffing shortages on existing residential recycling collection routes, this would likely not be an option the City would pursue in the short-term.

Additional opportunities for improving diversion of SSR include increasing enforcement of existing recycling programs (e.g., for apartment buildings and condominiums), supporting a City ordinance (or state legislation) requiring the ICI sector to report recycling tonnages, and providing additional funding for school recycling programs.

Summary

A summary of the City's assessment of its existing SSR diversion programs is found below.

Component		Assessment
	**Barriers**	• Collection schedule (once every two weeks) • Lack of incentive to reduce waste • Access to reusable alternatives • Lack of education and communication • Social barriers to recycling • Lack of trust in the recycling process • Contamination • Lack of school recycling programs

		• Inconsistent collection from apartments and condominiums • Lack of enforcement of existing recycling mandates • Lack of public recycling bins • Lack of reporting from the commercial sector • Economics of recycling
	**Opportunities**	**Legislative:** • Design guidance/codes for multi-family dwellings • Support City ordinance to require recycling reporting from ICI sector **Administrative:** • Improve education and outreach initiatives • Encourage (or require) reporting of recycling tonnages from commercial sector • Providing additional funding for school recycling programs **Programmatic:** • Provide cash or rewards for recycling • Payment for goods or services using recyclables • Revise bin size and allocation • Implement dual or multi-stream recycling • Implement SAYT Program • Reinstate weekly SSR collection • Extend curbside recycling collection to multi-family dwellings • Provide mobile collection units • Improve recycling in public spaces • Additional support for Special event recycling • Expand recycling collection services to the private sector • Improve enforcement of existing SSR recycling mandates

4.2.2 Organics

Organics include yard waste, food waste, and compostable paper. Based on the results of a waste sort performed as part of the LWBB Plan, it is estimated that organics constitute approximately 21% of the City's disposed waste stream. Waste diversion data from 2021 indicates that approximately 7,000 tons, or 3.5% of organic waste generated in the City, is currently diverted. The City's organics reduction and diversion programs are described in Section 3.3.

Reducing Food Wastage

The City's existing food waste reduction efforts have grown since 2016, when city organizations were gathered to conceive and draft an initial list of recommendation that culminated in the Baltimore Food

Waste and Recovery Strategy. Today, DPW supports 5 food-scrap drop off locations across the city with plans to launch 5 additional sites in 2023. Though some progress has been made to divert waste food from the city's waste stream, there are significant opportunities for improving food waste reduction.

Barriers to Reducing Food Wastage

The assessment of the food waste reduction initiatives in the city identified the following primary barriers:

1. Behavior change focused on food waste reduction
2. Donation Opportunities: Much of the food waste produced in the City is the result of residents purchasing more food than they can eat. Many residents choose to dispose of unused food (even non-perishable food or food that is not yet past its date) rather than donating it to one of the many food waste donation facilities in the City (detailed in Section 3.3).
3. Healthy Food Priority Areas (HFPAs): A map showing the City's HFPAs is found in Figure 4.1 below. HFPAs are defined as areas where the average healthy food availability index for all food stores is low, the median household income is at or below 185% of the federal poverty level, over 30% of households have no vehicle available, and the distance to a supermarket is more than a quarter mile. Approximately 146,000 people in Baltimore live in HFPAs. These residents are highly dependent on fast food and convenience stores, which may contribute to more food waste if they are not able to control their own food preparation or portion sizes.

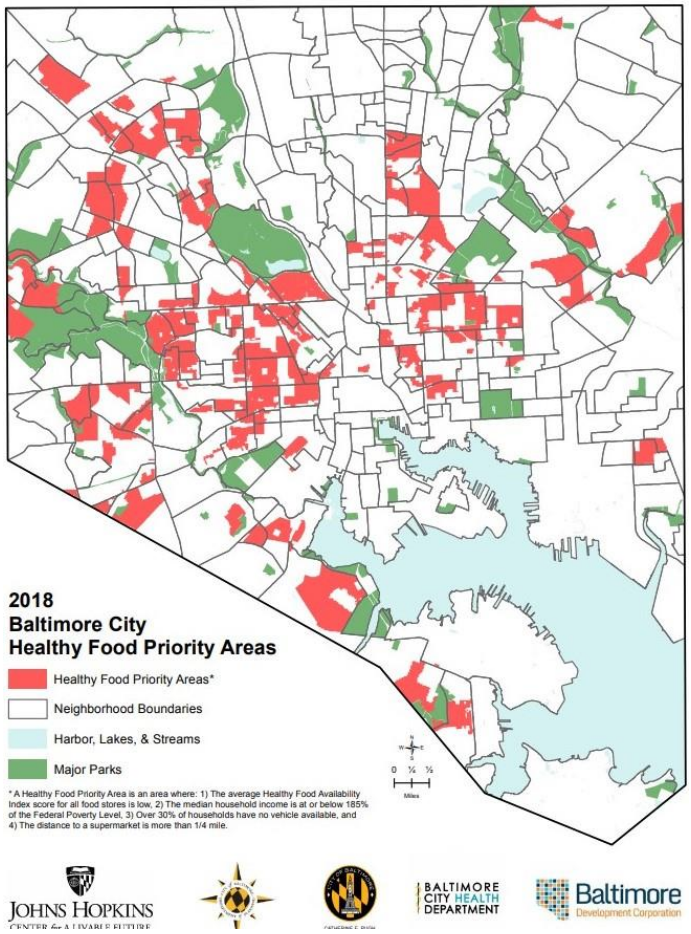


Figure 4-1. Healthy Food Priority Areas in Baltimore (from the City's 2018 Food Environment Report)

Opportunities to Reduce Food Wastage:

Improved food waste reduction can be achieved through a combination of food rescue and donation (e.g., via food banks) and true source reduction (e.g., educating consumers to purchase only the amount of food they need and hence generate less food waste). This will require a coordinated effort between the City, local food generators (businesses, universities, and residents), and local food rescue/donation organizations. The NRDC recently commissioned a report titled "Food Rescue in Baltimore: Assessing Current Landscape and Potential Growth" (26 March 2019) from Full Plate Venture LLC and the Maryland Food Bank assessing the current landscape for food rescue in Baltimore and the potential for future growth (referred to herein as the NRDC report). Recommendations from this document as well as those provided in the BFWRS and LWBB are summarized below.

1. Conducting a needs assessment for the City's food recovery system;
2. Creating a "best practices" guide for businesses and institutions that wish to donate edible food in the City;

3. Creating a resource guide for individuals and businesses wishing to use produce "seconds" (i.e., ugly fruit and vegetables);
4. Supporting state legislation that extends liability protection for entities selling recovered food and donors that donate past-date foods;
5. Working with the Maryland Department of Agriculture to include food recovery at the Maryland Buyer-Grower Expo;
6. Creating a public awareness/marketing campaign for businesses around reducing food waste;
7. Supporting local and state legislation that calls for a phased-in food waste and organics landfill ban;
8. Creating and staffing a City government position tasked exclusively with managing food recovery and food waste reduction initiatives;
9. Creating incentive programs for food donation, or businesses sourcing recovered food;
10. Ensuring there are enough community partners to handle the volume of all donated food, and ensuring that these partners are adequately resourced (refrigeration, hauling, etc.);
11. Creating/supporting a waste audit program for commercial food waste producers;
12. Supporting existing business models that sell "seconds" produce and if gaps exist, supporting the creation of a "Vendors Market" for unsold produce from wholesale distributors; and
13. Creating/adapting an entity to coordinate and promote all food recovery activities citywide.
14. Supporting the development of a Food Recovery Network chapter in every higher education institution in the city;
15. Supporting the completion of waste audits at every higher education institution in the city;
16. Creating a public awareness/marketing campaign around food recovery for colleges and universities;
17. Working with colleges, universities, and institutional food providers to change the culture of campus cafeterias from one of required abundance to "it's ok to run out;"
18. Creating/supporting a public awareness and education campaign around household food waste;
19. Supporting community-based culinary education programs, with emphasis on food waste reduction;
20. Creating and implementing a voluntary household waste audit program, including incentives for participation;
21. Developing and implementing a system for tracking household food waste;
22. Distributing "smart" trash cans to all city residents capable of tracking waste weight, creating a positive feedback loop by sending waste data to residents via water bill or other means.
23. Convene meetings of stakeholders in the food rescue system, including the City, food donors, food rescue organizations, last mile organizations (LMOs); these refer to any entities such as shelters, soup kitchens, or food pantries that distribute donated food to food insecure individuals), and clients, on a regular basis to support relationship building and strategic planning;

24. Track food donations received from local sources each year at food rescue organizations to support progress tracking under the BFWRS;
25. Develop, in coordination with other stakeholders, a three to five-year strategic plan for expanding food donations and strengthening the food rescue system;
26. Hire a "sourcer" to cultivate relationships between prospective food donors and food rescue organizations;
27. Develop and distribute food safety guidance for licensed food facilities from the City's Health Department;
28. Develop policies and programs that incentivize food donation;
29. Distribute educational materials on liability protections and tax incentives to food donors;
30. Develop a citywide strategy to recruit the next generation of food rescue volunteers to support the effective training, management, and retention of volunteers in the food rescue system;
31. Develop a coordinated strategy to engage the local philanthropic and business communities to mobilize support for food rescue infrastructure, staffing, and other needs;
32. Identify organizational development resources to strengthen food rescue capacity for fundraising, management, and communications;
33. Evaluate strategies for making donated food more geographically accessible to clients;
34. Evaluate the need for potential technology solutions to connect clients and LMOs;
35. Elevate the voices of food assistance clients by including them in advocacy activities, volunteer opportunities, and community outreach;
36. Work with LMOs to gather input and feedback from clients on an ongoing basis;
37. Conduct a detailed study of the specific food security-related needs of people living with disabilities; and
38. Expand outreach to clients on ways to access food assistance.
39. Encourage the use of online food waste reduction tools: The U.S. EPA provides a food waste management cost calculator to estimate the cost competitiveness of alternatives to food waste disposal for food waste generators, including source reduction, donation, composting, and recycling of yellow grease.
40. Encourage food waste tracking: Private organizations (some of which are listed in Appendix J) provide a secure ledger that tracks an organization's surplus food waste from pickup to donation. These companies aim to improve an organization's bottom line through charitable donations, reduce GHG emissions, and route edible surplus food to local communities in need. Hartsfield-Jackson Atlanta International Airport currently uses one such company to help meet its zero-waste target.
41. Encourage the use of mobile apps: There are a number of smartphone applications meant to connect food rescue agencies with consumers (detailed in Appendix J).

42. Conduct educational campaigns: Education and outreach is critical to changing behaviors. Specific educational programs recommended in LWBB to reduce food wasage include educating students about composting, educating residents on the difference between "Sell By," "Use By," and "Best By" dates, and educating residents about purchasing food more sustainably.

Summary

A summary of the City's assessment of its existing organics reduction and diversion programs is found below.

Component		Assessment
	**Barriers**	• Lack of education and outreach for food waste reduction and donation programs • Healthy food priority areas contributing to food wastage
	**Opportunities**	**Legislative:** • Support state legislation that extends liability protection for entities selling recovered food and donors that donate past-date foods **Administrative:** • Improve education and outreach campaigns around food waste reduction for City residents, institutions, and businesses • Help match food waste generators with food waste donation organizations and processing facilities (through technology, best practice guides, stakeholder meetings, etc.) • Improve tracking of food waste donation **Programmatic:** • Developing a system to track food waste generation (including distributing "smart" trash cans to all city residents) • Improving enforcement of food waste reduction initiatives • Create incentive programs for food donation, or businesses sourcing recovered food • Perform food waste audits for City businesses, institutions, and residents

Organics Diversion

Existing organics diversion programs in the City are fairly young and limited in scope. As such, there are significant opportunities to improve these programs in the future.

Barriers to Increasing Organics Diversion

The assessment of the City's organics programs identified the following primary barriers to reducing food wastage and diverting organics from disposal:

1. Lack of Organics Recycling Infrastructure: There are currently no operational large-scale composting or anaerobic digestion facilities that accept yard waste, food scraps, or compostable paper in the City. This lack of infrastructure inhibits City residents and businesses (including those targeted by HB264) from diverting their organic waste (even when legally required).
2. Lack of Centralized Organics Collection Programs: There are currently no large-scale, centralized organics collection programs in the City. While curbside organics collection is offered by private companies and community collectives, the monthly charges for participation in these programs are fairly expensive (greater than $20 per month).
3. Lack of Marketing for Existing Organics Programs: Many residents are unaware that food scrap collection is offered at residential drop-off centers and farmers markets. As such, participation in these programs tends to be low. Further, the food scrap collection bins offered by the City at residential drop-off centers are not easily accessible by walking, biking, or bus.
4. Lack of Education and Outreach Regarding Organics Diversion Programs: Most City residents have limited experience managing and separating organics from their waste stream. Further, many residents harbor misconceptions regarding the odor and vector impacts of large organics management facilities (like composting and anaerobic digestion facilities) and organics collection programs.
5. Lack of Education about Which Organic Materials are Divertible: Specific materials can and cannot be composted or digested depending on the vendor providing organics collection and operating the organics processing facility. While the City does not offer a public option for organics diversion, this is still a barrier to implementing a successful organics diversion program in the City.
6. Difficulty Identifying Businesses Targeted by HB264: HB264 requires large food waste generators (currently defined as those generating more than two tons of food waste per week, reducing to those that generate one ton of food waste per week beginning 1 January 2024) to divert all of their food waste providing they are located within 30 miles of an organics recycling facility with capacity and willingness to accept the generator's food waste. However, there is no easy way for the City to identify the food waste generators targeted by this law. As such, enforcement of this law will be difficult for the City.

Opportunities to Improve Organics Diversion:

Recommendations from the NRDC Report, BFWRS, and LWBB for improving organics diversion in the city are summarized below.

1. Expand Use of Existing Processing Capacity: The BFWRS lays out a series of recommendations to expand existing capacity in Baltimore including improving access to backyard compost bins to residents, establishing school gardens at public schools to encourage on-site gardening and composting, supporting/incentivizing the creation of community composting locations in Baltimore neighborhoods. Other strategies included in LWBB include expanding the use of City-partnered organics processing facilities (e.g., BCCF, BRPF, BPPF, and Camp Small), encouraging on-farm composting (perhaps by expanding the Food Matters Program), encouraging backyard and

community composting (e.g., by providing residents with subsidized backyard composting units and initiating education and outreach programs), and encouraging the use of in-sink disposal units to process food waste.

2. Revise collection frequency of trash pickup: By reducing the frequency of trash pickup in the City, residents may be encouraged to participate in existing or future organics diversion programs to reduce their trash volume. While this is unlikely to be implemented in the City in the near future, it could be discussed as a long-term option after an organics diversion program is implemented and trash volumes decrease.
3. Provide and Encourage Curbside Collection of Organics: Recommendations from the BFWRS for the City to implement and encourage a source separated organics (SSO) collection program including conducting a residential curbside collection pilot program, expanding curbside collection throughout the city (long-term), conducting a feasibility study for save-as-you-throw (SAYT) and other incentive-based residential waste collection strategies, and implementing a residential food waste ban. Other recommendations from LWBB include expanding City collection services to include collection of SSO, contracting SSO collection from residents to a third party, providing drop-off centers for food and yard waste, implementing a save-as-you-throw (SAYT) program, implementing a food waste disposal ban, and reducing the frequency of trash pickup.
4. Implement a ban on commercial organics disposal in the City: Recommendations from LWBB include a phased approach to encourage organics diversion, beginning with a subsidy for organics diversion and surcharge pricing for organics disposal and moving toward a blanket ban on organics disposal from commercial entities in the City.
5. Construct (or facilitate construction) of in-city organics processing capacity: Expanding organics processing capacity would facilitate an expansion of organics collection programs in the City and would provide commercial organics generators a nearby location to bring their SSO. This opportunity is described further in Section 4.6

Other potential opportunities include improving enforcement of existing food waste diversion mandates (e.g., Legislation - HB0264 (maryland.gov)).

Summary

A summary of the City's assessment of its existing organics reduction and diversion programs is found below.

Component		Assessment
	**Barriers**	• Lack of organics recycling infrastructure • Lack of centralized organics collection programs • Lack of marketing for existing organics programs • Lack of education and outreach regarding organics diversion programs • Difficulty identifying businesses targeted by HB264

	**Opportunities**	**Legislative:** • Implement a ban on commercial organics disposal in the City **Administrative:** • Improve education and outreach campaigns around food waste diversion for City residents, institutions, and businesses **Programmatic:** • Expand use of existing processing capacity • Revise collection frequency of trash pickup • Provide and encourage curbside collection of organics • Construct (or facilitate construction) of organics processing capacity • Improving enforcement of food waste diversion initiatives (HB264)

4.2.3 Construction and Demolition Debris

C&D waste includes lumber, concrete, drywall, asphalt, and other materials generated from the construction or demolition of structures. Based on a waste sort performed for the LWBB Plan, it is estimated that C&D waste constitutes approximately 31% of the City's disposed waste stream. Waste diversion data from 2021 indicates that approximately 232,300 tons, or 45% of C&D waste generated in the City, is currently recycled. C&D waste is predominantly produced and recycled by the private sector (details are provided in Section 3.3).

Barriers to C&D Reduction and Diversion

The assessment of the City's C&D programs identified the following primary barriers to improved reduction and diversion of C&D waste:

1. Lack of City-Led Deconstruction Program: The City has previously partnered with a local nonprofit-established deconstruction firm to assist the City with demolition of City-owned buildings. This deconstruction firm developed a business selling material salvaged from deconstruction activities. However, the City has since stopped partnering with this deconstruction firm. The City could improve deconstruction by partnering with a similar deconstruction firm for future demolition projects.
2. Lack of Clean Wood Recycling Infrastructure: There is limited infrastructure in the City to salvage clean, untreated structural lumber and pallets from construction and demolition projects. This clean wood may be repurposed for other construction projects or ground for mulch.
3. Lack of Drywall Repurposing and Recycling: Landfilled drywall can contribute significantly to odor issues. As such, it is imperative to reduce waste drywall generation and divert drywall from disposal at the landfill.

Opportunities for Improvement

The LWBB Plan details multiple policy options and strategies exist to encourage C&D waste reuse. These are detailed below.

1. City-Mandated Deconstruction of Existing Structures: Legislation that mandates all construction projects to "deconstruct" rather than "demolish" existing structures would reduce C&D waste generation and encourage separation and reuse. Capacity for deconstruction and reuse of salvaged building materials already exists in Baltimore, which is home to multiple deconstruction companies and building materials reuse centers (Second Chance, the Loading Dock, Habitat for Humanity of the Chesapeake, Brick + Board, as well as the Baltimore Wood Project).
2. Establishing an Architectural Salvage Program: An architectural salvage program may be implemented in coordination with mandated deconstruction of existing structures to encourage reuse of building materials. An architectural salvage program could be implemented as an online database to match potential buyers with companies offering salvaged building materials. City facilities and/or existing resale companies could hold the material while it is advertised.
3. Encouraging Green Construction: A green construction policy would require new construction or major remodeling of existing buildings meet certain environmental and sustainability standards. The best-known example is the Leadership in Energy and Environmental Design (LEED) green building certification program, developed by the nonprofit U.S. Green Building Council and used worldwide as an objective measure of achievement. A green construction policy in Baltimore could also promote facilities certified as TRUE Zero Waste and encourage others to be certified.
4. Mandatory diversion ordinance: The City could improve diversion by passing an ordinance that requires construction and demolition projects to divert a certain percentage of their waste from disposal.
5. Deposits as part of permitting: The City could require deposits during the permitting process for new construction and demolition projects that would be returned to the contractors if and when they provide documentation that the project has met a designated diversion threshold.

Summary

A summary of the City's assessment of its existing C&D reduction and diversion programs is found below.

Component		Assessment
	**Barriers**	• Lack of City-led deconstruction program • Lack of clean wood recycling infrastructure • Lack of drywall repurposing and recycling
	**Opportunities**	**Legislative:** • City-mandated deconstruction of existing structures • Encouraging green construction • Mandatory diversion ordinance **Administrative:** • Establishing an architectural salvage program • Deposits as part of permitting

4.2.4 Bulk Waste

Bulk waste includes furniture, homewares, appliances, electronics, and other large waste. Based on a waste sort performed for the LWBB Plan, it is estimated that bulk waste constitutes less than one percent of the City's disposed waste stream. Waste diversion data from 2021 indicates that approximately 53,300 tons, or 90% of bulk and special waste generated in the City, is currently recycled. While bulk waste does not constitute a large fraction of the City's waste stream, it is difficult to dispose and is therefore a priority area for reduction and diversion. Bulk waste diversion programs are described in Section 3.3.

Barriers to Reduction and Diversion of Bulk Waste

The assessment of the City's bulk waste programs identified the following primary barriers to improved reduction and diversion of bulk waste:

1. Lack of Donation Space: While private companies and nonprofits in the City will accept some bulk waste for donation, they are typically only willing to accept high value material with the highest likelihood for resale to avoid potential disposal fees if the bulk waste cannot be reused or sold. This lack of centralized and consistent donation programs reduces ability of residents to donate or divert bulk waste.
2. Difficulty of Repair: When bulk objects like appliances and electronics break, it is often very difficult or cost prohibitive for residents to repair them (or find low-cost companies or contractors capable of repairing them). As such, appliances and electronics are often disposed even if they have only minor or easily repaired damage.
3. Vehicles available to move bulk items: If a resident does not have access to a vehicle large enough to move their bulk item to a donation location, it will likely end up on the street for pickup as trash.

Opportunities for Improvement

The LWBB Plan outlines four options and strategies to encourage repair, donation, and reuse of bulk waste:

1. Investing in Programs that Turn Waste into Art: The City could donate abandoned buildings and bulk waste material to artists, sculptors, and recycling innovators to organize shows and contests that encourage the reuse of bulk waste materials.
2. Funding Fix-It/Repair Clinics: The City could help to fund clinics where residents can learn how to repair broken electronics, homewares, appliances, bikes, etc. rather than throwing them away. Fix-It Clinics are currently used as a way to reduce bulk trash in many cities across the country, including Austin, TX, Flagstaff, AZ, Minneapolis, MN, and San Diego, CA. The Baltimore Tool Library also holds fix it fairs a few times a year. These clinics are usually staffed by volunteers with skills to share, gained either professionally or through hobbies, and are free of charge for attendees, although donations may be encouraged. Fix-It Clinics may be hosted by the City, local

nonprofits, local businesses, or some combination of private and public entities. In Baltimore, clinics could be offered in coordination with, or in a similar manner to GROW centers, which offer tips and materials for greening and landscaping.

3. Holding Reuse and Swap Events: Reuse events allow residents to get rid of or obtain gently used materials (e.g., furniture, clothes, and toys) in a convenient and structured way in a formal or semi-formal setting. These managed events avoid contributing to uncleanliness or litter in the way that informal garage or yard sales may do, and also reduce the incentive for residents to simply dump used items on the street. Reuse events could include curbside giveaway events in common areas of multi-residential buildings, block parties for single-family neighborhoods, and swap events such as jewelry or clothing exchanges. Many counties and municipalities promote once or twice yearly curbside events, generally held in the spring or fall as people adjust and update their homes and closets.
4. Right to Repair Bill: Right to repair bills, typically focused on electronic devices and small appliances, refer to government legislation that is intended to allow consumers the ability to repair and modify their own consumer products, rather than being obligated by the manufacturer of such devices to use their (often expensive) repair or replacement services. Right to repair legislation has been introduced in 17 states.
5. Provide mobile collection units: The City could consider provision of mobile collection for diversion or reuse of bulk waste and other materials using a modified trailer or truck. While DPW currently accepts these materials at residential drop-off centers, residents must have the means to physically transport these materials. Provision of a more convenient way to accept these materials may encourage additional diversion.

Summary

A summary of the City's assessment of its existing bulk waste reduction and diversion programs is found below.

Component		Assessment
	**Barriers**	• Lack of donation space or repair facilities • Difficulty of repair • Long wait times for bulk waste collection • Lack of accessibility
	**Opportunities**	**Legislative:** • Supporting right to repair bills at the State level **Administrative:** • Investing in programs that turn waste into art • Funding fix-it/repair clinics **Programmatic:** • Holding reuse and swap events • Provide mobile collection units

4.2.5 Other Diversion Programs

Other waste includes generally hard to recycle materials such as carpet, mattresses, textiles, paint, non-compostable organics, medical waste, composite materials, etc. Based on a waste sort performed for the LWBB Plan, it is estimated that other waste constitutes approximately 15% of the City's disposed waste stream. Waste diversion data from 2021 indicates that approximately 99,400 tons, or 42% of other waste generated in the City, is currently recycled.

Barriers to Reduction and Diversion of Other Waste

The assessment of the City's other waste programs identified the following primary barriers to improved reduction and diversion of other waste:

1. Lack of Durable Medical Equipment Reuse Opportunities: The Maryland Department of Aging has a program in place to collect durable medical equipment (including wheelchairs, walkers, scooters, etc.) for refurbishment. Currently, containers are located at the residential drop-off centers at NWTS and QRL. However, this service is not offered at any other locations in the City.
2. Lack of Mattress Recycling Opportunities: Mattresses are very difficult to recycle and dispose. The City currently does not offer mattress recycling to residents, WIN Waste currently does not accept mattresses, and the City has considered banning them at QRL as well.. As such, mattresses are often illegally dumped in the City.
3. Lack of Textile and Clothing Donation Opportunities: While several nonprofits in the City offer reuse opportunities for clothing in good condition (see Section 3.3), recycling opportunities for damaged textiles and clothing are limited.
4. Lack of Paint Recycling Opportunities: Oil-based paint is currently accepted as HHW at the Sisson Street Residential Drop-off Center and latex paint can be dried out and collected with residential trash. Some larger non-profits will also accept paint (see Appendix I). However, no true public reuse or recycling opportunities are offered in the City for paint.
5. Lack of Christmas Tree Diversion: Currently, Christmas trees may be brought to multiple locations throughout the City where residents are given the option to mulch their trees and collect the mulch. However, mulch that is not collected is sent to QRL or WIN Waste for disposal.
6. Lack of Animal Carcass Diversion: Animal carcasses are currently collected and sent for incineration. However, these carcasses would ideally be diverted and composted.
7. Lack of Visibility and Marketing for Existing Recycling Programs: Many residents are unaware of the recycling programs currently offered at residential drop-off centers (e.g., electronics recycling, bulk waste recycling, oyster shell recycling, durable medical equipment recycling, etc.).
8. Lack of Carpet and Carpet Padding Programs: Carpet and carpet padding are some of the hardest materials to recycle and very few opportunities currently exist in the City to recycle these materials.

9. Lack of Donation Opportunities: Many hard to recycle materials, like bicycles and electronics, are disposed even when they are still operational (or in need of light repair). If more donation opportunities were offered for these materials, they could be reused rather than disposed.

Opportunities for Improvement

Other waste reduction and reuse opportunities detailed in LWBB include:

1. Libraries and lending organizations: Opportunities for sharing items that are used infrequently are becoming more prevalent in many communities. The City could support organizations (e.g., non-profit organizations or public libraries) or develop partnerships with existing organizations to provide opportunities for the public to borrow items such as bikes, appliances, or tools. Items can be donated to the libraries or organizations can purchase and cover expenses through user fees.
2. Bans or restrictions on specific materials: Results from the survey of stakeholders conducted for the LWBB Plan indicated clear support for policies aimed at eliminating specific "bad actor" materials from the waste and recycling streams. For example, 86% of responders supported a ban on single-use plastics such as food containers, plastic bags, and straws. As an alternative to outright bans, however, some responders suggested taxing the use of single-use materials or introducing laws to incentivize reuse.
3. Extended Producer Responsibility (EPR): EPR is a government mandate for product stewardship that requires a manufacturer's responsibility for its product to extend to post-consumer management of that product and its packaging and/or upstream redesign/reduction. EPR policies therefore shift some financial and management responsibility for waste management upstream to the manufacturer and away from the public sector, while incentivizing manufacturers to incorporate environmental considerations into the design of their products and packaging. Applied effectively, EPR can be valuable in helping communities manage and fund the reduction/recycling/diversion of difficult materials.
4. Product Take-Back Programs: Similar to EPR programs, product take-back programs are a form of product stewardship for hard-to-recycle items and packaging. These initiatives are typically organized by a manufacturer or retailer to collect used products or materials from consumers and reintroduce them to the original processing and manufacturing cycle. A company may implement this program in collaboration with end-of-life logistics and material processing firms. For manufacturers and retailers, there are multiple benefits for implementing a take-back program, including stronger customer relationships, lower cost of goods sold due to secondary material supply, providing an alternative supply of critical raw minerals, mitigating risks associated with hazardous materials handling, and reduced environmental impacts. These benefits often result in no cost or discounts to consumers when they participate. Companies can estimate the success of their take-back programs by measuring the total mass of products sold against those collected each year.
5. Targeted recycling programs: The City could consider implementing recycling programs for mattresses, box springs, carpets and rugs, textiles, porcelain and ceramics, batteries, and other difficult to recycle materials. These programs would improve recycling while also keeping many of these nuisance materials out of the landfill.

Other opportunities for improving diversion include improving diversion efforts for Christmas trees and animal carcasses. For example, whole Christmas trees can reportedly be diverted for use as a biodegradable material to restore natural habitat along shorelines. Additionally, Christmas trees may be fed to goats as a nutritional supplement during winter months. Animal carcasses should be diverted to a compost facility (particularly if the City constructs or facilitates construction of a compost facility within the City).

Summary

A summary of the City's assessment of its existing waste reduction and diversion programs for other waste is found below.

Component		Assessment
	**Barriers**	• Lack of durable medical equipment reuse opportunities • Lack of mattress recycling opportunities • Lack of textile and clothing donation opportunities • Lack of paint recycling opportunities • Lack of Christmas tree diversion • Lack of animal carcass diversion • Lack of visibility and marketing for existing recycling programs • Lack of carpet and carpet padding recycling programs • Lack of donation opportunities
	**Opportunities**	**Legislative:** • Bans or restrictions on specific materials • Extended producer responsibility • Product take-back programs **Administrative:** • Libraries and lending organizations **Programmatic:** • Targeted recycling programs • Improved diversion efforts for Christmas trees and animal carcasses

4.2.6 Litter Reduction and Cleanup Programs

Although litter does not constitute a large percentage of total waste generated in the city, it is an eyesore, and may contribute to rodent (and other vector) problems. As such, improving litter reduction and cleanup programs is of critical importance to the City.

Barriers to Litter Reduction

Despite the many community-based litter reduction and collection programs in place, litter remains a serious problem in the City. Some of the barriers to litter reduction identified in this assessment include:

1. Unreliable Litter Collection: Residents report that street litter is unreliably collected by the city and/or local residents. Further, residents report that street litter is disproportionately collected from affluent neighborhoods.
2. Lack of Enforcement: Anti-littering laws are not reliable enforced.
3. Education and Outreach: As evidenced by the City's persistent litter problem, existing educational programs to reduce litter do not appear to be effective.
4. Landlords do not Provide Trash Bins to all Tenants: While landlords are legally required to provide trash bins to all tenants, some landlords do not comply with the law. As such, many residents have to supply their own trash bins or share with neighbors. This results in many residents placing bags of trash on the street, where they may be torn open.

Opportunities for Improvement

Litter reduction and cleanup opportunities detailed in LWBB include:

1. Educational Programs to Reduce Litter: Baltimore needs to build ownership to keep neighborhoods clean, which requires educating residents and schoolchildren on littering and what is recyclable (e.g., through anti-littering campaigns and PSAs).
2. Litter Crews: DPW could provide more litter cleanup crews, separate from curbside collection crews, or alternatively contract private organizations for street litter collection. One example is to have "on calls" for rapid cleanup of litter or illegal dumping by small hauling contractors.
3. Litter Collection Drives: The City could organize litter collection initiatives with local schools or communities, providing certificates for community service hours and/or offering awards for groups that clean up and recycle the most litter. This could be conducted as an extension of the biannual Mayor's Spring and Fall Cleanups in which participants earn credits towards their stormwater fee.
4. Responsible Businesses: The City could conduct educational campaigns to encourage businesses such as restaurants, cafes, and stores to collect litter from in front of their premises.
5. Residents' Litter Squads: The City could create jobs for those who need them by hiring squads to collect litter and bulk trash from the streets. Squads could be staffed by vulnerable and at-risk members of the community (e.g., youth and homeless people), connecting and organizing them with additional support services. Communities are less likely to tolerate littering and dumping in areas they have cleaned. Examples of U.S. cities that have programs to give homeless people and panhandlers jobs picking up trash, pulling weeds, and street cleaning include Albuquerque, NM, which started their program in 2015, as well as Los Angeles, CA, Chicago, IL, Denver, CO, and Portland, ME.
6. Improved Enforcement: The City could enforce the use of nets on waste collection trucks to prevent debris from falling and producing litter, enforce laws requiring landlords to provide trash bins to residents, and enforce fines for littering and install cameras in areas where littering is persistent.

Summary

A summary of the City's assessment of its litter reduction and cleanup programs is below.

Component		Assessment
	**Barriers**	• Unreliable litter collection • Lack of enforcement • Education and outreach surrounding litter
	**Opportunities**	**Administrative:** • Educational programs to reduce litter (including responsible businesses initiative) **Programmatic:** • Litter crews • Litter collection drives • Residents' litter squads • Improved Enforcement

4.3 Residential Drop-Off Centers

Residential drop-off centers are managed by the Street Sweeping and Roll-Off Division and are described in Section 3.4.

4.3.1 Barriers to Efficient Operation of Residential Drop-Off Centers

The assessment of the City's residential drop-off centers identified the following barriers to effective operation:

1. Commercial Vehicles and Non-Residents: Residential drop-off centers are meant to serve only residents of the City. However, many commercial vehicles and non-residents attempt to use the facilities. Currently, workers at the drop-off centers check drivers licenses and license plates to prevent commercial vehicles and non-residents from dumping at the residential drop-off centers. However, commercial and non-resident vehicles contribute to lines and inefficiencies.
2. Unacceptable Wastes: The most common unacceptable wastes dumped at residential drop-off centers include drywall, concrete, structural wood, and pallets. Customers with these materials are generally sent away, but regularly have already dumped or argue with the staff.
3. Illegal Dumping: Waste (both acceptable and unacceptable) is left outside and inside of residential drop-off centers on a near daily basis resulting in staff time to move the material to the appropriate location within the drop off center.
4. Staffing Shortages: Staff hiring and retention (particularly for CDL roll-off truck drivers) are a persistent problem at residential drop-off centers. On busy days at some facilities, roll-off

containers cannot be hauled offsite fast enough to keep up with demand. While the City offers many long-term benefits over private companies (e.g., job stability, benefits, etc.), private trucking companies offer a significantly higher starting pay than the City. As such, the City often has difficulty hiring new drivers and retaining existing drivers.

5. Space Restrictions: Many of the residential drop-off centers are space restricted. On busy days, this lack of space can mean that lines to enter the facilities back up onto City streets. Further, there is minimal storage space for additional roll-off containers, trucks, or equipment.
6. Equipment Shortages: Some residential drop-off centers lack the equipment necessary to operate efficiently. Specific equipment shortages include roll-off trucks and bobcats.
7. Security: Not all residential drop-off centers are fenced and gated around their entire perimeter. As such, they are subject to illegal dumping and break-ins.
8. Worker Comfort: Many residential drop-off centers lack shelter and break rooms for workers. As such, many workers are forced to work in the elements without a space to eat their lunches or take breaks.

4.3.2 Opportunities for Improvement

The LWBB Plan outlines several options to improve residential drop-off centers in the City. These include:

1. Constructing additional capacity: This option would require DPW to either construct new facilities for both residents and small haulers to drop off waste, or expand existing DOCs to allow small haulers to use them in addition to QRL and NWTS. As most existing DOCs are on fairly compact lots, it seems unlikely that these locations could be expanded sufficiently to allow small hauler use (this would require a truck scale and larger throughput capacity, amongst other upgrades). As such, it is assumed that developing new capacity would require the construction of new DOCs.
2. Expanding reuse and diversion opportunities at existing facilities: This option would require reconfiguration of existing DOCs to allow for a larger number of materials to be handled and diverted. This would require increased staffing to direct residents and haulers to the correct location for each material. Additional materials to consider for acceptance include non-traditional recyclable/divertible items such as mattresses, carpet, furniture, homewares, textiles, household hazardous waste, and ceramics/porcelain, as well as items that are currently accepted but are not separated (e.g., C&D waste, bulk waste, appliances with large amounts of rigid plastic, and yard waste). This option could include a materials exchange network/partnership that would allow residential drop-off centers to partner with nonprofits to expand donation of items such as bicycles, musical instruments, books, clothes, etc.
3. Constructing a resource recovery park (eco-park): The most practical option available for construction of an RRP would be to co-locate individual reuse and diversion facilities in one large, centralized location. The location of this facility would be subject to an extensive siting and feasibility study, although optimally it should be located close to QRL to minimize transportation of process residuals. Reuse and diversion facilities that could be located within the RRP include reuse facilities (such as a food bank, C&D salvage and reuse center, a thrift store, and a fix-it/repair clinic), a composting facility, a MRF for processing SSR, a MRF for processing C&D waste, or a residential drop-off center that could serve small haulers.

Additional opportunities to improve the operation of residential drop-off centers include installing tag readers or driver's license scanners to efficiently identify non-residents and commercial haulers, installing security fencing and gates to prevent illegal dumping, increasing starting pay for CDL roll-off truck drivers, and upgrading staff facilities (including shelters and breakrooms).

4.3.3 Summary

A summary of the City's assessment of its residential drop-off centers is found below.

Component		Assessment
	**Barriers**	• Commercial vehicles and non-residents • Unacceptable wastes • Illegal dumping • Staffing shortages • Space restrictions • Equipment shortages • Security • Worker comfort
	**Opportunities**	**Short-Term:** • Installing tag readers or driver's license scanners • Installing fencing and gates • Increasing starting pay for CDL drivers • Upgrading staff facilities (shelter and breakrooms) **Long-Term:** • Constructing additional capacity • Expanding reuse and diversion opportunities at existing facilities • Constructing a resource recovery park (eco-park)

4.4 Waste Collection

The City's waste collection system is described in Section 3.5. Since 2000, the City has used CitiStat, a database-driven performance measurement tool, to monitor and assess public service delivery and operation. Solid waste management performance is evaluated in a branch of CitiStat called CleanStat, which assists DPW in deciding how to provide more efficient service. Continued use of CleanStat, and continued feedback from citizens and employees is essential in developing a proper assessment of the City's solid waste management needs now and, in the period covered by this Plan.

4.4.1 Curbside Collection of Mixed Refuse and Single Stream Recyclables

Mixed refuse and SSR collection is provided by the Routine Services Division and is described in Section 3.4.

Barriers to Mixed Refuse Collection

The assessment of the City's mixed refuse and SSR collection program identified the following primary barriers to effective mixed refuse collection service:

1. Staffing Shortages: Hiring and retention of personnel, and particularly CDL drivers, has been extremely difficult. While the City offers many long-term benefits over private companies (e.g., job stability, benefits, etc.), private trucking companies offer a significantly higher starting pay than the City. As such, the City often has difficulty hiring new drivers and retaining existing drivers.
2. Inconsistent Collection: Regularly scheduled mixed refuse and SSR collection dates are sometimes not honored (mostly due to staffing issues). There is currently no back-up plan when this happens, and residents have to wait until the next schedule collection day for their trash or SSR to be collected.
3. Limited Refueling Locations: There is currently only one location where City collection vehicles can refuel (at the central yard). This makes refueling inefficient, particularly when there is traffic in the City.
4. Aging Collection Fleet: Many of the collection vehicles are near or exceeding their service life, leading to high equipment down time, and will require replacement over the next two years.
5. Trash can color: The municipal trash cans provided to residents by DPW are green. This leads to some confusion with residents who associate green bins with organics collection.
6. Lack of Enforcement: The state generally delegates enforcement of solid waste related laws (including recycling laws) to local government. DPW currently does not have an enforcement division but instead depends on the Department of Housing and Community Development to enforce trash and SSR-related violations.
7. Education and Outreach: Some residents do not know that trash should be bagged before placing it in trash bins to protect collection workers from sharp or hazardous materials. Additionally, some residents use their recycling bin as a second trash can, leading to significant contamination in the SSR stream (discussed in more detail in Section 4.2).

Opportunities for Improvement

Surveys conducted as part of the LWBB Plan indicated that most residents are satisfied with their curbside collection services. However, some residents complained that roads and alleys are littered due to messy waste collection practices and suggested providing collection crews with brooms and shovels to clean up waste dropped during collection. In 2022, the City prepared an operational review (Rubicon Report) of

Routine Services operations to optimize collection routes for the City[9]. The Rubicon Report provides the following recommendations to improve trash and SSR collection:

1. Short-Term Rightsizing of Routes, Equipment, and Personnel: The Rubicon Report found that trash collection routes put the City near the upper end of industry standard route sizes with 1,173 stops per route. To reduce the number of stops per route to 1,050 in the short-term, it was recommended that the City maintain a fleet of at least 60 load packers with less than 20% breakdown factor, increase the number of CDL trash collection drivers to 60, and increase the number of trash laborers to 120. For SSR collection, the Rubicon Report found that the City was near the upper end of industry standard route sizes with 2,608 stops per route. To reduce the number of stops per route to 2,200 in the short-term (while maintaining collection once every two weeks), it was recommended that the City maintain a fleet of at least 29 load packers with less than 20% breakdown factor, increase the number of CDL SSR collection drivers to 29, and increase the number of SSR laborers to 58.
2. Final Rightsizing of routes, Equipment, and Personnel: For trash collection in the long-term, the Rubicon Report recommends reducing the number of stops per trash collection route to 950 by maintaining a fleet of at least 66 load packers with less than 20% breakdown factor, increasing the number of CDL trash collection drivers to 66, and increasing the number of trash laborers to 132. For SSR collection in the long-term the Rubicon Report recommends reducing the number of stops per recycling collection route to 1,300 by maintaining a fleet of at least 48 load packers with less than 20% breakdown factor, increasing the number of CDL SSR collection drivers to 48, and increasing the number of SSR laborers to 196.
3. Increase Funding Levels to Sustain Fleet and Staffing: To improve the long-term performance of trash collection in the City, the Rubicon Report recommends increasing future funding levels to sustain at least a 20% reserve of vehicles and personnel.
4. Maintain Onboard Technology for Employee and Departmental Success: The Rubicon Report recommends installing onboard technology to verify collection service in real time and provide drivers with intuitive tools to enhance their workflow.
5. Implement a Collection Performance Standard: the Rubicon Report recommends that the Routine Services Division adopt an appropriate performance management system for trash collection that tracks route completion time and customer complaints.

Additional opportunities to improve mixed refuse and SSR collection include increasing starting pay for CDL drivers, adding additional refueling stations (possibly at residential drop-off centers), enforcing existing trash and recycling collection programs (e.g., for multi-family dwellings), and improving education and outreach to improve worker safety and reduce contamination in the SSR stream.

[9] "Baltimore Routine Services Operational Review" (2022); https://publicworks.baltimorecity.gov/sites/default/files/FINAL%20DPW%20Rubicon%20Report.pdf

Summary

A summary of the City's assessment of its existing mixed refuse collection program is found below.

Component		Assessment
	**Barriers**	• Staffing shortages • Inconsistent collection • Limited refueling locations • Aging collection fleet • Trash can color • Landlords do not Always Provide Trash Bins to Tenants • Lack of Enforcement • Education and Outreach
	**Opportunities**	**Administrative:** • Increase funding levels to sustain fleet and staffing • Implement a collection performance standard • Increase starting pay for CDL drivers • Enforce existing trash collection programs • Improve education and outreach **Programmatic:** • Short-term rightsizing of routes, equipment, and personnel • Final rightsizing of routes, equipment, and personnel • Maintain onboard technology for employee and departmental success • Add additional refueling stations

4.4.2 Bulk Waste Collection

Bulk waste collection is provided curbside, by calling 311, or at residential drop-off centers. Bulk waste collection is described in Section 3.4.

Barriers to Bulk Waste Collection

The assessment of the City's bulk waste collection program identified the following barriers to effective operation:

1. Lack of Accessibility: While the City does provide curbside collection of bulk waste and collection at residential drop-off centers for bulk waste disposal, it does not provide collection of bulk waste for diversion or reuse.

Opportunities for Improvement

The LWBB Plan includes several strategies for improving bulk waste collection in the City. These include:

1. Collecting bulk waste for donation: DPW currently recycles or disposes of bulk trash collected at residential drop-off centers and via curbside collection. Working with local charitable and reuse organizations (e.g., the Salvation Army, Goodwill, Habitat for Humanity ReStores) to offer donation of bulk items might encourage more participation in the program.
2. Charging residents for bulk waste collection: This would encourage reuse, repurposing, and resale of bulk items. As an example, Seattle, WA currently charges residents $30 per item collected and $38 for items with refrigerants. However, this option could also encourage illegal dumping.
3. Reducing the amount of bulk trash that can be collected via curbside collection: The City already limits the amount of bulk waste per household to three items per household per month. However, this could be reduced to encourage residents to pursue other options (such as donation). Currently, many other cities (e.g., Washington DC and San Francisco, CA) have limits on the amount of bulk waste collected per household in order to reduce disposal of bulk waste. However, this option could also encourage illegal dumping.
4. Constructing a large, accessible recycling center for bulk waste: This facility would not need to be open every day, but its opening hours would need to be clearly communicated to residents to encourage recycling. This facility could be part of an expanded network of residential drop-off centers (see above). Monterey, CA operates a facility called "Last Chance Mercantile".

Summary

A summary of the City's assessment of its bulk waste collection program is found below.

Component		Assessment
	**Barriers**	• Long wait times for bulk waste collection • Lack of accessibility
	**Opportunities**	**Administrative:** • Charging residents for bulk waste collection • Reducing the amount of bulk trash that can be collected via curbside collection • Increasing staffing for 311 calls • Allowing City workers to enter residents' homes **Programmatic:** • Collecting bulk waste for donation • Constructing a large, accessible recycling center for bulk waste

4.4.3 Yard Waste and Leaf Collection

Yard waste and leaves are not collected separately within the City. Instead, residential yard waste is collected with mixed refuse on trash collection days and sent to WIN Waste for incineration with the residential trash. Additional information on yard waste and leaf collection is provided in Section 3.4.

Barriers to Yard Waste and Leaf Collection

As indicated, yard waste is not currently diverted from the waste stream. This is a missed opportunity for the City that needs to be corrected. Yard waste should be collected separately from residential waste and diverted through a combination of community based, small-scale programs (e.g., backyard composting or community composting) and centralized collection and diversion programs (e.g., through separate collection and diversion to an organics management facility). The assessment of the City's yard waste and leaf collection program identified the following barriers to effectively implementing a yard waste diversion program in the City:

1. Education and Outreach: Due to a lack of educational materials, many residents are unaware of existing community-based composting programs and/or do not know how to begin composting at home.
2. Lack of Separate Collection: Yard waste and leaves are not currently collected separately from residential trash. As such, they cannot be diverted from disposal.
3. Lack of Organics Recycling Infrastructure: There are currently no operational large-scale composting or anaerobic digestion facilities that accept yard waste in the City. This lack of infrastructure inhibits the City from developing a yard waste and leaf diversion program.

Additional barriers to yard waste and leaf collection include staffing shortages (particularly for CDL drivers), which inhibit the development of a separate yard waste collection program.

Opportunities for Improvement

The following opportunities for improving yard waste and leaf collection were identified as part of this assessment:

1. Improve education and outreach initiatives to connect residents with existing community-based composting programs and to educate residents on how to effectively compost at home.
2. Improve access to backyard composting by providing residents with subsidized backyard composting tools.
3. Develop a separate yard waste and leaf collection program in the city so that yard waste and leaves can be diverted from disposal. In addition to starting a separate collection program, the City could increase starting pay for CDL drivers to alleviate staffing shortages.
4. Construct or encourage construction of an organics recycling facility in the city to facilitate a separate yard waste and leaf collection program.

Summary

A summary of the City's assessment of its yard waste and leaf collection program is found below.

Component		Assessment
	**Barriers**	• Lack of education and outreach • Lack of separate collection • Lack of organics recycling infrastructure

	**Opportunities**	• Improve education and outreach initiatives • Improve access to backyard composting • Develop a separate yard waste and leaf collection program • Construct or encourage construction of an organics recycling facility in the City

4.4.4 Illegal Dumping

Illegal dumping remains a persistent problem in the City with an annual cost to the city for cleanup of over $26.7 million. Additional information on illegal dumping collection is provided in Section 3.4.

Barriers to Reducing Illegal Dumping

The assessment of the City's illegal dumping problem identified the following barriers:

1. Lack of Working Mechanism to Prevent Illegal Dumping: In fiscal year 2022, 325 citations were issued for illegal dumping activities. These citations included fines ranging from $50 - $30,000, and in some cases, included imprisonment. However, the problem of illegal dumping persists in the City.
2. Fees Imposed on Small Haulers: Fees imposed on small haulers as part of the small hauler program may incentivize illegal dumping.
3. Illegal Dumping is Not Reliably Collected: The City has trouble keeping up with the illegal dumping problem in the City. As such, illegally dumped material becomes an eyesore until it can be collected. If waste is not collected, more waste is added by other illegal dumping activities.

Opportunities For Improvement

The LWBB Plan highlights several opportunities to reduce illegal dumping in the City. These include:

1. Provide stronger enforcement of fines for illegal dumping violations equally throughout the city;
2. Offer more bulk trash pickup;
3. Use surveillance cameras in highly impacted areas to identify people illegally dumping their trash;
4. Remove fees for small haulers and residents using commercial vehicles (e.g., U-Haul vans) at QRL, NWTS, and the other residential drop-off centers;
5. Contract residents and/or small haulers to pick up and transport illegally dumped waste in their private vehicles;
6. Increase DPW staff capacity to improve reliability of waste collection services and information and to provide better response to illegal dumping, including following up more promptly on complaints from 311 calls/website;

7. Identify common illegal dumping sites (e.g., in Carrollton Ridge, Shipley Hill, and Edmondson Village), place a dumpster there, and schedule regular collections;
8. Get input from local haulers who could help identify the culprits of illegal dumping;
9. Require small haulers of junk to report where they take the materials they collect;
10. Maintain a list of registered contractors to help track and identify where illegally dumped material is coming from;
11. Use social media to reward those reporting illegal dumping, and to publicize contractors and small haulers determined to be illegally dumping so others don't use them;
12. Establish a smartphone app that would provide credits or coupons to people who take verifiable pictures of illegal dumping in the act;
13. Work more closely with community development organizations, neighborhood business districts, conservation land trusts, BMORE Beautiful, small haulers, and other interested parties to explore and provide opportunities for the purchase and transfer of derelict land and buildings to residents and nonprofits to create public safe clean green spaces, reduce blight, and implement a vision of community led stewardship for the land;
14. Require absentee landowners to perform cleanups and make the site improvements required by the City, or forfeit their property under eminent domain for transfer to a Conservation Land Trust that is willing to make those site improvements; and
15. Transfer lands in public ownership (e.g., plots where public housing was torn down but not replaced) to Conservation Land Trusts to begin pilot programs.

Summary

A summary of the City's assessment of its illegal dumping program is found below.

Component		Assessment
	**Barriers**	• Lack of working mechanism to prevent illegal dumping • Fees imposed on small haulers • Illegal dumping is not reliable collected
	**Opportunities**	**Administrative:** • Increase enforcement • Remove fees for small haulers and residents using commercial vehicles • Increase DPW staff capacity to improve response to illegal dumping • Interview small haulers to identify likely culprits • Require small haulers to report where they take their waste • Maintain a list of registered contractors to track illegal dumping • Use social media to reward those reporting illegal dumping and publicly identify contractors who have illegally dumped material • Establish a smartphone app • Work closely with community development organizations

		• Require absentee landowners to perform cleanups or forfeit their property • Transfer land in public ownership to Conservation Land Trusts **Programmatic:** • Offer expanded bulk trash collection • Install and monitor surveillance cameras in highly impacted areas • Contract residents and/or small haulers to collect illegally dumped materials • Place dumpsters in common illegal dumping sites

4.4.5 Street and Sidewalk Sweeping

Street and sidewalk sweeping is provided by the Street Sweeping and Roll-Off Division and is described in Section 3.4.

Barriers to Effective Street and Sidewalk Sweeping

The assessment of the City's street and sidewalk sweeping program identified the following barriers:

1. Year-Round Operation: Street sweepers in the City run year-round, but they may not be needed in the winter when freezing conditions prevent debris collection.
2. Inconsistent or Nonexistent Service: Street sweeping is reportedly inconsistent or non-existent in some neighborhoods. This issue is due predominantly to a lack of enforcement when parked cars are not moved during street sweeping days.
3. Dated Street Sweeping Fleet: The City's street sweeping equipment is dated, with the newest vehicles purchased in 2016.
4. Ineffective for Collecting Leaves: The City's current street sweeping trucks are not appropriate for collecting leaves from the city's streets
5. Ineffective for Bike Lanes: The City's current street and sidewalk sweeping trucks are ineffective for cleaning bike lanes.

Opportunities for Improvement

This assessment identified multiple ways to improve street sweeping in the city. These include:

1. Streamlining Street Sweeping Schedule: The current street sweeping schedule is seen as intermittent and hard to understand. This could be improved by ensuring sweepers come as scheduled and by making the schedule simpler to understand. The efficacy of street sweeping could be improved by offering sweeping services in more places (e.g., alleys) and by enforcing parking rules for sweeping days.

2. Improving Enforcement: Reliable enforcement of parking laws would allow City crews to access more neighborhoods and provide more consistent service.
3. Procuring New Street Sweeping Vehicles: Procuring new street sweeping vehicles may help the City better service underserved areas. It may also improve collection efficiency.
4. Redesigning Bike Lanes: If bike lanes were redesigned such that existing street sweeping vehicles could access them, the City could improve cleaning on streets with bike lanes.
5. Procuring Specialized Vehicles for Cleaning Bike Lanes: If bike lanes cannot be redesigned, the City could procure additional smaller street sweeping vehicles to clean bike lanes.
6. Procuring Additional Leaf Collection Vehicles: Procuring additional vehicles specifically for leaf collection would reduce the hazards (e.g., fires) associated with collecting leaves with street sweeping vehicles.

One additional opportunity is to suspend street and sidewalk cleaning during winter months to free up drivers for snow plowing. However, this would only be advisable during periods of freezing temperatures and snowfall.

Summary

A summary of the City's assessment of its street and sidewalk sweeping program is found below.

Component		Assessment
	**Barriers**	• Year-round operations • Inconsistent or nonexistent service • Ineffective leaf collection • Ineffective bike lane sweeping
	**Opportunities**	**Administrative:** • Educational programs to reduce litter • Improved enforcement **Programmatic:** • Redesigning bike lanes • Procuring specialized vehicles for cleaning bike lanes • Procuring leaf collection vehicles

4.4.6 Small Hauler Program

The City's small hauler program is described in Section 3.4.

Barriers to Small Hauler Program Operation

The assessment of the City's small hauler program identified the following barriers:

1. Inefficient Payment System: Currently, small haulers pay a set fee for every load they dump at NWTS or QRL. However, small haulers have to pay every time they enter the facilities, which can be slow (particularly when paying with cash).
2. Lines at NWTS and QRL: Since rollout of the small hauler program, small haulers have significantly outnumbered residents and commercial haulers at NWTS and QRL. This has led to lines at both facilities (particularly on Saturdays).

Opportunities for Improvement

The following opportunities for improving the small hauler program have been identified:

1. Setting up an automatic payment system: Setting up an automatic payment system where small haulers had registered accounts to charge would make the program easier, safer, and more efficient and may help to reduce lines at QRL and NWTS.
2. Expand the small hauler program to additional locations: While the City does not currently have other locations where small haulers could bring waste (existing residential drop-off centers are space constrained), if the City develops a new facility (e.g., an eco-park or a new drop-off center), the small hauler program could be expanded at that new facility.

Summary

A summary of the City's assessment of its small hauler program is found below.

Component		Assessment
	**Barriers**	• Inefficient payment system • Lines at QRL and NWTS
	**Opportunities**	• Setting up an automatic payment system • Expand small hauler program to additional locations

4.4.7 Other Waste Collection Programs

The City's other waste collection programs are described in Section 3.4.

Barriers to Collecting Other Waste

The assessment of the City's other waste collection programs identified one primary barrier regarding collection of sharps and human waste from encampments. City collection crews and DPW employees are not properly trained to safely handle biological waste or sharps. Expanding DPW's collection services to

include cleanup of human waste and sharps would require a significant investment in training, collection equipment, and personal protective equipment.

Opportunities for Improvement

One potential opportunity to improve collection of human waste and sharps is for the City to contract with a private company to provide collection of these materials from encampments. This would prevent the City from incurring excessive training and materials costs for such a specialized collection task. Currently, the City is piloting a program to contract with a cleaning service to remove sharps and human waste from encampments. If the pilot is successful, this program could be implemented at a larger scale.

Another potential opportunity is for the City to provide safe needle deposit boxes in public green spaces. The City currently partners with Charm City Land Trust to provide a safe needle deposit box, which has significantly improved safety with respect to discarded sharps. Installing other safe needle deposit boxes in similar locations could improve safety for others who currently need to clean and dispose of sharps.

4.5 Waste Transfer

Currently, the City only operates one transfer station: NWTS. This section will focus on NWTS and opportunities to expand the City's transfer capacity. This section will not focus on transfer stations operated by the private sector as these facilities are outside of the City's control.

4.5.1 Northwest Transfer Station

As indicated in Section 3.6, NWTS is currently operated by DPW as a transfer station to consolidate mixed refuse and single-stream recycling (SSR) loads collected curbside by DPW's load-packer trucks into larger truckloads. It also serves as a drop-off point for the small hauler program and operates a residential drop-off center. Mixed recyclables are sent from NWTS to the WMRA and World Recycling materials recovery facilities while trash is sent to QRL and WIN Waste. NWTS has a permitted capacity of 150,000 tons per year. However, in 2021, only about 22,100 tons of recyclables and 59,200 tons of mixed refuse were handled at the facility. It is noted that since 2019, NWTS has been used only as a drop-off center for small haulers and residents and for transfer of curbside recyclables, but this is mainly due to a current shortage of transfer truck drivers at DPW. As indicated in Section 3.7, NWTS has a permitted capacity of 150,000 tons per year but an average throughput of 70,000 tons per year or less (likely the result of the facility's popularity among small haulers, which results in longer lines and smaller average loads per vehicle). The facility's operational life is expected to exceed 20 years.

Barriers to Operation

An assessment of NWTS identified the following barriers to efficient operations:

1. Staffing Limitations: Due to a shortage of CDL transfer truck drivers, waste and recyclables currently accumulate on the tipping floor. On especially busy days, this can force operations to halt, causing lines.

2. Small Hauler Program: One reason for this lower throughput has been the implementation of the small hauler program at NWTS, which has limited the volume of load packer trucks that the site can easily accommodate. To operate NWTS at its permitted capacity of 150,000 tons per year, the small hauler program would have to be significantly cut back or relocated to another location.
3. Size Constraints: Expansion of NWTS is constrained by the location and size of the property and existing infrastructure. In order to process the permitted capacity of 150,000 tons per year, NWTS would have to expand operation to include more shifts and/or longer working hours (which may require a permit amendment from MDE).

Opportunities for Improvement

Opportunities for improving or expanding the existing waste transfer system are taken from the LWBB Plan and other publicly available planning documents.

1. Reconfigure Northwest Transfer Station for Out-of-City Disposal: To reduce the City's reliance on WIN Waste and conserve airspace in QRL, the LWBB Plan recommends upgrading NWTS to operate at its full permitted capacity of 150,000 tons per year (the facility processed 81,400 tons in 2021) and reconfiguring the facility for out-of-City disposal. It is estimated that this would require adding additional shifts and equipment to keep the facility open for longer (potentially 24 hours a day, six days a week, depending on permit conditions and local neighborhood concerns).
2. Construction of an Additional Truck Transfer Facility: To relieve some of the small hauler pressure at NWTS and allow load packers servicing the east side of the city a way to consolidate loads, the LWBB Plan recommends constructing a transfer station on the east side of the city.

Summary

A summary of the City's assessment of NWTS is found below.

Component		Assessment
	**Barriers**	• Staffing limitations • Lines due to small hauler program • Size constraints
	**Opportunities**	• Reconfigure NWTS for out-of-City disposal • Construct an additional truck transfer facility

4.5.2 Opportunities for Expanded Transfer Capacity

Opportunities for improving or expanding the existing waste transfer system are taken from the LWBB Plan and other publicly available planning documents.

Eastside Transfer Station

There is not currently a transfer point that allows load packers servicing the eastern part of the City to consolidate their loads prior to hauling waste for disposal at WIN Waste or QRL or recycling at out-of-City facilities. As such, load packers servicing the eastern part of the City must either go directly to WIN Waste or QRL (and wait in potentially long lines) or travel across the city to dump their loads at NWTS. To provide a central transfer point to the eastern part of the City and increase the City's overall transfer capacity, the LWBB Plan recommends constructing an additional truck transfer facility in the eastern part of the City. The LWBB Plan includes a conceptual layout for the Eastside transfer station at the Bowleys Lane Drop-off Center.

Large Rail Transfer Station

The LWBB Plan recommends constructing a large rail transfer facility to reduce the City's reliance on WIN Waste and conserve airspace in QRL (particularly given that the City's contract with WIN Waste expires in 2031). Such a facility would be constructed so it could be operated as a truck transfer station but would be built along a rail spur to allow for containerization and rail shipment to suitable out-of-city landfills as the primary transfer mechanism. Rail would be the preferred method of transfer with trucking capabilities providing a backup. This option would allow the City to send waste to regional landfills or even more distant facilities as needed. Likely locations for a large rail transfer facility are QRL (rail lines currently run around the northern property boundary) or the Western Acceptance Facility in Baltimore County. If the Western Acceptance Facility is chosen for development, it will require a collaborative agreement with Baltimore County to construct the facility. Adding a rail spur at Western Acceptance Facility will likely be more challenging than at QRL.

4.6 Waste Processing and Recycling

The only waste processing facility currently operated by the City is Camp Small. This section will assess Camp Small and also offer opportunities for constructing additional processing capacity in the City.

4.6.1 Camp Small

Camp Small is a 5-acre facility operated by the Department of Recreation and Parks for processing wood waste from tree debris. In 2021, Camp Small received 8,500 tons of material. Of that volume received, 1,300 tons of logs and 2,100 tons of wood chips were repurposed. Additional information is provided in Section 3.7.

Barriers to Efficient Operation

An assessment of Camp Small identified the following barriers to efficient operations:

1. Space Constraints: As a relatively small site, Camp Small has very limited opportunities to expand operations or store materials and equipment.

2. Lack of Equipment: The facility currently requires a large grinder to grind large logs and branches.
3. Staffing Limitations: Two full time employees currently have to split their time between processing high value woods to sell as prime logs , chipping less valuable woods to generate mulch, sorting all incoming materials and administrative work. Camp Small has a supply to process more wood but do not have the personnel to do so.
4. Lack of Marketing/Visibility: Many residents are not aware that Camp Small exists or that they can purchase mulch, logs, and other wood products from the facility. As such, mulch has been accumulating at the site.

Opportunities for Improvement

The following opportunities for improving Camp Small have been identified:

1. Improve education and outreach: Education and outreach can help improve visibility of the facility and help the facility to sell more mulch and wood products.
2. Use of stored mulch as a carbon bank: Due to the large amount of stored mulch at the site, there is an opportunity to use Camp Small as a carbon bank if the City constructs or facilitates construction of a composting facility (described in more detail below).
3. Increase staffing and funding: Increasing staffing and funding for the facility could allow the facility to purchase a large grinder and hire additional personnel to process wood waste more efficiently.

Summary

A summary of the City's assessment of Camp Small is found below.

Component		Assessment
	**Barriers**	• Space constraints • Lack of equipment • Staffing limitations • Lack of marketing/visibility
	**Opportunities**	• Improve education and outreach • Use stored mulch as a carbon bank • Increase staffing and funding

4.6.2 Opportunities for Expanded Processing Capacity

Opportunities for improving or expanding the existing waste processing and recycling system are taken from the LWBB Plan and other publicly available planning documents.

Opportunities to Improve SSR Processing Capacity

The LWBB Plan includes several opportunities to improve SSR processing capacity in the City. To reduce transportation costs and reliance on out-of-city recycling facilities, these opportunities involve the expansion of in-City processing capacity. Opportunities include:

1. Expanding existing MRFs in the City: The City may partner with existing MRFs in the City to expand in-City SSR processing capacity and reduce reliance on an out-of-City processing facility. Older facilities focus on providing recycling services to bulk customers, mainly in the construction industry. They are not equipped to handle high volumes of SSR. Further, the changing composition of SSR and markets for recovered materials requires MRFs to make regular upgrades to include newer technology into their facilities. While older facilities may be retrofitting with new technology, this is unlikely to be economical for the owners unless the City is willing to help fund the upgrades.
2. Constructing a City-operated centralized MRF: The City could develop a new centralized MRF (either directly or by entering into an agreement with the private sector) to process SSR locally. However, it seems unlikely this would provide a more cost-effective solution, when considering all capital costs and marketing experience needed.
3. Constructing City-operated decentralized mini-MRFs: The City could develop a system of "mini-MRFs" to try to process SSR locally at a lower cost than can be offered by WMRA. This option offers flexibility, as the City can choose to construct some mini-MRFs while continuing to send excess recyclables to WMRA for processing. Mini-MRFs could be developed by community organizations in collaboration with experienced small haulers and licensed contractors, with the City potentially providing small business development grants. Due to their small operational footprint, mini-MRFs can relatively easily be installed within disused/abandoned warehouses or industrial buildings. With a smaller system, haulers would develop relationships with residents while mini-MRFs would also provide a source of jobs for the local community. Shorter haul routes could even allow investment in smaller trucks (ideally non-compacting) to reduce contamination and produce a higher quality product.

Opportunities to Improve Organics Processing Capacity

One central recommendation from the LWBB Plan and the BFWRS is the need to develop in-City organics processing capacity (either composting or anaerobic digestion). It is expected that organics diversion efforts in the City will increase over the Planning Period. To reduce the transportation costs associated with hauling organic waste outside of the City for processing, additional in-City processing capacity should be created. The LWBB plan offers three methods for the City to increase organics processing capacity:

1. Building, permitting, and operating its own organics processing facilities;
2. Partnering with private companies to design, build, and operate organics processing facilities under a public-private partnership (PPP); or
3. Contracting with other existing public or private entities to accept organics for processing.

The BFWRS provides further guidance on how to expand organics processing in Baltimore, including conducting a feasibility and cost-benefit analysis for establishing composting or AD facilities at City-owned sites, working with surrounding counties to identify viable locations for small, medium, and large-scale

composting and AD facilities, and issuing joint RFPs for private organics management companies to develop processing facilities at selected sites.

If the City chooses to construct (or facilitate construction) of organics processing facilities, it has two options:

1. Construct a centralized facility: Site, permit, construct, and operate one large facility capable of processing all SSO collected from residential sources as well as City government and public schools. This facility would likely be sited at or near QRL.
2. Construct decentralized facilities: Site, permit, construct, and operate a series of small facilities to process SSO. These would be distributed around the city and developed sequentially as demand for additional SSO processing capacity builds.

The main advantage of the centralized option is economies of scale, as it would be less expensive in the long term to staff and operate one large facility rather than a series of small facilities. Another advantage is that a large facility requires only one plot of land while a decentralized would require multiple plots of land. If only one facility is constructed, a temporary or permanent shutdown of the facility would completely eliminate the ability to process organic waste.

The main advantage of a decentralized approach is redundancy and reducing vehicle miles. If there is a problem and one of the facilities has to temporarily (or permanently) shut down, capacity could be relatively easily transferred to the other facilities. Decentralized systems are thus more robust to climate change impacts such as flooding or storms. Another advantage of decentralization is that capacity can be scaled up with time to match the demands of the SSO collection program. SSO collection would most likely be rolled out in phases; therefore, constructing a series of small organics processing facilities would allow processing capacity to match demand and require less initial capital and operational funding. Developing multiple facilities also entails more permitting and environmental monitoring effort.

Opportunities to Improve C&D Processing Capacity

The LWBB Plan outlines three strategies for increasing C&D processing capacity in the City:

1. Construct and operate a C&D MRF: This would allow the City to implement full control over all aspects of C&D recycling. However, it would also force the City to bear all the responsibility for any operational issues.
2. Construct a C&D MRF in coordination with a private company under a PPP: With this option, the City would own the facility while the private company would operate it.
3. Allow private companies to expand existing facilities and/or develop a new C&D MRF: Baltimore is already home to at least two large operational C&D MRFs. If increased C&D recycling is mandated, it is likely that private companies could expand capacity without any help or direction from the City.

Opportunities for Developing a Mixed Waste Processing Facility

The LWBB Plan considered the development of a mixed waste processing (MWP) facility to improve diversion. MWP facilities are complex operations that employ a multi-stage approach to sort and process the incoming mixed waste stream. A typical MWP facility includes a "dirty" MRF to recover recyclables and separate out undesirable materials prior to processing, an anaerobic digestion facility to convert organics separated from the MRF to methane, and other processing technologies (e.g., gasification) to convert plastics and other high calorific wastes to energy or fuel. It is noted that an MWP facility may not include all these technologies or may employ different technologies in alternative configurations. However, the main goals of MWP are to generate energy, recover recyclables, create reusable products, and reduce the final quantity of waste that requires disposal.

Ultimately, the LWBB Plan did not recommend construction of a MWP facility in the City for the following reasons:

1. MWP technologies are largely unproven for use in the U.S;
2. MWP technologies also tend to be capital intensive and expensive to operate, especially when compared with other waste disposal options, such as continued use of WIN Waste or constructing a transfer station;
3. MWP facilities work in opposition to reduction/diversion measures. In other words, mixed waste processing performs best when all organic and recyclable material is left in the mixed waste stream. MWP may thus be an inefficient, expensive, and highly centralized method of meeting diversion goals, which could be better achieved by implementing some of the reduction and diversion options detailed in Sections 4.1 and 4.2.

4.7 Waste Disposal

The City currently uses two facilities for waste disposal: QRL and WIN Waste. This section presents an in-depth assessment of QRL, as this facility is owned and operated by the City and is thus entirely under the City's control. Because WIN Waste is not directly under City control, the assessment for this facility focuses primarily on the limitations of the current agreement with WIN Waste and opportunities to improve waste disposal methods.

4.7.1 Quarantine Road Landfill

The permitted capacity of QRL is 18,320,799 cubic yards. As of 2021, 15,653,479 cubic yards had been consumed, leaving 2,667,320 cubic yards of permitted capacity. It is anticipated that the landfill's remaining permitted capacity will be consumed in 2028. However, a lateral expansion of QRL onto the adjacent Millennium Landfill is currently planned, with submission of the Phase III permit application report to MDE occurring in October 2022. Based on the Phase III report, the lateral expansion will increase the landfill's total capacity by 5.7 million cubic yards and extend its service life through 2035. It is possible that QRL could be vertically expanded at a subsequent date, which would further increase its capacity and service life.

Barriers to Efficient Operation

An assessment of QRL identified the following barriers to efficient operation:

1. Payment Issues: QRL currently does not accept credit cards for payment. As such, an armed off-duty police officer must be present at the scale house during operating hours to prevent theft of cash payments. Further, the lack of credit card payments means that some haulers who do not have cash simply do not pay for disposal as there is currently no means to penalize haulers that do not pay.
2. Unacceptable Materials: There are currently cameras in place at the scale house so that cashiers can identify unacceptable loads. However, cashiers are typically busy processing payments and often do not have time to inspect every load. As such, unacceptable loads often make it to the active face where they may be landfilled if they are not identified by onsite workers. The most common unacceptable wastes encountered at QRL are tires.
3. Mattresses: Mattresses are very difficult to landfill as they are large, bulky, and they do not compact well.
4. WWTP Sludge: QRL is temporarily accepting sludge from the BRWWTP while maintenance of the facility is underway. However, sludge is a weak material that requires mixing with waste and ash prior to placement to maintain stability of the landfill.
5. Lack of Signage/Communication: There is a general lack of signage and communication with customers and residents.
6. Lack of Equipment: QRL currently does not have a roll-off truck onsite to haul roll-offs (and particularly tires) collected at the residential drop-off center. As such, the landfill manager must schedule removal of all roll-offs from the site. Additional roll-off containers are also required to store bulk waste.
7. Staffing Limitations: Hiring and retention of personnel is a problem at QRL. Laborers had to be hired through a third party to remove litter from the site as there were not enough onsite personnel. Equipment operators are also hard to hire and retain as starting salaries are considerably lower at QRL than for private sector jobs.
8. Power Outages: There is an issue with the power supplied to the site which has led to shutdowns of the landfill gas flare and leachate pump stations.
9. Wait Times and Lines: Particularly on busy days (e.g., Saturdays), QRL is subject to significant wait times and lines. These lines are often the result of limited on-site roll-off containers at the residential drop-off center.
10. Greenhouse Gas (GHG) Emissions: The Greenhouse Gas Emissions Inventory for the City produced by the BOS estimates that QRL generated approximately 636,000 tons of carbon dioxide equivalents (using a global warming potential of 20 years) in 2020. This represents approximately 2.5 tons of carbon dioxide equivalents (TCO2E) produced per ton of waste landfilled in 2020. These emissions are largely driven by methane produced from the anaerobic degradation of organic waste in the landfill.
11. Potential PFAS Contamination: There is potential that the leachate generated at QRL contains PFAS, which may subject the landfill to strict treatment requirements.

12. Expiration of WIN Waste Contract: When the existing disposal contract with WIN Waste expires in 2031, QRL will be the only waste disposal facility in the City.

Opportunities for Improvement

The assessment of QRL identified several opportunities to improve efficient operation of the facility. These include:

1. Installing internet capabilities and credit card readers at the scale house.
2. Training cashiers to identify unacceptable waste at the scale house.
3. More consistent use of cameras at the scale house to identify unacceptable waste.
4. Installing radiation sensors at scale house to identify unacceptable waste.
5. Procurement of a roll-off truck and additional roll-off containers to provide additional storage and hauling capacity and reduce lines and complaints.
6. Increasing pay, adding retention bonuses, and improving training to improve hiring and retention (particularly of CDL equipment operators).
7. Providing more specific job postings to target equipment operators.
8. Installing license plate readers and gates at the scale house to prevent people from leaving without paying.
9. Procuring driver's license scanners for use at the residential drop-off center to facilitate identification of non-residents and commercial haulers.
10. Working with local utility to reduce power outages at the site.
11. Increasing diversion away from the landfill (particularly organic waste) to reduce greenhouse gas emissions and reduce disposal pressure on QRL when the WIN Waste contract expires.
12. Construction of a Large Rail Transfer Facility: As described in Section 4.5, construction of a large rail transfer station would provide additional disposal options for the City and reduce disposal pressure at QRL.

Summary

A summary of the City's assessment of QRL is found below.

Component		Assessment
	**Barriers**	• Payment issues • Unacceptable materials • Mattresses • WWTP Sludge • Lack of signage/communication • Lack of equipment • Staffing limitations • Power outages • Wait times and lines • Greenhouse gas emissions • Potential PFAS contamination (leachate)

		• Expiration of WIN Waste contract
	**Opportunities**	• Training cashiers to identify unacceptable waste • More consistent use of cameras to identify unacceptable waste • Installing radiation sensors to identify unacceptable waste • Procurement of roll-off truck and roll-off containers • Increasing pay, bonuses, and training of equipment operators • Providing more specific job postings to attract equipment operators • Installing license plate reads and gates at the scale house • Installing internet and credit card readers at the scale house • Procuring driver's license scanners for the residential drop-off center • Working with BGE to reduce power outages • Increasing diversion efforts • Constructing a large rail transfer station

4.7.2 WIN Waste

WIN Waste has a capacity of 2,250 tons of refuse per day and the anticipated remaining service life of the plant is over 20 years. Currently, the City sends most of its waste to WIN Waste under a contract with the Northeast Maryland Waste Disposal Authority. The existing contract is not a "put or pay" contract. This contract will expire in 2031.

Barriers to Efficient Operation

An assessment of the City's usage of WIN Waste for waste disposal identified the following barriers:

1. Emissions: The Greenhouse Gas Emissions Inventory for the City produced by the BOS estimates that WIN Waste generated approximately 653,000 TCO2E (using a global warming potential of 20 years) in 2020. This represents approximately one TCO2E produced per ton of waste disposed in 2020. Additionally, WIN Waste produces particulate matter, heavy metals, sulfur oxides, nitrogen oxides and other pollutants that can have a negative impact on the health of city residents.
2. Mattresses: WIN Waste has stopped accepting mattresses, which contributes to the mattress problem experienced at QRL.
3. Contract Ending in 2031: If the City's contract with WIN Waste is allowed to expire in 2031, the City will need to be prepared to maximize source reduction, waste diversion, and the development of alternative waste disposal methods.

Opportunities for Improvement

This assessment identified the following opportunities for improving the City's use of WIN Waste:

- Increasing diversion away from disposal to prepare the City for the expiration of the WIN Waste contract in 2031 and to reduce the City's GHG emissions.
- Construction of a Large Rail Transfer Facility: The LWBB Plan recommends constructing a large rail transfer facility to reduce the City's reliance on WIN Waste and conserve airspace in QRL (particularly given that the City's contract with WIN Waste expires in 2031). This facility is described further in Section 4.5.

Summary

A summary of the City's assessment of WIN Waste is found below.

Component		Assessment
	**Barriers**	• GHG emissions • Mattresses • Expiration of WIN Waste contract
	**Opportunities**	• Increasing diversion efforts • Constructing a large rail transfer station

4.8 Plan to Return to Pre-Pandemic Services

As discussed in Section 3.1, the City had to reduce services during the Covid-19 pandemic to accommodate significant staff shortages and equipment breakdowns. As a result, the City has had to shift curbside recycling collection services from once a week to biweekly. The City is currently planning to re-establish weekly recycling collection by hiring additional staff (particularly drivers) and procure additional load packers. Current efforts to provide job opportunities include training programs, open positions, job fairs, and other opportunities. These efforts will continue until the City can hire enough workers to provide weekly recycling pickup.

4.9 Potential Limitations on Development

This section contains information on the limitations for development of new solid waste management facilities in Baltimore. Solid waste management facilities considered in this section include transfer stations, solid waste processing facilities, and compost facilities. As indicated in Section 4.6, no new landfills or incinerators are planned in the City; as such, these facilities are not considered in this section.

4.9.1 Geographic Considerations

Location and Topography

The location selected for development of any new solid waste management facility will likely need to be fairly flat to allow for site access and facility construction. The facility should be located in such a way that it does not negatively impact any adjacent communities (e.g., by increasing traffic, generating noise, generating air or water pollution, etc.).

Land Use

The location selected for development of any new solid waste management facility should be consistent with historic land use for the site. As such, historically industrial sites should be considered first for development of a new solid waste management facility.

Zoning

Zoning requirements for solid waste management facilities are described in Section 2.3 and Appendix C.

Defined Critical Areas

Maryland's Critical Areas Law requires a buffer of at least 1,000 feet from tidal waters and tidal wetlands. Any proposed development of new solid waste management facilities will meet this buffer.

4.9.2 Geologic and Hydrogeologic Considerations

Soil Types and Characteristics

Soil types should be considered when siting a proposed solid waste management facility. Soil types and characteristics can have implications for stormwater management, infiltration, erosion and sediment control, and groundwater contamination and monitoring.

Geologic Conditions

Geologic conditions should also be considered when siting a potential solid waste management facility. Geologic conditions can determine the locations of aquifers (typically in coarse-grained or fractured, permeable geologic layers) and aquitards (typically in fine-grained, low permeability geologic layers). As such, geologic conditions can greatly impact the location and flow of groundwater at a site.

Aquifers

The location, depth, flow, and usage of aquifers at a proposed site should be considered when siting a new solid waste management facility. The facility should be designed in such a way as to minimize impacts to aquifers (particularly those that are used for drinking water) and groundwater monitoring wells should be located to monitor potential impacts to all aquifers potentially impacted by site development and operation.

4.9.3 Hydrologic Considerations

Site Water Management

A stormwater management plan for a potential solid waste management facility will be drafted and approved by DPW prior to construction of the facility. Stormwater must be managed consistent with the approved stormwater management plan.

Any contact water produced at the proposed solid waste management facility will be collected and treated in accordance with the approved operations and maintenance manual for the facility. Discharge to waters of the State must be limited to those allowable under permits governing solid waste disposal and water pollution control.

Surface Water

Proposed solid waste management facilities should be sited to minimize impacts to surface water sources. No water containing pollutants shall be discharged from the site.

Wetlands

A proposed solid waste management facility should be sited to minimize impacts to non-tidal wetlands. If wetland impacts cannot be avoided, a Joint Federal/State Application for the Alteration of Any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland must be filed with MDE.

Floodplains

Solid waste management facilities cannot be sited within FEMA-designated floodplains.

Watersheds

Development of a proposed solid waste management facility should not significantly alter watershed drainage areas or cause potential impacts to downstream facilities.

4.9.4 Existing Water Quality

The existing water quality for a given site should be considered when siting a proposed solid waste management facility. Development of the proposed facility should not lead to significant impacts to existing surface or groundwater quality. Construction of monitoring wells may be required prior to site development to determine the existing water quality conditions for the site.

4.9.5 Planned Long-Term Growth Patterns

Long-term growth patterns should be considered when siting a proposed solid waste management facility. As previously indicated, solid waste management facilities should be located where they will not negatively impact any adjacent communities. Similarly, long-term growth patterns should be considered such that the facility will not negatively impact any future communities over the proposed life of the facility.

4.10 Asbestos Disposal Capacity

The disposal of asbestos is largely unaddressed. Private companies that remove asbestos from older buildings in the City are mandated to transport it out of Baltimore for disposal. Asbestos removal from City owned buildings is contracted out to private firms.

4.11 Emergency Response Procedures for Hazardous Leaks and Spills

State regulations for the development of comprehensive solid waste management plans require that Chapter 4 evaluates programs and procedures for responding to the unplanned (emergency) spilling or leaking of hazardous wastes within the local jurisdiction. In compliance with this requirement, the City's emergency response system for hazardous wastes is summarized below.

The Office of Emergency Management (OEM) has developed an Emergency Operations Plan, which includes instructions for handling hazardous material emergencies, sources of information, and parties to be notified.

The City's emergency response system is activated by telephone calls to 911. Callers are asked to provide as much information as possible about the nature of the hazardous material, impending danger, and location and extent of the incident. The facility where the incident occurred, or the transporter, is required to notify the National Response Center of the incident after calling 911.

The Fire Department responds to 911 hazardous materials calls by dispatching a hazardous material task force of fire engines/trucks and a rescue team. Other agencies and resources are notified as required. At the site of the incident, an operations command post is established, and the severity of the incident is determined based on the likelihood of public impact. Depending on the public impact and its probable extent, the incident commander may initiate "secure premises," "public relocation," or a “general information” procedure to protect the public until the hazard has been neutralized.

The entire response to the emergency is coordinated by the Fire Department, whose personnel are trained and equipped to handle hazardous material emergencies. Other agencies respond only at the direction of the Fire Department's incident commander, to avoid any duplication of efforts or confusion.

The City's Emergency Operations Plan is incorporated by reference into this solid waste plan.

4.12 Adequacy of Local Zoning and Master Plan

As indicated in Section 2.4, the City’s Comprehensive Plan provides the policy basis for guiding redevelopment and revitalization of the City’s developed neighborhoods. Any proposed development of new solid waste management facilities will be conducted in accordance with this plan.

5. PLAN OF ACTION

Chapter 5 provides a plan of action for the City to improve the performance of its solid waste system during the planning period. This plan of action contains input from DPW (driven predominantly by data collected and recorded by the City), and the public (received predominantly in the form of comments collected at public meetings and hearings conducted as part of the development of this Plan). The planning period for this plan of action is ten years, from 2024 through 2033. The organization of this plan is detailed below:

Section 5.1: "Discussion of Funding Mechanisms" describes the potential funding mechanisms that the City intends to use to finance the plan of action;

Section 5.2: "Waste Reduction and Diversion Goals and Programs" describes the specific action items that the City intends to take to meet short- and long-term diversion goals. Action items are grouped by waste or recyclable type, including SSR, organics, C&D waste, bulk waste, other waste, and litter;

Section 5.3: "Residential Drop-off Centers" describes specific action items that the City intends to take to improve operations, access, and diversion from residential drop-off centers;

Section 5.4: "Waste Collection System" descries specific action items to improve waste collection efficiency and efficacy. Action items are grouped by collection type, including curbside collection of mixed refuse and SSR, bulk waste collection, yard waste and leaf collection, illegal dumping, street and sidewalk sweeping, the small hauler program, and other waste collection programs.

Section 5.5: "Waste Transfer System," establishes a plan of action to improve the City's waste transfer system. Action items are organized by facility, including NWTS, the proposed Eastside Transfer Station, and the proposed rail transfer station.

Section 5.6: "Waste Processing and Recycling System," establishes a plan of action to improve the city's waste processing and recycling system. Action items are organized by facility, including Camp Small, proposed mini-MRFs, and proposed composting facilities.

Section 5.7: "Waste Disposal System," establishes a plan of action to improve the City's waste disposal system. Action items are organized by facility, including QRL and WIN Waste.

Action items in each subsection of this plan are broken down into legislative, administrative, and programmatic actions, with estimates of timeline diversion potential (if relevant), costs, permitting requirements (if relevant), funding mechanisms, and benefits for each action item discussed. The proposed changes to the waste disposal system detailed in this plan of action (broken down by waste category) are summarized in Table 5-1.

Table 5-1. Proposed Changes to the Waste System

Waste Category	Proposed Changes to Waste System
Residential (MSW)	• Reduction: • Diversion: Section 5.3 (SSR, organics) • Residential drop-off centers: Section 5.4 • Collection: Section 5.5 (Mixed refuse, SSR, yard waste) • Transfer: Section 5.6 (Eastside transfer station, rail transfer station) • Processing: Section 5.7 (Camp Small, mini-MRFS, composting facilities) • Disposal: No change
Commercial (MSW)	• Diversion: Section 5.3 (SSR, organics) • Transfer: Section 5.6 (rail transfer station) • Processing: Section 5.7 (mini-MRFs, composting facilities) • Collection, disposal: No change
Industrial (Solids, liquid, etc.)	• No change
Institutional (schools, hospitals etc.)	• Included with commercial waste
Demolition Debris (C&D)	• Diversion: Section 5.3 (C&D) • Collection, transfer, disposal: No change
Land Clearing	• Included with C&D waste
Controlled Hazardous Substance (CHS)	• No change
Dead Animals[(1)]	• Diversion: Section 5.3 • Collection, transfer, processing, disposal: No change
Bulk or Special Waste	• Diversion: Section 5.3 (bulk, other) • Residential drop-off centers: Section 5.4 • Collection: Section 5.5 (bulk, other) • Transfer, processing, disposal: No change
Vehicle Tires	• No change
Treatment Plant Sludge	• No change
Wood	• Processing: Section 5.7 (Camp Small) • Diversion, collection, transfer, disposal: No change
Asbestos	• No change
Soil	• Diversion: Section 5.3 (C&D) • Collection, transfer, disposal: No change
Special Medical Waste	• No change
Asphalt	• Diversion: Section 5.3 (C&D) • Collection, transfer, disposal: No change
Concrete/Brick	• Diversion: Section 5.3 (C&D) • Collection, transfer, disposal: No change
Septage	• No change

5.1 Sources of Information and Funding Mechanisms

Sources of information for costs and benefits associated with action items reported in this section as well as potential funding mechanisms that the City intends to leverage to fund the action items reported in this section are described below.

5.1.1 Potential Costs

Potential costs reported in Section 5 are estimates and are provided for planning purposes only. All costs are provided in 2023 dollars and do not account for future inflation or price volatility. Potential costs were taken from the following sources:

1. LWBB: Potential costs taken from the LWBB Plan (published in 2020) were inflated to 2023 dollars using the consumer price index inflation calculator published by the United States Bureau of Labor Statistics.
2. Current grant applications: Potential costs taken from current grant applications are reported in 2023 dollars.
3. The City's Capital Improvement Program budget estimates

5.1.2 Potential Funding Mechanisms

All the action items presented herein are contingent on securing funding. Potential funding mechanisms considered for the various action items presented in this section include:

1. Public Funding
    a. Grants: The City has historically pursued grants from the state and federal government to secure funding for diversion activities, capital improvements, community initiatives, etc. The City intends to continue pursuing grant opportunities for many of the action items listed in Section 5 to reduce the cost burden to Baltimore residents and businesses.
    b. General Fund: The City's general fund is used to provide funding for many existing solid waste programs. The City intends to minimize funding new programs from the general fund wherever possible to reduce the cost burden to Baltimore residents and businesses.
    c. Enterprise Fund: An enterprise fund or other innovative funding mechanism would have to be investigated and scoped to determine its feasibility. The responsibility for carrying out these actions is shared by DPW with other City agencies.
2. Private Funding: There are currently many privately run solid waste hauling, recycling, transfer, and disposal companies and facilities in the City (as described in Section 3). These companies and facilities predominantly handle solid waste generated by the private or commercial sector in the City. The City intends to leverage these existing private facilities wherever possible to continue processing solid waste and recyclables generated by the private sector. The City also intends to

stimulate additional in-city private solid waste development by advocating for legislative action that will promote additional diversion from the private sector (e.g., waste bans).

3. Public Private Partnership (PPP): For large capital-intensive projects, the City may consider partnering with private companies through a PPP. Under a PPP, the City would provide a land lease and a partially guaranteed waste stream with a third party (likely a private company, although a state agency such as MES could be involved) serving to construct and operate the facility.

In addition to reassessing funding mechanisms, the City will revise its contract policies to ensure that checks and balances are in place to guarantee optimal performance, health and equity standards for contracted service providers and private partnerships.

5.1.3 Potential Benefits

Potential benefits considered in this analysis include:

1. Greenhouse gas (GHG) emissions reductions: Estimates of GHG emissions reduction are taken from the LWBB Plan and are reported on a per ton basis (e.g., per ton of waste diverted from landfill or incineration).
2. Airspace savings at QRL: Estimates of airspace savings at QRL were not quantified. However, any waste diverted from disposal represents airspace savings and potential service life extension of QRL. Extending the service life of QRL allows the City to maintain local in-city disposal capacity, which contributes to solid waste independence and resilience.
3. Job creation: Shifting away from disposal and toward reuse, recycling, and composting can lead to significant job creation, as diversion-oriented industries tend to be more labor intensive than landfills or waste incinerators. The City intends for these new jobs to be local, stable, sustainable, and competitive with respect to pay and benefits.

5.2 Waste Reduction and Diversion Goals and Programs

This section builds on the assessment provided in Sections 4.1 and 4.2 and provides a plan of action for the City to meet its short and long-term waste reduction and diversion goals. Specifically, this section provides a roadmap for the City to achieve an MRA recycling rate of at least 35% during the planning period while also laying a foundation for the City to achieve its long-term zero waste goals (as laid out in the BSP, the BFWRS, the LWBB Plan, and other City planning documents). Specific action items in this section are grouped by major waste and recyclable categories.

5.2.1 Single Stream Recyclables

This section provides a plan of action to improve SSR diversion during the planning period. For a summary of existing SSR programs, see section 3.3. As indicated in Table 4-3, the City's current diversion rates for SSR are 14.9% and 16.3% for the residential and commercial sector, respectively. As shown in Table 4-4, to meet the City's long-term diversion rate of 90%, it is estimated that the City will need to increase

diversion by 113,400 tons of residential SSR and 137,100 tons of commercial SSR per year (for a maximum diversion potential of 250,500 tons per year).

Plan of Action

To improve diversion of SSR, DPW plans to take the following actions over the planning period:

Legislative Actions:

1. Support local and state legislation that bans recyclable materials from landfill and incineration;
2. Support local and state legislation banning single use plastics;
3. Support City ordinances that require deposits on beverage containers. These deposits can be repaid upon recycling the bottles (container deposit law).
4. Support local and state legislation that requires businesses of all sizes to recycle;
5. Support a City ordinance or state legislation requiring mandatory recycling reporting from all non-residential entities;
6. Support local and state legislation to create recyclable content purchase mandates for private businesses (including, but not limited to restaurants, offices, and hotels);
7. Support local legislation to create enforcement mechanisms that penalize violation of recycling requirements; and
8. Propose local laws to enable and encourage refill businesses (i.e., those businesses that use reusable packaging or those that sell their products without packaging).

Administrative Actions:

9. Improve education and outreach: The City plans to expand its existing education and outreach program to educate residents and businesses about what types of materials may be recycled, reduce social and cultural barriers to recycling, and improve trust in the recycling process. Specific actions that the City plans to take to improve education and outreach include:
    a. Holding community-engaged seminars intended to gather data on residents' barriers and motivations as they relate to recycling activities, gather group pledges to foster behavior change around recycling habits, and build public understanding of the connections between zero waste, recycling, health, climate change, and local resilience.
    b. Building a zero-waste coalition to gather stakeholders from the residential, institutional, and recycling sectors with the City to identify benefits, barriers, and priorities for zero waste programs and services in the city.
    c. Developing and deploying resources to improve recycling habits. Resources may include a guide to dispose hard-to-recycle materials at residential drop-off centers, a reuse directory, social media campaigns to dispel myths around recycling, or a "business case for zero waste" flyer to highlight the incentives of recycling. Resources can be deployed to residents, businesses, and city schools to improve recycling behaviors.
    d. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change.

e. Offering workshops to help residents experiment with sustainable resource management behavior shifts. Workshops may include creative reuse classes or community recycling sorts to identify contamination.

10. Improve compliance with state mandates: The City plans to improve compliance with state recycling mandates for apartments and condominiums, office buildings, and public schools by:
    a. Coordinating with the Department of Housing and Community Development (DHCD) to develop incentive programs for apartments and condominiums that recycle and self-report their recycling tonnages.
    b. Coordinating with DHCD to determine mechanisms to enforce recycling at apartments and condominiums. Note that improving enforcement will likely require hiring additional staff (or reallocating staff) to perform inspections. Due to the current state of the labor market and staffing shortages at the City, this is currently unlikely. However, over the planning period it is anticipated that the City will be able to hire additional staff or reallocate existing staff to perform inspections and improve enforcement.
    c. As indicated previously, the City intends to improve education and outreach at public schools to improve participation in existing recycling programs. It is hoped that by holding workshops and events at public schools, the City may inspire school leadership to prioritize recycling and provide more consistent recycling services.
11. Review and update contract policies and standards for issuing requests for proposals. The City intends to require MRFs and other disposal contractors to report on end markets for materials to improve reporting.
12. Consider ways to improve transparency around recycling rates, recycling contamination, recycling markets and vendors, city contracts, and where waste and recycling is exported.
13. Assess funding mechanisms by conducting a comprehensive capital, operational, and fiscal study on potential funding mechanisms for waste diversion and disposal.
14. Incentivize the growth of local recycling markets by:
    a. Advocating for green procurement processes for the City that mandate recycled paper and paper products constitute at least 50 percent of the total dollar value of paper and paper products purchased by or for the City government.
    b. Holding market development workshops between local businesses that use recycled materials and local recyclers to promote the development of local recycling markets.

Programmatic Actions:

15. Apply for grant funding opportunities to support waste diversion programming
16. Offer a green business certification to promote waste diversion programs in the private sector and build a network of organizations that regularly report and measure their waste streams
17. Improve recycling in public spaces by deploying additional recycling cans in public spaces to improve collection of recyclables and reduce litter. The City may also consider using public cans with different shaped openings to separate different materials.
18. Reinstate weekly recycling collection: The City plans to reinstate weekly recycling collection to improve waste diversion. This is described further in Section 5.4.
19. Optimize routes to ensure that recycling pick up schedules and routes are efficient and logistically reliable. This is described further in Section 5.4.

Expected Timeline

It is expected that the plan of action for improving SSR diversion will be implemented in stages, with the expected implementation timelines for each component listed below. Note that this implementation timeline is contingent on the City securing funding for all programs outlined:

1. Legislative actions: The City intends to begin advocating for legislative change as soon as possible and over the entire planning period (2024 – 2033).
2. Administrative actions: The City intends to begin implementing administrative actions as soon as possible to improve diversion of SSR. Specific initiatives will be rolled out as funding becomes available (2024 – 2033).
3. Programmatic actions:
    a. Apply for grant funding opportunities: 2024-2033.
    b. Offer green business certification: contingent on grant funding, expected to begin in the latter half of the planning period (2029 – 2033).
    c. Improve recycling in public spaces: contingent on grant funding, expected to be implemented in the latter half of the planning period (2029-2033).
    d. Reinstate weekly recycling collection: See Section 5.4.
    e. Optimize routes: see Section 5.4.

Diversion Potential

The LWBB Plan estimates a performance timeframe of 10 years to reach the maximum diversion potential for SSR assuming that all recommended programs and initiatives are initiated in year one. Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 50% of the maximum diversion potential outlined in Section 4.1, or about 125,300 tons per year, during the planning period.

SINGLE STREAM RECYCLABLES PLAN SUMMARY		
Metric		**Description**
	**Plan of Action**	**Legislative:** 1. Support legislation that bans recyclables from disposal 2. Support legislation banning single use plastics 3. Support legislation requiring all businesses to recycle 4. Support City container deposit law 5. Support legislation requiring mandatory commercial reporting 6. Support legislation to create recyclable content purchase mandates 7. Support legislation to create enforcement mechanisms for recycling mandates 8. Propose local laws to enable and encourage refill businesses **Administrative:**

		9. Improve education and outreach 10. Improve compliance with state mandates 11. Review and update contract policies and standards 12. Consider ways to improve transparency around recycling 13. Assess funding mechanisms for waste diversion initiatives 14. Incentivize growth of local recycling markets **Programmatic:** 15. Apply for grant funding to support waste diversion programming 16. Offer green business certification 17. Improve recycling in public spaces 18. Reinstate weekly recycling collection 19. Optimize recycling collection routes
	**Timeline**	2024-2033
	**Diversion Potential**	125,300 tons/year
	**Costs**	**Legislative actions:** staff hours **Administrative Actions:** • Education and outreach: OPEX: $60,000/year • Improve enforcement: OPEX: $210,000/year • Incentive growth of local recycling markets: staff hours **Programmatic Actions:** • Apply for grant funding: staff hours • Offer green business certification: staff hours • Improve recycling in public spaces: CAPEX: $9.5 million • Reinstate weekly collection: see Section 5.4 • Optimize recycling collection routes: see Section 5.4
	**Funding Mechanisms**	• Public (grants, general fund)
	**Benefits**	**GHG:** 2.3 TCO2E/ton of SSR diverted **Airspace:** Extend service life of QRL

5.2.2 Organics

This section provides a plan of action to improve source reduction, donation, reuse, and diversion of organics during the planning period. For a summary of existing organics programs, see section 3.3. The major organic waste categories considered in this Plan include yard waste and food waste. As indicated in Table 4-3, the City's current diversion rates for food waste are 0.6% and 2.1% for the residential and commercial sector, respectively. Also shown in Table 4-3, the City's current diversion rates for yard waste are 8.8% and 6.4% for the residential and commercial sector, respectively.

To improve source reduction, donation, and diversion of organics, the City intends to focus on two strategies: (i) reducing organic waste (and particularly food wastage) through source reduction, donation, and reuse, and (ii) diverting remaining organic waste from disposal to composting or other organic processing facilities. It is recognized that tracking and quantification of organic waste reduction in the City will be challenging. However, the City is committed to prioritizing higher level reuse and reduction strategies before composting and organics diversion during the planning period.

As shown in Table 4-4, to meet the City's long-term food waste reduction rate of 80% for the residential sector and 50% for the commercial sector, it is estimated that the City will need to reduce food wastage by 51,300 tons of residential food waste and 33,800 tons of commercial food waste per year (for a maximum reduction potential of 85,100 tons per year). Also shown in Table 4-4, to meet the City's long-term organics diversion rate of 80% for the residential sector and 50% for the commercial sector, it is estimated that the City will need to divert an additional 9,900 tons of residential food waste, 15,500 tons of commercial food waste, 27,600 tons of residential yard waste, and 12,300 tons of commercial yard waste per year (for a maximum diversion potential of 65,300 tons per year).

Plan of Action

The City's plan of action to improve source reduction, donation, reuse, and diversion of organics is presented below. Action items meant to improve source reduction, reuse, and donation of organics are colored in green while those meant to improve diversion of organic waste are colored in black.

Legislative Actions:

1. Support state legislation that expands upon the Bill Emerson Good Samaritan Act to extend liability protection to nonprofits selling recovered food at discounted prices (as well as their donors), extends liability protections to donations made by food service establishments and retailers directly to individuals, and explicitly extend protections to past-date foods.
2. Support local legislation implementing a food safety code.
3. Support MDE in enforcing HB264 (2021) by supporting food waste related data collection.
4. Support a ban on commercial organics disposal in the City. To build on HB264, the City will support a total ban on commercial organics disposal during the planning period. This ban could be implemented at the City or state level. In addition to a total ban on organics disposal, the City may also support implementing a subsidy for businesses that report their diversion activities to the City.
5. Support a blanket landfill ban on organic materials.

Administrative Actions:

6. Improve education and outreach campaigns around food waste reduction for City residents, institutions, and businesses. Specific action items include:
    a. Holding community-engaged seminars intended to gather data on residents' barriers and motivations as they relate to food waste reduction activities, gather group pledges to

foster behavior change around food waste reduction habits, and build public understanding of the connections between zero waste, food waste, health, climate change, and local resilience.

   b. Building a zero-waste coalition to gather stakeholders from the residential, institutional, and food service sectors with the City to identify benefits, barriers, and priorities for zero waste programs and services in the city.
   c. Developing and deploying resources to improve food waste reduction habits. Resources may include a food waste donation directory, guides to reduce food waste at home, social media campaigns to dispel myths around food waste reduction, online food waste reduction tools, or a "business case for zero waste" flyer to highlight the financial incentives of reducing or donating food waste. Resources can be deployed to residents, businesses, and city schools to improve food waste reduction behaviors.
   d. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change.
   e. Scheduling workshops, such as circular cooking classes, to help residents experiment with sustainable resource management behavior shifts.

7. Help match food waste generators with food waste donation organizations and processing facilities. This would likely be conducted by the Office of Sustainability. Specific actions include:
   a. Supporting or developing online or mobile applications and mobile apps to connect food rescue agencies and LMOs with consumers and clients;
   b. Holding stakeholder meetings between the City, food donors, food rescue organizations, LMOs, and clients on a regular basis to support relationship building and strategic planning;
   c. Encouraging the use of produce "seconds" by creating a resource guide for individuals and businesses wishing to use produce "seconds" and supporting creation of a "Vendors Market" for unsold produce from wholesale distributors;
   d. Supporting the development of a Food Recovery Network chapter in every higher education institution in the city; and
   e. Evaluating strategies for making donated food more geographically accessible to clients;
8. Improve tracking of food waste donations by:
   a. Conducting a needs assessment for the city's food recovery system;
   b. Conducting surveys to see if there are enough community partners to handle the volume of all donated food, and checking that these partners are adequately resourced (refrigeration, hauling, etc.);
   c. Tracking food donations received from local sources each year at food rescue organizations; and
   d. Conducting a detailed study of the specific food security-related needs of individual communities in the city.
9. Explore and develop incentive programs for food donation, or businesses sourcing recovered food.
10. Create and support food waste audits for City businesses, institutions, and residents by:
   a. Considering audit subsidies;

   b. Distributing "how to" guides on do-it-yourself audits;
   c. Developing guidelines for "rightsizing" food ordering to reduce food wastage; and
   d. Encouraging food waste tracking to help residents and businesses improve their bottom line through food waste reduction and charitable donations of edible surplus food to local communities in need.
11. Explore methods to estimate and track food waste generation in the city as a way to track the progress and success of food waste reduction initiatives.
12. Explore and develop incentive programs to support and encourage development of yard waste reuse facilities, including wood pellet energy and biochar production.
13. Assess disposal fee restructuring. The City intends to assess disposal fee restructuring to allow tip fees at organics processing facilities to remain lower than those at disposal facilities in the City. This could provide a financial incentive for businesses and residents to divert rather than dispose organics.
14. Improve education and outreach campaigns around organics diversion for City residents, institutions, and businesses. Specific actions include:
   a. Holding community engaged seminars intended to gather data on residents' barriers and motivations as they relate to organics diversion activities, gather group pledges to foster behavior change around organics diversion habits, and build public understanding of the connections between zero waste, organics diversion, health, climate change, and local resilience;
   b. Developing and deploying resources to improve organics diversion habits. Resources may include a guide to divert organic material at residential drop-off centers, a directory of community composting organizations, social media campaigns to dispel myths around organics diversion, or a "business case for zero waste" flyer to highlight the financial incentives of diverting organic waste. Resources can be deployed to residents, businesses, and city schools to improve organics diversion behaviors;
   c. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change; and
   d. Holding workshops, such as home composting courses, to help residents experiment with sustainable resource management behavior shifts.
15. Improve compliance with food waste diversion initiatives (HB264): To improve compliance with HB264, which mandates diversion of food waste from large commercial generators, the City will take the following actions:
   a. Coordinating with the Department of Housing and Community Development (DHCD) to develop incentive programs for large commercial generators that divert food waste and self-report their diverted tonnages.
   b. Coordinating with the Department of Housing and Community Development (DHCD) to improve enforcement of diversion from large commercial generators. Note that improving enforcement will likely require hiring additional staff (or reallocating staff) to perform inspections. Due to the current state of the labor market and staffing shortages

at the City, this is currently unlikely. However, over the planning period it is anticipated that the City will be able to hire additional staff or reallocate existing staff to perform inspections and improve enforcement.

Programmatic:

16. Expand the use of existing processing capacity by:
    a. Improving access to backyard compost bins to residents by subsidizing or providing free backyard composting tools;
    b. Initiating education and outreach programs to promote backyard composting;
    c. Establishing school gardens at public schools to encourage on-site gardening and composting;
    d. Supporting the creation of community composting locations in Baltimore neighborhoods
    e. Expanding the use of City-owned organics processing facilities (e.g., Camp Small);
    f. Encouraging on-farm composting (perhaps by expanding on partnerships developed from the Food Matters Program);
    g. Initiating "adopt a lot" programs to turn empty lots into parks and gardens
    h. Expanding existing food drop-off locations to take meat products
17. Expand the existing organics collection program from residential drop-off centers and farmers markets to include public schools, city government offices, and some residents (Pilot). The Pilot expansion includes:
    a. Conducting a feasibility study to identify funding, staffing, and equipment needs;
    b. Securing the necessary funding, human capital, and equipment needed to properly staff and equip the Pilot expansion (based on the results of the feasibility study);
    c. Expanding collection of SSO from public schools (PS) and city government offices (CG) after securing funding, human capital, and equipment by supplying bins and dumpsters to participating PS and CG locations for collecting and consolidating SSO.
    d. Establishing a three-bin pilot program for collecting trash, recycling, and organics from single family residences in representative samples of the city by providing bins and weekly SSO collection to each serviced residence.
18. Expand the existing organics collection program in a stepwise manner to all residents (Phase II). Expansion to Phase II will depend on the success and performance of the Pilot program. The Phase II expansion includes:
    a. Conducting a performance evaluation for the Pilot program by evaluating metrics such as participation rate, contamination, collection costs, etc. The Phase II expansion will only be pursued after the Pilot is deemed successful;
    b. Conducting a feasibility study to identify funding, staffing, and equipment needs at each stage of the proposed expansion;
    c. Securing the necessary funding, human capital, and equipment needed to properly staff and equip each stage of the expansion (based on the results of the feasibility study); and
    d. Expanding the three-bin pilot program to all city neighborhoods in a staged manner by providing bins and weekly SSO collection to all single-family residences in the city.

19. Construct (or facilitate construction) of in-city organics processing capacity (compost facilities). The City intends to take a phased approach that includes:
    a. Constructing a compost training facility. The facility will be less than 5,000 square feet in size (and so will not require a compost facility permit per COMAR 27.04.11.05) and have a capacity of approximately three tons of organic waste per week. This training facility will not only be used to process organics collected from the City's residential drop-off centers and Pilot collection program but will also be used to host workshops and trainings to build resident and workforce competency in the composting field (i.e., to support community composting efforts).
    b. As organics collection through the Pilot program increases, the City intends to develop several covered aerated static pile (CASP) composting facilities to facilitate SSO diversion. This is described in more detail in Section 5.6.

Expected Timeline

It is expected that the plan of action for improving source reduction, reuse, donation, and diversion of organics will be implemented in stages, with the expected implementation timelines for each component listed below. Note that this implementation timeline is contingent on the City securing funding for all programs outlined:

1. The City intends to begin advocating for legislative change as soon as possible and over the entire planning period (2024 – 2033).
2. Administrative actions: The City intends to begin implementing administrative actions as soon as possible to improve source reduction, reuse, donation, and diversion of organics. Specific initiatives will be rolled out as funding becomes available (2024 – 2033).
3. Programmatic actions:
    a. Expand the use of existing processing capacity: Programs to expand existing processing capacity will begin in 2024 and expand as funding becomes available (2024-2033).
    b. Pilot SSO collection program: Feasibility planning and assessment will begin in 2025. Rollout of the pilot program is contingent on securing funding, human capital, and equipment.
    c. Phase II SSO collection program: Feasibility planning and assessment will begin following the success of the pilot program, estimated in 2029. Rollout of the Phase II collection program is contingent on securing funding, human capital, and equipment.
    d. Construct in-city organics processing capacity: Assuming that funding is secured, the compost training facility will be constructed in 2024. A timeline for construction of subsequent larger-scale composting facilities is presented in Section 5.6.

Reduction and Diversion Potential

The LWBB Plan estimates a performance timeframe of 20 years to reach the maximum food waste reduction potential assuming that all recommended programs and initiatives are initiated in year one.

Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 30% of its maximum reduction potential, or about 25,500 tons per year, during the planning period.

The LWBB Plan estimates a performance timeframe of 20 years to reach the maximum organics diversion potential assuming that all recommended programs and initiatives are initiated in year one. Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 30% of its maximum diversion potential, or about 19,600 tons per year, during the planning period.

ORGANIC WASTE REUSE AND REDUCTION SUMMARY		
Metric		**Description**
	**Plan of Action**	**Legislative:** 1. Support state legislation that extends liability protection for entities selling recovered food and donors that donate past-date foods 2. Support local legislation implementing a food safety code 3. Support local legislation to enforce HB264 4. Support a ban on commercial organics disposal 5. Support a blanket landfill ban on organic material **Administrative:** 6. Improve education and outreach campaigns for food waste reduction 7. Help match food waste generators with food waste donation organizations and processing facilities 8. Improve tracking of food waste donation 9. Explore incentive programs for food donation 10. Create and support food waste audits 11. Explore methods to estimate and track food waste generation 12. Explore incentive programs to encourage yard waste reuse 13. Assess disposal fee restructuring 14. Improve education and outreach for organics diversion 15. Improve compliance with HB264 **Programmatic:** 16. Expand the use of existing processing capacity 17. Pilot organics collection program 18. Phase II organics collection program 19. Construct in-city organics processing capacity
	**Timeline**	2024-2033
	**Reduction/ Diversion Potential**	**Reduction Potential**: 25,500 tons/year **Diversion Potential**: 19,600 tons/year

	**Costs**	• Education and outreach: OPEX: $120,000 per year • Program management: OPEX: $580,000 per year • Health monitoring: OPEX: $1.3 million per year • Education and outreach: OPEX: $700,000 per year • Program management: OPEX: $210,000 per year • Enforcement of organics disposal bans: OPEX: $210,000 per year • Curbside bins and dumpsters at PS and CG: CAPEX: $480,000 • Curbside bins at residences: CAPEX: $50 per household • Collection vehicles: CAPEX: $210,000 per vehicle • Collection services: OPEX: $200,000 per vehicle per year • Compost training facility: CAPEX: $350,000 • Total CAPEX of $480,000+($50*190,000)+($210,000*50)+$350,000 = $21,000,000 • Annual OPEX of 120+580+1300+700+210+210+(200*50) = $15,000,000
	**Funding Mechanisms**	• Public (grants or general fund)
	**Benefits**	**GHG:** 4.2 TCO2E/ton reduced; 0.1 TCO2E/ton diverted **Airspace:** Extend service life of QRL

5.2.3 Construction and Demolition Debris

This section provides a plan of action to improve C&D reuse and diversion during the planning period. The city does not currently offer any C&D diversion programs or initiatives, but C&D reuse and diversion provided by the private sector is described in Section 3. As indicated in Table 4-3, the City's current diversion rates for C&D waste are 100.0% and 35.5% for the residential and commercial sector, respectively. As shown in Table 4-4, to meet the City's long-term reduction and diversion rates of 4% and 90%, respectively, it is estimated that the City will need to reduce C&D waste generation by 17,300 tons and increase diversion by 220,300 tons of commercial C&D waste per year.

Plan of Action

To improve C&D reuse and diversion, the City plans to take the following actions over the planning period:

Legislative:

1. Support City-mandated deconstruction policy: The City will support a mandated deconstruction policy to require construction and demolition projects to divert a certain percentage of their waste from disposal and encourage reuse of C&D materials. It is anticipated that this deconstruction policy will target high value reusable components of C&D waste such as lumber

and clay bricks. The City will also support a policy that retains industrial zoned buildings for use by local manufacturers.

2. Support City-mandate on source separation of recyclable materials from construction, remodeling, and demolition projects.
3. Support a mandatory diversion ordinance: The City will support a mandatory diversion ordinance to improve C&D diversion. It is anticipated that the ordinance could be implemented in a stepwise manner to facilitate construction and expansion of private C&D MRFs in the City to accommodate the expected increase in diversion.
4. Remove any barriers to reuse in building inspection code

Administrative:

5. Support a City-wide policy and procedure for procuring construction services that prioritize the use of recycled materials instead of virgin materials for city-led construction or repair projects.
6. Support a City-wide policy and procedure to encourage architectural salvage programs by ensuring that City-generated deconstruction materials are being diverted to higher use via local salvage businesses before being recycled or disposed. To support this policy, the City intends to provide educational materials and seek out partnerships with construction companies to improve reuse of C&D materials.
7. Develop a comprehensive C&D diversion and reuse plan to guide City strategy over the planning period.

Expected Timeline

It is expected that the plan of action for improving C&D diversion will be implemented in stages. It is hoped that legislative actions (City-mandated deconstruction and a mandatory diversion ordinance) can be enacted during the first half of the planning period (2024-2028), with periodic increases in the minimum required diversion percentage enacted subsequently over the second half of the planning period (2029-2033). Administrative actions will be pursued over the entire planning period (2024-2033).

Reduction and Diversion Potential

The LWBB Plan estimates a performance timeframe of 10 years to reach the maximum reduction potential for C&D waste assuming that all recommended programs and initiatives are initiated in year one. Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 75% of its maximum reduction potential, or about 13,000 tons per year, and 30% of its maximum diversion potential, or about 66,100 tons per year, during the planning period.

SUMMARY OF C&D PLAN		
Metric		**Description**
	Plan of Action	**Legislative:** 1. Support City-mandated deconstruction policy 2. Support City mandate on source separation of recyclable materials 3. Support a mandatory diversion ordinance

		Administrative: 4. Support City-wide policy to prioritize use of recycled materials in construction and repair projects 5. Support a City-wide policy to support architectural salvage programs 6. Develop comprehensive C&D reuse and diversion plan
	**Timeline**	2024-2033
	**Reduction Potential**	**Reduction Potential:** 13,000 tons/year **Diversion Potential:** 66,100 tons/year
	**Costs**	$150,000 per year
	**Funding Mechanisms**	Public (grants, general fund, enterprise fund): The City will cover administrative costs associated with the plan of action Private: the private sector will cover costs associated with increased diversion (e.g., by expanding MRFs or expanding salvage businesses.
	**Benefits**	**GHG:** 0.9 TCO2E/ton of C&D reduced; 0.2 TCO2E/ton C&D diverted **Airspace:** Negligible (C&D waste is currently largely disposed at out-of-city landfills)

5.2.4 Bulk Waste

This section provides a plan of action to improve bulk waste reuse and diversion during the planning period. The City currently supports bulk waste diversion at residential drop-off centers (as described in Section 3.4) and via 311 requests (as described in Section 3.5). As indicated in Table 4-3, the City's current diversion rates for bulk waste are 40% and 93% for the residential and commercial sector, respectively. As shown in Table 4-4, to meet the City's long-term reduction and diversion rates of 50% and 60%, respectively, it is estimated that the City will need to reduce residential bulk waste generation by 2,000 tons and commercial bulk waste generation by 27,800 tons (for a total maximum reduction potential of 29,800 tons).

Plan of Action

To improve bulk waste reuse and diversion, the City plans to take the following actions over the planning period:

Legislative:

1. Support right to repair bills intended to allow consumers the ability to repair and modify their own consumer products, rather than being obligated by the manufacturer of such devices to use

their (often expensive) repair or replacement services, at the state level for electronics, vehicles, and industrial equipment:

Administrative:

2. Improve education and outreach: The City plans to expand its existing education and outreach program to educate residents and businesses about where and how bulk materials may be repaired rather than thrown away, what types of bulk materials may be reused/donated or recycled, and how to reuse and recycle bulk waste. Specific actions that the City plans to take to improve education and outreach include:
    a. Holding community-engaged seminars intended to gather data on residents' barriers and motivations as they relate to bulk waste reuse and recycling activities, gather group pledges to foster behavior change around bulk waste reuse and recycling habits, and build public understanding of the connections between zero waste, recycling, health, climate change, and local resilience.
    b. Building a zero-waste coalition to gather stakeholders from the residential, institutional, and bulk waste donation and recycling sectors with the City to identify benefits, barriers, and priorities for zero waste programs and services in the city.
    c. Developing and deploying resources to improve bulk waste reuse and recycling habits. Resources may include a guide to dispose bulk waste materials at residential drop-off centers, a reuse directory, social media campaigns to dispel myths around bulk waste recycling, or a "business case for zero waste" flyer to highlight the incentives of bulk waste recycling. Resources can be deployed to residents and businesses to improve recycling behaviors.
    d. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change.
    e. Offering workshops to help residents experiment with sustainable resource management behavior shifts. Workshops may include creative reuse classes or repair clinics.
3. Support programs that turn waste into art: By donating bulk waste to local artists, the City could help raise awareness of bulk waste recycling opportunities in the community. The City plans to reach out to reach out to the Maryland Institute College of Art (MICA) and other art institutions to partner on this initiative.

Programmatic:

4. Support or provide fix-it/repair clinics: By supporting or providing clinics at existing facilities such as Green Resources and Outreach for Watersheds (GROW) Centers, the City can help residents learn how to repair broken electronics, appliances, bikes, etc. rather than disposing of them. This will also encourage residents to be more thoughtful about consumption and reduce their waste generation.
5. Provide opportunities for reuse and swap events: Reuse or swap events could also be hosted at existing facilities or GROW Centers to help facilitate reuse or exchange or appliances or other bulk wastes.

6. Develop additional recycling and reuse/donation capacity for bulk waste: It is anticipated that additional recycling and donation capacity for bulk waste would be hosted at existing residential drop-off centers. This described in more detail in Section 5.4.

Expected Timeline

It is expected that the plan of action for improving bulk waste diversion could be implemented as follows:

1. Legislative actions: The City will support legislative actions over the entire planning period (2024-2033).
2. Administrative actions: The City intends to begin implementing administrative actions as soon as possible to improve reuse and diversion of bulk waste. Specific initiatives will be rolled out as funding becomes available (2024 – 2033).
3. Programmatic actions: The City will begin implementing programmatic actions when funding becomes available. It is expected that programmatic actions will be implemented between 2029 and 2033.

Reduction Potential

The LWBB Plan estimates a performance timeframe of 10 years to reach the maximum reduction potential for bulk waste assuming that all recommended programs and initiatives are initiated in year one. Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 50% of its maximum reduction potential, or about 1,000 tons of residential bulk waste and 13,900 tons of commercial bulk waste per year, during the planning period (for a total reduction potential of 14,900 tons per year).

SUMMARY OF BULK WASTE PLAN		
Metric		**Description**
	**Plan of Action**	**Legislative:** 1. Support right to repair bills **Administrative:** 2. Improve education and outreach 3. Investing in waste-to-art initiatives **Programmatic:** 4. Supporting or providing fix-it/repair clinics 5. Holding reuse or swap events 6. Developing additional reuse/donation/recycling opportunities (see Section 5.3)
	**Timeline**	2029-2033

	**Reduction Potential**	14,900 tons/year
	**Costs**	Education and outreach, staffing: $140,000 per year
	**Funding Mechanisms**	Public (grants or general fund)
	**Benefits**	**GHG:** 2.8 TCO2E/ton of bulk waste reduced **Airspace:** Extend service life of QRL

5.2.5 Other Diversion Programs

This section provides a plan of action to improve reuse and diversion of other waste during the planning period. The City currently supports diversion of other waste (including tires, batteries, electronics, HHW, mattresses, textiles, Christmas trees, etc.) at residential drop-off centers (as described in Section 3.4). As indicated in Table 4-3, the City's current diversion rates for other waste are 0% and 62% for the residential and commercial sector, respectively. As shown in Table 4-4, to meet the City's long-term diversion goal of 90%, it is estimated that the City will need to divert 67,700 tons of other residential waste and 45,800 tons of commercial other waste (for a total maximum diversion potential of 113,500 tons).

Plan of Action

To improve diversion of other, hard to recycle materials, the City plans to take the following actions over the planning period:

Legislative:

1. Support EPR bills at the state level to encourage producers to take more responsibility for the waste that they generate (either through packaging or the product itself).
2. Support statewide or local product stewardship legislation to encourage manufacturers to produce reusable, recyclable, and biodegradable products.

Administrative:

3. Improve education and outreach to promote participation in existing and proposed diversion programs. Specific action items include:
    a. Holding community-engaged seminars intended to gather data on residents' barriers and motivations as they relate to waste reuse and recycling activities, gather group pledges to foster behavior change around waste reuse and recycling habits, and build public understanding of the connections between zero waste, recycling, health, climate change, and local resilience.

b. Building a zero-waste coalition to gather stakeholders from the residential, institutional, and bulk waste donation and recycling sectors with the City to identify benefits, barriers, and priorities for zero waste programs and services in the city.
c. Developing and deploying resources to improve reuse and recycling habits. Resources may include a guide to dispose other waste materials at residential drop-off centers, improved signage at residential drop-off centers, a reuse directory, and social media campaigns to dispel myths around recycling. Resources can be deployed to residents and businesses to improve recycling behaviors.
d. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change.
e. Offering workshops to help residents experiment with sustainable resource management behavior shifts and roundtables with community members to solicit feedback on program improvements and possible new offerings.

Programmatic:

4. Implement a mattress recycling program: The City intends to contract with a private recycling company to recycle residential mattresses collected at the residential drop-off facility at the landfill and discourage disposal of mattresses at QRL.
5. Participate in textile recycling through the contract available with the Northeast Maryland Waste Disposal Authority.
6. Improve Christmas tree recycling: To prevent the disposal of unclaimed mulch at WIN Waste, the City intends to partner with non-profits and local farmers to divert whole Christmas trees for shoreline restoration or goat feed.
7. Implement an animal carcass recycling program: To divert animal carcasses from incineration, DPW intends to partner with the Department of Health and a local organics processing facility to accept animal carcasses for composting.

Expected Timeline

It is anticipated that the diversion programs for other materials could be implemented in stages throughout the planning period (2024-2033).

Diversion Potential

The diversion potential for other waste diversion activities is quantified in Section 5.4 when considering improvements to the residential drop-off centers.

SUMMARY OF OTHER DIVERSION PLANS	
Metric	**Description**

	**Plan of Action**	**Legislative:** 1. Support EPR bill 2. Support statewide or local product stewardship legislation **Administrative:** 3. Improve education and outreach **Programmatic:** 4. Implement a mattress recycling program 5. Participate in textile recycling through existing contract 6. Improve Christmas tree recycling 7. Implement an animal carcass recycling program
	**Timeline**	2024-2033
	**Diversion Potential**	**See Section 5.4**
	**Costs**	**Not quantified.** • Education and outreach • Education and outreach, staffing: $140,000 per year • Program management • Fees paid to partner organizations for processing/recycling materials.
	**Funding Mechanisms**	Public (grants or general)
	**Benefits**	**Not quantified.** • Diverting nuisance materials from disposal • Providing residents additional diversion opportunities

5.2.6 Litter Reduction and Cleanup Programs

This section provides a plan of action to reduce litter generation during the planning period. The City currently supports multiple litter reduction and cleanup programs as described in Section 3.3. However, litter is a persistent problem in the City that will require significant behavior change to completely solve. As such, the City plans to operate both proactively (through community engagement to change behaviors that lead to littering) and reactively (through continued cleanup operations) to reduce litter generation and improve litter cleanup during the planning period. Additional information on the City's plan to reduce litter and illegal dumping can be found in the Blight Eradication Plan.

Plan of Action

To reduce litter and improve cleanup programs in the city, the City plans to take the following actions over the planning period:

Administrative:

1. Identify vulnerable communities where litter is persistent: As a first step to tackle litter, the City plans to identify and support vulnerable communities that are bearing the greatest impact of litter and illegal dumping by:
    a. Utilizing available City data and engaging multiple City departments (including DOT, DHCD, Baltimore City Police Department (BCPD), and DPW) and nearby universities to assess litter in the city and identify vulnerable neighborhoods. As part of this process, DPW will create a new internship position to focus on data assessment;
    b. Contacting and engaging with selected residents, community leaders, and public officials in impacted, vulnerable communities to conduct public meetings, identify new or recurring incidents, and respond to those incidents promptly; and
    c. Recruiting, training, and promoting future employees from impacted, vulnerable neighborhoods to create a pipeline of job opportunities in DPW for young people aged 18-24.
2. Improve educational programs to reduce litter: The City intends to educate communities about illegal dumping and empower them with resources to dispose of waste appropriately and reduce the amount of trash dumped on the streets. Specific action items include:
    a. Working with community partners to increase awareness of the negative impacts of blight and litter;
    b. Conducting a robust communications campaign about available programs and services in regards to blight and litter removal;
    c. Delivering a comprehensive educational program to children in City public schools through the ECO Ambassador Program;
    d. Organizing and launching a robust volunteer program citywide that will empower residents to take ownership of the conditions in their neighborhoods;
    e. Promoting awareness of composting opportunities through educational materials and social media; and
    f. Conducting a robust communications campaign educating residents regarding enforcement, codes, and potential fines for litter.

Programmatic:

3. Improve litter cleanup efforts by:
    a. Partnering with programs that offer day-labor, and provide mandated community service work, such as Youth Works, ECO Ambassador programs and YH2O to create volunteer projects;
    b. Prioritizing litter collection in the most vulnerable neighborhoods through coordinated deployment of City departments, community partners, volunteers, and residents;
    c. Increasing the use of signage in regards to litter and illegal dumping;
    d. Establishing proactive protocols for communication across City departments;
    e. Creating a method to inform residents of service request status;

f. Coordinating community volunteers to engage in street cleanup efforts and publicly acknowledging communities where behavior demonstrates change;
g. Identifying accessible locations within the city for easy access for organizations and individuals to pick up supplies; and
h. Providing operations support with community organizations engaged in the Mayor's Clean Corps program by utilizing Community Liaisons to provide communication and feedback loops.
i. Expanding Community Pitch-in progam capacity
j. Improving coordination between Pitch-In program and 311.

4. Improve enforcement: DPW plans to improve enforcement of existing litter and illegal dumping laws by:
    a. Pursuing a multi-pronged and interdepartmental approach to enforcement using tickets, signage, resident reporting, license plate tracking, and other tools to identify those who litter and dump illegally. City departments that will be involved in this effort include DPW, DHCD, BCPD, and the Mayors' Office; and
    b. Creating a DPW Environmental Enforcement Unit to patrol high incidence areas and cite violators. This Unit will focus on litter and illegal dumping hot spots and will rely on interagency collaboration, increased enforcement staffing, and community liaison presence.
5. Implement improved graffiti removal process by:
    a. Creating a graffiti art program to promote storytelling, public art initiatives, and mural programs; and
    b. Designating graffiti walls for graffiti writers.

Expected Timeline

The expected timeframe for improving litter reduction and cleanup programs is 2024 – 2028, but litter reduction programs and initiatives will likely remain in place throughout the planning period.

SUMMARY OF LITTER REDUCTION & CLEAN UP PLAN		
Metric		**Description**
	**Plan of Action**	**Administrative:** 1. Identify vulnerable communities where litter is persistent 2. Improve education and outreach **Programmatic:** 3. Improve litter cleanup efforts 4. Improve enforcement
	**Timeline**	2024-2028
	**Diversion Potential**	**Not quantified** – likely negligible.

	**Costs**	**Not quantified**. • Education and outreach • Education and outreach, staffing: $140,000 per year • Program management • Fees/wages paid for "on call" cleanup crews • Wages for inspectors
	**Funding Mechanisms**	Public (grants or general)
	**Benefits**	**Not quantified.** • Vector reduction • City beautification • Improved resident behavior

5.2.7 Interim Plan to Achieve 35% MRA Recycling Rate

The City's interim plan to achieve an MRA recycling rate of 35% or above is summarized below. Note that all of the strategies listed below are described in more detail in the referenced sections:

1. Improve education and outreach around diversion programs and initiatives: Described in Section 5.3 (SSR, organics, bulk waste, and other diversion programs). Improving education and outreach should improve participation in existing programs and increase residential diversion rates.
2. Reinstate weekly curbside SSR collection: Described in Section 5.4 (curbside collection of SSR). Reinstating weekly curbside collection should improve participation and increase diversion rates for residential SSR (which are currently below 35% for paper, plastic, and metals).
3. Improve and expand organics collection: Described in Section 5.3 (organics) and Section 5.4 (yard waste and leaf collection). Expanding organics collection programs should allow more people to participate, improving diversion rates for organic waste (which are currently well below the 35% goal).
4. Construct (or support construction) of an in-city composting facility: Described in Section 5.3 (pilot facility) and Section 5.7 (full-scale facilities). Constructing in-city organics processing capacity should improve organics diversion from both the residential and commercial sectors (which are considerably below the 35% goal).
5. Improve reporting and enforcement of recycling from the commercial sector: Described in Section 5.3 (SSR, organics) and Section 5.5 (SSR collection). Improving enforcement of existing recycling mandates should improve participation in the programs, which should improve MRA rates. Improving reporting of recycling tonnages from the commercial sector should also improve MRA rates.

In addition to the action items listed above, the City also intends to monitor MRA recycling rates and tonnages on an annual basis to identify which waste streams are showing improved diversion and which require additional investment or attention. This will allow the City to adjust its plan of action to target waste streams where diversion is lagging below the required 35% rate.

5.3 Residential Drop-Off Centers

Residential drop-off centers are described in Section 3.4 and assessed in Section 4.3. City residents may drop off waste and recycling for free at the residential drop-off centers located at QRL, NWTS, Reedbird Avenue Drop-off Center, Bowleys Lane Drop-off Center, and Sisson Street Drop-off Center. In addition, DGS operates three drop-off centers that only accept commingled recyclables – York Road Substation, Calverton Road Substation, and Lewin Substation. As indicated in Figure 3-1, it is estimated that approximately 4,000 tons of recyclables and 5,000 tons of MSW were collected at residential drop-off centers in 2021.

5.3.1 Plan of Action

The plan of action to improve the residential drop-off centers is detailed below. It is broken down into short-term actions that can be implemented within the next few years and long-term actions that may be implemented later in the planning period.

Short-Term:

1. Install tag readers and driver's license scanners: The City plans to install license tag readers and license scanners at QRL and the transfer station to better identify out-of-City vehicles and commercial haulers.
2. Increase security measures and fencing: The City plans to install additional fencing and security cameras at residential drop-off centers to keep trespassers out and reduce illegal dumping inside the facilities.
3. Work to improve pay, benefits, and retention of workers: To attract additional drivers and relieve staffing shortages, DPW will advocate for improved pay and benefits for workers (particularly CDL drivers). Specifically, DPW will :
    a. Work with the Department of Human Resources (DHR) to complete a class and compensation study to improve pay and benefits;
    b. Implement a retention and hiring bonus policy for CDL drivers;
    c. Hold monthly hiring fairs where CDL positions are prioritized; and
    d. Expand the CDL training program to allow for external candidates to participate in the program
4. Upgrade staff facilities: The City will provide shelters and upgrade break facilities for laborers at residential drop-off centers.
5. Create a plan to improve accessibility at residential drop-off centers
6. Determine infrastructure priorities (both in-City and regionally): The City intends to assess priorities for constructing a regional resource recovery park, reuse and repair clinics, and tool

lending libraries to supplement the existing system of residential drop-off centers. The City is committed to engaging with regional partners to develop strategies and solid waste infrastructure to encourage source reduction, reuse, and diversion.

7. Consider implementing a cardboard bailing operation at one of the drop-off centers.
8. Consider a glass separation pilot program to improve the quality of diverted glass.
9. Expand opportunities for tire, HHW, and metal recycling.

Long-Term:

10. Expand Bowleys Lane Drop-off Center: Following an environmental and safety study at the adjacent closed landfill, the City intends to expand the Bowleys Lane Drop-off Center to increase capacity and functionality. Specifically, the City intends to:
    a. Repair or replace the inactive maintenance building;
    b. Repair deteriorating parking lot and road conditions;
    c. Construct a composting facility (see Section 5.6 for additional details);
    d. Encourage construction of a nearby reuse facility (such as a food bank, C&D salvage and reuse center, a thrift store, or a fix-it/repair clinic). It is anticipated that this facility would be constructed by the private sector;
    e. Improve functionality and traffic flow; and
    f. Construct Eastside Transfer Station (see Section 5.5 for additional details).
11. Expand Reedbird Avenue Drop-off Center: Following an environmental and safety study at the adjacent closed landfill, the City intends to expand the Reedbird Avenue Drop-off Center to improve waste diversion and increase capacity and functionality. Specifically, the City intends to:
    a. Repair and expand the parking lot; and
    b. improve functionality and traffic flow
12. Expand reuse and diversion opportunities at existing facilities: After expanding the Bowleys Lane and Reedbird Drop-off Centers, the City intends to provide additional reuse and diversion opportunities at these and the Sisson Street facility. Additional reuse and diversion opportunities considered at the expanded facilities include:
    a. Bulk waste donation and reuse;
    b. Mattress recycling; and
    c. Textile donation

5.3.2 Expected Timeframe

It is anticipated that short-term improvements to residential drop-off centers could be completed within the first five years of the planning period (2024-2028) while the long-term improvements could be completed within the second half of the planning period (2029 – 2033).

5.3.3 Diversion Potential

The LWBB Plan estimates a performance timeframe of five years to reach the maximum diversion potential from residential drop-off centers assuming that all recommended programs and initiatives are initiated in year one. Given the proposed implementation timeframe for the plan of action outlined above, it is estimated that the City could achieve 100% of its maximum diversion potential, or about 16,100 tons per year, during the planning period. Maximum diversion potential is based on diverting select materials from the "Other" waste category and meeting long-term solid waste goals described in Section 4.1.

SUMMARY OF RESIDENTIAL DROP-OFF CENTER PLAN	
Metric	**Description**
Plan of Action	**Short-Term:** 1. Install license tag and drivers license readers 2. Install security fencing and gates 3. Work to improve pay, benefits and retention for workers 4. Upgrade staff facilities (shelter and breakrooms) 5. Create a plan to improve accessibility at residential drop-off centers 6. Determine infrastructure priorities 7. Consider implementing cardboard bailing operation 8. Consider a glass separation pilot program 9. Expand opportunities for tire and metal recycling **Long-Term:** 10. Expand Bowleys Lane Drop-off Center 11. Expand Reedbird Avenue Drop-off Center 12. Expand reuse and diversion opportunities at existing facilities
Timeline	Short-term: 2024-2028 Long-term: 2029-2033
Diversion Potential	16,100 tons/year
Costs	• Short-term improvements: CAPEX: $XX, OPEX: $YY per year • Expand Bowleys Lane Drop-off Center: CAPEX: $6.0M • Expand Reedbird Avenue Drop-off Center: CAPEX: $4.8M • Expand reuse/diversion opportunities: CAPEX: $375k, OPEX: $420k/year
Funding Mechanisms	• Public (grants, general fund, enterprise fund)
Benefits	**GHG:** 1.6 TCO2E/ton of waste reduced or diverted **Airspace:** Based on current tip fee at QRL

5.4 Waste Collection System

The City's waste collection system is described in Section 3.5 and assessed in Section 4.4. The plan of action for improving these programs is detailed below.

5.4.1 Curbside Collection of Mixed Refuse and Single Stream Recyclables

To improve collection of mixed refuse and SSR, the City plans to take the following actions over the planning period:

Administrative:

1. Propose an increase in funding levels to sustain fleet and staffing: the Rubicon Report found that the City is operating at a deficit for both operational vehicles and staff for trash and SSR collection. To correct this, the City will advocate for an increase in funding levels to maintain a 20% reserve of vehicles and staff.
2. Implement a collection performance standard: Using recommendations from the Rubicon Report, the City intends to develop and implement a collection performance standard for its trash and SSR collection fleet.
3. Work to improve pay, benefits, and retention of workers: To attract additional drivers and relieve staffing shortages, DPW will advocate for improved pay and benefits for CDL drivers. Specifically, DPW will:
    a. Work with the Department of Human Resources (DHR) to complete a class and compensation study to improve pay and benefits;
    b. Implement a retention and hiring bonus policy for CDL drivers;
    c. Hold monthly hiring fairs where CDL positions are prioritized; and
    d. Expand the CDL training program to allow for external candidates to participate in the program
4. Improve compliance with existing trash collection programs: The City plans to improve enforcement of state trash and recycling mandates by:
    a. Coordinating with DHCD to develop incentive programs for landlords that provide trash and recycling bins to residents; and
    b. Coordinating with DHCD to improve enforcement of trash and recycling collection at apartments and condominiums. Note that improving enforcement will likely require hiring additional staff (or reallocating staff) to perform inspections. Due to the current state of the labor market and staffing shortages at the City, this is currently unlikely. However, over the planning period it is anticipated that the City will be able to hire additional staff or reallocate existing staff to perform inspections and improve enforcement.

5. Implement stricter hauler licensing and reporting: The City intends to implement stricter hauler licensing requirements to require private haulers to report on the source, destination, and tonnage of all materials collected or disposed in or outside the city.
6. Improve education and outreach: The City will increase educational initiatives to inform residents about the proper way to bag their trash and what is and is not recyclable (to improve SSR collection and reduce contamination). Specific action items include:
    a. Holding community-engaged seminars intended to gather data on residents' barriers and motivations as they relate to recycling activities, gather group pledges to foster behavior change around recycling habits, and build public understanding of the connections between zero waste, recycling, health, climate change, and local resilience.
    b. Building a zero-waste coalition to gather stakeholders from the residential, institutional, and recycling sectors with the City to identify benefits, barriers, and priorities for zero waste programs and services in the city.
    c. Developing and deploying resources to improve recycling habits. Resources may include a guide to what is and is not recyclable in the curbside program or social media campaigns to dispel myths around recycling.
    d. Developing community-based social marketing campaigns to inspire behavior change using social norms, social diffusion, and public pledges as mechanisms for change.
    e. Offering workshops to help residents experiment with sustainable resource management behavior shifts. Workshops may include community recycling sorts to identify contamination.

Programmatic:

7. Short-term rightsizing of routes, equipment, and personnel: The City intends to hire additional drivers and laborers to meet the recommendations of the Rubicon Report. It also intends to improve maintenance of its existing fleet to meet industry standard breakdown rates. Specifically, the City intends to:
    a. Increase the number of full-time CDL trash and SSR collection drivers and laborers;
    b. Improve vehicle maintenance to achieve a breakdown rate of less than 20%; and
    c. Reduce the number of stops per route to 1,050 for trash collection and 2,200 for recycling collection.
8. Final rightsizing of routes, equipment, and personnel: The City intends to hire additional drivers, hire additional laborers, and purchase additional load packers to meet the recommendations of the Rubicon Report and return to weekly SSR collection. Specifically, the City intends to:
    a. Increase the number of full-time CDL trash and SSR collection drivers and laborers;
    a. Increase the size of the SSR collection fleet;
    b. Work with DOP, DGS, DOT to update fleet to accommodate alleys and bike lanes;
    c. Reduce the number of stops per route to 950 for trash collection and 1,300 for recycling collection; and
    d. Return to weekly recycling collection as soon as possible contingent on acquiring necessary equipment and meeting staffing demands.

9. Maintain onboard technology: The City intends to upgrade its collection fleet to include onboard technology to improve routing efficiency and performance.
10. Develop a system to improve data tracking on business recycling collected curbside.

5.4.2 Bulk Waste Collection

To improve collection of bulk waste, the City intends to take the following actions:

1. Expand route optimization to bulk pickup. Specifically, the City intends to perform an operational review to determine the best path forward to optimizing bulk waste collection.
2. Improve staff training
3. Create a method to recycle white goods collected curbside
4. Improve the process for tire and propane tank pickup
5. Explore options to make bulk waste pickup more accessible to residents with disabilities

5.4.3 Yard Waste and Leaf Collection

To improve collection of yard waste, the City plans to take the following actions over the planning period:

Administrative:

1. Improve education and outreach initiatives: See section 5.3 (Organics)

Programmatic:

2. Improve access to backyard composting: See section 5.3 (Organics)
3. Develop a separate yard waste and leaf collection program: See section 5.2 (Organics)
4. Construct or encourage construction of an organics processing facility: See section 5.7 (Proposed Composting Facilities)

5.4.4 Illegal Dumping

To reduce illegal dumping, the City plans to take the following actions over the planning period:

Administrative:

1. Identify vulnerable communities where illegal dumping is persistent: As a first step to tackle illegal dumping, the City plans to identify and support vulnerable communities that are bearing the greatest impact of litter and illegal dumping by:
    a. Utilizing available City data and engaging multiple City departments (including DOT, DHCD, Baltimore City Police Department (BCPD), and DPW) and nearby universities to assess litter and illegal dumping in the city and identify vulnerable neighborhoods. As

part of this process, DPW will create a new internship position to focus on data assessment;

b. Contacting and engaging with selected residents, community leaders, and public officials in impacted, vulnerable communities to conduct public meetings, identify new or recurring incidents, and respond to those incidents promptly; and
c. Recruiting, training, and promoting future employees from impacted, vulnerable neighborhoods to create a pipeline of job opportunities in DPW for young people aged 18-24.

2. Improve educational programs to reduce illegal dumping: The City intends to educate communities about illegal dumping and empower them with resources to dispose of waste appropriately and reduce the amount of trash dumped on the streets. Specific action items include:
    a. Working with community partners to increase awareness of the negative impacts of blight and illegal dumping;
    b. Conducting a robust communications campaign about available programs and services in regards to blight, illegal dumping, and litter removal;
    c. Delivering a comprehensive educational program to children in City public schools through the ECO Ambassador Program;
    d. Organizing and launching a robust volunteer program citywide that will empower residents to take ownership of the conditions in their neighborhoods;
    e. Promoting awareness of composting opportunities through educational materials and social media; and
    f. Conducting a robust communications campaign educating residents regarding enforcement, codes, and potential fines for litter and illegal dumping.

Programmatic:

3. Improve illegal dumping cleanup efforts by:
    a. Partnering with programs that offer day-labor, and provide mandated community service work, such as Youth Works, ECO Ambassador programs and YH2O to create volunteer projects;
    b. Prioritizing illegal dumping collection in the most vulnerable neighborhoods through coordinated deployment of City departments, community partners, volunteers, and residents;
    c. Increasing the use of signage in regards to litter and illegal dumping;
    d. Establishing proactive protocols for communication across City departments;
    e. Creating a method to inform residents of service request status;
    f. Coordinating community volunteers to engage in street cleanup efforts and publicly acknowledging communities where behavior demonstrates change;
    g. Identifying accessible locations within the city for easy access for organizations and individuals to pick up supplies; and

h. Providing operations support with community organizations engaged in the Mayor's Clean Corps program by utilizing Community Liaisons to provide communication and feedback loops.

4. Improve enforcement: DPW plans to improve enforcement of existing litter and illegal dumping laws by:
    a. Pursuing a multi-pronged and interdepartmental approach to enforcement using tickets, signage, resident reporting, license plate tracking, and other tools to identify those who litter and dump illegally. City departments that will be involved in this effort include DPW, DHCD, BCPD, and the Mayors' Office; and
    b. Creating a DPW Environmental Enforcement Unit to patrol high incidence areas and cite violators. This Unit will focus on litter and illegal dumping hot spots and will rely on interagency collaboration, increased enforcement staffing, and community liaison presence.

5.4.5 Street and Sidewalk Sweeping

To improve street and sidewalk sweeping, the City plans to take the following actions over the planning period:

Administrative:

1. Improve educational programs to reduce litter: see Section 5.2 – Litter Reduction and Cleanup Programs.
2. Improved signage: The City will work to improve signage to alert residents to parking restrictions for street sweeping.
3. Improved enforcement: The City will work with the department of transportation to improve enforcement of street sweeping parking ordinances. This will allow DPW to access and properly clean streets.

Programmatic:

4. Work with DGS for procuring specialized vehicles for cleaning bike lanes.
5. Consider procuring leaf collection vehicles: The City will propose funding to purchase specialized vacuum collection trucks to collect leaves from streets and sidewalks.

5.4.6 Small Hauler Program

The City will improve the small hauler program during the planning period by taking the following actions:

1. Set up an automatic payment system: The City will encourage small haulers to register accounts tied to their permits to make the payment process safer, easier, and more efficient. This will reduce the lines at QRL and NWTS.

2. Expand the small hauler program to additional locations: The City will construct a designated small hauler area at the proposed Eastside Transfer Station (see Section 5.6).
3. Improve permitting enforcement to make sure that small haulers that dump at NWTS and QRL are permitted.
4. Transfer the permitting process from the Health Department to DPW.

5.4.7 Other Waste Collection Programs

The City intends to take the following actions to improve other waste collection systems:

1. Continue to pilot a program to contract with a cleaning service to remove sharps and human waste from encampments. If this pilot program is successful, the City will expand the program throughout the city.
2. Purchase new skimmer boats to improve collection of waste from City waterways.
3. Consider installing a storm debris catcher near outfalls to catch litter form Jones Falls during storm events.
4. Consider a pilot program for reproductive disruption for rat management
5. Consider implementing routing software for property management personnel

5.5 Waste Transfer System

Given the limitations on existing transfer capacity and the need to improve collection efficiency and provide long-term disposal alternatives to WIN Waste and QRL in cases of emergency (as indicated in Section 4.7), the City intends to expand its transfer capacity during the planning period. Contingencies for disruption to transfer/disposal facilities are best addressed by adopting a decentralized approach that provides redundancy, that is developing multiple facilities rather than relying on one centralized facility; and ensuring the total capacity of decentralized facilities exceeds the total capacity requirement (e.g., if three facilities are developed, each should offer more capacity than simply a third of the total required). In this section, the City's plan to develop a decentralized and resilient transfer network is described.

5.5.1 Northwest Transfer Station

DPW operates NWTS as an intra-city truck transfer facility where waste collected from Baltimore's northern neighborhoods can be transferred from smaller load-packer trucks to larger roll-off trucks for transportation to WIN Waste or QRL. The current permit for the facility expires in 2026, but the City intends to renew and extend this permit so that the facility can continue to serve the city through the entire planning period. No changes are proposed to the operation of NWTS during the planning period.

Plan of Action

The City plans to take the following actions over the planning period to improve operation of NWTS:

1. Improve existing infrastructure: The City intends to install a ventilation system for the transfer facility to improve air circulation and employee health. The City also intends to improve the existing floor drain system to improve stormwater and leachate collection.
2. Replace aging equipment: To replace aging equipment and improve operations at NWTS, the City intends to purchase a new scale, additional front-end loaders, and additional transfer trailers.
3. Hire additional staff: The City intends to hire additional staff, including CDL drivers and equipment operators, to improve operations at the site.
4. Work to improve pay, benefits, and retention of workers: To improve staff retention, the City intends to advocate for improved pay and benefits for NWTS workers (particularly CDL drivers and operators) by:
    a. Working with the Department of Human Resources (DHR) to complete a class and compensation study to improve pay and benefits;
    b. Implementing a retention and hiring bonus policy for CDL drivers;
    c. Holding monthly hiring fairs where CDL positions are prioritized; and
    d. Expanding the CDL training program to allow for external candidates to participate in the program.

Anticipated Permit Requirements

There are no planned expansions or operational changes at NWTS. As such, there are no new permit requirements. As indicated previously, the facility will be operational during the entire planning period, and existing permits will be renewed as necessary to provide continued operation.

Potential Costs and Funding Mechanisms

As there are no proposed large-scale changes to infrastructure or operations at NWTS, costs were not quantified. All planned expenditures at NWTS will be funded by the City. Costs will be covered through grants, or by allocating money from the general fund.

Potential Benefits

The potential benefits associated with the planned improvements at NWTS include improved operation. Maintaining existing equipment, replacing aging equipment, hiring additional staff, and improving retention are expected to generally improve operation and throughput at NWTS.

Expected Timeline

Planned improvements at NWTS will be implemented over the entire planning period, from 2024 through 2033.

5.5.2 Proposed Eastside Transfer Station

Pending the results of an environmental and safety assessment, the City proposes to construct the Eastside Transfer Station (ETS) at the Bowleys Lane Drop-off Center. ETS is intended to improve collection

efficiency by providing a second transfer station where mixed refuse, small hauler loads, and SSR can be consolidated prior to disposal (mixed refuse and small hauler loads) or recycling (SSR). While NWTS serves the northern and western parts of the city, ETS will serve the eastern and southern parts of the city.

Plan of Action

The City will construct ETS at the Bowleys Lane Drop-off Center (or an alternative location if the environmental and safety assessment indicate that the Bowleys Lane site is unsuitable). ETS will primarily service Baltimore's eastern and southern neighborhoods, but over time as residential recycling and diversion measures take effect the facility could also serve commercial MSW haulers. ETS will be sized to accommodate all the residential MSW and SSR collected in the City except for the waste and SSR handled by NWTS. As indicated in Table 3-2, it is anticipated that residential MSW and SSR will total approximately 310,000 tons by 2033. Assuming that constructing ETS will help to divert small hauler traffic and allow NWTS to operate at its maximum permitted capacity of 150,000 tons per year, it is expected that ETS will be constructed with a permitted capacity of 200,000 tons per year.

Anticipated Land and Permit Requirements

It is estimated that ETS would require at least 10 acres of land. If Bowleys Lane Drop-off Center is deemed unsuitable for development of ETS, other potential sites include the closed Monument St. Landfill, former Pulaski Incinerator property, City-owned land at Wagners Point, unused areas at Port of Baltimore properties in Dundalk or Locust Point, or unused areas at Sparrows Point. Development of ETS at QRL, or Western Sanitation Yard (Reedbird Avenue Drop-off Center) may also be possible.

The expected permit requirements and approvals required for development of ETS are summarized below:

- Refuse Disposal Permit: Issued by MDE
- Erosion and Sediment Control Plan: Reviewed and approved by Baltimore DPW
- Stormwater Management Plan: Reviewed and approved by DPW
- Building Permit: Issued DHCD
- NPDES Industrial Discharge Permit: Issued by MDE

Potential Costs

The potential costs for constructing and operating ETS are summarized below:

- CAPEX: estimated to be $93/ton of annual capacity (expected to be 200,000 tons per year). This equates to a total CAPEX of approximately $18.6M.
- OPEX: anticipated at $87/ton of annual throughput (expected to be 165,000 tons per year) for a total expected annual OPEX of $14.4M. Note that this cost includes the costs of out-of-city transfer and disposal. This cost would be partially offset by eliminating corresponding disposal costs at WIN Waste or QRL. OPEX for out-of-city transfer and disposal were estimated based on current contracts in place in Maryland.

Potential Funding Mechanisms

The potential funding mechanisms for ETS include:

- Public: Under the public option, DPW would self-develop and operate ETS, with costs covered by allocating money from the general fund, establishing an enterprise fund, direct billing, or adding a line item on property tax bills.
- PPP: Under a PPP option, the City could provide a land lease and a guaranteed waste stream with a third party (either a private company or a state agency such as MES) constructing and operating the facility. A PPP contract would be most attractive for bundled operation of ETS in conjunction with the proposed rail transfer station. Some minor outreach efforts by DPW would be needed to inform residents and small haulers of facility usage rules, especially if it involves redevelopment of an existing residential drop-off center such as Bowleys Lane Drop-off Center.

Potential Benefits

The estimated benefits for ETS include job creation and GHG emissions reductions:

- Job creation: It is anticipated that ETS would create as many as 14 additional jobs. This value was calculated by assuming an employment rate of 0.02 people per ton of waste transferred at the facility each day, with one additional supervisor.
- GHG emissions are likely to decrease with construction of ETS. Operating a second transfer station would decrease haul distances for individual load packers, allowing fewer, larger transfer trucks to haul waste and recyclables to their final destination.

Expected Timeline

It is anticipated that it will take two years to design ETS, two years to permit ETS, and two years to construct ETS for a total of six years. Assuming design begins in 2024, it is anticipated that ETS will be operational beginning in 2030.

Summary

A summary of the plan of action and associated costs and benefits is provided below:

Metric		Description
	**Plan of Action**	• Proposed location: Bowleys Lane Drop-off Center • Permitted capacity of 200,000 tons per year
	**Land and Permitting**	• Land requirements: at least 10 acres • Permit requirements: ○ Refuse disposal permit (MDE) ○ Erosion and sediment control plan (DPW) ○ Stormwater management plan (DPW) ○ Building permit (DHCD)

		○ NPDES industrial discharge permit (MDE)
	**Costs**	• CAPEX: $18.6 million • OPEX: $14.4 million per year
	**Funding Mechanism**	• Public • PPP
	**Benefits**	**Jobs:** 14 **GHG:** Likely to decrease due to waste consolidation at ETS
	**Timeline**	Design, permitting, and construction complete by 2030

5.5.3 Proposed Rail Transfer Station

In addition to constructing ETS to complement NWTS, DPW may also construct a large rail transfer station (RTS) where operations can be consolidated and provided more efficiently. With QRL expected to reach full capacity in 2035 and the City's contract with WIN Waste set to expire in 2031, RTS will provide the City a long-term method to manage its solid waste. RTS will be constructed so that it could be operated as a truck transfer station but will be built along a rail spur to allow for containerization and rail shipment of waste. Rail will be the primary method of transfer with trucking capabilities available as a contingency. Rail transfer from RTS will provide a more efficient, cost-effective, and environmentally friendly service than out-of-city truck transfer from NWTS and ETS and will allow waste to be sent to multiple regional landfills or even more distant facilities as needed.

Plan of Action

RTS will be constructed at a location suitable for installing a rail spur. Potential sites include Baltimore County's Western Acceptance Facility (WAF), which would require a collaborative agreement with Baltimore County. Adding a rail spur at WAF could be challenging, however. Other potential sites include the former Pulaski Incinerator property, City-owned land at Wagners Point, unused areas at Port of Baltimore properties in Dundalk or Locust Point, or unused areas at Sparrows Point.

Developing RTS would be a capital-intensive project; therefore, it is assumed the facility will be sized to accept waste from the commercial as well as residential sectors in Baltimore (and potentially surrounding counties) to help make it economically viable. Following construction of RTS, NWTS and ETS are expected to function as intra-city transfer stations sending residential waste to RTS for consolidation. RTS will be sized to handle the city's combined disposed residential and commercial MSW (estimated to be 282,400 tons of residential MSW and 250,100 tons of commercial MSW, for a total of approximately 530,000 tons/year). Applying a factor of safety of 1.2 gives a design capacity of 640,000 tons per year.

Anticipated Land and Permit Requirements

It is estimated that RTS would require at least 20 acres of land adjacent to an existing rail line. The expected permit requirements and approvals required for development of RTS are summarized below:

- Refuse Disposal Permit: Issued by MDE
- Erosion and Sediment Control Plan: Reviewed and approved by DPW
- Stormwater Management Plan: Reviewed and approved by DPW
- Building Permit: Issued DHCD
- NPDES Industrial Discharge Permit: Issued by MDE

Potential Costs

The potential costs for constructing and operating RTS are summarized below:

- CAPEX: Estimated to be $110/ton of annual capacity, which is conservatively estimated at 640,000 tons (i.e., 120% of the maximum expected annual throughput of 530,000 tons). This equates to a total CAPEX of $70.5M.
- OPEX: Estimated to be about $58/ton of annual throughput, yielding maximum expected annual OPEX of $30.7M, including the costs of out-of-city transfer and disposal. OPEX for out-of-city transfer and disposal were estimated based on current contracts in Maryland for out-of-state waste disposal as well as estimated rail transfer costs.
- Cost Offsets: Operating costs would be partially offset by eliminating corresponding disposal costs at WIN Waste or QRL. RTS would also charge a tip fee for commercial waste accepted. Assuming that RTS would be capable of processing all of the commercial MSW generated in the City (approximately 250,000 tons per year), and using an estimated tip fee of $81/ton, this could generate revenues of up to $20.3M annually.

Potential Funding Mechanisms

The potential funding mechanisms for RTS include:

- Public: Under the public option, DPW would self-develop and operate ETS, with costs covered by allocating money from the general fund, establishing an enterprise fund, direct billing, or adding a line item on property tax bills. However, given the high capital costs, the public option is the least preferred.
- Private: Private development would see the private sector develop the facility with DPW simply delivering residential waste as a customer. However, this option does not give the City any control over pricing or usage.
- PPP: The preferred delivery mechanism would be a PPP contract, with the City providing a land lease and a partially guaranteed waste stream with a third party (likely a private company, although a state agency such as MES could be involved) serving to construct and operate the

facility. A PPP contract would be particularly attractive for bundled operation of RTS in conjunction with ETS and/or NWTS.

Potential Benefits

The estimated benefits for RTS include job creation and GHG emissions reductions:

- Job creation: It is anticipated that RTS would create as many as 42 additional jobs. This value was calculated by assuming an employment rate of 0.02 people per ton of waste transferred at the facility each day, with one additional supervisor.
- Although emissions from rail transport are low compared with other forms of transport, GHG emissions may increase if RTS is constructed and waste is transferred a long distance out-of-city. The LWBB report estimates that GHG emissions may increase by as much as 30,000 TCO2E per year if residential waste is transferred via RTS rather than being incinerated at WIN Waste.

Expected Timeline

It is anticipated that it will take six years to design and permit RTS, and four years to construct RTS and its associated rail spur, for a total of ten years. Assuming design begins in 2024, it is anticipated that ETS will be operational beginning in 2034.

Summary

A summary of the plan of action and associated costs and benefits is provided below:

Metric		Description
	**Plan of Action**	• Potential locations include WAF, Pulaski Incinerator property, City-owned land at Wagners Point, unused areas at Port of Baltimore properties in Dundalk or Locust Point, or unused areas at Sparrows Point • Permitted capacity of 640,000 tons per year
	**Land and Permitting**	• Land requirements: at least 20 acres with rail access • Permit requirements: ○ Refuse disposal permit (MDE) ○ Erosion and sediment control plan (DPW) ○ Stormwater management plan (DPW) ○ Building permit (DHCD) ○ NPDES industrial discharge permit (MDE)
	**Costs**	• CAPEX: $70.5 million • OPEX: $30.7 million per year • Cost offsets: $20.3 million per year
	**Funding Mechanism**	• Public • Private • PPP (preferred)

	**Benefits**	**Jobs:** 42 **GHG:** May increase by as much as 30,000 TCO2E/year due to long haul transport costs
	**Timeline**	Design, permitting, and construction complete by 2034

5.6 Waste Processing and Recycling System

Given the limitations on existing processing and recycling capacity in the City (as indicated in Section 4.6), and the desire for the City to improve its diversion and recycling programs (as indicated in Section 5.3), the City intends to expand its waste processing and recycling capacity during the planning period. Specific action items for each existing and proposed waste processing and recycling facility are described below.

5.6.1 Camp Small

As discussed in Section 4.6, Camp Small has an opportunity to increase the amount of felled trees that are recovered and processed into lumber and other high-value wood products by using a combination of grant and city funds to purchase equipment, increase staffing, and increase marketing and outreach efforts. As such, the City intends to increase Camp Small's wood waste processing capacity by purchasing a large wood grinder, pyrolysis unit, sawmill, vacuum kiln and wood shop equipment, hiring additional personnel and increasing marketing efforts. These efforts will be led by Camp Small under Rec and Parks in partnership with DPW and the Office of Sustainability.

Plan of Action

The City will purchase a large horizontal wood grinder, pyrolysis unit, 55' Wide Sawmill, Vacuum Kiln, and Woodshop Equipment, increase permanent staff and marketing efforts. Equipment purchases are explained below:

- Pyrolysis Unit – this will allow the city to process low value Biomass (wood chips and grindings) into biochar while also using the thermal energy to heat the expanding facilities at Camp Small. The Biochar will be made available to the City for use in bio-retention efforts, enhancing soils for tree plantings, and urban farming
- 55" Wide Sawmill – this will allow the City to saw a significant increase of logs that are larger than the current sawing capacity, more than doubling Camp Small's lumber production.
- Vacuum Kiln – this will allow the City to kiln dry another 18,000 board foot each year, more than doubling the current production of kiln dried lumber.

- Wood Shop Equipment- the addition of a large slab-flattener, and a wide planer, will allow Camp Small to market and sell a more finished product. Which increases the value of the material while expanding the user audience.

Additionally Camp Small will work with DPW's Office of Waste Diversion to provide woody material for composting once the City builds a local processing facility.

Camp Small will also implement a Workforce Development Program with a six-month paid training course to City residents facing employment barriers. Camp Small intends to increase permanent staff by hiring from those who have gone through the program.

Potential Costs

Potential Benefits

The plan of action above will will enhance Camp Small's ability to recover and circulate woody materials at their highest and best use. These improvements will expand Camp Small's ability to produce lumber, as well as make use of second-tier materials by making and selling Biochar, which is particularly beneficial for tree planting. Biochar can also be added to compost to create a value-added compost product for Baltimore communities.

Expected Timeline

Summary

5.6.2 Proposed Mini MRFs

As discussed in Section 4.6, constructing in-city SSR processing capacity is important to reduce transportation costs and reliance on out-of-City vendors (particularly given the expected expansion in SSR diversion described in Section 5.3). As such, the City intends to construct (or facilitate construction of) in-city SSR processing capacity over the planning period. Specifically, the City plans to take a decentralized and incremental approach to developing in-City SSR processing capacity, with proposed construction of small-scale "mini-MRFs" as SSR diversion expands.

Plan of Action

Although other opportunities were identified in Section 4.6 (including construction of a large centralized MRF or retrofitting an existing in-city MRF), a phased-in decentralized approach, in which a system of mini-MRFs would be developed sequentially to satisfy expected diversion potential from improved SSR recycling programs described in Section 5.3, was ultimately identified as the preferred option for the City. Specifically, the mini-MFR option gives the City more control over recycling and has the advantage that

they can be housed in moderately sized unused industrial properties in the city. Mini-MRFs are expected to have a total capacity of approximately 11,400 tons per year.

Anticipated Land and Permit Requirements

It is anticipated that each mini-MRF would require a minimum of a half-acre lot, but larger lots would be preferred to provide more flexibility. It is expected that mini-MRFs would be constructed in disused warehouse or industrial buildings that could be easily repurposed. Permitting requirements for each mini-MRF are listed below:

- Refuse Disposal Permit: Issued by MDE
- Erosion and Sediment Control Plan: Reviewed and approved by DPW
- Stormwater Management Plan: Reviewed and approved by DPW
- Building Permit: Issued DHCD
- NPDES Industrial Discharge Permit: Issued by MDE

Potential Costs

The potential costs for constructing and operating each mini-MRF (from LWBB) are summarized below:

- CAPEX: Estimated to be $1.3M for each mini-MRF.
- OPEX: Estimated to be about $70/ton of annual throughput, yielding maximum expected annual OPEX of $750,000 (including the costs of labor, benefits, repair, and maintenance).
- Cost Offsets: Operating costs would likely be partially offset through the sale of recyclables. Assuming 85% recovery of saleable material and a bulk value of $30/ton give an estimated revenue of $280,000 per mini-MRF.

Potential Funding Mechanisms

Several workable contract mechanisms exist for developing a mini-MRF program, including DPW owning and operating the mini-MRFs, DPW contracting out mini-MRF development to a private third party, or a PPP contract where DPW provides a property lease and guaranteed SSR feedstock with a private third party constructing and operating the facilities. Contract mechanisms involving the private sector are preferred.

Potential Benefits

The estimated benefits for constructing composting facilities include job creation and GHG emissions reductions:

- Job creation: It is anticipated that each mini-MRF would employ ten full time employees and one supervisor.
- GHG emissions reductions for diverting and recycling additional SSR are discussed in Section 5.3.

Expected Timeline

It is anticipated that it will take one year to design and permit each mini-MRF plus an additional one year for construction. It is estimated that design and permitting of the first composting facility will begin in 2027 such that the first facility will be operational in 2029. Construction of additional facilities will be on an as-needed basis (i.e., when the amount of material collected via the curbside SSR collection program described in Section 5.3 is expected to exceed the existing facility capacity).

Summary

A summary of the plan of action and associated costs and benefits is provided below:

Metric		Description
	**Plan of Action**	• Phased, decentralized approach • Each facility is expected to have a permitted capacity of 11,400 tons/year
	**Land and Permitting**	• Land requirements: at least ½ acre • Permit requirements: ○ Erosion and sediment control plan (DPW) ○ Stormwater management plan (DPW) ○ Building permit (DHCD) ○ NPDES industrial discharge permit (MDE)
	**Costs**	• CAPEX: $1.3 million per facility • OPEX: $750,000 per facility per year • Cost offsets: $280,000 per facility per year
	**Funding Mechanism**	• Public • Private • PPP (preferred)
	**Benefits**	**Jobs:** 10 per facility **GHG:** Described in Section 5.3
	**Timeline**	Design, permitting, and construction of first facility complete by 2029

5.6.3 Proposed Composting Facilities

As discussed in Sections 5.2, 5.3, and 5.4, constructing in-city organics processing capacity is critical to the City's plans to meet a minimum 35% MRA recycling rate, improve organics diversion from both the residential and private sectors, and improve yard waste collection. As such, the City intends to construct (or facilitate construction of) in-city organics processing capacity over the planning period. Specifically, the City will take a decentralized and incremental approach to developing organics processing capacity, in which several, small-scale composting facilities would be constructed on an as-needed basis.

Plan of Action

Although many processing methods could be combined to manage the volume of diverted residential organics expected over the planning period (see Section 5.3), a phased-in decentralized approach was ultimately identified as the best approach to organics management in the City. In this approach, 20,000 ton/year composting facilities would be developed sequentially to meet expected demand from the residential SSO collection program described in Section 5.3. It is assumed that this annual throughput capacity of 20,000 tons using a 1:1 carbon to nitrogen recipe, which may be supplied from Camp Small by BCRP. It is further assumed these composting facilities would operate as covered aerated static piles (CASPs), the dominant technology used for organics processing in the U.S.; however, other composting or anaerobic digestion (AD) technologies may be employed if at comparable performance and costs. As such, use of the term "composting facility" in this section is for simplicity only.

Anticipated Land and Permit Requirements

It is anticipated that each composting facility would require a minimum of four acres, but larger lots would be preferred to provide more flexibility and scope for expansion. Permitting requirements for each composting facility are listed below:

- Compost Facility Permit: Issued by MDE
- Erosion and Sediment Control Plan: Reviewed and approved by DPW
- Stormwater Management Plan: Reviewed and approved by DPW
- Building Permit: Issued DHCD
- NPDES Industrial Discharge Permit: Issued by MDE

Potential Costs

The potential costs for constructing and operating each composting facility (from LWBB) are summarized below:

- CAPEX: Estimated to be $174/ton of annual capacity, which is assumed to be 20,000 tons (including 14,000 tons of SSO and 6,000 tons of bulking material). This equates to a total CAPEX of approximately $3.5M per facility.
- OPEX: Estimated to be about $64/ton of annual throughput, yielding maximum expected annual OPEX of $1.3M, including the costs of labor, benefits, repair and maintenance, and disposal of residuals).
- Cost Offsets: Operating costs would likely be partially offset through the sale of compost. Assuming that high quality compost could be sold for $35/cubic yard, it is anticipated that each facility could generate annual revenue of approximately $580k.

Potential Funding Mechanisms

The potential funding mechanisms for each composting facility include:

- Public: Under the public option, DPW would self-develop and operate each composting facility, with costs covered by grants, allocating money from the general fund, establishing an enterprise fund, direct billing, or adding a line item on property tax bills.
- Private: Private development would see the private sector develop the facility with DPW simply delivering residential SSO as a customer. However, this option does not give the City any control over pricing or usage.
- PPP: The preferred delivery mechanism would be a PPP contract, with the City providing a land lease and a partially guaranteed waste stream with a third party (likely a private company, although a state agency such as MES could be involved) serving to construct and operate the facility.

Potential Benefits

The estimated benefits for constructing composting facilities include job creation and GHG emissions reductions:

- Job creation: It is anticipated that each composting facility would employ eight full time employees and one supervisor.
- GHG emissions reductions for diverting and composting SSO are discussed in Section 5.3.

Expected Timeline

It is anticipated that it will take two years to design and permit each composting facility plus an additional one year for construction. It is estimated that design and permitting of the first composting facility will begin in 2025 such that the first facility will be operational in 2028. Construction of additional facilities will be on an as-needed basis (i.e., when the amount of material collected via the SSO collection program described in Section 5.3 is expected to exceed the existing facility capacity).

Summary

A summary of the plan of action and associated costs and benefits is provided below:

SUMMARY OF WASTE PROCESSING PLAN		
	**Plan of Action**	• Phased, decentralized approach • Each facility is expected to have a permitted capacity of 20,000 tons per year (including 6,000 tons of bulking material)
	**Land and Permitting**	• Land requirements: at least four acres • Permit requirements: ○ Compost Facility Permit (MDE) ○ Erosion and sediment control plan (DPW) ○ Stormwater management plan (DPW) ○ Building permit (DHCD) ○ NPDES industrial discharge permit (MDE)
	**Costs**	• CAPEX: $3.5 million per facility • OPEX: $1.3 million per facility • Cost offsets: $580,000 per year

	**Funding Mechanism**	• Public • Private • PPP (preferred)
	**Benefits**	**Jobs:** 9 per facility **GHG:** Described in Section 5.3
	**Timeline**	Design, permitting, and construction of first facility complete by 2028

5.7 Waste Disposal System

As indicated in Sections 5.3 and 5.6, the City intends to improve waste diversion and transfer capacity to relieve the disposal pressure on the existing disposal facilities in the City (specifically QRL and WIN Waste). As such, the City does not intend to expand its existing waste disposal system.

5.7.1 Quarantine Road Landfill

The City operates QRL for disposal of MSW, small hauler debris, sewage sludge, and incinerator ash from WIN Waste. As indicated in Section 4.7, the landfill's remaining permitted capacity will be consumed in 2028. However, a lateral expansion of QRL onto the adjacent Millennium Landfill is currently planned (with submission of the Phase III permit application report to MDE occurring in October 2022) that would extend the facility's service life through 2035.

Plan of Action

The City plans to take the following actions over the planning period to improve operation of QRL:

1. Permit and construct lateral expansion onto Millennium Landfill: The lateral expansion of QRL is expected to extend the facility's service life from 2028 through 2035. As such, permitting and constructing this expansion is critical to the continued operation of QRL over the planning period.
2. Install scale house improvements: To improve traffic flow, reduce lines, improve enforcement, and reduce instances where customers do not pay, the City intends to install new software and an enhanced payment and accounting system.
3. Improve identification of unacceptable waste: The City intends to train cashiers to identify unacceptable waste through both visual inspections and cameras. Additionally, the City intends to install radiation sensors at the scale house to help identify radiation emitting waste.
4. Replace aging equipment: The City intends to replace aging equipment to provide additional storage and hauling capacity and reduce lines and complaints at the residential drop-off center.

5. Work to improve pay, benefits, and retention of workers: To improve staff retention, DPW will advocate for improved pay and benefits for QRL workers (particularly CDL drivers and operators) by:
    a. Working with the Department of Human Resources (DHR) to complete a class and compensation study to improve pay and benefits;
    b. Implementing a retention and hiring bonus policy for CDL drivers;
    c. Holding monthly hiring fairs where CDL positions are prioritized; and
    d. Expanding the CDL training program to allow for external candidates to participate in the program.
6. Work with local utility to reduce power outages at the site: The City intends to work with the local utility provider to improve power supply to the facility and reduce power outages.
7. Increase diversion away from the landfill: Diverting materials from disposal at QRL will help to extend the estimated service life of the facility and reduce greenhouse gas emissions (particularly if organic waste is diverted from disposal). Specific diversion action items are described in Section 5.3.
8. Expand the landfill gas wellfield to more efficiently capture landfill gas, prevent off-gassing, and comply with new Maryland methane regulations published by MDE in December 2022.
9. Assess and determine a long-term disposal plan for the City.

Anticipated Land and Permit Requirements

Construction of the lateral expansion of QRL onto the Millennium Landfill will increase the facility's footprint area to 128 acres and will require the diversion of Quarantine Road and all utilities that run along the road right of way (including a water main, gas lines, and underground and overhead electrical lines). The expected permit requirements and approvals required for the lateral expansion of QRL are summarized below:

- Refuse Disposal Permit: Issued by MDE; major modification of existing permit
- Erosion and Sediment Control Plan: Reviewed and approved by DPW
- Stormwater Management Plan: Reviewed and approved by DPW
- Building Permit: Issued DHCD
- NPDES Permit: Issued by MDE

Potential Costs

The estimated costs for the lateral expansion and improvement of QRL are summarized below:

- CAPEX: estimated to be $99.5M for design and permitting, relocation of stockpiles at Millennium Landfill, relocation of Quarantine Road, facility improvements, and construction of the new landfill cells.
- OPEX: OPEX is not expected to change significantly.

Potential Funding Mechanisms

The improvement and expansion of QRL will be funded by the City through grants (particularly for small-scale improvements, such as scale house improvements, equipment purchase, etc.) and from the general fund (for large-scale improvements, like the lateral expansion of QRL).

Potential Benefits

The estimated benefits associated with improving and expanding QRL include:

- Extension of service life: the proposed expansion is expected to extend the service life of QRL from 2028 through 2035.
- Improved payment: Scale house improvements are expected to result in improved payment (and less customers avoiding paying).
- Reduced unacceptable waste: Scale house improvements and improved identification of unacceptable wastes are expected to result in less unacceptable waste being dumped at the facility.
- Improved operation: Scale house improvements, improving pay for workers, improving electrical service, and the procurement of additional equipment are expected to result in smoother operation of QRL.

Expected Timeline

It is anticipated that design and permitting of the lateral expansion will be completed in 2024, with construction of the first disposal cell expected by 2026. Other improvements will be phased in over the planning period (between 2024 and 2033).

Summary

A summary of the plan of action and associated costs and benefits is provided below:

SUMMARY OF WASTE DISPOSAL PLAN		
Metric		**Description**
	**Plan of Action**	1. Permit and construct lateral expansion onto Millennium Landfill 2. Install scale house improvements 3. Improve identification of unacceptable waste 4. Replace aging equipment 5. Improve pay and benefits for workers 6. Work with local utility to reduce power outages at the site 7. Increase diversion away from the landfill 8. Expand landfill gas wellfield 9. Assess and determine a long-term disposal plan for the City

	**Land and Permitting**	• The expanded facility will be 128 acres in size • Permit requirements: ○ Refuse disposal permit (MDE) ○ Erosion and sediment control plan (DPW) ○ Stormwater management plan (DPW) ○ Building permit (DHCD) ○ NPDES industrial discharge permit (MDE)
	**Costs**	• CAPEX: $99.5 million • OPEX: Not expected to change
	**Funding Mechanism**	• Public: grants (small-scale improvements) and general fund (expansion of QRL)
	**Benefits**	• Extension of service life • Improved payment • Reduced incidence of unacceptable waste • Improved operation
	**Timeline**	Design, permitting, and construction of first cell of expansion by 2026. Other improvements phased in from 2024-2033.

5.7.2 WIN Waste

The City's current contract with WIN Waste expires in 2031. Baltimore City has adopted plans committed to maximizing waste reduction and diversion to achieve zero waste goals and Mayor Scott has included decommissioning the use of waste incineration in the next decade as goal 1.1 of the Mayor's Action Plan. DPW is committed to expanding options for waste diversion over the course of the planning period. With this investment in recycling and reuse programs, the use of the WIN Waste facility for residential municipal waste processing is expected to decline over the course of the planning period. However, a large portion of waste disposed at WIN Waste is generated in the private sector or outside the City. Until there is universal, coordinated adoption of waste diversion practices across public and private sectors, it is likely that the facility will continue to operate at or near its current throughput.