CITY OF ALEXANDRIA

SMART MOBILITY

Framework Document 2018

GOROVE / SLADE
Transportation Planners and Engineers

What is Smart Mobility?

Smart Mobility is the concept of applying information technologies to roads, traffic signals, transit vehicles, and other transportation infrastructure to help us better understand how our roadway network operates. This data can be leveraged to improve quality of life in Alexandria in a variety of ways – from managing traffic to improving transit to enhancing safety to optimizing parking to streamlining emergency management.

Strategy

When it comes to Smart Mobility, Alexandria is committed to a proactive, innovative approach. Implementation of this Framework will come from various sources and partnerships. It will involve an interdepartmental team of City staff tasked with streamlining existing Smart Mobility-related programs, researching and implementing new programs, and coordinating with external partners. In doing so, the City will lay the groundwork for application developers, vendors, and other technology creators to partner with Alexandria to advance its Smart Mobility goals.

Guiding Principles

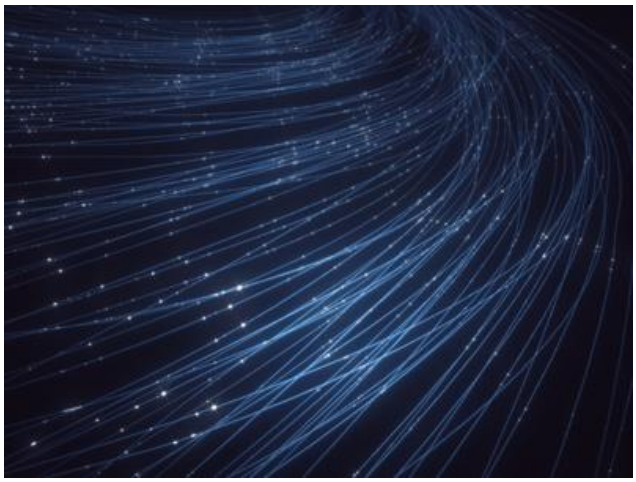
Six Guiding Principles have been identified to inform the Smart Mobility Framework and ensure it serves the City's goals and principles.

Safety	Eliminate all traffic fatalities and severe injuries while increasing safe, healthy, equitable mobility for all.
Mobility	Improve accessibility and transportation options for residents and visitors of all abilities
Forward-looking	Proactively plan for emerging and future transportation technologies
Sustainability	Improve environmental quality and resiliency.
Traffic Management	Optimize traffic flow on City streets, improving travel times and reducing congestion.
Transparency	Use data and analytics to improve decision making and City services while broadening public access to information.

| INFRASTRUCTURE

Alexandria is upgrading its communications networks to ensure they're ready for the latest mobility technologies.

With a modernized and expanded fiber optics network, Alexandria's streets will become conduits of real-time communications – linking traffic signals, weather stations, and other devices with the Traffic Management Center (TMC).



Combined with upgraded traffic signal management system, closed circuit television (CCTV) systems, traffic signal cabinets, state of the art controllers, and smart detection, these updates will allow the City to better manage and respond to delays and incidents, plan for special events, share critical alerts and data to better inform the public and support new mobility technologies as they come online.

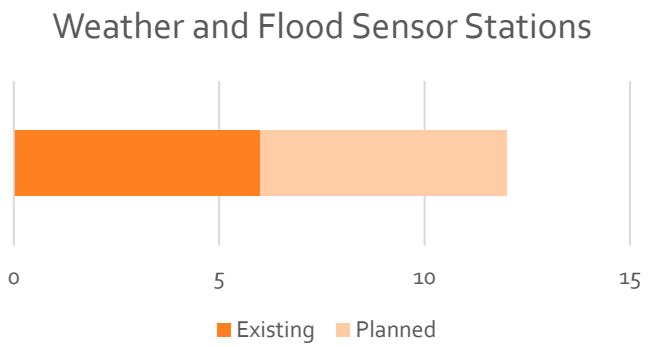
Expanding and upgrading the City's fiber optics network will provide the necessary infrastructure to expand Municipal Broadband across the City to support voice, video, and data transport among the City's public institutions, including schools, libraries, public safety buildings, and other City facilities. An additional goal of this initiative is to pursue opportunities to increase consumer choice in cable, voice, and broadband services to provide consumer options and increased data speeds

| ROAD WEATHER

By implementing technology that tracks and measures road weather conditions, Alexandria will be equipped to better respond to severe weather events, such as high winds and flooding.

Alexandria is expanding its network of roadside flood and weather sensor stations. These stations detect and send alerts when weather conditions at the site warrant a road closure or other action.

By letting travelers and City staff know exactly where weather is impacting roadways, these sensors can keep the transportation network running safely and efficiently.



By analyzing the data that the road weather sensor stations collect, the City will be able to proactively plan for extreme weather events, improving the information the timeliness of push notifications for residents and route planning for emergency responders

| PUBLIC SAFETY

Alexandria is giving emergency responders the tools to travel quickly and safely to incidents.

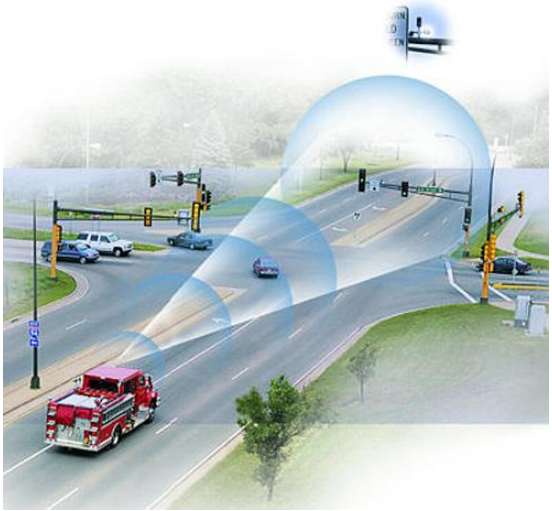
Because every second matters for emergency responders, Alexandria is making sure response teams have up-to-the-minute information about road and incident site conditions.

The City will explore incident scene staging guidance, a technology that allows emergency responders to coordinate incident site staging and operations in real time.

Alexandria is exploring integrating its existing emergency vehicle Computer Aided Dispatch (CAD) system with real-time traffic data to improve on-scene arrival times.

The City is planning on upgrading its fleet of emergency vehicles with Emergency Vehicle Preemption equipment, which will enable traffic signals to change in response to emergency vehicles responding to an emergency, improving response times.

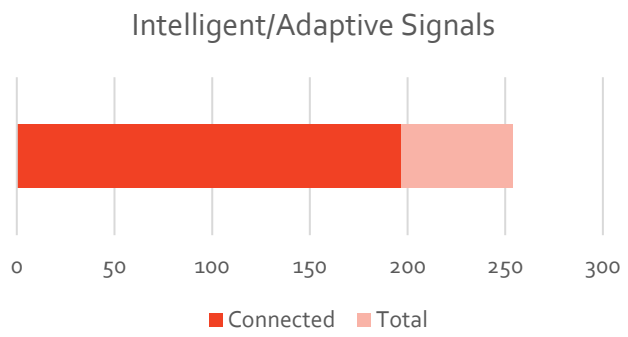
The City is currently working to install for emergency vehicle preemption on Beauregard.



| TRAFFIC SIGNALS

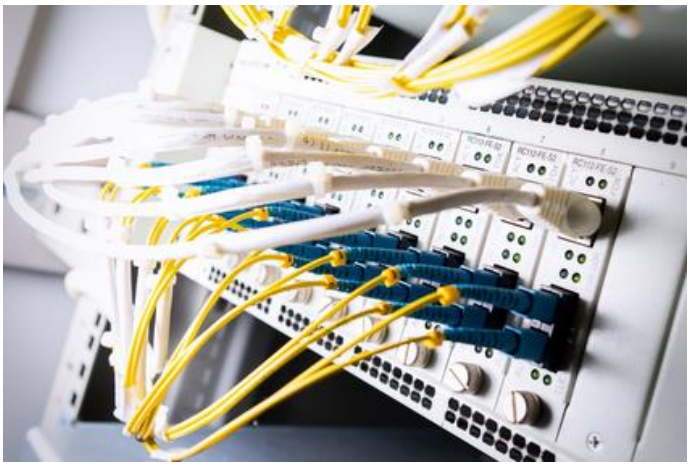
To manage traffic flow and move transit and emergency vehicles faster and safer, Alexandria is installing smart signals and preemption throughout the city.

Alexandria is rolling out intelligent traffic signals that respond and adapt to real-time vehicle location and movement data, optimizing traffic flow, decreasing delays, and reducing stops at various intersections throughout the city.



The new signals are equipped with technology to prioritize transit and emergency vehicles, allowing equipped vehicles to request preemption at intersections and bypass stopped vehicles or congestion.

The City is also exploring mobile accessible pedestrian signal systems that use GPS and other technologies to help people with limited or no eyesight cross signalized intersections safely.



| TRANSIT

From transit signal priority on major corridors to mobile fare payment and real-time arrival information, Alexandria is making transit faster, easier, and more reliable than ever.

Alexandria will soon implement a mobile fare payment pilot, allowing riders to pay bus fare using their smartphone.

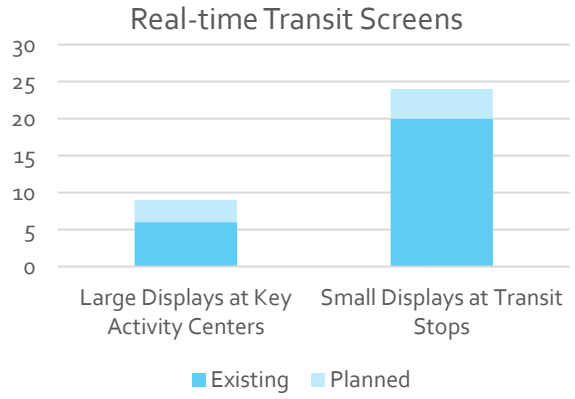
All new DASH buses come with automated passenger counters (APCs), allowing a better understanding of transit demand for future planning. DASH is also retrofitting existing buses to inlcude APCs

In addition to the DASH Tracker, Alexandria has begun providing third party apps like Moovit and the Transit app with real-time transit feed, so riders can see exactly where their bus is and when it will arrive.

The existing bus fleet will be retrofitted with transit signal priority (TSP) equipment as the City upgrades traffic signals with TSP on corridors throughout the City, starting with Duke Street and Route 1.

2
transit signal priority corridors

Real-time transit arrival screens are being installed at key activity centers, various buildings, and bus stops across the city



| MOBILITY ON DEMAND

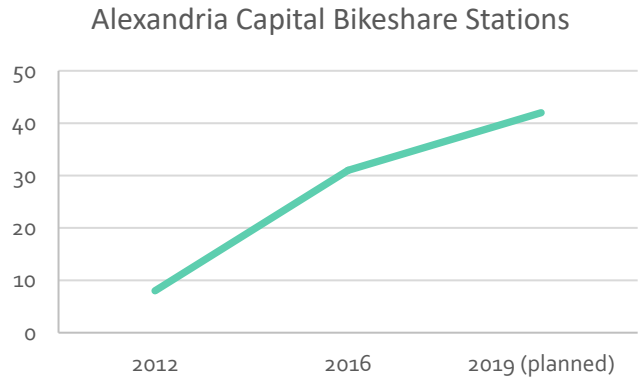
From Capital Bikeshare to dockless bikes and scooters to ride-hailing services, Alexandria is partnering with shared, on-demand mobility providers to give residents and visitors more choices.

The recent growth of shared, on-demand mobility services presents an exciting opportunity to give Alexandria residents and visitors more transportation options, as well as reducing vehicle trips and parking demand.

In addition to the continued operation of car-sharing and ride-hailing services in the city, Alexandria is currently undertaking a nine-month dockless mobility pilot, permitting private dockless bicycle and scooter companies to operate in the city.

Alexandria currently has 31 Capital Bikeshare stations and continues to expand the system.

The City is working with Transportation Network Companies (TNCs) on a data sharing policy through SharedStreets, a neutral, anonymized clearinghouse for data collected by transportation providers, private companies and government agencies, for data analysis, traffic planning, street design and development of new technologies.



Ⓟ | PARKING

Through technology, curbside management, and improved City services, Alexandria is making parking more predictable and efficient.

Alexandria is exploring the feasibility of migrating its residential and visitor permit parking programs online, making it easier and less time consuming for residents and visitors to the City to register their vehicles and obtain a parking permit.

The City is increasing its use of Automated License Plate Readers (ALPRs), allowing parking enforcement officers to streamline ticketing, and manage citations via autonomous vehicle mounted units. In addition, ALPRs are used by APD to capture and analyze license plates against known databases for enforcement

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Automated License Plate Readers

Alexandria has begun replacing traditional multi-space, pay and display parking meters with multi-space, pay-by-plate meters, making parking enforcement easier.

At selected garages, the City will install parking guidance systems that tell customers whether there are spaces available in the facility.

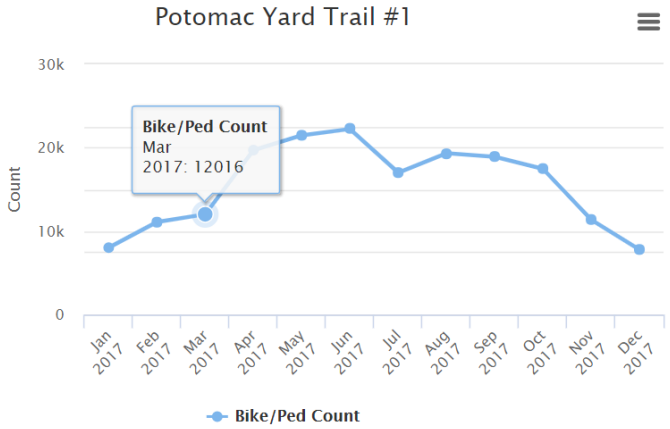
| PERFORMANCE MONITORING

By modeling, studying, and analyzing data from sensors, video, and other sources, Alexandria can better understand travel patterns and determine how to manage traffic.

Alexandria will analyze data from Bluetooth devices, cellular devices, on-street sensors, and video equipment to make sure streets are functioning safely and efficiently.

The City is utilizing technology that both monitors traffic conditions and tallies vehicular, bicycle, and pedestrian movements at intersections.

Alexandria has seven automated bicycle and pedestrian counters set up throughout the City. In 2017, these counters captured over 2.5 million unique pedestrian and bicycle trips. This data helps City staff better understand local and regional transportation trends, and plan accordingly. This data is also publicly available for the public to consult, download, improve, and analyze.



The City recently used data collected from Bluetooth data collection devices to quantify the impacts of eliminating cut-through traffic in the Central Alexandria Traffic Study. Over the next three The City is planning on adding 46 additional Bluetooth units across the City, which will collect anonymized travel pattern data for public use and analysis by City staff.

ⓘ | INFORMATION MANAGEMENT

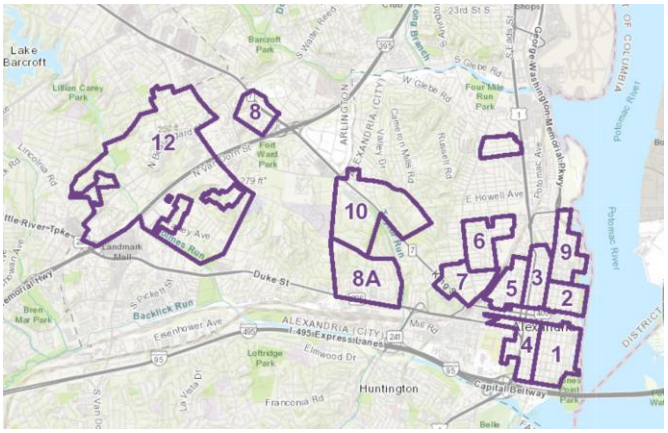
With a data-driven mobility approach, Alexandria is committed to sharing its data with local and regional stakeholders, while also making sure information is handled responsibly and securely.

Alexandria's Traffic Management Center (TMC) will be equipped to receive upgrades, allowing it to manage on-street traffic equipment, monitor overall system status, configure devices remotely, and analyze data.

To allow regional cooperation on mobility and safety, the City will participate in secure data exchanges with nearby jurisdictions, state agencies, and private companies.

For example, the City is working towards joining SharedStreets, a first-of-its-kind data-sharing and planning platform that allows cities to work with companies to manage streets, reduce traffic deaths, and prepare for the unprecedented technological advancement emerging in cities' transportation networks.

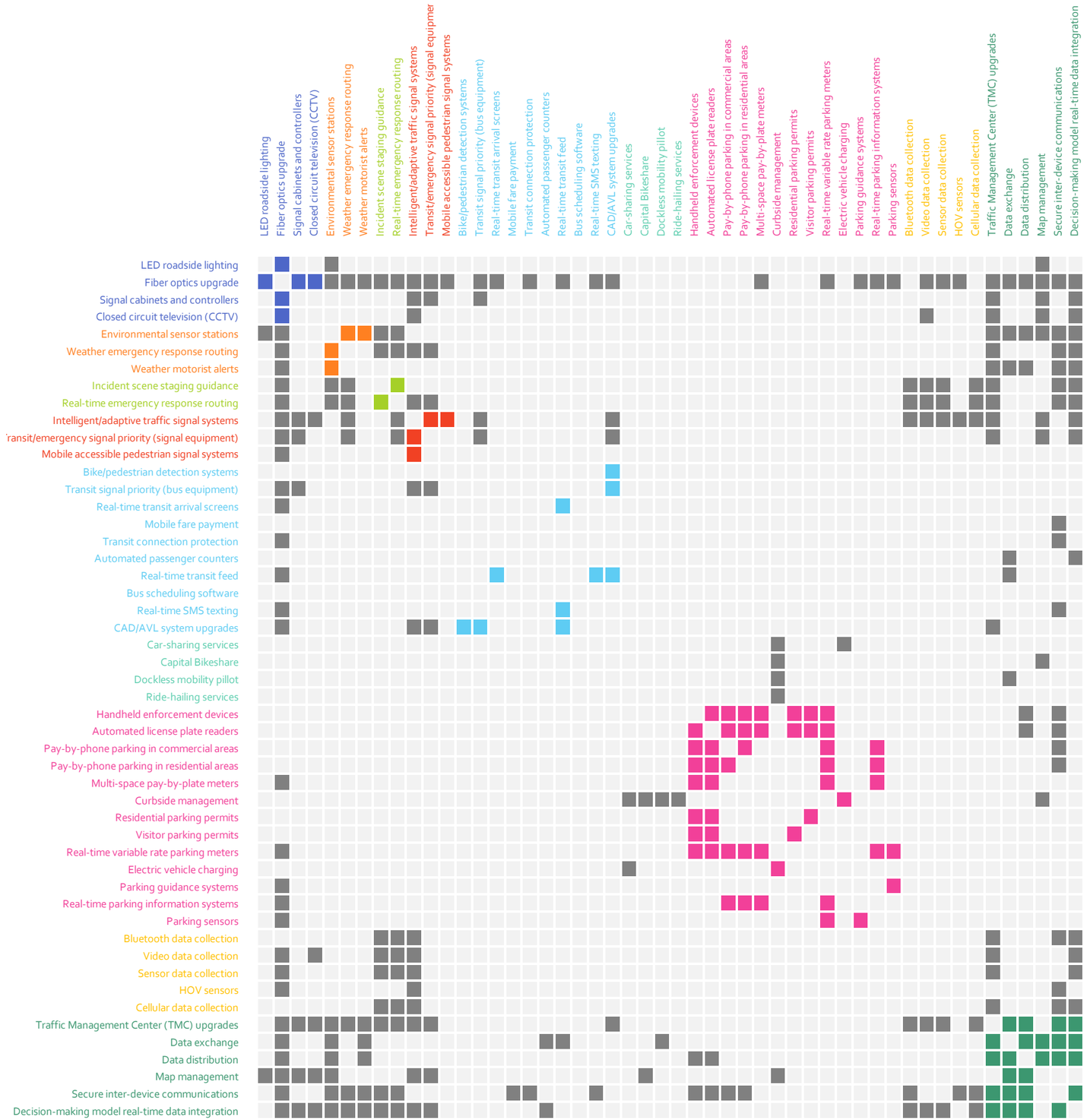
The City will expand the number of automated interactive maps available to staff and the public. Provides agencies and residents with access to easy to use searchable maps targeted to specific exploration and discover needs.



The City of Alexandria makes its geospatial data available for free in multiple ways thorough its GIS Open Data Portal. Using these existing methods for distributing geospatial data, the City will make new data sets available to staff and the public when possible.

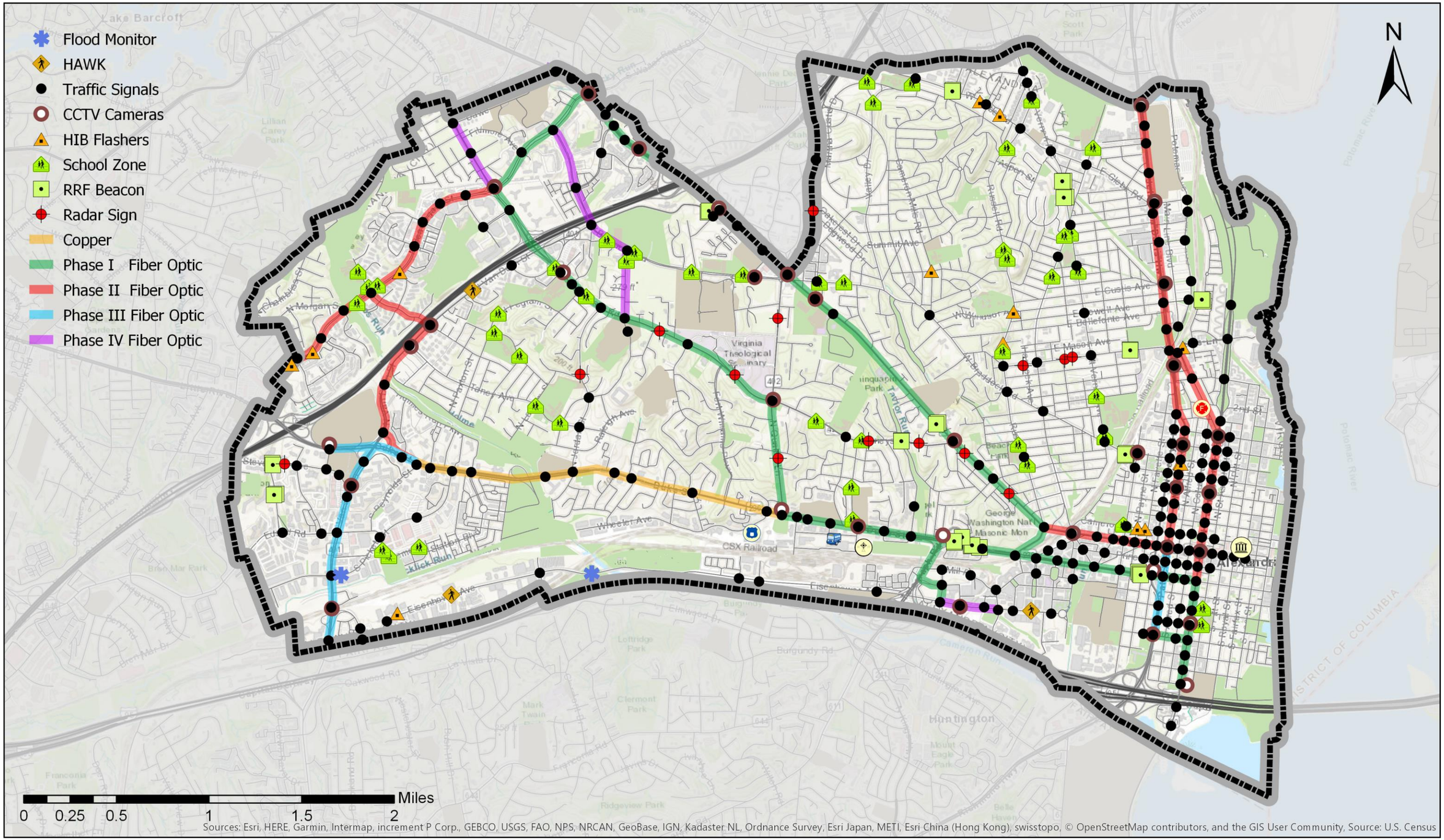
Program Synergies Diagram

The collection of programs included in the Smart Mobility Framework are a connected network, drawing from and strengthening one another. This diagram illustrates where these synergies exist.



Program Map

This map shows the location of selected Smart Mobility programs.



Program Progress Chart

This chart lists progress made on each of the [x] programs in the Smart Mobility Framework. For more details about individual programs, please visit [website].

Progress Key

- ●●●● Not started
- ●●●● Initiated
- ●●●● Moderate progress
- ●●●● Significant progress
- ●●●● Complete

	PROGRAM / ACTION	LEAD DEPARTMENT	FUNDING SOURCE	IMPLE-MENT YEAR	TIME FRAME	PROGRESS
	1. INFRASTRUCTURE					
1.1	Install LED roadside lighting	T&ES	-	-	Long	
1.2	Upgrade, expand fiber optics communications network	T&ES	CMAQ, SmartScale	2021	Short	
1.3	Upgrade traffic signal cabinets, controllers, and detection systems	T&ES	CIP	2019-20	Short	
1.4	Increase coverage of closed-circuit television (CCTV)	T&ES	-	2019	Short	
1.5	Expand Municipal Fiber/Broadband	ITS	CIP	2020-21	Medium	
	2. ROAD WEATHER					
2.1	Expand number of environmental sensor stations	T&ES, OEM, ITS	CIP	-	Short	
2.2	Integrate road weather data with emergency response routing support	ITS	-	-	Long	
2.3	Implement road weather motorist alerts	ITS	-	-	Long	
	3. PUBLIC SAFETY					
3.1	Implement incident scene staging guidance for emergency responders	OEM	-	-	Long	
3.2	Integrate real-time data with emergency response routing support	OEM	-	-	Long	
3.3	Install emergency vehicle preemption equipment on fleet vehicles	OEM, T&ES	-	2019	Medium	
	4. TRAFFIC SIGNALS					
4.1	Install intelligent/adaptive and traffic responsive traffic signal systems	ITS	SmartScale18	2019-24	Short	
4.2	Install transit and emergency signal priority equipment on signals	ITS, OEM	NVTA	2024	Medium	
4.3	Implement mobile accessible pedestrian signal systems	T&ES	-	-	Long	
	5. TRANSIT					
5.1	Install bike/pedestrian detection systems on buses	DASH	DRPT	2019-21	Medium	
5.2	Install transit signal priority equipment on buses	DASH, T&ES	SmartScale19	2024	Medium	
5.3	Install information displays at bus stops and key activity centers	DASH	DRPT, NVTA	2019	Short	
5.4	Implement mobile fare payment capability	DASH	RSTP	2021-22	Medium	
5.5	Automate collection of bus boarding and alighting data	DASH	RSTP, NVTA	2019	Short	
5.6	Upgrade to real-time transit feed from static feed	DASH, ITS, T&ES	RSTP, NVTA, City funds	2019	Short	
5.7	Update bus scheduling software	DASH	RSTP	2023	Medium	
5.8	Implement real-time SMS texting for bus arrivals	DASH	RSTP, NVTA	2019	Short	
5.9	Upgrade bus CAD/AVL systems, including Mobile CAD systems	DASH	NVTA	2019	Medium	
	6. MOBILITY ON DEMAND					
6.1	Continue existing car-sharing operations & consider expansion	T&ES	-	2019	-	
6.2	Continue, expand Capital Bikeshare program	T&ES	CMAQ	2019-25	Medium	
6.3	Begin dockless/shared mobility pilot program	T&ES	Permit fees	2018-19	Short	
6.4	Allow continued existing ride-hailing operations & consider curbside management policies	T&ES	RSTP	2021	Short	

	PROGRAM / ACTION	LEAD DEPARTMENT	FUNDING SOURCE	IMPLE-MENT YEAR	TIME FRAME	PROGRESS
	7. PARKING					
7.1	Continue and expand use of handheld enforcement devices	T&ES, APD	CMAQ, RSTP	2019-23	Short	
7.2	Continue and expand use of automated license plate readers	T&ES, APD	CIP, RSTP	2019-23	Short	
7.3	Continue pay-by-phone parking in commercial areas	T&ES	-	-	-	
7.4	Continue and expand pay-by-phone parking in residential areas	T&ES	N/A	2019	Short	
7.5	Continue and expand pay-by-plate parking at multi-space meters	T&ES	CIP	2023	Medium	
7.6	Establish curbside management policy	T&ES	RSTP	2021	Medium	
7.7	Streamline residential parking permit issuance	T&ES	CIP, RSTP	2020	Short	
7.8	Streamline visitor parking permit issuance	T&ES	CIP, RSTP	2020	Short	
7.9	Implement real-time variable rate parking meters	T&ES	RSTP	-	Medium	
7.10	Implement electric vehicle charging station management	DGS	-	-	Medium	
7.11	Install parking garage guidance systems	T&ES, APD	RSTP	-	Medium	
7.12	Implement near real-time parking information systems	T&ES	RSTP	-	Medium	
7.13	Install parking sensors	T&ES	RSTP	-	Medium	
	8. PERFORMANCE MONITORING					
8.1	Implement Bluetooth data collection	T&ES	-	-	Short	
8.2	Implement video data collection	T&ES	-	-	Short	
8.3	Implement sensor data collection	T&ES	-	2021-22	Short	
8.4	Implement HOV sensors	T&ES	-	-	Short	
8.5	Implement cellular data collection	T&ES	-	-	Short	
	9. INFORMATION MANAGEMENT					
9.1	Upgrade Traffic Management Center (TMC)	T&ES	-	2019-20	Short	
9.2	Facilitate data exchange	ITS	-	-	Short	
9.3	Facilitate data and alerts distribution	T&ES, ITS	-	-	Short	
9.4	Creation of automated Interactive Maps	ITS	-	-	Medium	
9.5	Facilitate secure inter-device communications	T&ES, ITS	-	-	Short	
9.6	Integrate real-time data into decision-making model	OEM	-	-	Long	

Agency Acronyms

APD Alexandria Police Department
DASH Driving Alexandria Safely Home (Alexandria Transit Company)
DGS Department of General Services
ITS Information Technology Services
OEM Office of Emergency Management
T&ES Transportation & Environmental Services

Funding Acronyms

CIP Capital Improvement Program
CMAQ Congestion Mitigation and Air Quality Improvement Program
DRPT Virginia Department of Rail and Public Transportation
NVTA Northern Virginia Transportation Authority
RSTP Regional Surface Transportation Program

Program Description Chart

This chart provides more detail about individual programs in the Framework, describing how they benefit residents and visitors and highlighting which Guiding Principles they address.

	PROGRAM / ACTION	DESCRIPTION	BENEFIT	GUIDING PRINCIPLES: Safety	Mobility	Forward-looking	Sustainability	Traffic Management	Transparency
	1. INFRASTRUCTURE								
1.1	Research LED roadside lighting	Uses environmental data and the presence of vehicles, bicycles, or pedestrians to alter roadside lighting levels, adjusting for adverse weather conditions	Allows for more efficient usage of lighting, increasing and decreasing brightness as needed	●		●	●		
1.2	Upgrade, expand fiber optics communications network	Links traffic signals, weather stations, and other devices with the Traffic Management Center (TMC), allowing real-time data analysis and decision-making; provides infrastructure required for Municipal Broadband	Provides dynamic communications backbone, allowing TMC to better understand travel patterns and congestion; provides infrastructure to pursue opportunities to increase consumer choice in cable, voice, and broadband services to provide consumer options and increased data speeds, as well as infrastructure for Municipal Broadband.	●	●	●		●	
1.3	Upgrade traffic signal cabinets, controllers, and detection systems	Provides mechanical support for more advanced signal infrastructure such as intelligent/adaptive traffic signal systems and transit/emergency vehicle signal priority systems	Enables more advanced signal operations, including for transit and emergency vehicles	●	●	●		●	
1.4	Increase coverage of closed-circuit television (CCTV)	Provides real time traffic condition information for operational decision-making and traveler information; may be accessed by emergency services for improved situational awareness and response	Delivers contextual, useful travel information to transportation and safety officials	●	●	●		●	
1.5	Expand Municipal Fiber/Broadband	Expanding Municipal Broadband across the City to supports voice, video, and data transport among the City's public institutions, including schools, libraries, public safety buildings, and other City facilities.	Allows for reliable and cost-effective voice, video, and data transport among the City's public institutions			●			●
	2. ROAD WEATHER								
2.1	Expand network of weather sensor stations	Fixed roadway location with one or more sensors measuring atmospheric, pavement/soil, and/or water level conditions	Allows decision makers to understand and analyze problem areas for flooding and other weather concerns, enables real time alerts to motorists and residents	●	●	●			
2.2	Integrate road weather data with emergency response routing support	Uses environmental data from sensors to produce warnings or advisories for emergency response vehicles or dispatchers	Allows emergency responders to track road weather conditions in real time, allowing routing changes if necessary	●		●			
2.3	Implement road weather motorist alerts	Uses road weather data from sensors to produce warnings or advisories for individual motorists	Allows motorists to track road weather conditions in real time, allowing routing changes if necessary	●	●	●		●	
	3. PUBLIC SAFETY								
3.1	Implement incident scene staging guidance for emergency responders	Provides situational awareness and coordination among emergency responders at all points of dispatch, travel, arrival, and departure from incident scenes	Allows real-time communication among emergency responders to coordinate more efficient staging and travel to incident sites	●		●		●	
3.2	Integrate real-time data with emergency response routing support	Integrate existing emergency vehicle Computer Aided Dispatch (CAD) and routing decision software with real-time data to improve reliability and on-scene arrival times	Allows emergency responders to determine routes to incident sites using real-time information	●		●		●	
3.3	Install emergency vehicle preemption equipment on fleet vehicles	Uses emergency vehicle to infrastructure communications to allow an emergency vehicle to request preemption at intersections	Allows emergency vehicles to change traffic signal while responding to an emergency call, improving response times.	●		●		●	
	4. TRAFFIC SIGNALS								
4.1	Install intelligent/adaptive and traffic responsive traffic signal systems	Uses location and movement information from near-real time data to improve traffic signal control system operations	Enables more efficient signal operations; Allow real-time adjustments to signals along major traffic corridors	●		●		●	
4.2	Install transit and emergency signal priority equipment on signals	Signals allows transit and emergency vehicles to request priority/preemption at intersections	Enables more efficient movement of transit and emergency vehicles	●	●	●	●	●	
4.3	Research mobile accessible pedestrian signal systems	Uses GPS and other technologies to help people with limited or no eyesight cross signalized intersections safely	Increases mobility and accessibility to people with limited or no eyesight	●	●	●			
	5. TRANSIT								
5.1	Install bike/pedestrian detection systems on buses	Uses smart sensors to provide real-time visual and audible alerts when pedestrians or cyclists are in bus blind spots	Reduces the risk of bus collisions with bicycles or pedestrians	●		●			
5.2	Install transit signal priority equipment on buses	Uses transit vehicle to infrastructure communications to allow a transit vehicle to request priority at intersections	Allows transit vehicles to bypass congestion and offer more reliable service		●	●	●	●	
5.3	Install information displays at bus stops and key activity centers	Electronic screens display real-time arrival countdowns of nearby transit lines	Allows riders to plan and choose a travel mode quickly and on the spot		●	●	●		●
5.4	Implement mobile fare payment capability	Allows users to pay and validate simultaneously using a bank card or mobile device for trips on multiple modes	Removes barrier to transit usage by letting users pay with a bank card or mobile device		●	●	●		
5.5	Automate collection of bus boarding and alighting data	Near-real time collection of transit boarding and alighting data	Gives transit planners better information about route usage or crowding, allowing service adjustments to meet demand		●	●	●	●	●
5.6	Upgrade to real-time transit feed from static feed	Allows real time updates of transit vehicles' location data, which can be disseminated to customers via third party apps	Allows transit riders to see exactly where their bus is and when it will arrive, improving the accuracy and less uncertainty while traveling by transit		●	●	●	●	●
5.7	Update bus scheduling software	Upgrades bus scheduling software to a more dynamic, capable program than the current one	Allows transit planners to more efficiently plan and service bus routes		●	●	●	●	
5.8	Implement real-time SMS texting for bus arrivals	Allows transit riders to send a text from a transit stop to learn when the next bus will arrive	Provides transit riders without smartphones the ability to receive real-time transit arrival information		●	●	●		
5.9	Upgrade bus CAD/AVL systems, including Mobile CAD system	Performs bus vehicle diagnostics through upgrades to existing Computer Aided Dispatch (CAD) and Automated Vehicle Location (AVL) systems on buses	Allows more efficient predictive and preventative maintenance of bus fleet	●	●	●	●		●
	6. MOBILITY ON DEMAND								
6.1	Continue existing car-sharing operations and consider expansion	Allows users to rent cars by the hour or day with self-service reservation, pickup, and return	Provides an automobile option for people who do not own or wish to use a personal vehicle, provides last-mile solution		●		●	●	
6.2	Continue, expand Capital Bikeshare program	Allows users to borrow a bike from a dock and return it to another dock within the system	Allows one-way trips on shared bicycles, provides last-mile solution		●		●	●	
6.3	Begin dockless/shared mobility pilot program	Allows users to borrow a bike or scooter by unlocking it via smartphone app and returning it anywhere within the provider's service area (i.e. not in a dock)	Allows one-way trips on shared bicycles or scooters with more origin/destination flexibility than docked systems, provides last-mile solution		●	●	●	●	
6.4	Allow continued existing ride-hailing operations and consider curbside management policies	Allow users to request a ride via smartphone app, computer, or phone	Provides an automobile option for people who do not own or wish to use a personal vehicle, provides last-mile solution		●		●	●	

	PROGRAM / ACTION	DESCRIPTION	BENEFIT	GUIDING PRINCIPLES: Safety	Mobility	Forward-looking	Sustainability	Traffic Management	Transparency
Ⓟ	**7. PARKING**								
7.1	Continue use of handheld enforcement devices	Allows parking enforcement officers to streamline ticketing, manage citations, and improve enforcement	Allows more effective enforcement of parking regulations	●		●			●
7.2	Continue use of automated license plate readers	Allows parking enforcement officers to streamline ticketing, manage citations via autonomous vehicle mounted units, and improve enforcement; used by APD to capture and analyze license plates against known databases for enforcement	Allows more effective enforcement of parking regulations; used by APD for public safety	●		●			●
7.3	Continue pay-by-phone parking in commercial areas	Allows users to pay for parking using a mobile device	Provides ease and flexibility in parking payment		●	●		●	●
7.4	Continue pay-by-phone parking in residential areas	Allows users to pay for parking in residential areas using a mobile device	Provides ease and flexibility in parking payment		●	●		●	●
7.5	Continue and expand pay-by-plate parking at multi-space meters	Allows users to pay for parking by entering their license plate number into a ticket machine	Provides ease and flexibility in parking payment		●	●		●	●
7.6	Establish curbside management policy	Determination of how curbside space is used, whether by vehicle parking, rideshare pick-up and drop-off areas, loading/unloading, bicycle parking, open space (parklet) or other uses	Allows more orderly functioning of curbside space by reducing conflicts among pedestrians, cyclists, and motorists	●	●	●		●	
7.7	Streamline residential parking permit issuance	Online process to register and produce virtual residential parking permits	Provides ease and flexibility in obtaining visitor parking permits		●	●			●
7.8	Streamline visitor parking permit issuance	Online process to register and produce residential visitor parking permits	Provides ease and flexibility in obtaining residential parking permits		●	●			●
7.9	Implement real-time variable rate parking meters	Parking meters that respond to demand by adjusting rates	Reduces the need for vehicles to circle looking for parking by dynamically adjusting prices based on demand, ensuring a certain proportion of spaces are always vacant		●	●		●	●
7.10	Implement electric vehicle charging station management	Provides an exchange of information between vehicle and charging station to manage the charging operation	Helps ensure effective electric vehicle charging		●	●	●	●	
7.11	Install parking garage guidance systems	Monitors individual parking spaces and overall parking facility capacity, directing users via digital signage	Helps motorists determine whether a garage has open spaces before entering it		●	●		●	●
7.12	Implement near real-time parking information systems	Provides users with real-time location, availability, type (e.g., street or garage), and price of parking	Helps motorists find available parking more quickly, reducing the Vehicle Miles Travelled (VMT)		●	●	●	●	●
7.13	Install parking sensors	Uses smart sensors and intelligent software to optimize use of urban parking facilities and eliminate congestion caused by motorists searching for parking	Helps motorists find parking more quickly		●	●		●	●
	8. PERFORMANCE MONITORING								
8.1	Expand Bluetooth data collection	Uses traffic sensors to collect data from passing devices to aid understanding of congestion, travel times, and delay	Delivers contextual, useful travel information to transportation officials; used to better understand travel patterns in the City		●	●			●
8.2	Implement video data collection	Uses video to collect and classify data to aid understanding of transportation networks	Delivers contextual, useful travel information to transportation officials; used to better understand travel patterns in the City		●	●			●
8.3	Implement sensor data collection	Uses sensors to collect and classify data to aid understanding of transportation networks	Delivers contextual, useful travel information to transportation officials; used to better understand travel patterns in the City		●	●			●
8.4	Implement HOV sensors	Automates identification and processing of vehicles in HOV/HOT lanes that violate occupancy limits	Delivers contextual, useful travel information to transportation officials; used to better understand travel patterns in the City		●	●			●
8.5	Implement cellular data collection	Uses cellular networks to collect data from passing devices to aid understanding of travel times and congestion	Delivers contextual, useful travel information to transportation officials; used to better understand travel patterns in the City		●	●			●
ⓘ	**9. INFORMATION MANAGEMENT**								
9.1	Upgrade Traffic Management Center (TMC)	Allows TMC to manage on-street traffic equipment, monitor overall system status, configure devices remotely, and analyze and sharing of data	Allows transportation officials to better manage traffic flow		●	●		●	●
9.2	Facilitate and automate data exchange	Facilitates exchange of information between jurisdictions	Allows decisions to be made based on regional transportation needs and patterns		●	●			●
9.3	Facilitate and automate data distribution	Manages distribution of data to City agencies, residents, and stakeholders and protects data from unauthorized access	Provides open, transparent access to data for use and examination by stakeholders in the City			●			●
9.4	Creation and automation of Interactive Maps	Provides access to data for examination and analysis via interactive dynamic maps	Provides agencies and residents with access to easy to use searchable maps targeted to specific exploration and discover needs		●	●			●
9.5	Facilitate secure inter-device communications	Facilitates trusted communications between mobile devices and other mobile devices or roadside devices and protects data from unauthorized access	Ensures data transmitted over mobile devices is protected and secure			●			●
9.6	Integrate real-time data into decision-making model	Automated decision making, automated information dissemination to the City and the public, and the ability to aggregate information about individual incidents to inform decisions	Allows better understanding of incident patterns, enabling more contextual, informed decisions	●		●		●	●