



SMART MEMPHIS

City of Memphis, Tennessee

DIVISION OF PLANNING AND DEVELOPMENT | OFFICE OF PERFORMANCE MANAGEMENT | INFORMATION TECHNOLOGY DIVISION

APRIL 2021

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No dinosaurs.

INTRODUCTION

Background

The Smart Memphis Plan is about technology. But many of the challenges facing cities and city governments are adaptive, rather than technical. In other words, cities are complex places not easily optimized by technical solutions alone.

In this plan, we recommend advancements in the City's use of technology, analysis of data, and deployment of fiber. We discuss how operations and management – people – enable these advancements. The aim of the plan is to illustrate how city government can serve the people of Memphis by using technology for the primary purpose of improving economic opportunity and quality of life.

This plan focuses on the short-term: the next five years. It does not attempt to predict how technology will shape the future. Rather, it is based on a belief that the city's policies, investments, and organizational coordination of resources can shape the future of economic opportunity and quality of life for residents and businesses alike. This plan serves as a starting point to inform how we use technology to do just that.

Purpose

The purpose of the Smart Memphis Plan is to enhance the use of digital technology and data to improve how the City functions for and serves the people, businesses, and institutions of Memphis. Smart City work focuses on



connecting an array of systems, from devices to networks to infrastructure, and harnessing the data and technology within these systems to improve the function of a city.

A smart city plan can take many forms: it can focus on leveraging systems to enhance business, move vehicles, connect residents, and gather and analyze data and information. It is important to state the purpose of this plan is not merely to advance technology for technology's sake. Rather, it is a means to an end.

A smart city should be a sustainable ecosystem where data and technology are used to improve the relationship between residents and government, enable social innovation, improve the quality of life across communities, and deliver efficient and effective services to our residents. A smart city plan should provide the roadmap for how to build that connected ecosystem.

Precedent

An important precedent to the Smart Memphis Plan is the Memphis 3.0 Comprehensive Plan. Why? First, Memphis 3.0 is the foundational document on which other planning activities in the City should build going forward. It articulates a central vision for the City beyond “build up, not out” - that Memphis will anchor our growth on the assets found in our City's core and neighborhood centers and the City will prioritize connectivity, access, and opportunity.

The Comprehensive Plan includes Objective 4.4 recommending the City invest in smart city infrastructure, but its guidance does not begin and end there. The Smart Memphis Plan is considered a “systems plan” of Memphis 3.0, meaning recommended infrastructure or physical improvements recommended in the Smart Memphis Plan will follow the direction of the Comprehensive Plan. The impact of this precedent can be found in the plan's concept map and Plan Elements.

Next, an additional precedent of the Smart Memphis Plan includes the work to advance data-driven governance that began in 2015 and has been championed by



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Mayor Jim Strickland since he took office in 2016, formalizing the Office of Performance Management and bringing divisions and agencies of City government together monthly to review key performance metrics to advise service improvements. For its efforts, Memphis was designated a Silver ranking in 2019 from What Works Cities for excellence in data-driven governance. This process is a valuable window into understanding the adaptive

nature of challenges city government faces, rather than purely technical. This initiative also underscores the importance of using data in decision-making, along with the commitment to track metrics and progress. The City remains committed to these ideals and principles and demonstrates the cultural readiness for smart city innovation.

PROJECT LEADERSHIP

Executive

- Jim Strickland, Mayor
- Doug McGowen, Chief Operating Officer
- Chandell Ryan, Deputy Chief Operating Officer
- Dan Springer, Deputy Chief Operating Officer
- Kyle Veazey, Deputy Chief Operating Officer

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- John Zeanah, Director
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- Sarah Harris, Sr. Performance Analyst

Information Technology Division (ITD)

- Kimberly Bailey, Director/CIO

ACKNOWLEDGMENTS

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Division of Housing and Community Development (HCD)

- Paul Young, Director
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- Twarla Guest, Administrator, Affordable Housing
- Joyce Cox, Senior Manager, Neighborhood Engagement
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- Tavita Conway, Lead Remediation Construction Manager

Legal Division

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- Amber Floyd, Deputy City Attorney
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- Yolanda Fullilove, Administrator, Permits and Licenses

Division of Parks and Neighborhoods

- Nick Walker, Director

Division of Solid Waste Management

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- Amanda Fryer, Recycling Administrator
- Harold Mitchell, Database Analyst

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- Pragati Srivastava, Administrator, Regional Transportation Planning
- Mavrick Fitzgerald, Transportation Planner
- Bobby Decker, Building Official
- Christopher Simmons, Chief Zoning Inspector

Memphis Public Libraries (MPL)

- Keenon McCloy, Director
- Chris Marszalek, Deputy Director
- Lauryce Graves-McIver, Assistant Director of Strategic Partnerships
- Sue Schnitzer, Assistant Director, Outreach and Special Projects
- Kevin Dixon, Virtual Digital Branch Manager
- Shaun Thornton, IT Support Manager
- Jordan Howard, Grants Coordinator

Division of Public Works

- Robert Knecht, Director

Division of General Services

- Antonio Adams, Director

Division of Fire Services (MFD)

- Gina Sweat, Chief and Director
- Colin Burress, Deputy Director of Operations
- Hope Lloyd, Deputy Director of Administration
- Chris Wilson, Deputy Chief, Technology and IS
- Donald Pannell, Assistant Fire Marshal

Memphis Police Department (MPD)

- Michael Rallings, Chief and Director
- Mike Ryall, Deputy Director
- Don Crowe, Deputy Chief, Information Systems
- Michael Spencer, Emergency Communications Administrator
- Stephen Chandler, Lt. Colonel, MPD Heliport
- Darrel Banks, Executive Assistant

Memphis Light, Gas, and Water (MLGW)

- J.T. Young, President and CEO
- Nick Newman, Vice President of Engineering and Operations
- Michael Taylor, Manager, Strategic Planning and Innovations

Memphis Area Transit Authority (MATA)

- Gary Rosenfeld, Chief Executive Officer
- John Lancaster, Director of Planning and Scheduling

Downtown Memphis Commission (DMC)

- Jennifer Oswalt, President and Chief Executive Officer

Information Technology Division (ITD)

- Wendy Harris, Deputy Director
- Mickey Alderson, Network Architect Advisor



INTRODUCTION

Scope

Smart city systems can be thought about on four levels: devices, management, networks, and infrastructure. Examples of each level include:

1. **DEVICES** – Lighting, sensors, mobile devices, cameras
2. **MANAGEMENT** – Software, cloud applications, management systems, Internet of Things
3. **NETWORK** – High-speed internet, Wi-Fi, 5G
4. **INFRASTRUCTURE** – Fiber network, small/macro cells, utilities, power generation and distribution, smart grid

The Smart Memphis Plan aims to provide an organizational framework and policy roadmap for the City to follow over the next five years. As a result, the plan will focus more on deployment of devices, software solutions, data and information management systems, organization, and policy. That said, network and infrastructure are important to consider. The plan addresses a conceptual direction for planning the network and infrastructure levels that can be undertaken or pursued by future studies.

Process

In late 2019, a group of City stakeholders gathered to begin exploring a smart city strategy for Memphis. The exploration considered the work of other cities, including those discussed below, and led to a trip to Chattanooga, Tennessee to learn more about their efforts. After continued background research, the Division of Planning and Development, Office of Performance Management, and Information Technology Division coalesced around

a process of bringing divisions and agencies together to discuss individually led projects to advance technology and how those efforts could be leveraged into a broader smart city plan for Memphis.

In Fall 2020, the project team held a series of roundtable discussions with key City divisions and agencies to learn more about current integration of smart technologies and opportunities for future deployment to enhance service delivery. Using the information gathered from these discussions and guidance from leadership, the project team developed the following planning approach and recommendations.

Planning Approach

In order to assess the current state of use of technology, set goals, and track performance, the Smart Memphis Plan defines progress using a six-tier maturity index, shown on the right. The maturity index, adapted and modified from the Smart City Plan of Bellevue, Washington¹, generally describes advancement of technology and technological systems to address issues outlined in the Smart Memphis Plan.

Issues are defined by element and sub-element. After gathering research and initial input from city stakeholders, each sub-element was assigned a current score during a series of smart city roundtable discussions. The roundtable discussions and synthesis of stakeholder input was then used to identify a potential 'future' maturity level, which would be reached should the City

0 - NOT STARTED

No work or progress has been made to advance smart technologies within the sub-element.

1 - AD HOC

The City has taken initial implementation steps to incorporate smart technologies within the sub-element to solve single, unrelated issues.

2 - OPPORTUNISTIC

The City has implemented smart technologies within the sub-element and has taken steps to upgrade or expand the technology or to address multiple, related issues.

3 - REPEATABLE

The City's smart technology deployment within the sub-element is being integrated across a division or divisions.

4 - MANAGED

Smart technology has been deployed across the sub-element and is being advanced to increase organizational performance.

5 - OPTIMIZED

The City is using smart technology to innovate within a sub-element.

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¹: https://bellevuewa.gov/sites/default/files/media/pdf_document/mc2352A-Smart-Cities-Strategic-PlanWEB.pdf



INTRODUCTION

undertake identified recommendations and implement key projects in the short-term.

Based on staff review of the plan elements and related issues, discussions with stakeholders conducted during the roundtable phase, and analysis of information collected to prepare this memorandum, the project team considered three alternative approaches for the structure and direction of this plan:

1 – CENTRALIZE AND REPEAT. There are many decentralized systems operating at an ad hoc or opportunistic level of maturity across City government. This alternative generally recommends centralizing these systems to achieve operational connections and efficiencies to advance goals and maturity across all sub-elements.

2 – FOCUS AND MANAGE. Some systems – or sub-elements – are more ready than others to advance to “Managed” maturity, but focusing on those areas will come at the expense of a comprehensive, centralized approach. This alternative generally recommends to focus efforts on one or two sub-elements in each plan element.

3 – SELECTIVE OPTIMIZATION. In this approach, the City would laser focus resources, innovation, and acceleration of smart city technology within one or two elements and forget the rest.

While each has its advantages, the **CENTRALIZE AND REPEAT** approach consistently rose to the top as the project team moved through synthesizing input from stakeholders. This approach helps the City build a strong foundation for long-term success by prioritizing consistent, enterprise-



PHOTO: JOHN ZINN

driven decision-making across various divisions and agencies in the short-term.

Examples

The Smart City concept has taken shape in different ways in cities across the globe. Each city’s experience offers lessons for Memphis in shaping our own smart city plan. Each of these cities have multi-faceted smart city plans. Each incorporates aspects from different sectors and presents their plans as comprehensive solutions to address complex city issues and problems. However, in many cases, implementation relies on individual projects that may address a narrow view. Ultimately, the Smart Memphis Plan should take shape based on the needs, priorities, and values of Memphis, but the experiences of the following cities are worth considering.

COLUMBUS, OHIO: Winner of the U.S. Department of Transportation’s Smart City Challenge in 2016, Columbus, Ohio is one of the leading cities in the U.S. to embrace

smart city technology to solve city issues. Columbus’s main Smart City focus is the “reinvention of mobility” and much of its planning and programs (what it calls its “playbook”) deal primarily with transportation, including projects to advance connected vehicle infrastructure, self-driving shuttles, multi-modal transportation, and electric vehicles and charging.

LONG BEACH, CALIFORNIA: Similar to Columbus, the City of Long Beach, California’s Smart City initiative is focused primarily around one area of innovation – digital equity and inclusion. The City’s approach is organized into three primary areas: capacity, or digital literacy; connectivity, through in-home internet, public Wi-Fi, and broadband; and technology, such as devices and technical support for users. Long Beach’s approach illustrates a more targeted, narrowly defined initiative to solve issues related to digital access.

BOSTON, MASSACHUSETTS: Considering examples taking a broader approach to smart city, the City of Boston

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has organized its smart city focus into a “playbook”, though less defined than in Columbus. Boston’s Smart City Playbook recognizes the evolving nature of smart city and urges caution treating complex urban issues as simple optimization problems. Boston’s smart city “plays” emphasize first identifying and understanding the issues the city is trying to solve and then using data and technology to solve them, rather than allowing technology to define the issues. Boston’s playbook makes clear they do not have all the answers and that smart city is often a process of learning while making informed and strategic decisions.

NASHVILLE, TENNESSEE: Nashville’s Connected Nashville plan reads more like a traditional, comprehensive plan for addressing smart city advancements. The plan is organized into six elements covering mobility, environment, governance, people, living, and economy. Each of the elements have a set of sub-elements framed as objectives for achievement. The plan defines a smarter city by use of technology and data to achieve goals of the community, understand needed services of the community, improve the lives of residents, and ensure equality of access to an improved quality of life. While many of the “strategic actions” recommended in the plan do involve use of technology and data to advance associated objectives, many are common-sense, good-government recommendations not necessarily dependent

on the advancement of data or technology.

NEW YORK CITY, NEW YORK: Seeking to increase opportunities for New Yorkers to access internet, the

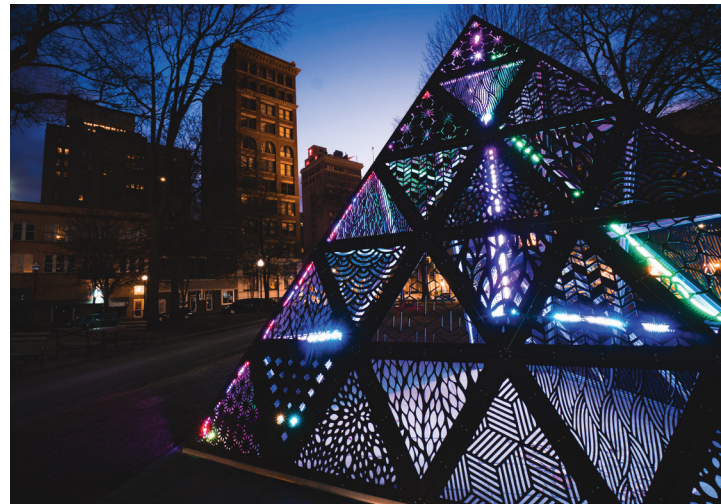


PHOTO: DAVE ROSEBERRY

City’s LinkNYC program replaced thousands of payphones across the City with free public Wi-Fi “Links”. While the project has been successful in accomplishing what it set out to do, the benefit of free, fast internet has come at the cost of data privacy for users. The project is an example of a public-private partnership between New York City and a consortium of private service providers, led by Google’s Sidewalk Labs, who fund the service through advertisements served up to users based on their online

activity. The service also makes other personal data such as location available for private consumption. This illustrates the need to think through how data are used and where a balance between data use and privacy need to exist to meet the needs of a particular City.

CHICAGO, ILLINOIS: In contrast to LinkNYC, the Array of Things (AoT) project in Chicago sought to create an “Internet of Things” by deploying sensors throughout the city to track a number of data points, ranging from daily temperature to vehicle traffic to air quality. But these sensors did not collect personal information. The City of Chicago partnered with the Argonne National Laboratory and the University of Chicago on this project to create an all-inclusive system to measure a vast array of these types of indicators in the urban environment. In contrast to LinkNYC, the City’s main partners in AoT are public institutions, rather than private industry, allowing it to maintain a service-oriented approach

without consideration for profit.

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VISION AND VALUES

CENTRAL QUESTION:

How do we better develop, use, and share information to create more economic opportunity and improve the quality of life for our residents?

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VISION AND VALUES

In developing a Smart City approach for the City of Memphis, a vision and purpose bring relevance and accountability to the process. The aim of this vision is to essentially answer “To what end?” and show the utility of smart city processes. We seek to understand how we can better develop, use, and share information to create more economic opportunity and improve the quality of life for our residents. The actions required to achieve this will help show measurable progress, and demonstrate local government’s capacity and willingness to look critically at our own processes and identify how to improve dialogue, access, and transparency into our operations. It is important to consider both the economic and social fabric of this initiative.

An Economic Focus: Preparing for current and future technological advancements, maturing use of technology to achieved managed systems, and innovating in our use of technology to solve city issues can be catalysts to retaining, attracting, and creating businesses. Advancements in technology aimed at providing dependable, high-quality services to residents and businesses can help attract investment and stir economic activity.

A Social Focus: Improved and updated technology and better use of data and information can lead to more efficient and equitable delivery of city services. This has the potential to directly improve the lives and well-being of residents and generate enhanced opportunities to address longstanding inequities. The City’s advanced use of technology can better connect residents in disinvested neighborhoods to resources and facilitate access to employment and educational opportunities.

Guiding Values

EQUITY – Enhance racial and social equity in provision of city resources for connectivity and prioritization of services enhanced by technology

TRANSPARENCY – Make City processes, programs, data collection, and data use transparent and accessible

INFORMATION EXCHANGE – Strengthen dialogue and communication between government, residents, and other entities

GOOD GOVERNANCE – Deliver city services more effectively and efficiently by advancing the use of data and technology

SUSTAINABILITY – Prioritize policies and investments that improve the long-term sustainability of our infrastructure and environment



PHOTO: CITY OF MEMPHIS

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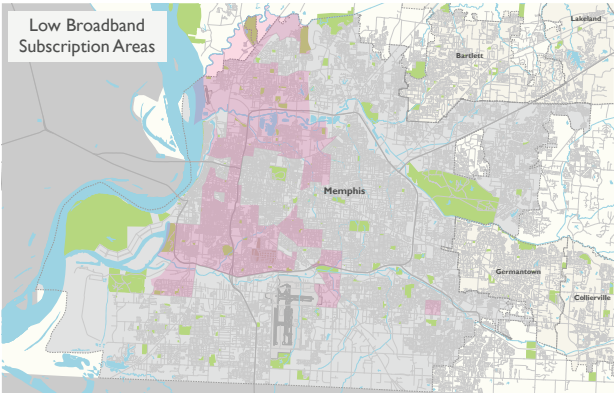
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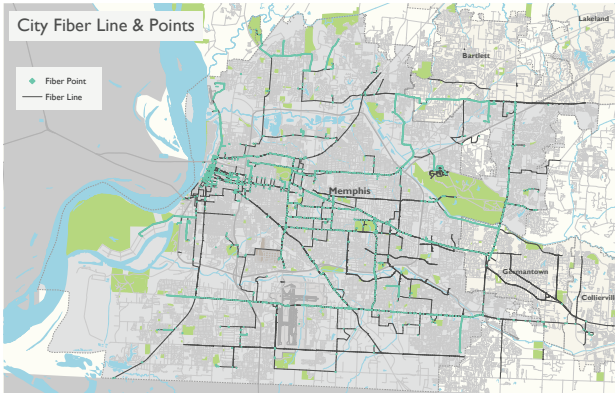
Concept Map

Though the Smart Memphis Plan is focused more on a policy and organizational framework, many of the policy recommendations and technological advancements on the horizon for city divisions and agencies have a geographic scope. The purpose of the concept map is to provide general direction on where to prioritize, not just what to prioritize.

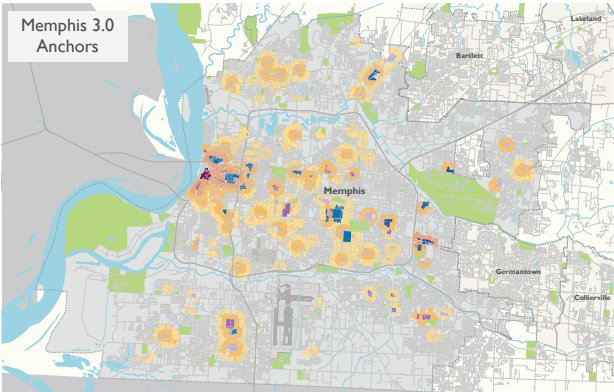
Based on the Central Question and Guiding Values, the Concept Map for the Smart Memphis Plan is balanced across a number of goals. To the right are a series of maps illustrating those goals, including: existing City-owned fiber assets, gaps in broadband connectivity, Memphis 3.0 anchors, and the 2040 transit vision network.



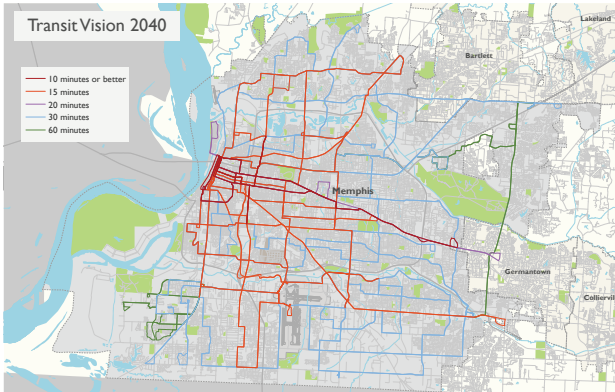
LOW BROADBAND SUBSCRIPTION AREAS ARE DEFINED AS CENSUS TRACTS WHERE LESS THAN 40% OF HOUSEHOLDS HAVE BROADBAND SUBSCRIPTIONS OF AT LEAST 10 MBPS.



EXISTING FIBER ASSETS OF THE CITY OF MEMPHIS. THIS MAP DOES NOT INCLUDE ASSETS OF MLGW OR PRIVATE ENTITIES.



ANCHORS AND SURROUNDING ANCHOR NEIGHBORHOODS AS DEFINED IN THE MEMPHIS 3.0 COMPREHENSIVE PLAN. ANCHOR AREAS ARE PRIORITIZED FOR DEVELOPMENT IN THE CITY'S PLAN.



THE MEMPHIS 3.0 TRANSIT VISION RECOMMENDS TRANSIT IMPROVEMENTS TO HIGHER FREQUENCY OF SERVICE ALONG KEY CORRIDORS IN THE CITY.

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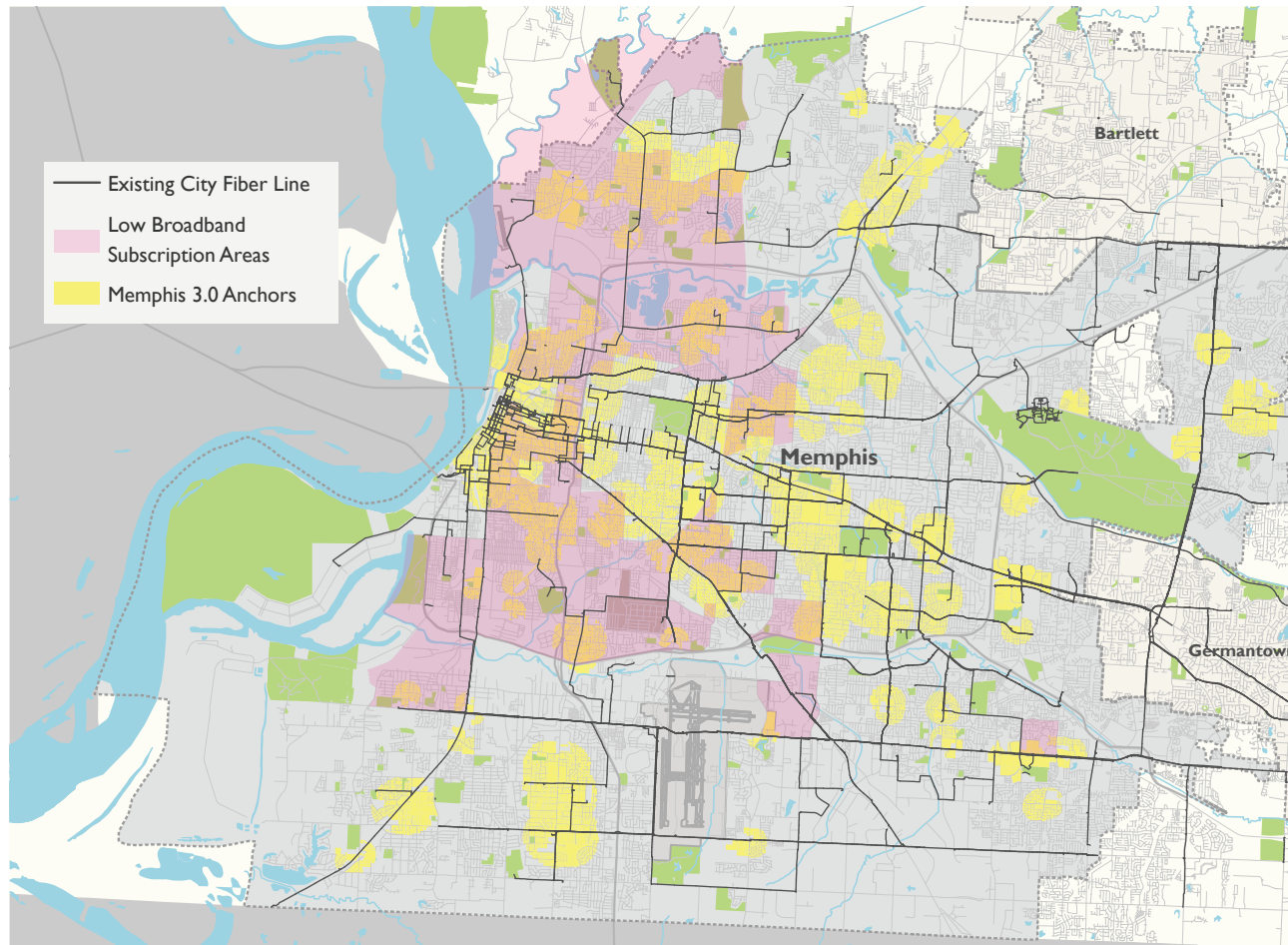
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SMART MEMPHIS CONCEPT MAP



The Smart Memphis Concept Map provides an initial geographic framework for prioritizing the future expansion of City fiber resources. This approach balances community goals related to digital access and equity, smart community-centered growth, and effective stewardship of City resources.

The highest priority areas – or **TIER 1** areas – are Memphis 3.0 anchors located in neighborhoods where subscription rates to broadband service are low (less than 40% of households have access to broadband subscriptions of at least 10 Mbps) and where there is some access to an existing City fiber line. As illustrated graphically, these are the areas where the pink (low broadband subscription rates) and yellow (Memphis 3.0 anchors) colors overlap, and where City fiber lines are located.

TIER 2 areas are similar to Tier 1 in that they include Memphis 3.0 anchors where subscription rates are low, but these areas lack access to City fiber. While fiber investment would certainly benefit these anchors in the future, the lack of existing fiber lines to build on presents additional financial and infrastructure hurdles and requires a more intensive investment of time and resources.

The final priority level – **TIER 3** areas – are Memphis 3.0 anchors that are not located in low broadband subscription neighborhoods.

This prioritization framework is a starting point for future City fiber network investments. Any further prioritization of anchor areas within the same tier will require a more detailed review of policy guidance in Memphis 3.0, the level of access to transit service, particularly high-frequency routes, and the presence of complementary/additive public and private investments.

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PHOTO: JOHN ZINN



*Transportation and
Streets*



PHOTO: JOHN ZINN



Utilities



PHOTO: CONNOR RYAN



Buildings



PHOTO: CITY OF MEMPHIS



Public Safety

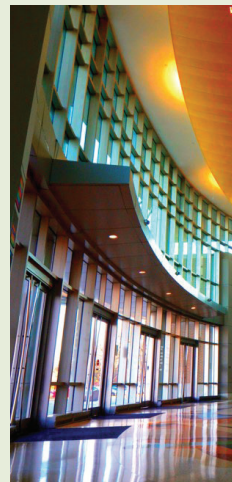


PHOTO: CITY OF MEMPHIS



*Digital Equity and
Economy*



PHOTO: CITY OF MEMPHIS



Public Services



PLAN ELEMENTS

The Smart Memphis Plan is organized around six plan elements: Transportation and Streets, Utilities, Buildings, Public Safety, Digital Equity and Economy, and Public Services. The plan elements were selected following a review of the primary services of city government and activities underway to advance the use of technology to solve issues and challenges of the city in each of the divisions. The plan elements are not exhaustive and skew toward issues and services focused on the built environment in Memphis.

Elements

Each of the six elements of the plan is broken into multiple sub-elements. The list of elements and sub-elements is included below. The following section contains more detail, organized by plan element, regarding the activities accomplished, what is currently underway, and future opportunities for advancement.

TRANSPORTATION AND STREETS: street design, construction, and maintenance; mobility, public transit, and vehicles; signals, signs, markings, and lighting; parking and curb/access management.

UTILITIES: utility systems; meters and grid; sewer and wastewater; stormwater; integrated asset management.

BUILDINGS: building codes and permitting; public

buildings; energy efficient and healthy homes.

PUBLIC SAFETY: crime tracking and prevention; emergency management and dispatch.

DIGITAL EQUITY AND ECONOMY: digital literacy and workforce development; broadband, Wi-Fi, and device access; tech entrepreneurship and innovation.

PUBLIC SERVICES: code and zoning enforcement; solid waste; permitting.



PHOTO:DAVE ROSEBERRY

USING THIS PLAN

Maturity Index

Each element listed in the forthcoming section includes a list of sub-elements and matrix illustrating the maturity index score - current and potential - for each sub-element. Potential scores represent the expected level of maturity achieved if all plan recommendations are implemented over the next five years.

Recommendations

Each element listed in the forthcoming section includes a list of recommendations, organized by sub-element. Recommendations may be undertaken in the next five years.

Lead Agency

For each recommendation, the primary agencies are listed. Other agencies not listed may be involved.

Implementation

For each recommendation, implementation type is represented by the following icons:



Funding



Policy Change



Staff Capacity



Process Change

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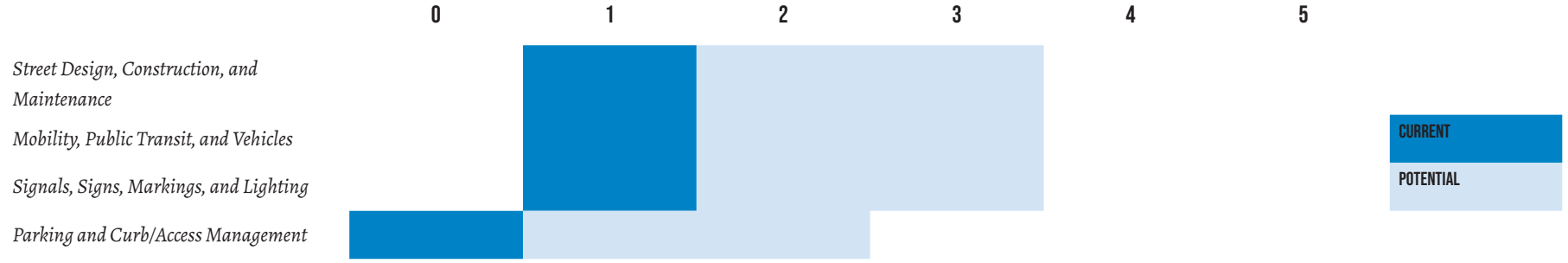
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Transportation and Streets



Moving people, vehicles, and freight is an essential function of the city’s transportation and streets system. The system is supported by a complex network of signs and signals, regulated by policies of access, parking, and loading, and maintained by multiple agencies responsible for various components of the system. Technology is currently deployed by individual divisions and agencies to improve how these components are administered, but system connectivity is necessary to enhance economic and social good and innovate new solutions to mobility.

MATURITY INDEX



SUB-ELEMENTS

- STREET DESIGN, CONSTRUCTION, AND MAINTENANCE
- MOBILITY, PUBLIC TRANSIT, AND VEHICLES
- SIGNALS, SIGNS, MARKINGS, AND LIGHTING
- PARKING AND CURB/ACCESS MANAGEMENT

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PLAN ELEMENTS

Transportation and Streets

The City’s work related to the above sub-elements has integrated smart technologies on an ad hoc basis where applied. Within the sub-element of street design, construction, and maintenance, the City has taken initial steps to using technology to improve service or performance. The City’s pothole detection pilot project use cameras on buses and Public Works vehicles is one such example. Traffic calming and road diet implementation rely mainly on long-range plans and resident complaints, though the 311 platform has introduced efficiencies. Coordination on street cut/right-of-way work among City divisions has improved, but there are opportunities to improve the City’s database on underground assets. The Division of Engineering has recently introduced a requirement for fiber providers to disclose where underground assets are present in the right-of-way. One recommendation to build on these actions is to implement a Dig Once policy to improve coordination and lay conduit for future fiber network expansion.

Regarding mobility, public transit, and vehicles, Memphis Area Transit Authority (MATA) has launched a number of smart technologies including a mobile fare application, free Wi-Fi on buses, and real-time data collection on system performance. With additional technology integration in the works (such as integrated payment for multiple modes, one-stop shop website for mobility information), MATA has identified the need for increased staff capacity to better analyze and translate this data into improved service and system performance. Improving data collection and translating it into Smart City investments was identified as an opportunity for



PHOTO: MEMPHIS MEDICAL DISTRICT COLLABORATIVE

both the City’s speed/red light camera program and shared mobility company information. In preparing for connected and autonomous vehicles (CAV), the City has made little progress in terms of policy work, but the ongoing deployment of fiber at signalized intersections is an important initial step of infrastructure preparation.

For signals, signs, markings, and lighting, most of the City’s ad hoc progress has come from the successful installation of fiber at signalized intersections (~50%). There are opportunities to leverage this ongoing expansion of traffic signal fiber to address other City priorities related to public safety and bike/ped safety. Streetlights also represent an opportunity for implementation not only of energy efficient LED lights, but also additional smart capabilities related to automation, public safety, and Wi-Fi access. MLGW has piloted LED streetlights with automated controls around the University of Memphis main campus and the Medical District, and the City is developing a plan to convert all streetlights to LED by 2023. Smart signs have

been implemented on a limited basis to help with speed enforcement and information sharing, but more research is needed on the cost-benefit of these technologies. Time and effort may be better spent focusing on increasing information sharing among TDOT and local jurisdictions for incident management and traffic flow monitoring.

Parking and curb/access management is the least developed of the sub-elements in this section. The Downtown Memphis Commission has completed a downtown parking study and is working to develop a demand pricing framework for parking garages to better manage parking assets and congestion, pilot implementation of a mobile pay app, and bring more activity to less-trafficked parts of downtown. The City has not yet integrated smart technologies into addressing curb/access management issues in general as well as for connected and autonomous vehicles. Opportunities here focus on developing basic policy priorities first before jumping into smart technologies.

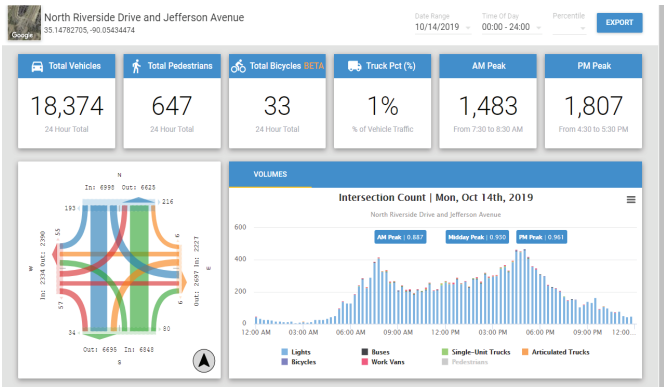


PHOTO: CITY OF MEMPHIS DIVISION OF ENGINEERING

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RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION	
<i>Street Design, Construction, and Maintenance</i>			
(1.1.1) Use sensor technology to measure effectiveness of traffic calming measures.	Engineering	\$	👥
(1.1.2) Implement a comprehensive roadway surface inspection system using cameras, machine learning, and artificial intelligence to prioritize maintenance and improvements.	Engineering	\$	👥
(1.1.3) Enhance coordination on street cut permitting among divisions using Accela Civic Platform.	Engineering	\$	👥
(1.1.4) Implement a Dig Once policy where conduit for fiber could be laid during City and private construction projects to make future fiber installation less expensive.	Engineering, Public Works		📄
<i>Mobility, Public Transit, and Vehicles</i>			
(1.2.1) Increase staffing capacity to better analyze and use data generated through transit technology applications to continue to improve service and system performance.	MATA		👥
(1.2.2) Ensure regular coordination among MATA's performance data staff and the City's Office of Performance Management.	MATA, OPM		👥
(1.2.3) Prepare for future connected and autonomous vehicle (CAV) deployment by strengthening policies that prioritize transit and bicyclists/pedestrians. Invest in Complete Streets design that promotes safety and accessibility for all modes.	Engineering	\$	📄👥
(1.2.4) Continue expanding the fiber network at signalized intersections	Engineering	\$	
(1.2.5) Utilize data from speed cameras and intersection technologies such as cameras to identify street design and pedestrian safety issues and prioritize investments.	Engineering	\$	👥
(1.2.6) Build capacity to use existing databases to determine where shared mobility services are used and where investments in improved street infrastructure - such as buffered bike lanes, cycle tracks, etc. - may be needed.	Engineering, MATA, DPD	\$👥	👥
<i>Signals, Signs, Markings, and Lighting</i>			
(1.3.1) Leverage the fiber network at signalized intersections to accomplish other City priorities to improve bike/ped safety, enhance public safety, and increase digital access with free, public Wi-Fi.	Engineering, ITD	\$	👥
(1.3.2) During the LED streetlight conversion process, implement smart systems in tandem such as dimmability, gunshot detection, and Wi-Fi.	Public Works, ITD	\$	👥
(1.3.3) Increase information sharing among TDOT and the City on incident management and response, traffic flow monitoring, and other traffic measures. Use advanced technologies such as artificial intelligence to optimize traffic movement.	DPD, Engineering		👥
<i>Parking and Curb/Access Management</i>			
(1.4.1) Implement a comprehensive demand parking system downtown and in surrounding areas to strategically reduce congestion and stimulate pedestrian activity in less-developed areas of downtown.	Engineering, DMC	\$	📄👥
(1.4.2) Use the new, dedicated transit lanes on Second St. and BB King Blvd. to measure and better understand access management issues when implementing Bus Rapid Transit (BRT).	Engineering, MATA		👥

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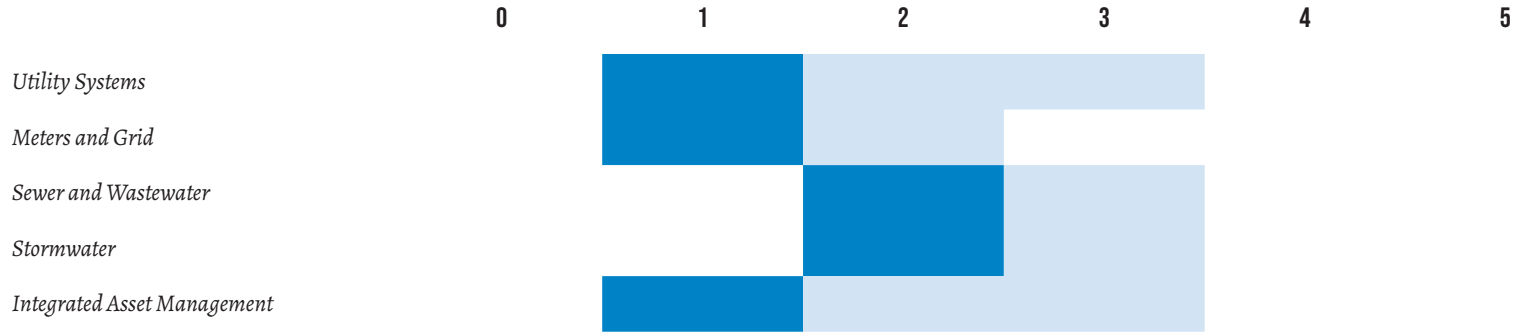
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Utilities



Utilities and associated infrastructure serve to connect and network our city. The system is made up of electrical components, meters, fiber, and hardscaped infrastructure to manage the network of information exchange and conveyance of electricity, gas, and water systems on and under the City’s surface. This element includes comprehensive, integrated asset management to assess infrastructure condition, prioritize repairs, and contribute to making informed and strategic infrastructure interventions. Technology can be used to better gather and manage information. There are opportunities to advance use of this information in decision-making and improve innovation and collaboration across City divisions.

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- UTILITY SYSTEMS
- METERS AND GRID
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- STORMWATER
- INTEGRATED ASSET MANAGEMENT

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CURRENT

POTENTIAL



PLAN ELEMENTS

Utilities

Integration of smart technologies into the City’s utilities has mostly been carried out in an ad hoc or opportunistic way. The public fiber network – City and MLGW – is currently disjointed and managed by different divisions and entities. Opportunities exist to take a more strategic approach to building out the City’s fiber network and better integrating it with other public fiber assets. Public Wi-Fi is available in libraries, some parks, and on MATA buses, but the City lacks a strategy to expand Wi-Fi access.

In considering the meters and grid sub-element, MLGW is approaching completion of smart meter installations and is beginning a 5-year infrastructure upgrade plan which will include some smarter tech solutions (smart switches, etc.), but there are several opportunities to increase the maturity level of smart technology use, including: upgrading the management platform for the water system; utilizing smart meter data to better understand energy burden trends and to target programmatic and outreach efforts; and undertaking more comprehensive smart grid upgrades to limit the duration and frequency of power outages and enhance community resilience.

The City’s sewer and wastewater system has benefited from its Sewer Assessment and Rehabilitation Program (SARP10) – currently in year 6 of 10 – resulting in better information on sewer conditions, maintenance needs, and infrastructure upgrade opportunities. Public Works is using a GIS-based system to manage this new dataset and to manage FOG (Fats, Oils, and Grease) problems. The Environmental Engineering group in Public Works has



PHOTO: JOHN ZINN

also implemented sensor technology to better monitor wastewater discharges from large industrial customers. The success of this sensor technology application could inform broader use of sensor technology to monitor wastewater/sewer issues and develop a dynamic model to identify potential overflows before they happen.

Much of the City’s efforts on stormwater issues have focused on flood reduction and mitigation. Flow sensors are used in some major drainage systems to detect issues, and there are opportunities to expand this program to enhance identification of flood risks and to monitor water quality. Engineering is also in the process of working with consultants to complete drainage basin studies that could be used to better prioritize and guide investments in green and gray stormwater infrastructure. The recent hire of a stormwater program manager aims to move the City toward an integrated management approach to stormwater that prioritizes systems-thinking and data-driven decision making.

Integrated asset management for the City’s various

utility systems has taken a more ad hoc approach as well. Different divisions take different approaches to asset management and planned investments in maintenance. For example, Public Works currently uses a GIS-based system to manage their infrastructure. There are opportunities to streamline asset management and utilize City IT’s expertise to align these systems across divisions.



PHOTO: JOHN ZINN

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RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Utility Systems</i>		
(2.1.1) Map existing fiber resources.	MLGW, ITD	
(2.1.2) Investigate centralization of MLGW and City fiber.	MLGW, ITD	
(2.1.3) Identify priorities for public fiber investment following the Smart Memphis Plan's concept map.	ITD	
(2.1.4) Centralize City fiber resources and management and develop a comprehensive plan to expand its authority.	ITD	
(2.1.5) Expand public Wi-Fi following the Smart Memphis plan's concept map.	ITD	
(2.1.6) Continue expansion of public Wi-Fi into City parks and facilities.	ITD, Parks	
(2.1.7) Explore district-wide coverage of public Wi-Fi in areas such as downtown.	ITD, DMC	
(2.1.8) Explore opportunities to outfit all bus stops with public Wi-Fi.	MATA	
(2.1.9) Establish a partnership among MLGW, City, and County IT departments to identify opportunities for shared procurement and data sharing.	MLGW, ITD, SCG	
(2.1.10) Build on the partnership to centralize IT solutions and purchasing decisions among related public agencies countywide.	MLGW, ITD, SCG	
<i>Meters and Grid</i>		
(2.2.1) Collect and use data from past smart switch projects to quantify impacts to residents in terms of avoided/shorter duration of power outages, cost impacts to MLGW as a result of those avoided outages, and business continuity.	MLGW	
(2.2.2) Expand analysis to measure larger scale business continuity and economic impacts.	MLGW	
(2.2.3) Expand energy efficiency, weatherization, and rehabilitation programs utilizing data comparing energy use to household income status or home square footage and identifying energy burdened candidates for City programs.	MLGW, HCD	
(2.2.4) Measure efficacy of weatherization programs to meet climate action and household energy efficiency goals.	MLGW, HCD	
(2.2.5) Identify common platform for water flow metering that can inform infrastructure investment/upgrades.	Engineering, Public Works	
(2.2.6) Expand upon the current 24hr-continuous water detection notification program to track and address other types of usage concerns or opportunities for water conservation efforts.	MLGW	
(2.2.7) Incorporate data generated from Aquifer Study into local decision-making and policies. Methods to do so may include land use changes, types of and placement of stormwater infrastructure, priority land conservation for water recharge purposes, improved floodplain management principles in the Unified Development Code or pursue flood mitigation initiatives, among others.	MLGW, Engineering, DPD, Public Works	

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RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Sewer and Wastewater</i>		
(2.3.1) Move towards a sensor-based real-time dashboard to guide maintenance responses.	Public Works	\$
(2.3.2) Incorporate additional sensors to support sewer maintenance GIS modeling underway to guide future priorities.	Public Works	\$
(2.3.3) Improve the prediction component of this work through evaluating how the smart flow system can predict sanitary sewer overflows (SSOs).	Public Works	
(2.3.4) Develop a dynamic model to help identify potential SSOs before they happen.	Public Works	\$
(2.3.5) Apply wastewater COVID study results to mapping and future opportunities to assist health department actions, such as tracing or mapping of other infectious diseases.	Public Works, SCG	
(2.3.6) Pursue alternative energy production to offset high energy costs at Wastewater Treatment Plants (WWTPs).	Public Works	\$
(2.3.7) Examine results from the planned one year feasibility study for the South WWTP regarding solar and wind energy generation to reduce energy costs.	Public Works	
(2.3.8) Expand circular economy opportunities with biogas sales and identify ways to expand this effort.	Public Works	\$
(2.3.9) Guide infrastructure investments and system upsizing to areas intended for greater density to attract development.	Public Works, DPD	\$
<i>Stormwater</i>		
(2.4.1) Expand monitoring to capture water quality metrics such as TSS (total suspended solids), BOD (biological oxygen demand), COD (chemical oxygen demand).	Engineering, Public Works	\$
(2.4.2) Advance flood metering and notification technology. Work towards predictive modeling to identify potential flood risks before they occur. Link metering to flood notification processes.	Engineering, Public Works	\$
(2.4.3) Examine possibilities such as regional detention, infrastructure upgrades, and system-wide thinking to address stormwater issues.	Engineering, Public Works	\$
(2.4.4) Better use the data generated through drainage studies to inform and help solve flood/stormwater issues.	Engineering, Public Works, DPD	\$
(2.4.5) Determine efficacy of certain infrastructure alternatives over others, for example the capacity for green stormwater infrastructure and sensor integration to monitor progress towards larger scale watershed retention and detention goals.	Engineering, Public Works	\$
<i>Integrated Asset Management</i>		
(2.5.1) Pursue a centralized asset management solution (such as Accela) to address the needs of all Divisions. Begin implementation by developing an integrated asset management plan.	ITD, DPD	\$
(2.5.2) Develop a condition assessment program from Google AI projects underway (pilot project to detect potholes).	ITD, Public Works	\$
(2.5.3) Expand usage of ESRI-based GIS systems and integrate with enterprise solutions such as Accela.	ITD, DPD	\$

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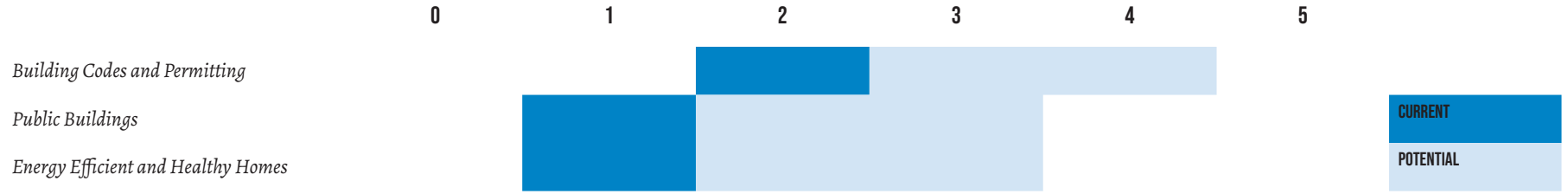
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Buildings



Buildings are more than the bricks and mortar used to build them – they are a complex set of working pieces that serve essential functions as homes, workspaces, and public places. Through permitting and codes, the City influences how buildings are placed, designed, and constructed, offering opportunity to manage the City’s growth. The City’s facilities are essential components of how it functions and provides services. Making public buildings more energy efficient is fiscally responsible and supports climate action goals. Energy use in buildings is a significant component of greenhouse gas emissions, and making public and privately-owned structures more energy efficient is a smart long-term investment in our City’s future. Technology can improve management of these services.

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- BUILDING CODES AND PERMITTING
- PUBLIC BUILDINGS
- ENERGY EFFICIENT AND HEALTHY HOMES

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PLAN ELEMENTS

Buildings

Similar to the first two elements, the City's integration of smart technologies into programs and processes related to buildings is tilted toward an ad hoc approach. Recently, however, the City with Shelby County Government has made strides in advancing technology to improve building permitting and construction code enforcement. The Division of Planning and Development recently deployed use of the Accela Civic Platform, a streamlined, cloud-based software system to improve coordination and communication among City and County divisions and offer a more transparent, customer-friendly interface. Accela could potentially serve as an enterprise solution that other City divisions use to manage programs and processes.

The City and County have adopted the 2015 Energy Conservation Code, though more recent and innovative building, energy, and electrical codes focused on maximizing energy efficiency and sustainability for new construction are available. While currently using the 2015 International Code Council model codes – with some local

amendments – there is room to explore how updated codes could encourage or require integration of energy-efficient, smart building systems to improve our built environment and take action on climate change.

Considering public buildings, some City divisions have pursued energy efficiency and performance improvements, but on an ad hoc and limited basis. Fire has implemented LED lighting retrofits with motion sensor technology at a number of stations and has plans to integrate HVAC upgrades and other efficiency measures. The Building Design and Construction office is currently updating its consultant handbook for City construction projects to create a more streamlined and predictable process and to lay out broad organizational goals on sustainability, resilience, and smart technology. Overall, the City has room to take a more comprehensive approach to facility management to increase energy efficiency, building performance, and the employee and user experience.

The City plays a role in managing a number of programs that influence energy efficient and

healthy homes in our community. HCD manages the Weatherization Assistance Program and Lead Paint Abatement Program, while MLGW administers the Share the Pennies residential energy efficiency program. HCD is currently working with City IT and Innovate Memphis to develop a one-stop-shop online portal for residents interested in applying for housing improvement and rehab programs. There are opportunities to integrate other housing improvement providers into this portal (e.g. Shelby County Department of Housing, United Housing, MLGW, and Habitat for Humanity) to reach a greater number of residents and streamline the application process. The City could also benefit from enhanced measurement and tracking of the impacts of these housing improvement programs to improve service delivery and make the case for future investments.

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RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Building Codes and Permitting</i>		
(3.1.1) Continue expansion of Accela Civic Platform and seek new applications of this enterprise solution.	ITD, DPD	  
(3.1.2) Explore how Accela could assist in streamlining HCD's work with builders and inspectors, perhaps integrating into a one-stop-shop portal for home repair applications.	HCD, DPD	 
(3.1.3) Explore how Accela could be used for the City's proposed rental registry.	Public Works	  
(3.1.4) Continue to promote Accela adoption by other jurisdictions in Shelby County to aid coordination.	DPD	  
(3.1.5) Determine opportunities for smart technology to be used to promote adoption of greener building and energy codes. Identify projects to pilot technologies to monitor performance of new buildings that follow green code requirements.	DPD	 
(3.1.6) Explore the integration of more performance-based requirements in building and energy codes to provide flexibility while also meeting climate goals.	DPD	 
(3.1.7) Consider adding fiber-ready requirements to building codes to ensure that new construction can connect to future fiber networks.	DPD	 
(3.1.8) Investigate potential predictive measures for fire risk or higher risk properties in blighted areas. Determine feasibility of implementation on private property.	DPD, Fire	  
<i>Public Buildings</i>		
(3.2.1) Set up system to track the energy impacts of retrofit projects and develop broader City facility/portfolio management framework to prioritize future investments.	General Services	 
(3.2.2) Ensure sustainability and smart technology (fiber, etc.) goals are included in the consultant handbook for City construction projects.	Engineering, General Services, DPD	 
(3.2.3) Work with MLGW to get City utility data in a format that can connect with tracking systems. Develop a broader energy management strategy with cross-division input.	MLGW, General Services, DPD	 
<i>Energy Efficient and Healthy Homes</i>		
(3.3.1) Implement a one-stop-shop portal for home repair applications (weatherization, lead, aging in place) to streamline process for residents. Work with City IT to host portal and explore potential to use with other programs beyond housing.	HCD, MLGW, DPD	  
(3.3.2) Improve measurement and tracking of impacts of housing improvement programs, especially as related to energy savings, utility savings, and resident health outcomes.	MLGW, DPD	 

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Public Safety



Providing fire, emergency management services (EMS), and police services is a critical function of city government, the importance of which is reflected in the total complement and percent of overall budget dedicated to these efforts. The deployment of appropriate technology can increase the city’s return on investment, as each improvement creates additional time that firefighters, paramedics, and police officers can spend serving residents. In many ways, the police and fire departments have been leaders in the adoption of new technology, but there are opportunities to more effectively use and connect the systems they have.

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- EMERGENCY MANAGEMENT AND DISPATCH

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Public Safety

The City’s approach to integrating smart technologies into Public Safety programs and processes rates higher on the maturity index than other elements. Crime tracking and prevention efforts have focused on moving from more static, one-dimensional SkyCop cameras with LTE connections to increased implementation of license plate readers and ShotSpotter sensors that rely on fiber connectivity. Opportunities for future improvements to these programs could involve installation of multi-functional cameras with fiber connections and edge-based video processing. Staff capacity for data analysis and processing work was identified as a pressing need. The City and MPD should develop clear policy guidance on how any new technology is used in order to protect individual privacy and First Amendment rights.

The City’s emergency management and dispatch work is more advanced in maturity. Efforts are underway to move Fire and Police to a single Computer Aided Dispatch (CAD) system, and emergency response agencies have coordinated to implement the ALASTAR situational awareness software platform for public safety response. In addition, Memphis Fire has successfully implemented its Health Navigator system to help get the right response and resources to residents who aren’t necessarily experiencing an emergency health situation. This program has helped save resources and improve service to residents. There are opportunities to expand the capabilities and reach of these existing efforts – for example, consolidating other agencies and divisions to a single CAD system (311, Code Enforcement, Memphis Animal Services, and Zoning Enforcement) and bringing more regional partners in to the ALASTAR public safety response platform.

RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Crime Tracking and Prevention</i>		
(4.1.1) Install multi-functional cameras with fiber connection. Where possible, use cameras that can be accessed by and provide benefit to multiple agencies.	ITD, MPD, Engineering	 
(4.1.2) Explore the use of artificial intelligence for video.	ITD, MPD	  
(4.1.3) Develop clear policy guidance on how video will be used while protecting individual privacy and 1st Amendment rights.	Legal, MPD	
(4.1.4) Increase staffing capacity to meet technology needs.	ITD, MPD	 
(4.1.5) Gather input on camera and monitoring programs and conduct review on resource efficiency.	MPD	
(4.1.6) Examine cost-effectiveness of various camera programs (red light, SkyCop) and make specific recommendations based on public benefit and required resources to enforce.	MPD	
(4.1.7) Convert all existing streetlights to LED.	Public Works	 
(4.1.8) Coordinate response activities with other city divisions with law or code enforcement authority to increase presence and efficacy of enforcement and prevention in targeted areas.	MPD, Public Works, DPD, MFD	 
<i>Emergency Management and Dispatch</i>		
(4.3.1) Consolidate to a single CAD system and add all law and code enforcement agencies.	ITD, MPD, MFD	   
(4.3.2) Increase the use of ALASTAR's capabilities for coordinated regional emergency response.	MFD	  
(4.3.3) Identify additional opportunities to increase officer availability by centralizing CAD responsibilities.	MPD, ITD	 

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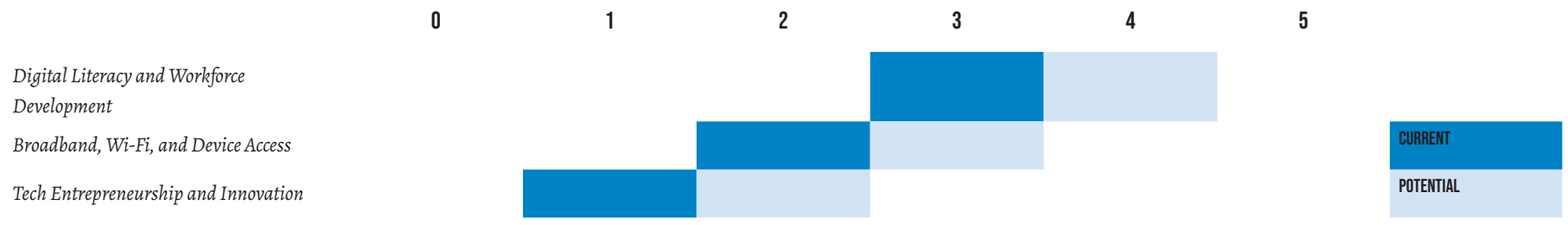
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Digital Equity and Economy



Over the last several decades, the digital revolution has transformed our economy and the types of jobs and skills in demand. It is more important than ever to have internet service, internet-connected devices, and basic technology skills to access information and resources, connect with educational opportunities, find jobs, and stay connected to friends and family. Despite the growing importance of digital technology to carrying out our everyday lives, inequities in digital literacy and access to broadband internet service persist within our city. Due to its mission and expertise, Memphis Public Libraries (MPL) has led the way in offering programs, training, and device access to help close the digital divide for residents of all ages.

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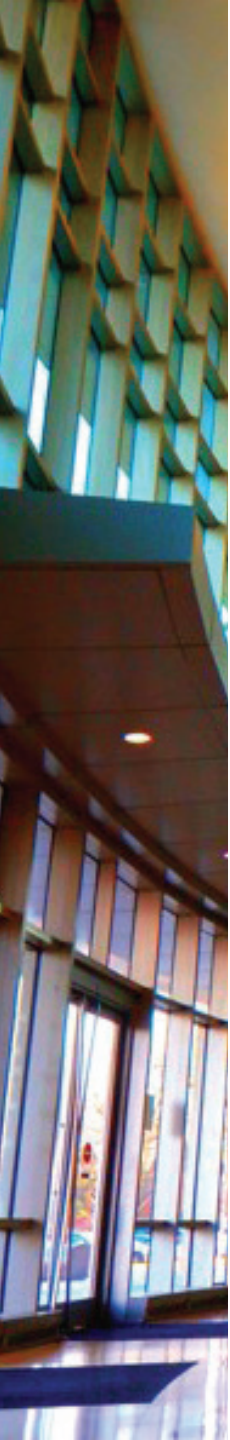
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BROADBAND, WI-FI, AND DEVICE ACCESS

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Digital Equity and Economy

Similar to Public Safety, City efforts on Digital Equity and Economy are more advanced in maturity and MPL has led the way. MPL serves as a resource hub for small businesses, nonprofits, and entrepreneurs and offers a variety of programming and training focused on building technology skills for all ages. During the COVID pandemic, MPL continues to expand opportunities online. MPL also plays an important role in providing internet and device access through free Wi-Fi (recently expanded coverage into parking lots), device and hot spot checkout program, and Start Here van providing mobile access to Wi-Fi and resources outside of library buildings. In addition, MPL offers programming, training, and resources for small businesses and entrepreneurs, as well as its CLOUD901 Teen Technology Lab and Teen Innovation Centers which provides digital media training and skill-building to teens. There are opportunities for other City divisions to integrate MPL’s programming and expertise to expand digital literacy and tech skill offerings at additional

City facilities and community centers. The City should also explore ways to integrate digital equity and workforce development goals into other programs and work carried out by the City’s Office of Business Diversity and Compliance (OBDC) and HCD.

The City is currently partnering with a private communications company to allow use of City fiber for low-cost, subsidized broadband service to a neighborhood in Klondike. Lessons learned from this project should be used to inform any future public-private partnerships (PPP) involving City-owned fiber. It is also important to formalize goals and priorities for any future PPPs to ensure that the public interest is well-served.

For tech entrepreneurship and innovation, private and institutional entities such as StartCo, EpiCenter, Code Crew, and the University of Memphis lead the way. MPL offers some programming, training, and coworking space for small businesses and entrepreneurs. OBDC should explore ways to support local, tech companies and start-ups who have expertise to assist with particular City IT needs and projects.

RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION	
<i>Digital Literacy and Workforce Development</i>			
(5.1.1) Build on the experience and expertise of Libraries to expand digital literacy programming and training to other City divisions and community facilities, particularly parks and community centers.	MPL, Parks	\$	
(5.1.2) Invest in devices and equipment at community centers; partner with Libraries to bring regular digital literacy programming to these centers.	MPL, Parks	\$	
<i>Broadband, Wi-Fi, and Device Access</i>			
(5.2.1) Invest in free, public Wi-Fi at more Parks facilities and community centers, as well as device/equipment access.	ITD, Parks	\$	
(5.2.2) Continue investments in broadband and device access at Libraries.	MPL	\$	
(5.2.3) Gather and share lessons learned from the Klondike broadband access public-private partnership to determine feasibility of future expansion.	ITD, HCD		
(5.2.4) Formalize City goals and priorities for any future public-private partnerships using City fiber for subsidized broadband access to ensure that public interest is better served.	Executive, HCD		
<i>Tech Entrepreneurship and Innovation</i>			
(5.3.1) Continue investment in Libraries programming that supports small businesses, nonprofits, and entrepreneurs and consider expanding to other community facilities (community centers and parks, HCD-supported housing developments).	MPL, Parks, HCD	\$	
(5.3.2) Develop a formal program within the Office of Business Diversity and Compliance (OBDC) to support local, tech companies and start-ups who have expertise to assist with particular City IT projects.	ITD, OBDC	\$ 	

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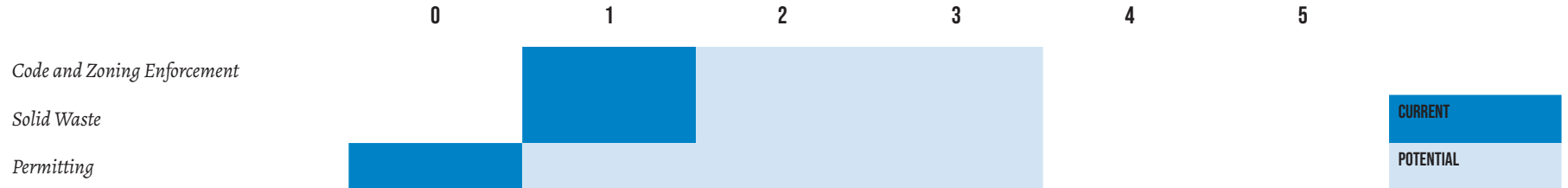
PLAN ELEMENTS

Public Services



Public Services including solid waste, codes and zoning, and permitting are at the heart of government function. Efforts are currently underway by individual divisions to increase efficiency and improve delivery of these services, but enhanced coordination is needed to ensure consistent and more efficient service. Advanced technologies, such as artificial intelligence (AI), provide an opportunity for smart service that will improve the lives of residents and allow for centralized efforts across City divisions.

MATURITY INDEX



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SUB-ELEMENTS

- CODE AND ZONING ENFORCEMENT
- SOLID WASTE
- PERMITTING



PLAN ELEMENTS

Public Services

Following the overall trend, much of the City’s Public Services work integrates smart technologies in an ad hoc way. In addressing litter and blight, the City is a partner in the Bluff City Snapshot work and the resulting Memphis Property Hub database which provides vital information on property conditions and blight issues in neighborhoods. Public Works has recently started working with Tolemi to better synthesize property data and information, including identifying rental housing, vacant properties, and areas of increased fire risk. In addition, Public Works has discussed using cameras with Google AI to help with blight detection and tracking. While this smart technology presents opportunities to better manage and track blight issues, the City should also keep in mind potential pitfalls of relying on machines to track an issue that can be difficult to precisely define and identify. There may also be opportunities to utilize enterprise solutions such as Accela to better manage processes and programs related to litter and blight, such as the commercial litter enforcement program and the rental property registry.

Zoning enforcement is currently transitioning their workflow to the Accela platform which should help improve project management and customer service. Smart technology such as AI could help with enforcement of the City’s vacant sign ordinance which currently requires quite a bit of staff hours for documentation and monitoring.

The Solid Waste Division has started to integrate a technology platform (Rubicon) that will assist with route optimization, documentation of collection issues, and vehicle maintenance tracking. Solid Waste has started with the route optimization capabilities but has identified



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opportunities to use the platform to help with a host of other service needs, such as tracking bulk waste pick-up trends. Solid Waste has released a Curbside Collection app that provides information to customers on a variety of solid waste issues. There are opportunities to use data collected from the app (questions from customers, etc.) to develop more targeted outreach materials and campaigns. Solid Waste has also identified technology needs that could help with enforcement of a local ordinance that requires private waste haulers to register and pay fees on commercial dumpster collection.

With a rating of ‘0’ on the

maturity index, the City’s permitting processes have tremendous room for improvement to integrate smart technology. Currently, the City uses Medallion to manage the permitting and licensing process for liquor and beer sales, special events, and specific types of businesses. The process for customers is cumbersome as there is no online application process (customer has to print, fill out, and email or fax permit application to the office), and permits cannot be updated once they are issued. Related permitting programs include the vacant property registry and the soon-to-be implemented rental registry program. There are opportunities to integrate these programs with the Accela platform to create more efficient workflow and transition away from time-consuming, manual approaches.



PHOTO: CITY OF MEMPHIS

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RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Code and Zoning Enforcement</i>		
(6.1.1) Operationalize AI technology to detect and predict pockets of blight, and integrate it with strategies to deter blight such as the rental registry.	Public Works	\$ [Icon: Document] [Icon: Gear]
(6.1.2) Centralize technology platforms and deploy enterprise wide solutions such as Accela for all code permitting, monitoring and enforcement services.	Public Works, DPD, ITD	\$ [Icon: People] [Icon: Gear]
(6.1.3) Explore how existing enterprise solutions such as Accela could help improve documentation and enforcement processes for commercial litter.	Public Works	\$ [Icon: Gear]
(6.1.4) Integrate monitors and/or other photo-sharing tech-based solutions to shift away from the need for hard copy violation documentation in the courtroom.	Public Works, DPD, ITD	\$ [Icon: Document] [Icon: Gear]
(6.1.5) Utilize video and artificial intelligence to detect non-compliance with sign codes and integrate with blight detection technology.	DPD, ITD	\$ [Icon: Document] [Icon: Gear]
<i>Solid Waste</i>		
(6.2.1) Implement the full functionality of Rubicon system to improve Solid Waste route optimization, collection issues, vehicle maintenance, etc.	Solid Waste	\$ [Icon: Gear]
(6.2.2) Explore options for Rubicon platform to help monitor monthly and annual bulk pick-up trends (e.g. leaf season and yard waste) and optimize collection schedules.	Solid Waste	\$ [Icon: Gear]
(6.2.3) Expand and better utilize the Curbside Collection app for efficient community outreach and public education.	Solid Waste	\$ [Icon: People] [Icon: Gear]
(6.2.4) Pilot use of sensors in public waste receptacles to provide alerts when bins are ready to empty.	Solid Waste, DMC	\$ [Icon: Gear]
(6.2.5) Utilize an enterprise solution such as Accela to audit all commercial dumpster locations, enforce compliance and digitize the permitting process.	Solid Waste	\$ [Icon: Document] [Icon: Gear]
<i>Permitting</i>		
(6.3.1) Utilize a centralized enterprise solution like Accela to digitize permitting applications and streamline the permitting process.	Legal	\$ [Icon: Gear]
(6.3.2) Integrate the rental registry and vacant property registry with Accela.	Legal, Public Works	\$ [Icon: Document] [Icon: Gear]
(6.3.3) Apply a data processing fee structure to all permits that come through Accela. These funds could support IT expansion or data analysis.	DPD	[Icon: People] [Icon: Document] [Icon: Gear]

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ORGANIZATIONAL RECOMMENDATIONS

In addition to the six elements above, the Smart Memphis plan reviewed the organizational capacity and ability of the City and its agencies, particularly the Information Technology Division, to deliver on the vision, values, and recommendations of the plan. Below are 12 additional recommendations related to organizational capacity.

RECOMMENDATIONS	LEAD AGENCY	IMPLEMENTATION
<i>Centralize People</i>		
(7.1.1) Increase IT staff size and expertise to meet growing demands of smart technologies.	ITD	\$ (People)
(7.1.2) Expand training of IT staff to manage support of enterprise systems used by City agencies.	ITD	\$ (People) (Gears)
(7.1.3) Formalize relationships among City's IT division and sister divisions with IT staff to ensure cooperation and support of Smart Memphis goals and recommendations.	ITD	(Gears) (Gears)
(7.1.4) Formalize relationships among City's Office of Performance Management, City's IT division, and sister divisions with performance management staff to ensure full capacity of data sharing and analysis.	ITD, OPM	(Gears) (Gears)
<i>Centralize Process</i>		
(7.2.1) Establish a process for requests for new devices or applications to be submitted to City's IT division to vet opportunities to configure existing enterprise solutions to meet divisions' needs.	ITD	(Gears)
(7.2.2) Manage procurement of devices and applications cooperatively by City's IT division in partnership with IT divisions of Shelby County Government, MLGW, and other county-wide public agencies.	ITD	(Gears)
(7.2.3) Determine how to bring existing ad hoc device or application solutions with no opportunity for expansion under an enterprise solution.	ITD	\$ (People) (Gears)
(7.2.4) Establish and execute a central system of asset management across City government under the City's IT division.	ITD	\$ (People) (Gears) (Gears)
<i>Centralize Fiber</i>		
(7.3.1) Determine comprehensive fiber needs of all City operations in order to plan for necessary capital improvements.	ITD	\$ (People)
(7.3.2) Centralize, connect, and expand City's fiber resources under a single division or authority to gain greatest benefit and leverage.	ITD, Executive	\$ (People) (Gears)
(7.3.3) Determine where fiber assets are encumbered by funding or contractual agreements and find solutions to maximize use.	ITD, Legal	(Gears) (Gears)
(7.3.4) Follow the Smart Memphis plan's concept map for future fiber expansion.	ITD	\$ (Gears)

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CONCLUSIONS

Toward A Smarter City of Memphis

The City is not short of areas to advance use of technology to provide key services and meet its goals for economic opportunity and quality of life. There are many decentralized systems operating at an ad hoc or opportunistic level of maturity. The recommendations laid out in this plan aim to centralize these systems in the near-term to achieve connections and efficiencies that will advance our goals and maturity across multiple elements in the long-term. This Centralize and Repeat approach includes progress in more subject areas, centralizes the City's systems and resources, pushes for greater internal capacity, and maximizes enterprise solutions. Critical to this strategy is the investment in Information Technology division's knowledge, capacity, and staffing.

While all City divisions identified in this plan will be responsible for implementation through their strategic planning and annual budgeting, the Information Technology division has a particularly important role in this Centralize and Repeat framework. As detailed in the organizational recommendations section, strengthening the people, processes, and tools of the IT division will be crucial to achieving our smart city goals. Immediate investments in these organizational areas will support success in all other plan recommendations.

To conclude this plan, it is important to reiterate this is the point of origin, not the complete roadmap. As noted in the plan elements section of the plan, there are multiple areas, or even whole sub-elements, where rudimentary technological advancement is present. Or none present at all. Determining how to bring these



PHOTO: CITY OF MEMPHIS

areas under an existing enterprise solution could greatly advance our goals and maturity across multiple sub-elements. For those areas where some advancement is present, systems and services are increasingly reliant on fiber to handle size, speed, and detail of data captured.

The City will need to centralize, connect, and expand its fiber resources under a single division or authority to gain the greatest leverage.

Centralized asset management is necessary to deploy strategic use of devices to advance smart city maturity across elements. Many existing devices do not produce data or analytics; only documentation. Devices do not perform functions specific to divisions, areas, or sub-elements; they too can be enterprise-wide solutions. To enable these advancements, centralized, systems thinking is necessary to achieve success. This includes not only software and fiber support, but staff resources, technical support, centralized procurement, and policy changes.

The Smart Memphis Plan is the foundation and starting point for achieving a smarter city. It identifies both the short-term actions and long-term investments the City can implement to use technology more effectively and equitably. While technology is ever-evolving – and future studies and planning efforts will be necessary to more fully address network and infrastructure investments – this plan will guide the City's essential work to enhance economic opportunity and quality of life in our community.

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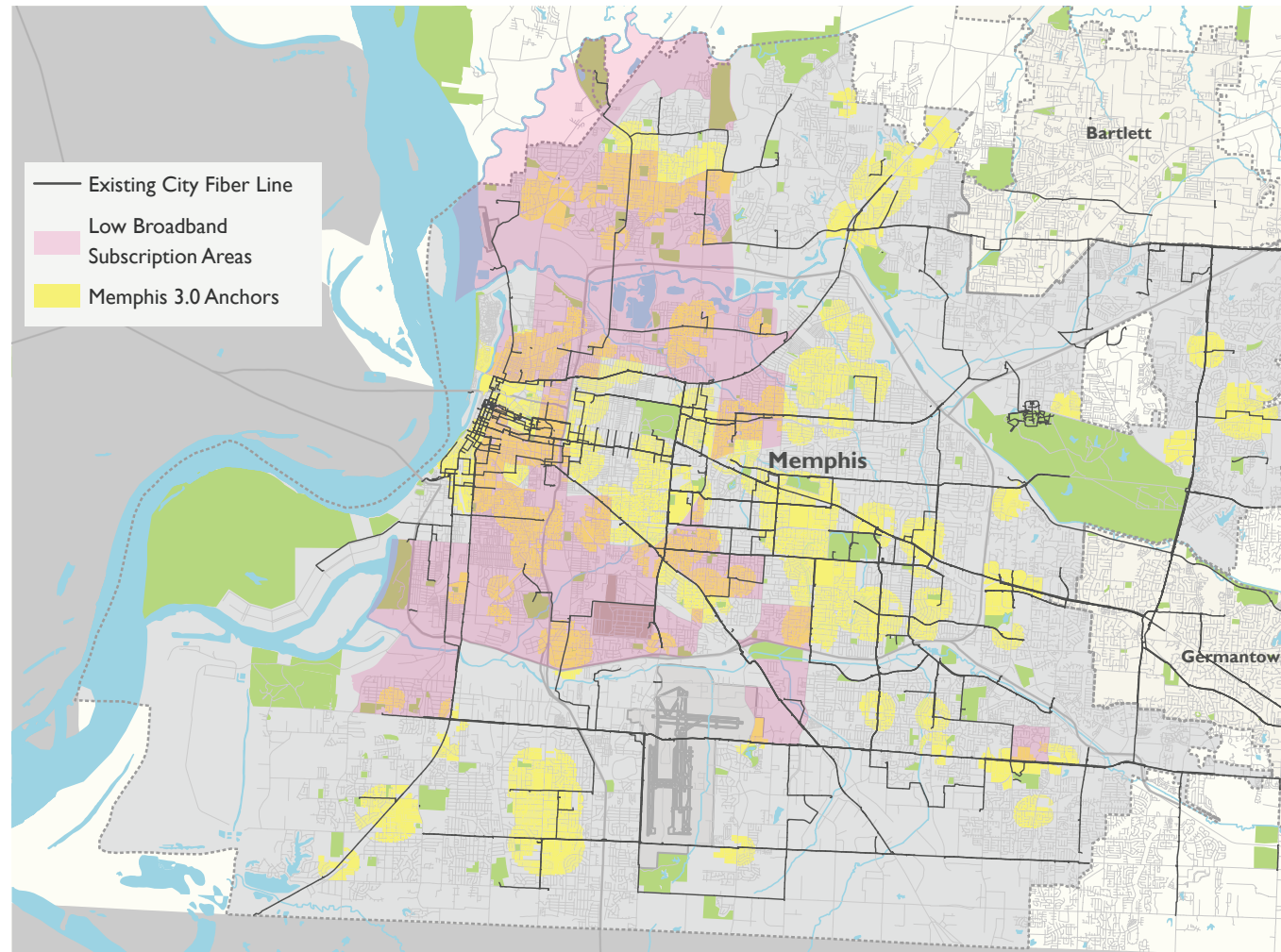
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APPENDIX

THE SMART MEMPHIS CONCEPT MAP PROVIDES AN INITIAL GEOGRAPHIC FRAMEWORK FOR PRIORITIZING THE FUTURE EXPANSION OF CITY FIBER RESOURCES. FOR MORE INFORMATION, SEE PAGE 9.



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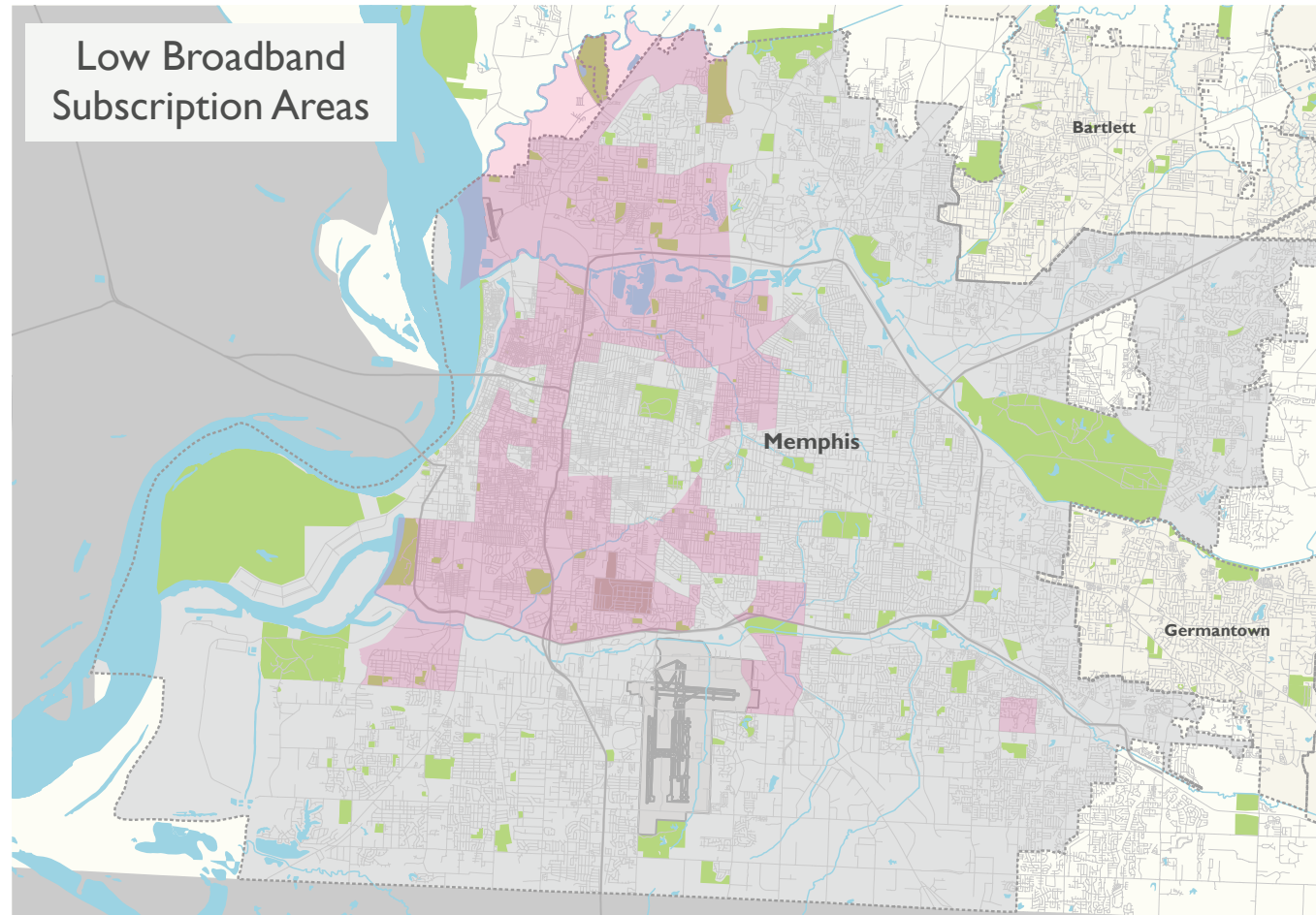
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LOW BROADBAND SUBSCRIPTION AREAS ARE DEFINED AS CENSUS TRACTS WHERE LESS THAN 40% OF HOUSEHOLDS HAVE BROADBAND SUBSCRIPTIONS OF AT LEAST 10 MBPS.



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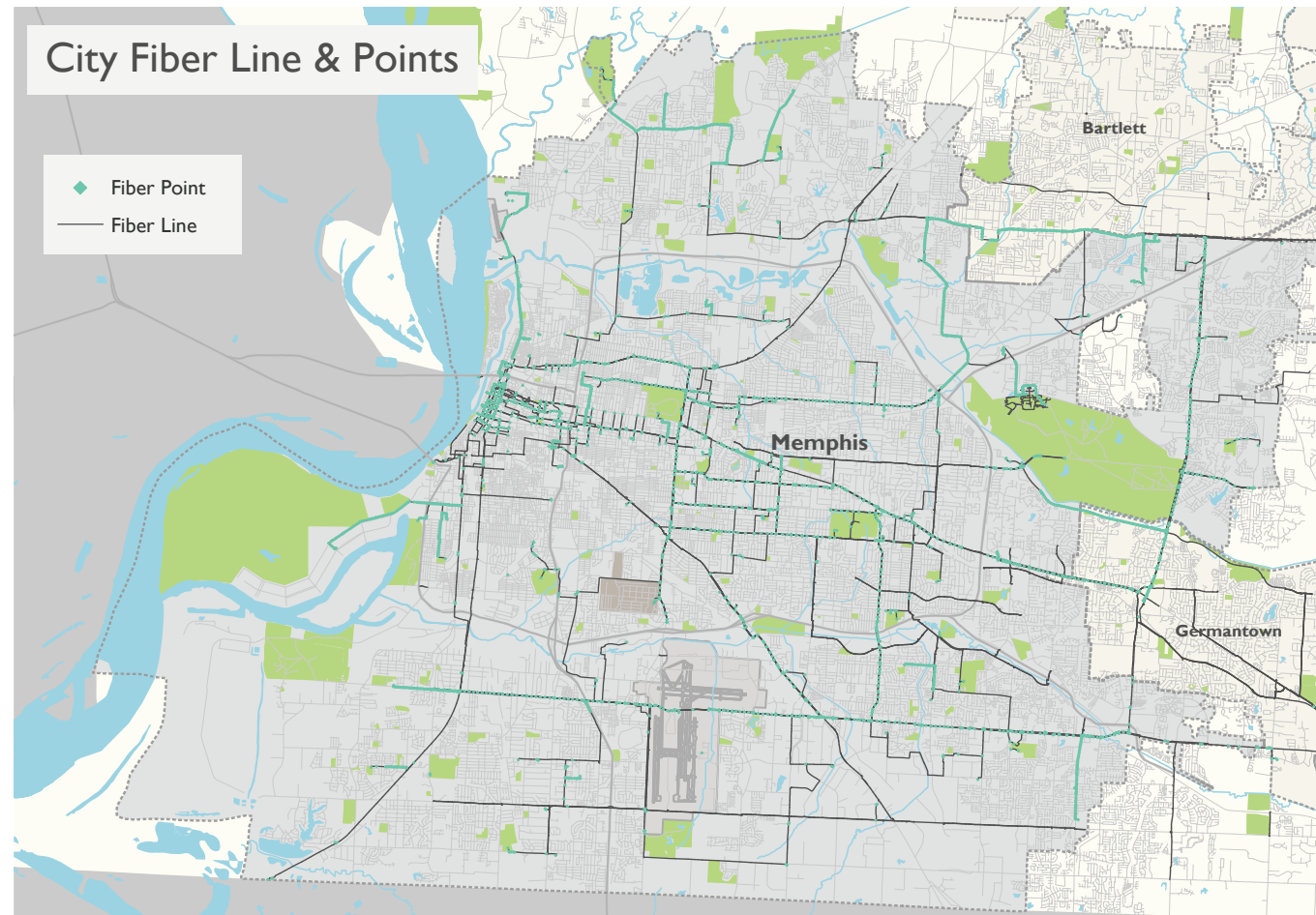
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EXISTING FIBER ASSETS OF THE CITY OF MEMPHIS. THIS MAP DOES NOT INCLUDE ASSETS OF MLGW OR PRIVATE ENTITIES.



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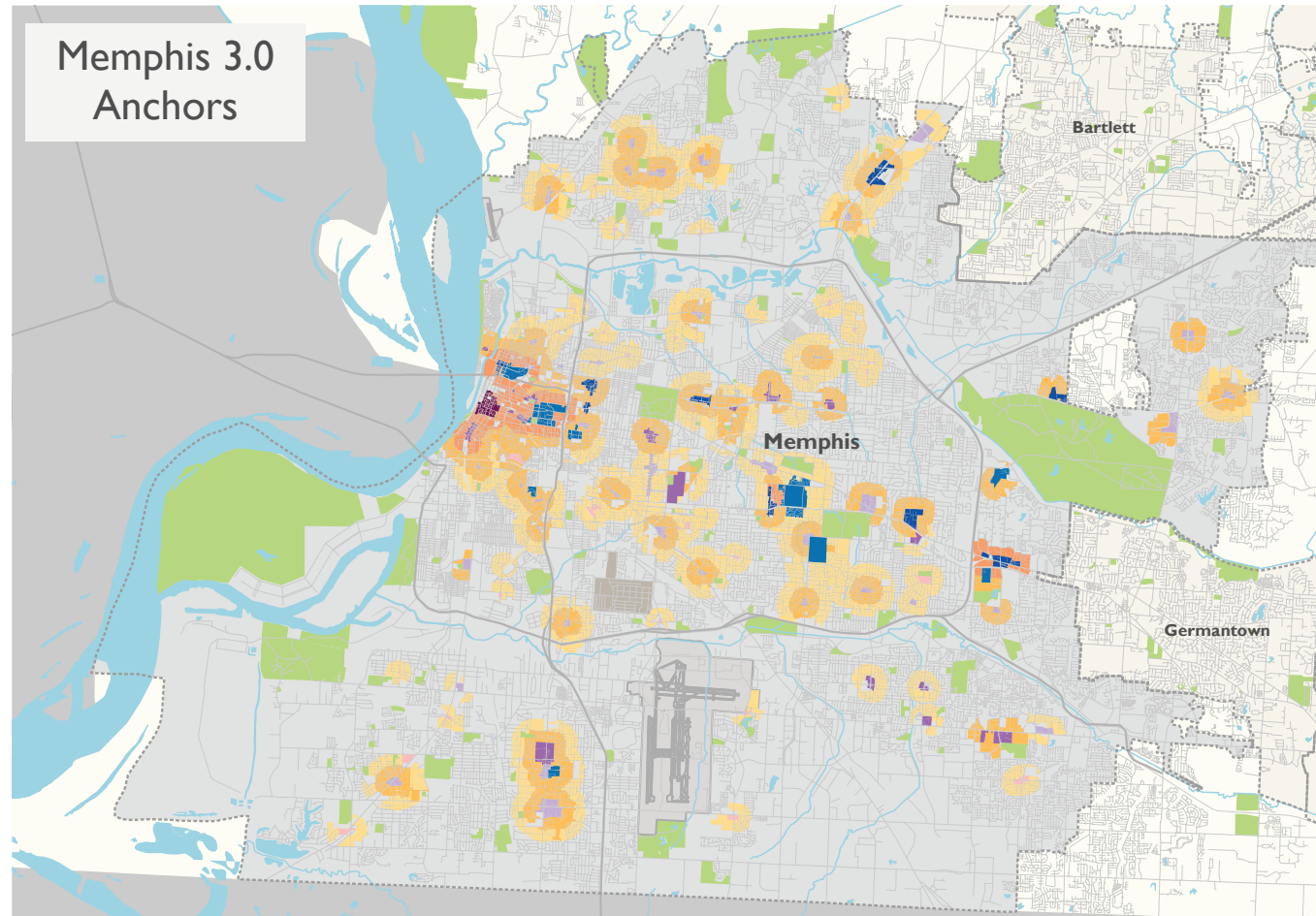
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ANCHORS AND SURROUNDING ANCHOR NEIGHBORHOODS AS DEFINED IN THE MEMPHIS 3.0 COMPREHENSIVE PLAN. ANCHOR AREAS ARE PRIORITIZED FOR DEVELOPMENT IN THE CITY'S PLAN.



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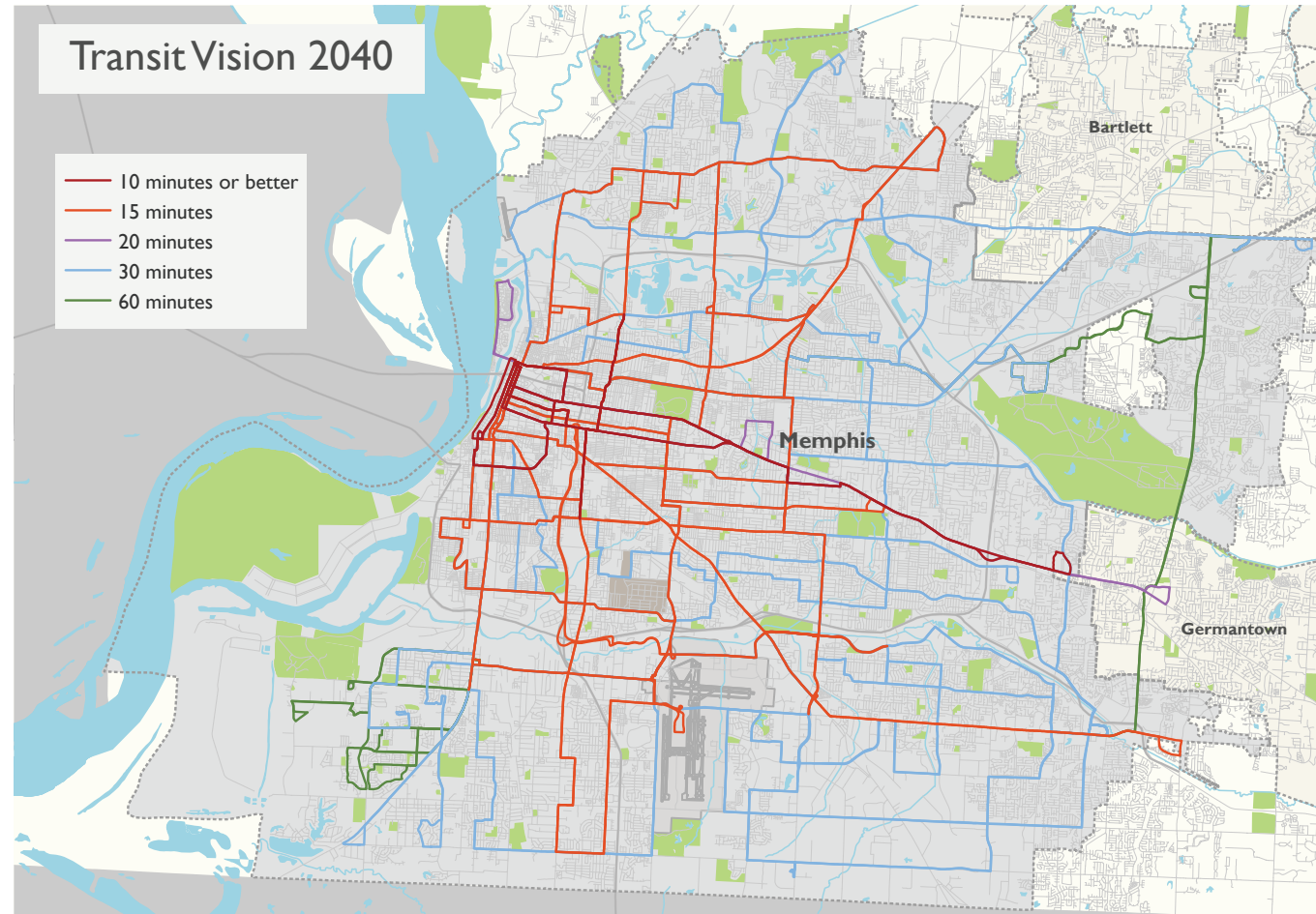
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THE MEMPHIS 3.0 TRANSIT VISION RECOMMENDS TRANSIT IMPROVEMENTS TO HIGHER FREQUENCY OF SERVICE ALONG KEY CORRIDORS IN THE CITY.



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