



Smart City Challenge Demonstration
Cooperative Agreement DTFH6116H00013
– Replacement Budget Application dated
June 27, 2019 (Revised August 27, 2019)



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U.S. Department of Transportation Cooperative Agreement Award Number DTFH6116H00013

Replacement Budget

June 27, 2019

1.0 Summary

After passing our three year mark of winning the Smart City Challenge (SCC) grant, the Smart Columbus Program Management Office took the opportunity to strategically review each of the eight (8) projects proposed in the original Smart Columbus application that was submitted to the USDOT. The project review included our enterprise-wide project management team including departments and organizations involved with the projects. Each project was evaluated in the context of four criteria: 1) USDOT expected outcomes; 2) stated city outcomes; 3) stakeholder feedback; and 4) end user needs.

As we have continued to work through Year 3, the program has continued to evolve.

2.0 Smart Columbus Program

2.1 Strategic Framework

While the definition of a “smart city” varies, the USDOT SCC specifically asked applicants how they would use emerging transportation technologies to address their most pressing problems and envision bold new solutions that could change the face of transportation by meeting the needs of residents of all ages and abilities; and bridging the digital divide; so that everyone, not just the tech-savvy, can be connected to everything their city has to offer. As the fourteenth largest city in the country, Columbus is experiencing challenges such as traffic congestion, crashes, infant mortality, poverty and unemployment; challenges not uncommon to urban cities, that are worth trying to solve. Columbus believes equitable access to transportation is an integral piece to solving these complex issues. Moreover, as the fastest growing city in the Midwest, Columbus must plan for and implement ITS solutions that allow for the efficient and effective flow of people and goods throughout the city to remain competitive. Solving for urban challenges and creating a Smart City are integral to Columbus’s future as a thriving city. The City of Columbus’ guiding smart city principle is that mobility is the great equalizer of the twenty-first century. More specifically, equitable access to transportation is the key to opening opportunities such as access to jobs, healthcare and services. Columbus plans to use transportation, powered by holistic solutions and integrated, open-source data, to give its residents access to opportunities that empower them. This could be access to healthcare providers, jobs, school, job training or other destinations. We are attempting to shift the paradigm on transportation to ensure all residents can traverse the city in a safe and efficient manner of their choice.

Smart Columbus will demonstrate how advanced technologies can be integrated into other operational areas within the city, utilizing advancements in ITS, CV, AV, electric vehicles (EV) to meet these challenges, while integrating data from various sectors and sources to simultaneously power these technologies while leveraging the new information they provide. Community and customer engagement will be present throughout the program, driving the requirements and outcomes for each project. This end-user engagement reinforces the idea that the residents of Columbus are ultimately the owner and co-creator of the Smart Columbus program.

2.1.1 Vision

Smart Columbus' vision is:

To empower our residents to live their best lives through responsive, innovative and safe mobility solutions.

2.1.2 Mission

Smart Columbus' mission is:

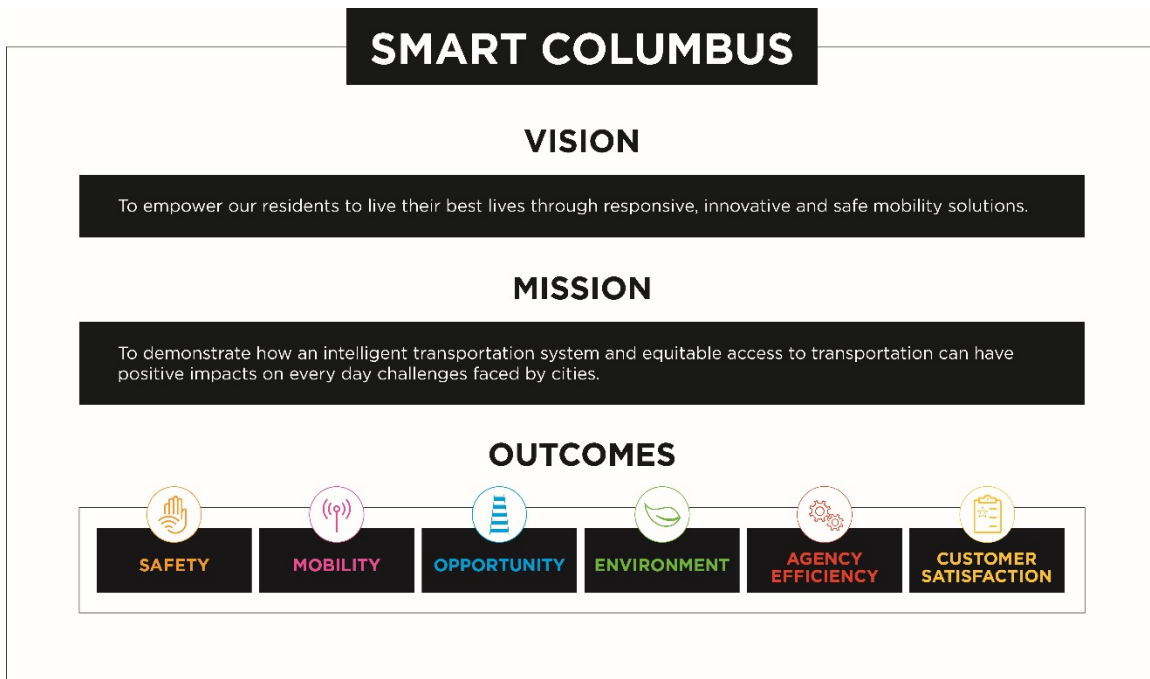
To demonstrate how an ITS and equitable access to transportation can have positive impacts on every day challenges faced by cities.

2.1.3 Outcomes

Outcomes of the Smart Columbus Program include:

- Improve Safety: Columbus wants to create safer streets where vehicles, cyclists and pedestrians are less likely to be involved in accidents.
- Enhance Mobility: Columbus wants to make traversing the city and parking as efficient and convenient as possible.
- Enhance Access to Opportunities & Services: Columbus wants to make multimodal transportation options and the ability to access them equitably available to all residents, especially those who need access to opportunity.
- Reduce Environmental Impact: Columbus wants to reduce the negative impact transportation has on the environment through becoming more efficient and embracing multimodal options.
- Agency Efficiency: Columbus wants to provide tools and access to the data generated by the projects to improve operations and efficiency of the city services.
- Customer Satisfaction: Columbus wants to provide resources and information to the citizens to increase their satisfaction with city services through the use and application of technology.

Figure 1 shows the Smart Columbus vision, mission, and outcomes.



Source: City of Columbus, January 2018

Figure 1. Smart Columbus Vision

2.2 Program Overview

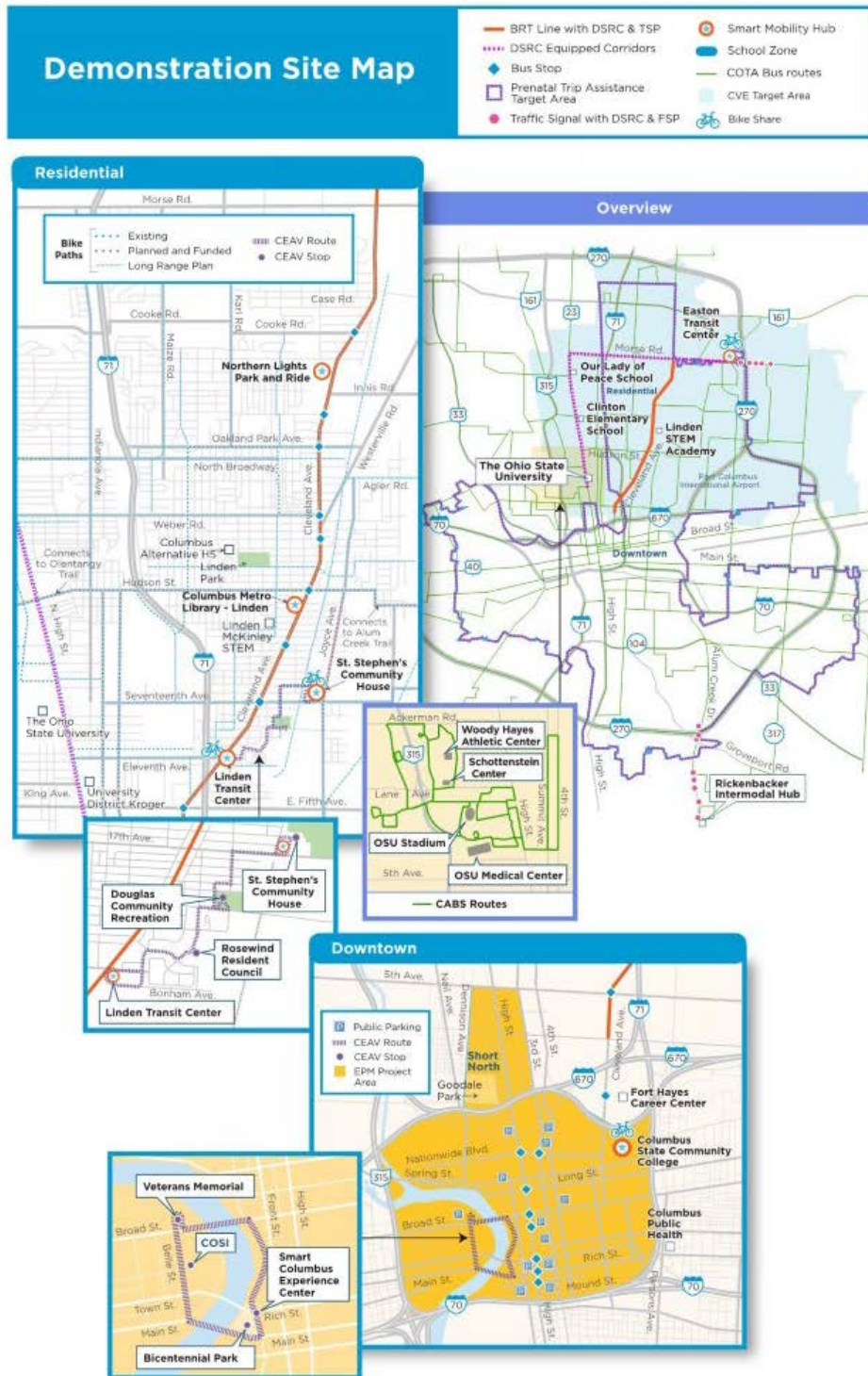
2.2.1 City Challenges

Smart Columbus will demonstrate effective implementation of a comprehensive portfolio of connected technologies that solve focused, relatable city issues and enhance mobility across the region. The challenges the city seeks to solve were selected based on the opportunity to provide a unique problem-solving proving ground which creates a foundation of nationwide scalability. A few of the representative challenges include:

1. *A lack of access to transportation options:* many residents in the city are transit-reliant yet planning and completing a trip to access employment and services can be challenging, particularly for parents with young children, seniors and travelers with disabilities. In particular, Linden is a high-opportunity Columbus neighborhood for some of the Smart Columbus projects, due to its numerous socio-economic challenges, including low household income, lack of major employers and high infant mortality rates.
2. *Reduced mobility and lack of first mile-last mile (FMLM) transportation options:* despite having areas of high-traffic retail and jobs, some areas of Columbus are accessed primarily by light-duty vehicles and some bus service operating along the fringes of the area. While these areas offer a major source of employment, the jobs are typically low paying and have a

- high rate of turnover. Research has demonstrated that a major contributor to the instability in these types of jobs is the lack of reliable transportation as well as FMLM challenges. Non-vehicle mobility solutions can assist in solving these challenges, improving mobility yet reducing emissions and their sources through a reduction in single occupancy vehicles and/or enhanced existing transit service.
3. *Lack of parking availability and information:* although downtown Columbus is a regional economic anchor and growing urban core, one challenge to continued growth and development of Downtown is the lack of parking availability. The commercial office vacancy rate for all classes of space is 12 percent. Commercial real estate brokers report that they cannot lease office space because prospective tenants cannot find parking for employees. Hotels and other service industries report high staff turnover because of the cost of parking. Major employers report an inability to add jobs downtown. Visitors for events and guests of everyday business activity report regular frustration with finding parking. Experience Columbus, the convention and visitors' bureau for greater Columbus, receives feedback from visitors as well as meeting and travel planners that parking, especially during large events and conventions, negatively impacts the visitor experience in Columbus.
 4. *Freight-induced congestion and queuing:* with Columbus the 10th most active logistics hub in America, there are significant challenges at the south end of the city where distribution centers have been established in proximity to Rickenbacker International Airport. One significant access road where truck volume and freight-induced congestion routinely occurs is along Alum Creek Drive on the south side of Rickenbacker Logistics Park.

An overview of the deployment area is shown in Figure 2. While some projects will be deployed within specific areas of the city, many projects will be deployed citywide and be designed in an integrated manner with the Smart Columbus Operating System (the Operating System) being the integral backbone and heart of all current and future smart city projects.



Source: City of Columbus, April 2019

Figure 2. Smart Columbus Deployment Map

The seven other Smart Columbus projects are grouped into three overarching themes: Enabling Technologies, Enhanced Human Services and Emerging Technologies.

- **Enabling Technologies:** These technologies leverage today's foundation in new and innovative ways to greatly enhance the safety and mobility of the transportation infrastructure. These advanced technologies empower deployments that increase our capabilities because of rich data streams and infrastructure that are designed to handle on-demand responses. The connected vehicle environment (CVE) is an enabling technology that will improve safety by leveraging cutting edge technology to advance the sustainable movement of people and goods.
- **Enhanced Human Services (EHS):** These services encompass meeting human needs through the application of technology that focuses on prevention as well as remediation of problems, and maintain a commitment to improving the overall quality of life of users of the technology-based solutions. Opportunity will be created as a result of the EHS projects that improve access to jobs, healthcare and events.
- **Emerging Technologies:** New technologies that are currently developing or will be developed over the next five to ten years will substantially alter the business and social environment. By focusing on key Emerging Technologies, the city will be able to exhibit potential solutions to address and mitigate future transportation and data collection challenges.

The method of themes demonstrates an integrated and holistic approach to delivering the Smart Columbus program.

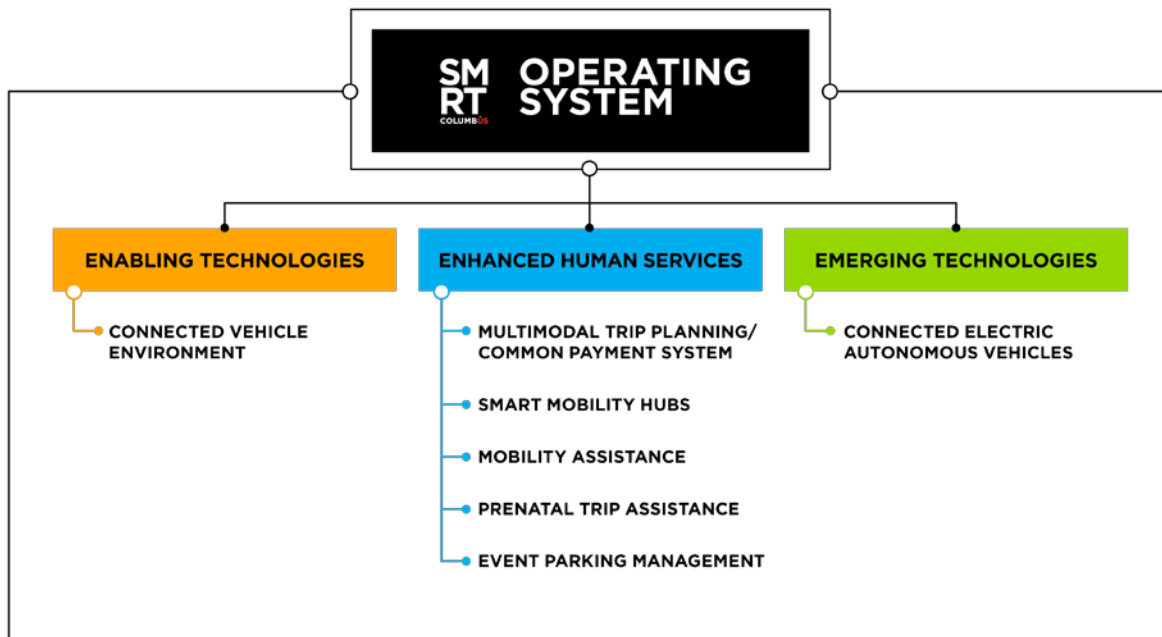
2.2.2 Project Descriptions

Figure 3 summarizes the Operating System and portfolio of USDOT projects. It depicts the criticality of the Operating System tying in these three themes, as well as their supporting projects, together. It also indicates the documentation and management of the overall program, anchored by the tools and documentation used in coordination and cooperation between the city and USDOT.

2.2.2.1 Smart Columbus Operating System

The Operating System is envisioned as a web-based, dynamic, governed data delivery platform built on a federated architecture that is at the heart of the Smart Columbus system. It will ingest and disseminate data while providing access to data services from multiple sources and tenants, including the planned Smart Columbus technologies, traditional transportation data and data from other community partners, such as food pantries and medical services. The Operating System will embody open-data, best-of-breed technologies including open-source and commercial off-the-shelf concepts that enable better decision-making and problem solving for all users. It will support a replicable, extensible, sustainable data delivery platform. The Operating System will be the source for performance metrics for program monitoring and evaluation; serve the needs of public agencies, researchers and entrepreneurs; and assist health, human services organizations and other agencies in providing more effective services to their clients. The Operating System will be scalable and demonstrate the potential for serving city and private

sector needs well beyond the life of the SCC Award period.



Source: City of Columbus, April 2019

Figure 3. Smart Columbus Framework

2.2.2.2 Enabling Technologies

2.2.2.2.1 Connected Vehicle Environment

There are corridors and intersections in Columbus that have high crash numbers with vehicles, bicyclists and pedestrians. In addition, there are several corridors that are congested that result in poor mobility conditions for emergency vehicles, freight and transit buses. The CVE corridors were selected based on regional crash data, enhanced transit services, recent infrastructure investments and relationship to other projects. For example, the CVE corridors have 17 intersections in the top 100 regional high-crash intersections.

The anticipated outcomes of the CVE project are to enhance safety and mobility throughout the city's transportation system utilizing CV technologies and applications with an emphasis on congested and high crash intersections and corridors. Safety applications are intended to be installed on multiple vehicle types including transit buses, first responder vehicles, city and partner fleet vehicles and private vehicles. Applications will be deployed to ensure emergency vehicles and the Central Ohio Transit Agency (COTA) Bus Rapid Transit (BRT) fleet can utilize signal prioritization when needed to ensure safety and efficiency. While the CV applications the

city plans to deploy will be identified as part of the planning phase of the systems engineering process, examples of strategies include:

- Enhanced emergency vehicle pre-emption that reduces delays at signalized intersections for emergency vehicles responding to incidents and other emergencies
- Transit signal priority that reduces delays at signalized intersections for transit vehicles helping to improve transit operations
- Red-light safety applications for improved safety of pedestrians and drivers of vehicles at signalized intersections
- School zone warnings that increase school zone visibility and alert drivers of posted speeds, helping to improve safety

The Performance Measurement Plan establishes the measures and methods through which the goals and objectives of the CVE project will be evaluated to determine the project's effectiveness of meeting the Smart Columbus vision and mission. The City of Columbus has identified the following preliminary objectives to evaluate the measurable impact the CVE project is intended to provide:

- Reduce emergency response times
- Improve motorist's adherence to red lights
- Improve adherence to speed limits in school zones
- Improve reliability of transit vehicle schedule adherence
- Reduce truck wait (delay) time at signalized intersection

2.2.2.3 Enhanced Human Services

2.2.2.3.1 Multimodal Trip Planning Application/Common Payment System (MMTPA/CPS)

Columbus residents and visitors do not have access to a system that allows for the seamless planning of or paying for a trip involving multiple transportation service providers and parking providers. Moreover, some Columbus residents are unbanked and therefore cannot access alternative modes of transportation including car and bike sharing systems. The multimodal trip planning application (MMTPA) will make multimodal options easily accessible to all by providing a robust set of transit and alternative transportation options including routes, schedules and dispatching possibilities. The application will allow travelers to request and view multiple trip itineraries and make reservations for shared-use transportation options such as bikeshare, transportation network companies (TNC) and carshare. Using the multimodal trip planning application, users will be able to compare travel options across modes, plan and pay for their travel based upon current traffic conditions and availability of services. Payment for transportation service providers and parking providers will be processed through a Common Payment System (CPS) that may be the first of its kind in the United States. It is the city's goal that this application will allow residents to more easily access the transportation systems available in Columbus today and in the future, so they can maximize services to live their best

lives. This project is anticipated to provide an innovative solution to improve mobility and access to opportunity. The City of Columbus identified the following objectives to evaluate the measurable impact the MMTPA/CPS project is intended to have:

- Provide a single point of access to multimodal trip planning information to plan, book, and pay for a multimodal trip.
- Increase access to jobs and services
- Improve customer satisfaction

2.2.2.3.2 Mobility Assistance for People with Cognitive Disabilities

Mobility assistance is needed to provide more independence to residents with cognitive disabilities. Persons with cognitive disabilities who wish to independently use public transit services in Columbus must either qualify for special paratransit services in accordance with federal law, or they must be sufficiently independent such that they are able to safely use fixed route bus service without assistance. The city's goal is to develop and deploy an application that would allow this population to independently traverse the city via COTA's fixed bus route system. The mobile application will be a highly-accurate, turn-by-turn navigator designed to be sufficiently intuitive such that older adults and groups with disabilities including the cognitively and visually disabled can travel independently.

This project provides an opportunity for users to empower themselves and gain mobility independence and not rely upon caregivers or COTA paratransit system for transportation. The City of Columbus identified the following objectives to evaluate the measurable impact the mobility assistance project is intended to provide:

- Improve access and use of COTA fixed route bus service for MAPCD participants
- Improve independence of travelers with cognitive disabilities by using fixed route bus service
- Reduce COTA expenditures

2.2.2.3.3 Prenatal Trip Assistance

Columbus has one of the highest infant mortality rates in the country, which is partially caused by expectant mothers not getting necessary prenatal healthcare. The existing Non-Emergency Medical Transportation (NEMT) system does not always provide reliable round-trip transportation. Linden residents have challenges accessing healthcare services due to the current NEMT model and technologies. It is the city's goal to work with Franklin County and Celebrate One to develop a means for bridging the gap among healthcare providers, expectant mothers and NEMT services that are paid for through the Medicaid system.

This project will be further vetted with key stakeholders to identify goals and measurable objectives. A driving force for deployment of this project is the need to provide a more streamlined and efficient NEMT system to improve mobility and satisfaction for users.

The City of Columbus identified the following objectives to evaluate the measurable impact that the PTA project is intended to provide:

- Examine pregnant women's improved access to NEMT trip in those assigned to PTA project compared to those assigned to usual transportation services.
- Increase usage of the NEMT benefits
- Improve customer satisfaction

2.2.2.3.4 Smart Mobility Hubs (SMH)

Currently, there are no enhanced mobility or multimodal transit features to alleviate FMLM challenges in the Linden area or along the Cleveland Ave corridor. Columbus is working to make mobility a great equalizer in part by embracing multi-modal transportation and making it as accessible and easy to use as possible. Our vision is to transform some COTA bus stops along the BRT CMAX corridor and transit centers into smart mobility hubs, where someone getting on or off the bus can easily access the next leg of their trip. Public Wi-Fi will be a key enabler for the hub and its points of connection (Wi-Fi is also present in COTA's stations, CMAX, and buses). The city plans to outfit the hubs with kiosks to assist in travel planning and expanded transportation options via other modes, such as bike and car-sharing. The smart mobility hubs will be linked with COTA systems to provide transit information with real-time arrival and departure times to the passengers waiting at the hubs. This project will also interface with the Connected Electric Autonomous Vehicle project by incorporating two (2) hubs into the vehicles' route.

This project provides an opportunity for residents and visitors to access multiple modes of travel to solve FMLM challenges. The City of Columbus identified the following objectives to evaluate the measurable impact the SMH project is intended to provide:

- Improve physical access to multimodal trip planning and payment options
- Improve customer satisfaction of SMH Users

2.2.2.3.5 Event Parking Management (EPM)

The City of Columbus lacks an integrated system for residents and visitors to easily and efficiently view available parking spaces at parking garages, surface lots and parking meters; especially at large events. Non-direct routing of travelers causes congestion and inefficiency in the transportation network. It is the city's goal to integrate parking information from multiple providers into a single availability and reservation services solution. This will allow travelers to plan and search for parking options at certain locations to reserve and book a parking space with the CPS. More direct routing of travelers during large events is expected to reduce congestion during those times. The City of Columbus identified the following objectives to measure the impact the EPM is expected to provide:

- Reduce parking related congestion
- Reduce vehicle emissions
- Increase knowledge of available parking

2.2.2.4 Emerging Technologies

2.2.2.4.1 Connected Electric Autonomous Vehicles (CEAV)

The use of connected and autonomous shuttles has been widely proposed as a solution to the first mile, last mile problem. Therefore, this project will address, investigate and develop solutions to the social and technical challenges associated with the use of connected and autonomous electric vehicle technology for safer and more efficient access to jobs in a smart city. Social challenges are how to gradually introduce an expand such a solution for best results, how to develop and improve user acceptance and user benefits, how to integrate with the rest of the transportation network for improving mobility and how to increase the user perception of safety and reliability. The technical challenges that will be focused on in this project are: 1) determination of penetration rates for improved mobility, 2) mixed traffic problems at higher speed urban roads, 3) autonomous shuttles right of way problems at intersections, 4) pedestrian and bicyclist safety, 5) all weather operation of autonomous shuttles, 6) latency and high network traffic problems in connectivity through V2X to other road users and infrastructure and to the data management hub, 7) handling uncertainty due to unpredictable operation of non-autonomous vehicles, other road users and environmental conditions.

Although the above technical challenges will be addressed, the most important technical problem blocking the deployment of connected autonomous shuttles in a smart city to enhance mobility is that no certification, testing and rating system for safe pre- deployment evaluation methods for these shuttles exists, forcing city officials and shuttle developers to rely on public road testing for the determination and solution of technical challenges like the ones above. This project will introduce and develop holistic modeling and simulation tools that will enable a priori determination and solution of connected and autonomous mobility technical challenges including the actual route and other vehicles and mobility improvements. This will be followed by proof-of-concept work and pilot deployments to demonstrate that connected and autonomous mobility can be used to improve the first mile, last mile access to jobs in a smart city.

The CEAV project will be deployed in the Linden area, connecting major community centers. The selected route will help alleviate FMLM challenges as it connects to the COTA bus line on the Cleveland Ave corridor and to two of the Smart Mobility Hubs. As an opportunity neighborhood, it is the city's hope that this possible solution will increase the mobility options and opportunities normally hindered by transportation to the Linden residents.

The CEAV project will be conducted with partners from the Ohio Department of Transportation (ODOT), The Ohio State University (OSU), Central Ohio Transit Authority (COTA) and The Columbus Partnership to plan, implement and evaluate the deployment of autonomous vehicles in the City. Working with these partners allows for the generation of various use cases, which will result in the deployment of CEAVs in various settings including a university and corporate campuses. These entities would jointly issue a request for proposals for CEAVs in various settings aimed at solving various community transit challenges. Partnering with our private, academic and public-sector partners presents the best opportunity to mitigate deployment risks and ensure successful deployment. Additionally, it presents the best opportunity for community learning and addressing challenges faced by those seeking to deploy autonomous technology. Including those related to safety, interoperability and user acceptance.



This project provides an opportunity for residents and visitors to access cutting edge mobility technologies to solve FMLM challenges. The City of Columbus is in the process of finalizing specific objectives to be evaluated in terms of measuring the impact of the CEAV project; however, the project identified the following preliminary objectives:

- Provide convenient, reliable FMLM transit option.
- Provide more access to jobs and services to residents from underserved communities.
- Improve the User experience

The budget included with this submittal has been prepared to reflect this program structure. Additionally, the City has estimated that the program will extend into Year 5 by nine (9) months. The schedule submitted with this budget has assumed this extension.



3.0 Budget

Budget - Agreement Year 1 (August 31, 2016 through August 30, 2017)

	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	TOTAL
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Direct Labor

Title	Name	Hours	Year 1 Rate	Total	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	TOTAL	
Deputy Director/Program Manager	Mandy K. Bishop	161	\$67.40	\$ 10,873	\$ 10,873					
Program Manager	Aparna Dial	515	\$60.10	\$ 30,930	\$ 30,930					
Engineer IV/Project Manager	Ryan Bollo	1311	\$49.50	\$ 64,881	\$ 64,881					
Assistant Director/Deputy Program Mgr.	Randy Bowman	1067	\$58.56	\$ 62,509	\$ 62,509					
Assistant Director/Communications (Interim)	Brandi Braun	637	\$50.00	\$ 31,869	\$ 31,869					
Fiscal Assistant I	Abbie L. Green	431	\$22.27	\$ 9,592	\$ 9,592					
Management Analyst II	Kevin McSweeney	326	\$40.72	\$ 13,281	\$ 13,281					
Communications Project Manager	Jeff Ortega	235	\$47.29	\$ 11,091	\$ 11,091					
Student Intern	Kevin Retta	703	\$13.50	\$ 9,489	\$ 9,489					
Student Intern	Sonja Summer	775	\$13.50	\$ 10,469	\$ 10,469					
Management Analyst I	Brandi A. Vance	458	\$23.50	\$ 10,764	\$ 10,764					
Engineer IV / Project Manager	Andrew Wolpert	1006	\$45.00	\$ 45,253	\$ 45,253					
Total Direct Labor =					\$ 311,000	\$ 311,000	\$ -	\$ -	\$ -	\$ 311,000

Indirect Costs

Fringe Applied to Direct Labor (18.9%)	\$ 58,779	\$ 58,779	\$ -	\$ -	\$ -	\$ 58,779
Insurance (20.0%)	\$ 62,200	\$ 62,200	\$ -	\$ -	\$ -	\$ 62,200
Total Indirect Costs =		\$ 120,979	\$ 120,979	\$ -	\$ -	\$ 120,979

Other Direct Costs

Program Management: Travel	\$ 10,000	\$ 10,000	\$ -	\$ -	\$ -	\$ 10,000
Program Management: City Equipment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Supplies	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Communications & Outreach	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Columbus Operating System (SCOS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enabling Technologies						
Connected Vehicle Environment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced Human Services						
Multi-modal Trip Planning Application/Common Payment System	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Mobility Hubs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobility Assistance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Prenatal Trip Assistance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Event Parking Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Emerging Technologies						
Connected Electric Autonomous Vehicles	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Truck Platooning	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Other Direct Costs =		\$ 10,000	\$ 10,000	\$ -	\$ -	\$ 10,000

Subcontractors

Procured Technical Services (Consulted Support Services/Program Manager)	\$ 2,460,937	\$ 2,460,937	\$ -	\$ -	\$ -	\$ 2,460,937
Procured Information Technology Services (SCOS only)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Information Technology Services (MMTPA/CPS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Prenatal Trip)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (CV applications)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Systems Engineering Expertise (ALE)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Event Parking Management)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Communications Services (Engage)	\$ 526,063	\$ 526,063	\$ -	\$ -	\$ -	\$ 526,063
Performance Measurement Assistance Evaluation & Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SCOS DMP/DPP Policy Development Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobility Assistance Project Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Prenatal Trip Assistance Project Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
MMTPA Evaluation and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Connected Electric Autonomous Vehicles Testing Standard Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Subcontractor Costs =		\$ 2,987,000	\$ 2,987,000	\$ -	\$ -	\$ 2,987,000

Year 1 Summary

	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	TOTAL
Direct Labor	\$ 311,000	\$ 311,000	\$ -	\$ -	\$ 311,000
Indirect Costs	\$ 120,979	\$ 120,979	\$ -	\$ -	\$ 120,979
Other Direct Costs	\$ 10,000	\$ 10,000	\$ -	\$ -	\$ 10,000
Subcontractors	\$ 2,987,000	\$ 2,987,000	\$ -	\$ -	\$ 2,987,000
Year 1 Summary	\$ 3,428,979	\$ 3,428,979	\$ -	\$ -	\$ 3,428,979

Budget - Agreement Year 2 (August 31, 2017 through August 30, 2018)

	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
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Direct Labor

Title	Name	Hours	Year 2 Rate	Total	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Deputy Director/Program Manager	Mandy K. Bishop	1080.0	\$69.42	\$ 74,976	\$ 74,976	\$ -	\$ -	\$ -	\$ -	\$ 74,976
Engineer IV/Project Manager	Ryan Bollo	1090.0	\$50.99	\$ 55,574	\$ 55,574	\$ -	\$ -	\$ -	\$ -	\$ 55,574
Assistant Director/Deputy Program Mgr.	Randy Bowman	250.0	\$60.32	\$ 15,080	\$ 15,080	\$ -	\$ -	\$ -	\$ -	\$ 15,080
Assistant Director/Communications (Interim)	Brandi Braun	510.0	\$51.50	\$ 26,265	\$ 26,265	\$ -	\$ -	\$ -	\$ -	\$ 26,265
Fiscal Assistant I	Abbie L. Green	1370.0	\$22.94	\$ 31,426	\$ 31,426	\$ -	\$ -	\$ -	\$ -	\$ 31,426
Management Analyst II	Kevin McSweeney	90.0	\$41.94	\$ 3,775	\$ 3,775	\$ -	\$ -	\$ -	\$ -	\$ 3,775
Communications Project Manager	Alyssa Chenault	300.0	\$51.50	\$ 15,450	\$ 15,450	\$ -	\$ -	\$ -	\$ -	\$ 15,450
Student Intern	Kevin Retta	560.0	\$13.91	\$ 7,787	\$ 7,787	\$ -	\$ -	\$ -	\$ -	\$ 7,787
Student Intern	Sonja Summer	1030.0	\$13.91	\$ 14,323	\$ 14,323	\$ -	\$ -	\$ -	\$ -	\$ 14,323
Management Analyst I	Brandi A. Vance	1380.0	\$24.21	\$ 33,403	\$ 33,403	\$ -	\$ -	\$ -	\$ -	\$ 33,403
Engineer IV / Project Manager	Andrew Wolpert	1660.0	\$48.50	\$ 80,510	\$ 80,510	\$ -	\$ -	\$ -	\$ -	\$ 80,510
Project Manager / Deputy Program Manager	Jodie Bare	1290.0	\$53.98	\$ 69,638	\$ 69,638	\$ -	\$ -	\$ -	\$ -	\$ 69,638
Total Direct Labor =				\$428,207	\$ 428,207	\$ -	\$ -	\$ -	\$ -	\$ 428,207

Indirect Costs

Fringe Applied to Direct Labor (18.9%)	\$80,932	\$80,932	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 80,932.00
Insurance (20.0%)	\$85,642	\$85,642	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 85,642.00
Total Indirect Costs =				\$166,574	\$166,574	\$ -	\$ -	\$ -	\$ -	\$ 166,574.00

Other Direct Costs

Program Management: City Travel	\$ 15,000	\$ 15,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 15,000
Program Management: City Equipment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Supplies	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Communications & Outreach	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Columbus Operating System	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enabling Technologies										
Connected Vehicle Environment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enhanced Human Services										
Multi-modal Trip Planning Application/Common Payment System	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Mobility Hubs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobility Assistance	\$ 29,970	\$ 29,970	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 29,970
Prenatal Trip Assistance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Event Parking Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Emerging Technologies										
Connected Electric Autonomous Vehicles	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Truck Platooning	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Other Direct Costs =				\$ 44,970	\$ 44,970	\$ -	\$ -	\$ -	\$ -	\$ 44,970

Subcontractors

Procured Technical Services (Consulted Support Services/Program Manager)	\$ 5,627,500	\$ 4,227,500	\$ 1,400,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,627,500
Procured Information Technology Services (SCOS)	\$ 3,554,800	\$ 3,204,800	\$ -	\$ 350,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,554,800
Procured Information Technology Services (MMTPA/CPS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Prenatal Trip)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (CV applications)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Systems Engineering Expertise (ALE)	\$ 75,000	\$ 75,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 75,000
Procured Technical Services (Event Parking Management)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Communications Services	\$ 850,000	\$ 550,000	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 850,000
Performance Measurement Assistance Evaluation & Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SCOS DMP/DPP Policy Development Support	\$ 50,377	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 50,377	\$ 50,377
Mobility Assistance Project Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Prenatal Trip Assistance Project Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
MMTPA Evaluation and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Connected Electric Autonomous Vehicles Testing Standard Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Subcontractor Costs =				\$ 10,157,677	\$ 8,057,300	\$ 1,700,000	\$ 350,000	\$ -	\$ 50,377	\$ 10,157,677

Year 2 Summary

	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL				
Direct Labor	\$ 428,207	\$ 428,207	\$ -	\$ -	\$ -	\$ 428,207				
Indirect Costs	\$ 166,574	\$ 166,574	\$ -	\$ -	\$ -	\$ 166,574				
Other Direct Costs	\$ 44,970	\$ 44,970	\$ -	\$ -	\$ -	\$ 44,970				
Subcontractors	\$ 10,157,677	\$ 8,057,300	\$ 1,700,000	\$ 350,000	\$ -	\$ 10,157,677				
Year 2 Summary				\$ 10,797,428	\$ 8,697,051	\$ 1,700,000	\$ 350,000	\$ -	\$ -	\$ 10,797,428

Budget - Agreement Year 3 (August 31, 2018 through August 30, 2019)

					Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Direct Labor										
Title	Name	Hours	Year 3 Rate	Total						
Deputy Director/Program Manager	Mandy K. Bishop	950.0	\$71.64	\$ 68,058	\$ 68,058	\$ -	\$ -	\$ -	\$ -	\$ 68,058
Engineer IV/Project Manager	Ryan Bollo	910.0	\$54.64	\$ 49,723	\$ 49,723	\$ -	\$ -	\$ -	\$ -	\$ 49,723
Assistant Director/Deputy Program Mgr.	*REQUESTED STAFF*	240.0	\$62.13	\$ 14,911	\$ 14,911	\$ -	\$ -	\$ -	\$ -	\$ 14,911
Assistant Director/Deputy Chief Innovation Officer	Brandi Braun	240.0	\$53.05	\$ 12,731	\$ 12,731	\$ -	\$ -	\$ -	\$ -	\$ 12,731
Fiscal Assistant I	Abbie L. Green	710.0	\$23.63	\$ 16,775	\$ 16,775	\$ -	\$ -	\$ -	\$ -	\$ 16,775
Communications Project Manager	Alyssa Chenault	1520.0	\$34.62	\$ 52,623	\$ 52,623	\$ -	\$ -	\$ -	\$ -	\$ 52,623
Student Intern	Sonja Summer	710.0	\$14.32	\$ 10,169	\$ 10,169	\$ -	\$ -	\$ -	\$ -	\$ 10,169
Engineer in Training	Sonja Summer	710.0	\$26.00	\$ 18,460	\$ 18,460	\$ -	\$ -	\$ -	\$ -	\$ 18,460
Management Analyst II	Brandi A. Vance	1050.0	\$30.26	\$ 31,773	\$ 31,773	\$ -	\$ -	\$ -	\$ -	\$ 31,773
Engineer IV / Project Manager	Andrew Wolpert	1520.0	\$54.03	\$ 82,126	\$ 82,126	\$ -	\$ -	\$ -	\$ -	\$ 82,126
Project Manager / Deputy Program Manager	Jodie Bare	670.0	\$55.60	\$ 37,254	\$ 37,254	\$ -	\$ -	\$ -	\$ -	\$ 37,254
Total Direct Labor =				\$ 394,603	\$ 394,603	\$ -	\$ -	\$ -	\$ -	\$ 394,603
Indirect Costs										
Fringe Applied to Direct Labor (18.9%)				\$ 74,580	\$ 74,580	\$ -	\$ -	\$ -	\$ -	\$ 74,580
Insurance (20.0%)				\$ 78,921	\$ 78,921	\$ -	\$ -	\$ -	\$ -	\$ 78,921
Total Indirect Costs =				\$ 153,501	\$ 153,501	\$ -	\$ -	\$ -	\$ -	\$ 153,501
Other Direct Costs										
Program Management: City Travel				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Equipment				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Supplies				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Communications & Outreach				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Columbus Operating System (SCOS)				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enabling Technologies										
Connected Vehicle Environment				\$ 9,668,687	\$ 3,859,687	\$ 3,925,000	\$ -	\$ 1,884,000	\$ -	\$ 9,668,687
Enhanced Human Services										
Multi-modal Trip Planning Application/Common Payment System				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Mobility Hubs				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobility Assistance				\$ 3,000	\$ 3,000	\$ -	\$ -	\$ -	\$ -	\$ 3,000
Prenatal Trip Assistance				\$ 114,669	\$ 114,669	\$ -	\$ -	\$ -	\$ -	\$ 114,669
Event Parking Management				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Emerging Technologies										
Connected Electric Autonomous Vehicles				\$ 1,700,000	\$ -	\$ 1,125,000	\$ 575,000	\$ -	\$ -	\$ 1,700,000
Truck Platooning				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Other Direct Costs =				\$ 11,486,356	\$ 3,977,356	\$ 5,050,000	\$ 575,000	\$ 1,884,000	\$ -	\$ 11,486,356
Subcontractors										
Procured Technical Services (Consulted Support Services/Program Manager)				\$ 5,000,000	\$ 5,000,000	\$ -	\$ -	\$ -	\$ -	\$ 5,000,000
Procured Information Technology Services (SCOS only)				\$ 6,237,109	\$ 5,837,109	\$ -	\$ 400,000	\$ -	\$ -	\$ 6,237,109
Procured Information Technology Services (MMTPA/CPS)				\$ 2,844,900	\$ 1,044,900	\$ 1,800,000	\$ -	\$ -	\$ -	\$ 2,844,900
Procured Technical Services (Prenatal Trip)				\$ 771,328	\$ 771,328	\$ -	\$ -	\$ -	\$ -	\$ 771,328
Procured Technical Services (CV applications)				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Systems Engineering Expertise (ALE)				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Event Parking Management)				\$ 450,000	\$ 450,000	\$ -	\$ -	\$ -	\$ -	\$ 450,000
Procured Communications Services				\$ 860,000	\$ -	\$ 860,000	\$ -	\$ -	\$ -	\$ 860,000
Performance Measurement Assistance Evaluation & Research				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SCOS DMP/DPP Policy Development Support				\$ 39,656	\$ -	\$ -	\$ -	\$ -	\$ 39,656	\$ 39,656
Mobility Assistance Project Development and Research				\$ 105,000	\$ -	\$ -	\$ -	\$ -	\$ 105,000	\$ 105,000
Prenatal Trip Assistance Project Development and Research				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
MMTPA Evaluation and Research				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Connected Electric Autonomous Vehicles Testing Standard Development and Research				\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Subcontractor Costs =				\$ 16,307,993	\$ 13,103,337	\$ 2,660,000	\$ 400,000	\$ -	\$ 144,656	\$ 16,307,993
Year 3 Summary										
					Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Direct Labor				\$ 394,603	\$ 394,603	\$ -	\$ -	\$ -	\$ -	\$ 394,603
Indirect Costs				\$ 153,501	\$ 153,501	\$ -	\$ -	\$ -	\$ -	\$ 153,501
Other Direct Costs				\$ 11,486,356	\$ 3,977,356	\$ 5,050,000	\$ 575,000	\$ 1,884,000	\$ -	\$ 11,486,356
Subcontractors				\$ 16,307,993	\$ 13,103,337	\$ 2,660,000	\$ 400,000	\$ -	\$ 144,656	\$ 16,307,993
Year 3 Summary				\$ 28,342,453	\$ 17,628,797	\$ 7,710,000	\$ 975,000	\$ 1,884,000	\$ 144,656	\$ 28,342,453

Budget - Agreement Year 4 (August 31, 2019 through August 30, 2020)

						Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Direct Labor						Dollar					
Title	Name	Hours	Year 4 Rate	Total							
Deputy Director/Program Manager	Mandy K. Bishop	1150.0	\$73.79	\$ 84,858	\$ 84,858	\$ -	\$ -	\$ -	\$ -	\$ 84,858	
Engineer IV/Project Manager	Ryan Bollo	950.0	\$56.28	\$ 53,466	\$ 53,466	\$ -	\$ -	\$ -	\$ -	\$ 53,466	
Assistant Director/Deputy Program Mgr.	*REQUESTED STAFF*	0.0	\$63.99	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Fiscal Manager	*REQUESTED STAFF*	1095.0	\$47.00	\$ 51,465	\$ 51,465	\$ -	\$ -	\$ -	\$ -	\$ 51,465	
Communications Project Manager	Alyssa Chenault	1490.0	\$35.66	\$ 53,132	\$ 53,132	\$ -	\$ -	\$ -	\$ -	\$ 53,132	
Engineer in Training	Sonja Summer	1255.7	\$26.78	\$ 33,627	\$ 33,627	\$ -	\$ -	\$ -	\$ -	\$ 33,627	
Management Analyst II	Brandi A. Vance	1490.0	\$31.17	\$ 46,441	\$ 46,441	\$ -	\$ -	\$ -	\$ -	\$ 46,441	
Engineer IV / Project Manager	Andrew Wolpert	1650.0	\$55.65	\$ 91,824	\$ 91,824	\$ -	\$ -	\$ -	\$ -	\$ 91,824	
Total Direct Labor =					\$ 414,813	\$ 414,813	\$ -	\$ -	\$ -	\$ 414,813	

Fringe Applied to Direct Labor (18.9%)	\$ 78,400	\$ 78,400	\$ -	\$ -	\$ -	\$ -	\$ 78,400
Insurance (20.0%)	\$ 82,963	\$ 82,963	\$ -	\$ -	\$ -	\$ -	\$ 82,963
Total Indirect Costs =		\$ 161,363	\$ 161,363	\$ -	\$ -	\$ -	\$ 161,363

Program Management: City Travel	\$ 20,000	\$ 20,000	\$ -	\$ -	\$ -	\$ -	\$ 20,000
Program Management: City Equipment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Supplies	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Communications & Outreach	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Columbus Operating System (SCOS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enabling Technologies							
Connected Vehicle Environment	\$ 670,800	\$ 670,800	\$ -	\$ -	\$ -	\$ -	\$ 670,800
Enhanced Human Services							
Multi-modal Trip Planning Application/Common Payment System	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Mobility Hubs	\$ 275,000	\$ -	\$ 275,000	\$ -	\$ -	\$ -	\$ 275,000
Mobility Assistance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Prenatal Trip Assistance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Event Parking Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Emerging Technologies							
Connected Electric Autonomous Vehicles	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Truck Platooning	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Indirect Costs =		\$ 965,800	\$ 690,800	\$ 275,000	\$ -	\$ -	\$ 965,800

Subcontractors							
Procured Technical Services (Consulted Support Services/Program Manager)	\$ 3,186,563	\$ 1,186,563	\$ 2,000,000	\$ -	\$ -	\$ -	\$ 3,186,563
Procured Information Technology Services (SCOS only)	\$ 4,114,063	\$ 3,214,063	\$ 500,000	\$ 400,000	\$ -	\$ -	\$ 4,114,063
Procured Information Technology Services (MMTPA/CPS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Prenatal Trip)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (CV applications)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Systems Engineering Expertise (ALE)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Technical Services (Event Parking Management)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Procured Communications Services	\$ 679,675	\$ -	\$ 679,675	\$ -	\$ -	\$ -	\$ 679,675
Performance Measurement Assistance Evaluation & Research	\$ 350,000	\$ -	\$ -	\$ -	\$ -	\$ 350,000	\$ 350,000
SCOS DMP/DPP Policy Development Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mobility Assistance Project Development and Research	\$ 174,724	\$ -	\$ -	\$ -	\$ -	\$ 174,724	\$ 174,724
Prenatal Trip Assistance Project Development and Research	\$ 460,243	\$ -	\$ -	\$ -	\$ -	\$ 460,243	\$ 460,243
MMTPA Evaluation and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Connected Electric Autonomous Vehicles Testing Standard Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Subcontractor Costs =		\$ 8,965,268	\$ 4,400,626	\$ 3,179,675	\$ 400,000	\$ -	\$ 984,967

Year 4 Summary						Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Direct Labor	\$ 414,813	\$ 414,813	\$ -	\$ -	\$ -	\$ -	\$ 414,813				
Indirect Costs	\$ 161,363	\$ 161,363	\$ -	\$ -	\$ -	\$ -	\$ 161,363				
Other Direct Costs	\$ 965,800	\$ 690,800	\$ 275,000	\$ -	\$ -	\$ -	\$ 965,800				
Subcontractors	\$ 8,965,268	\$ 4,400,626	\$ 3,179,675	\$ 400,000	\$ -	\$ 984,967	\$ 7,980,301				
Year 4 Summary		\$ 10,507,244	\$ 5,667,602	\$ 3,454,675	\$ 400,000	\$ -	\$ 984,967	\$ 9,522,277			

Budget - Agreement Years 1 - 5

							Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL	
Direct Labor		Y1	Y2	Y3	Y4	Y5	Total	Dollar					
Title	Name												
Deputy Director/Program Manager	Mandy K. Bishop	\$ 10,873	\$ 74,976	\$ 68,058	\$ 84,858	\$ 57,003	\$ 295,768	\$ 295,768	\$ -	\$ -	\$ -	\$ -	\$ 295,768
Deputy Director/Program Manager	Aparna Dial	\$ 30,930	\$ -	\$ -	\$ -	\$ -	\$ 30,930	\$ 30,930	\$ -	\$ -	\$ -	\$ -	\$ 30,930
Engineer IV/Project Manager	Ryan Bollo	\$ 64,881	\$ 55,574	\$ 49,723	\$ 53,466	\$ 33,332	\$ 256,976	\$ 256,976	\$ -	\$ -	\$ -	\$ -	\$ 256,976
Assistant Director/Deputy Program Mgr.	Randy Bowman	\$ 62,509	\$ 15,080	\$ 14,911	\$ -	\$ 49,433	\$ 141,933	\$ 141,933	\$ -	\$ -	\$ -	\$ -	\$ 141,933
Assistant Director/Communications (Interim)	Brandi Braun	\$ 31,869	\$ 26,265	\$ 12,731	\$ -	\$ -	\$ 70,865	\$ 70,865	\$ -	\$ -	\$ -	\$ -	\$ 70,865
Fiscal Assistant I	Abbie L. Green	\$ 9,592	\$ 31,426	\$ 16,775	\$ -	\$ -	\$ 57,793	\$ 57,793	\$ -	\$ -	\$ -	\$ -	\$ 57,793
Management Analyst II	Kevin McSweeney	\$ 13,281	\$ 3,775	\$ -	\$ 51,465	\$ -	\$ 68,521	\$ 68,521	\$ -	\$ -	\$ -	\$ -	\$ 68,521
Assistant Director/Communications	Jeff Ortega	\$ 11,091	\$ -	\$ -	\$ -	\$ -	\$ 11,091	\$ 11,091	\$ -	\$ -	\$ -	\$ -	\$ 11,091
Assistant Director/Communications (Permanent)	Alyssa Chenault	\$ -	\$ 15,450	\$ 52,623	\$ 53,132	\$ 38,565	\$ 159,770	\$ 159,770	\$ -	\$ -	\$ -	\$ -	\$ 159,770
Student Intern	*REQUESTED STAFF*	\$ 9,489	\$ 7,787	\$ 10,169	\$ -	\$ -	\$ 27,445	\$ 27,445	\$ -	\$ -	\$ -	\$ -	\$ 27,445
Student Intern	*REQUESTED STAFF*	\$ 10,469	\$ 14,323	\$ 18,460	\$ 33,627	\$ 24,826	\$ 101,705	\$ 101,705	\$ -	\$ -	\$ -	\$ -	\$ 101,705
Management Analyst I	Brandi A. Vance	\$ 10,764	\$ 33,403	\$ 31,773	\$ 46,441	\$ 33,708	\$ 156,089	\$ 156,089	\$ -	\$ -	\$ -	\$ -	\$ 156,089
Engineer IV / Project Manager	Andrew Wolpert	\$ 45,253	\$ 80,510	\$ 82,126	\$ 91,824	\$ 65,919	\$ 365,632	\$ 365,632	\$ -	\$ -	\$ -	\$ -	\$ 365,632
Project Manager / Deputy Program Manager	Jodie Bare	\$ -	\$ 69,638	\$ 37,254	\$ -	\$ -	\$ 106,892	\$ 106,892	\$ -	\$ -	\$ -	\$ -	\$ 106,892
Total Direct Labor =		\$ 311,000	\$ 428,207	\$ 394,603	\$ 414,813	\$ 302,786	\$ 1,851,409	\$ 1,851,409	\$ -	\$ -	\$ -	\$ -	\$ 1,851,409

							Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL	
Indirect Costs		Y1	Y2	Y3	Y4	Y5	Total						
Fringe Applied to Direct Labor (18.9%)		\$ 58,779	\$ 80,932	\$ 74,580	\$ 78,400	\$ 57,227	\$ 349,918	\$ 349,918	\$ -	\$ -	\$ -	\$ -	\$ 349,918
Insurance (20.0%)		\$ 62,200	\$ 85,642	\$ 78,921	\$ 82,963	\$ 60,558	\$ 370,284	\$ 370,284	\$ -	\$ -	\$ -	\$ -	\$ 370,284
Total Indirect Costs =		\$ 120,979	\$ 166,574	\$ 153,501	\$ 161,363	\$ 117,785	\$ 720,202	\$ 720,202	\$ -	\$ -	\$ -	\$ -	\$ 720,202

Budget - Agreement Years 1 - 5

Other Direct Costs	Y1	Y2	Y3	Y4	Y5	Total	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Program Management: City Travel	\$ 10,000	\$ 15,000	\$ -	\$ 20,000	\$ 30,000	\$ 75,000	\$ 75,000	\$ -	\$ -	\$ -	\$ -	\$ 75,000
Program Management: City Equipment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Program Management: City Supplies	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Communications & Outreach	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Columbus Operating System (SCOS)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Enabling Technologies												
Connected Vehicle Environment	\$ -	\$ -	\$ 9,668,687	\$ 670,800	\$ -	\$ 10,339,487	\$ 4,530,487	\$ 3,925,000	\$ -	\$ 1,884,000	\$ -	\$ 10,339,487
Enhanced Human Services												
Multi-modal Trip Planning Application/Common Payment System	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Smart Mobility Hubs	\$ -	\$ -	\$ -	\$ 275,000	\$ -	\$ 275,000	\$ -	\$ 275,000	\$ -	\$ -	\$ -	\$ 275,000
Mobility Assistance	\$ -	\$ 29,970	\$ 3,000	\$ -	\$ -	\$ 32,970	\$ 32,970	\$ -	\$ -	\$ -	\$ -	\$ 32,970
Prenatal Trip Assistance	\$ -	\$ -	\$ 114,669	\$ -	\$ -	\$ 114,669	\$ 114,669	\$ -	\$ -	\$ -	\$ -	\$ 114,669
Event Parking Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Emerging Technologies												
Connected Electric Autonomous Vehicles	\$ -	\$ -	\$ 1,700,000	\$ -	\$ -	\$ 1,700,000	\$ -	\$ 1,125,000	\$ 575,000	\$ -	\$ -	\$ 1,700,000
Truck Platooning	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Indirect Costs =	\$ 10,000	\$ 44,970	\$ 11,486,356	\$ 965,800	\$ 30,000	\$ 12,537,126	\$ 4,753,126	\$ 5,325,000	\$ 575,000	\$ 1,884,000	\$ -	\$ 12,537,126

Budget - Agreement Years 1 - 5

Subcontractors	Y1	Y2	Y3	Y4	Y5	Total	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Procured Information Technology Services (SCOS only)	\$ -	\$ 3,554,800	\$ 6,237,109	\$ 4,114,063	\$ 736,000	\$ 14,641,972	\$ 12,755,972	\$ 500,000	\$ 1,386,000	\$ -	\$ -	\$ 14,641,972
Procured Information Technology Services (MMTPA/CPS)	\$ -	\$ -	\$ 2,844,900	\$ -	\$ -	\$ 2,844,900	\$ 1,044,900	\$ 1,800,000	\$ -	\$ -	\$ -	\$ 2,844,900
Procured Technical Services (Prenatal Trip)	\$ -	\$ -	\$ 771,328	\$ -	\$ -	\$ 771,328	\$ 771,328	\$ -	\$ -	\$ -	\$ -	\$ 771,328
Procured Technical Services (CV applications)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Systems Engineering Expertise (ALE)	\$ -	\$ 75,000	\$ -	\$ -	\$ -	\$ 75,000	\$ 75,000	\$ -	\$ -	\$ -	\$ -	\$ 75,000
Procured Technical Services (Event Parking Management)	\$ -	\$ -	\$ 450,000	\$ -	\$ -	\$ 450,000	\$ 450,000	\$ -	\$ -	\$ -	\$ -	\$ 450,000
Procured Communications Services	\$ 526,063	\$ 850,000	\$ 860,000	\$ 679,675	\$ 100,000	\$ 3,015,738	\$ 1,076,063	\$ 1,939,675	\$ -	\$ -	\$ -	\$ 3,015,738
Performance Measurement Assistance Evaluation & Research	\$ -	\$ -	\$ -	\$ 350,000	\$ -	\$ 350,000	\$ -	\$ -	\$ -	\$ -	\$ 350,000	\$ 350,000
SCOS DMP/DPP Policy Development Support	\$ -	\$ 50,377	\$ 39,656	\$ -	\$ -	\$ 90,033	\$ -	\$ -	\$ -	\$ -	\$ 90,033	\$ 90,033
Mobility Assistance Project Development and Research	\$ -	\$ -	\$ 105,000	\$ 174,724	\$ -	\$ 279,724	\$ -	\$ -	\$ -	\$ -	\$ 279,724	\$ 279,724
Prenatal Trip Assistance Project Development and Research	\$ -	\$ -	\$ -	\$ 460,243	\$ -	\$ 460,243	\$ -	\$ -	\$ -	\$ -	\$ 460,243	\$ 460,243
MMTPA Evaluation and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Connected Electric Autonomous Vehicles Testing Standard Development and Research	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Subcontractors =	\$ 2,987,000	\$ 10,157,677	\$ 16,307,993	\$ 8,965,268	\$ 2,336,000	\$ 40,753,938	\$ 30,548,263	\$ 7,639,675	\$ 1,386,000	\$ -	\$ 1,180,000	\$ 40,753,938

Total Program Summary	Y1	Y2	Y3	Y4	Y5	Total	Federal Share	City Cost Share	ODOT Cost Share	Franklin Co. Cost Share	OSU Cost Share	TOTAL
Indirect Costs	\$ 120,979	\$ 166,574	\$ 153,501	\$ 161,363	\$ 117,785	\$ 720,202	\$ 720,202	\$ -	\$ -	\$ -	\$ -	\$ 720,202
Other Direct Costs	\$ 10,000	\$ 44,970	\$ 11,486,356	\$ 965,800	\$ 30,000	\$ 12,537,126	\$ 4,753,126	\$ 5,325,000	\$ 575,000	\$ 1,884,000	\$ -	\$ 12,537,126
Subcontractors	\$ 2,987,000	\$ 10,157,677	\$ 16,307,993	\$ 8,965,268	\$ 2,336,000	\$ 40,753,938	\$ 30,548,263	\$ 7,639,675	\$ 1,386,000	\$ -	\$ 1,180,000	\$ 40,753,938
Total Program Summary	\$ 3,428,979	\$ 10,797,428	\$ 28,342,453	\$ 10,507,244	\$ 2,786,571	\$ 55,862,675	\$ 37,873,000	\$ 12,964,675	\$ 1,961,000	\$ 1,884,000	\$ 1,180,000	\$ 55,862,675

FOR AWARENESS ONLY: Ohio State will be Contributing Additional	
Prenatal Trip Assistance Project Development and Research	\$ 206,479
MMTPA Evaluation and Research	\$ 163,711
Connected Electric Autonomous Vehicles Testing Standard Development and Research	\$ 160,187
Total	\$ 530,377



4.0 Budget Notes and Assumptions

Direct Labor

The Direct Labor budget was established for Years 2 through 5 by reviewing the city staff that are assigned to the Smart Columbus program and projecting the hours to be worked in those years. Direct Labor was updated using Years 1 through 3 actual hours to project the level of effort through the remainder of the program. Labor is underestimated as the agreed upon indirect cost actual billings are trending under the rates. Therefore, the overall budget for Direct Labor and Indirect costs is in line with expected expenditures.

The hours available to be worked are assumed to be 2080. Additionally, the average employee is assumed to use 160 hours of leave (e.g. holiday, personal, sick, vacation) per year. Therefore, projections for a full-time equivalent are 1920 hours per year.

Indirect Costs

The City and USDOT have agreed that fringe costs shall be calculated at 18.9% of Direct Labor. Additionally, although the cost varies by union, insurance is estimated at 20% of Direct Labor costs.

Other Direct Costs (ODCs)

Other direct costs are as described below.

City Travel

Year 1 allocated funds for travel that was incurred in Year 1 and may be outstanding for reimbursement (e.g. TRB 2017). A budget of \$75,000 is allocated for trips outline in the cooperative agreement for. Years 2 – 5.

Smart Columbus Operating System (Operating System)

These costs have been removed. These are included them in the cost of the Operating System build.

Enabling Technologies

Connected Vehicle Environment

Roadside equipment - eighty-four (84) DSRC equipped intersections, other roadside equipment, traffic signal controller upgrades, in-vehicle equipment (on board units) for 1500-1800 vehicles, GPS correction and connected vehicle application. Refer to Non-City Cost Share on Page 24 for details for Franklin County contribution.

Detail by Contract

Contract	Estimated Cost
Roadside unit contract (Kapsch):	\$1,050,000
In Vehicle Equipment w/apps (Siemens):	\$5,100,000
Installation for roadside units (GudenKaff w/Inspection):	\$2,300,000
Hi speed internet for backhaul network:	\$ 36,000



Smart Mobility Hubs

This line item includes integration of customer facing apps, construction/site work Operating System integration; operations & maintenance, multi-function kiosks (6).

Detail by Contract/Activity

CoGo Bikeshare Stations	\$200,000
Site work for Mobility Hubs	\$ 50,000

Cognitive Disability Application

The funding associated with this line item reflects the costs to serve up to 30 participants and provide incentives to the participants.

Detail by Contract/Activity

AbleLink:	\$29,970
Participant Incentives:	\$ 3,000

Prenatal Trip Assistance

Participant incentives are included in this line item.

Detail by Contract/Activity

Participant Incentives:	\$114,669
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Event Parking Management

Procurement and modification of the application to meet system requirements.

Detail by Contract/Activity:

Modification of Park Columbus Application:	\$450,000
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Emerging Technologies

Connected Electric Autonomous Vehicles

Funding for the lease, delivery and operation of the connected electric vehicle as well as infrastructure and ancillary costs to support the demonstration.

Detail by Contract/Activity

Easymile:	\$1,125,000
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Non-City Cost Share

The City has two non-city contributors to the cost share; The Ohio Department of Transportation and Franklin County. The Ohio Department of Transportation agreed to provide \$7,000,000 in data, professional and technical assistance and coordination between ODOT and Smart Columbus projects. It is clear that ODOT's contribution will not be met. Their contribution has been reduced to \$3,000,000 in the budget. It consists of contributions to the Operating System and Connected Electric Autonomous shuttle. ODOT and the Ohio Department of Transportation continue to explore opportunities to increase ODOT's contribution.

The total Franklin County contribution is estimated at \$2,000,000 of which \$1,884,000 has been reviewed and approved by USDOT. This is a reduction from \$4,000,000. The Franklin County Commissioners have deposited \$1,000,000 cash with the City of Columbus that is being appropriated for the In-Vehicle Equipment contract with Siemens. Additionally, the Franklin County Engineer has advanced the design and construction of the connected vehicle infrastructure for the freight signal priority system along Alum Creek Drive.

The Ohio State University (OSU) committed \$2,000,000 in funding to support delivery of the grant program. The investment is listed as a Key Leveraged Partner asset. The investments have been in research and evaluation of the USDOT projects and the program as whole. OSU has faculty, staff and students aligned to assist the city with the development of deliverables and/or evaluation of the following projects. We are estimating that approximately \$1,710,377 will be invested in support of delivering the grant program, however, only \$1,180,000 will be applied directly as a cost share contribution.

Connected Electric Autonomous Vehicle: \$160,187

One of the deliverables from this demonstration project is that the city will produce a set of operational and testing standards to aide other cities in the deployment of automated driving technology. OSU will provide research and support to develop the testing standards. This item is not applied to the budget.

Mobility Assistance: \$279,724

Evaluation of the applications and guidance on selection of application, identification of cognitive disabilities that may benefit, testing and evaluation of the application; training of interns and caregivers, developed materials and sought IRB approval, and performance of the research using the data collected during the demonstration period.

Multimodal Trip Planning Application: \$163,711

OSU will be evaluating mode-shift and mobility, specifically the efficacy of the trip planning application providing the single of planning, booking and paying for a trip. They will be evaluating how the application facilitated access to jobs and services. This item is not applied to the budget.

Prenatal Trip Assistance: \$666,722

OSU researchers guided the city on the development of the project, assisted with testing and are performing the research on the effectiveness of the intervention (technology transportation broker) on the adherence to women following their prenatal care plan and birth outcomes. Only \$460,243 is being applied to the budget.

Performance Measurement Plan: \$350,000

Evaluating program level objectives of mobility and opportunity as well as project level evaluation connected electric autonomous shuttle and smart mobility hubs. OSU will incorporate other project level evaluation data and information and incorporating it into the overall objectives of mobility and opportunity.



Smart Columbus Operating System: \$90,033
Support from College of Law for Policy Development for the Data Management and Data Privacy Plans for the Smart Columbus Operating System.

Scopes for the cost share from OSU will be submitted to USDOT for review.

City Cost Share

The City of Columbus has secured additional funding that will be available in October 2019 to offset decreases in Non-City Cost Share. The budget reflects a portion of the funds that have been secured.

Subcontractor

The City has budgeted funds in seven (7) line items. The intent of the line item is described below:

Procured Technical Services (Consulted Support Services/Program Manager): Funding allocated for this line item are for program management, technical and delivery services.

Detail by Contract

Program Management Consultant:	\$15,550,000
Project Management (Extension of City Staff):	\$ 2,127,000

Procured Information Technical (IT) Services: Funding allocated to this line item are for the purpose paying for IT Services to build the Smart Columbus Operating System on an open source platform.

Detail by Contract

Smart Columbus Operating System (SCOS) Development Services:	\$11,581,749
Smart Columbus SCOS Architect & Program Technologist:	\$ 1,241,909
Smart Columbus Data Curation Services:	\$ 300,000

Procured Information Technical (IT) Services (MMTPA/CPS): Funds allocated to this line item are for the purpose of procuring IT Services to develop, customize and/or integrate the MMTPA/CPS. There are a wide range of solutions but all will require some customization or further development.

Detail by Contract/Activity:

MMTPA Development & Demonstration:	\$ 900,000
CPS Development & Demonstration:	\$1,800,000
Integration with COTA Fare Payment System:	\$ 144,900

Procured Technical Services (Prenatal Trip): Funding allocated to this line item are for development and implementation of the project.

Detail by Contract/Activity:

Caresource:	\$446,738
Molina:	\$324,590



Systems Engineering Expertise: Funding allocated to this line item are budgeted for Acquisition Logistics Engineering (ALE) for systems engineering support.

ALE: \$75,000

Procured Miscellaneous Services: As with any program, there are unanticipated technical service needs. This line item is an unallocated budget for those services.

Procured Technical Services (Event Parking Management): Funding allocated to this line item are budgeted for to support advanced development of the ParkColumbus application to meet the needs identified in the Concept of Operations.

ParkMobile: \$450,000

Procured Communications Services: Communications services have been provided by Engage Communications. The city will be engaging two other firms. This line item establishes a budget for continued services in the area of end user engagement, presentation support, recruitment and other communication needs that will be outlined in to be update Communication Plan.

Engage/Murphy Epsom: \$1,099,850

Paul Werth: \$ 119,900

Futurety: \$ 220,000

Falgren Mortine: \$ 45,000

ITE: \$ 30,000

Partner Contributions

The City has reviewed partner contributions. Adjustments to the budget have been made to reflect changes that may be a result of any partner agreements.