Autonomous Vehicle Implementation in the City of Peoria, Arizona

Summary Table

Project Name/Title	
Eligible Entity Applying to Receive Federal Funding (Prime Applicant's Legal Name and Address)	City of Peoria, Arizona 9875 North 85th Avenue Peoria, Arizona 85345
Point of Contact (Name/Title; Email; Phone Number)	Cathy Colbath Transit Manager Cathy.Colbath@peoriaaz.gov 623-773-7993
Proposed Location (State(s) and Municipalities for the Demonstration	City of Peoria, Arizona
Proposed Technologies for the Demonstration (briefly list)	Autonomous Vehicle Kiosks Phone Application
Proposed duration of the Demonstration (period of performance)	One Year
Federal Funding Amount Requested	$750,000
Non-Federal Cost Share Amount Proposed, if applicable	$150,000
Total Project Cost (Federal Share + Non-Federal Cost Share, if applicable)	$900,000

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Introduction

The City of *Peoria, Arizona* is a suburb of Phoenix, located in North West Maricopa County, and is the 6th largest city in Arizona for land area, and the 9th most populated city in Arizona. It is 179.1 square miles in size and it has a population of 171,000. In terms of ethnic composition, it is 18% Hispanic, 3% African American, 3% Asian and 76% Caucasian. Approximately 93% of the adult residents have graduated from high school, and 31% have a Bachelor's degree or higher. The median home value is $230,400 and the median household income is $69,589.

As a city, Peoria is always looking for innovative ways to enhance the services provided to our community. The City has worked hard to transform from a once sleepy community, with the majority of residents travelling outside of the city for work and recreation, to a Sports and Entertainment center in the Valley of the Sun, and, indeed, the entire State. This transformation has resulted in residents staying in Peoria for recreation and entertainment, while also successfully drawing visitors from across the globe for events including Major League Baseball spring training games held at the Peoria Sports Complex. Fewer residents commute out of the city for employment, and the city is now a destination point for tourists. In February of this year, Peoria was featured as a travel destination in USA Today.

The vision of the City of Peoria is for our team members to provide unmatched quality of life and excellent customer service for our community. The mission of the City of Peoria

is to provide excellent municipal services by anticipating community needs, creating partnerships, promoting sustainability and embracing diversity. Our values are ingrained in our city name **P**rofessional, **E**thical, **O**pen, **R**esponsive, **I**nnovative and **A**ccountable. As such, the City of Peoria is responsible for ensuring safe transportation that is easily accessible for residents and visitors alike, while also focusing on meeting the demands created by the development and growth in distinct areas including "Old Town" and the Sports and Entertainment District known as Peoria and 83rd Avenue or P83.

Safe and efficient transportation is a key objective for Peoria. The city currently offers several modes of transit including fixed route, Dial-A-Ride and ADA paratransit services and in April 2019 will launch Peoria On The Go (POGO) – Peoria's first circulator bus route that will connect residents from neighborhoods to the main entertainment district of Peoria as well as shopping clusters and the auto dealerships and repair corridor. The objective is to continue to use innovative and collaborative approaches to ensure that travel in Peoria is safe, efficient and able to respond to the changing needs of the community. Peoria works in partnership with neighborhoods and businesses strengthening growth efforts to provide an inviting and easily accessible environment to our citizens and the public. This strategy ensures that Peoria continues to be a desirable place to live, work, raise a family, seek education, recreate and conduct business.

Peoria's population is projected to grow by 10% or 17,100 residents over the next five to ten years. With this rapid growth projected, it is critical to understand the needs for the future, which must be envisioned now. To that end, the Peoria City Council has adopted

Livability Goals to thoughtfully guide the city moving forward. These goal areas include Efficient Transportation, Economic Competitiveness, Healthy Neighborhoods, Smart Growth, Superior Public Service and Arts, Culture and Recreation.

Future growth will further increase the demand for safe and efficient public transportation services. During Major League Baseball (MLB) spring training and special events, there is a large influx of patrons to the two designated areas within the city. Autonomous vehicles will be an important component in the variety of transit services needed to deliver the best service possible to the community, and provide a technological, environmentally friendly edge to Peoria.

The City of Peoria is seeking $750,000 in funding for two autonomous driving routes that will focus on first mile/last mile needs. The vehicles would be deployed in the most highly concentrated areas of need, the Old Town area and the City's entertainment district. Peoria is committed to contribute a cash match of $150,000 to this program in a good faith effort to launch this service.

The P83 area is primarily focused upon entertainment functions, but also has employment, medical offices and residential components. The city is encouraging residents and visitors to rely on transit services and not be dependent on personal vehicles. An autonomous vehicle service would further encourage the use of transit, as autonomous cars would provide mobility for persons arriving in the area via transit, and others who use ride-share options to arrive at the entertainment district.

The second area of focus for this grant is the Old Town area, which is located in South Peoria, and is home to the municipal complex including city hall, the main library, a

performing arts center, the main police station and other city departments. The municipal complex is embedded in an area surrounded by historical and original homes and shops, the community and adult center (which includes unique programming for adults and youth with disabilities), as well as new neighborhoods with young families. The Old Town area is attracting new business including the development of a major health complex, restaurants and shopping. Old Town is also the site of community events and activities that draw residents and visitors to the area. Additionally, within the geofenced area there are low income and subsidized housing complexes associated with the Housing Authority of Maricopa County that would benefit from first mile/last mile transit service.

A grant from the U.S. Department of Transportation will allow our Transit Division to demonstrate a point-to-point public transit option using an autonomous van in two unique areas. This deployment seeks to provide data to support the safety and viability for an autonomous vehicle delivering point-to-point transit service in an environment with manual traffic controls (i.e. stop signs, mid-block crosswalks, yield signs), electronic traffic control devices such as traffic signals, with and without protected turning movements, and service on public rights of way (city streets), private property (such as store fronts and hotel porticos), and high traffic public property (municipal owned baseball stadium in the Sports and Entertainment District and the City Municipal complex in Old Town).

This free (to the rider) service further encourages economic growth in the community by offering new technology to meet transit needs in two distinctly different environments. It will also promote transit options that are available.

The grant award will enable the City to continue to meet both the vision and values of the organization. If awarded, the program could be implemented as early as third quarter 2019.

Executive Summary:

The City of Peoria, Arizona envisions this grant demonstrating autonomous driving systems in a ride-hailing capacity to provide first and last mile service as well as point-of-origin to point-of-destination services within two highly unique suburban districts. The demonstration will arm Peoria, and similar suburban municipalities across the country, with an understanding of how such service may compliment or detract from traditional transit service; operate on a mix of high traffic arterials, complete street collectors and low volume residential streets; as well as traverse private shopping complexes with big-box stores.

The desired outcome of this project features deploying autonomous vehicles that rely on Light Detection and Ranging (LIDAR) and radar technology to transport citizens, visitors and patrons to entertainment, hotels, and doctor's offices within the P83 entertainment district and Old Town geofenced areas of the city. This technology will further enhance our transit program by offering citizens another way to traverse the area. Since Peoria is a fairly typical suburban area, the resulting findings can help implement similar programs throughout the country.

The project will be completed in collaboration and cooperation with private entities including the proposed vendor, local businesses, citizens and visitors to the city. Cathy Colbath, Peoria's Transit Manager, will oversee the project with involvement from a multitude of city departments including Engineering, Streets, Economic Development, Communications, Sustainability and the City Manager's Office.

Issues and challenges addressed in this demonstration include the safe navigation of a variety of street conditions and traffic control devices; public awareness, acceptance and adoption or rejection of the technology; as well as usage of the technology within a larger public transit system.

The geographic area of the demonstration project will focus upon two subareas of the city of Peoria, Arizona. The primary area is a unique entertainment district known as P83. This district is anchored by the city-owned Major League Baseball (MLB) spring training stadium and field complex for the San Diego Padres and Seattle Mariners, which is used year-round for numerous events. The P83 district is host to a wide variety of restaurants, hotels, and shopping. It also includes a diversity of office, multifamily residential and senior living complexes. Lastly, this district is home to Huntington University and an assortment of medical offices and clinics. P83 entertainment district is a vibrant bustling place both in the daytime and in the evening.

Huntington University's is a four year degree university located within P83. It offers a digital media arts bachelor's degree and enrollment continues grow year over year. They have won awards for digital media arts in both years that they have competed,

competing with schools like Grand Canyon University and Arizona State University. The young and creative student body increasingly prefers the modern conveniences and easy access to activities in the region. Huntington University is bringing a new program to their campus in P83, Occupational Therapy, which will double the size of the student body and help it grow exponentially in these in-demand industries.

In the near future, Peoria's plans to strengthen its economic growth within P83 with an approximately 300,000 square feet of Class A office building as well as approximately 100,000 square feet of retail and restaurant space in a Corporate Lifestyle campus called Stadium Point on what is currently a portion of the Peoria Sports Complex parking lot. The City is targeting the high wage, high intellectual capital industries of Technology, Advertising, Media and Innovation. The workforce will be on the cutting edge of their own creative industries, and will demand quick access to local attractions in the area. Peoria also has plans for more office space in the area nearby.

The second demonstration area is Peoria's Old Town. Peoria's Old Town District is in the middle of a renovation and retooling to become the go-to place for increased employment, interesting restaurants, and vibrant entertainment. The 300-employee medical center and hospital, Maricopa Integrated Health Systems, is presently under construction in this area and stands on a 125-acre site that was recently rezoned to include multi-family housing, office buildings and an industrial park. Besides the employees, the facility will attract hundreds of patients from the entire region, all needing quick and easy transportation. Many people will use transit to access the services that will be provided there.

The City of Peoria's Old Town district has large employment centers associated with the municipal campus, as well as key destinations such as the Center for Performing Arts, Community Center and central park that hosts community events. Lastly, this district is home to an assortment of retail establishments, historic single-family homes, and a mass transit park and ride with bus transfer center.

The proposed period of performance including preparation, implementation and evaluation is anticipated to be 18 months beginning as early as third quarter 2019. The estimated cost for this one-year program is $900,000. Peoria is requesting $750,000 from the Department of Transportation through this grant. The remaining $150,000 will be funded by the city.

This project is instrumental to the enhancement of our transit plan. It provides a safe, free and convenient service to transport patrons to destinations within the designated areas.

Goals:

The program will initially deploy an autonomous van in a tightly geofenced area, a virtual geographic boundary, around the City's Sports & Entertainment district known as the P83 District. The project will deploy four autonomous vehicles; three in the P83 District area and one in Old Town. During times of peak demand or events, vehicles will be moved and deployed accordingly. Patrons can summon a car via a mobile application or through a sidewalk kiosk. Costs will include deploying six kiosks

throughout the designated areas. Each kiosk will house a tablet to arrange a ride on the vehicle.

Initially, the vans will have a safety driver in the front seat to acclimate riders to the driverless vehicle. Riders will use a mobile application to call the service, which will pick them up and deliver them to any point within the 2 square mile geofenced area free of charge. This service will enable the public to get acclimated to the service and enable the City to expand the program as needed to longer trips as this is accepted and adopted into the transportation plan.

The program will be implemented in phases. It will start with a driver at the wheel monitoring how the vehicle is running, then eventually the driver will be removed, and a chaperone will be in the front passenger seat assisting passengers and monitoring operations. The chaperone will eventually no longer be used, and the car will continue to be monitored remotely. This final phase is a remote operator that can see all monitors or items that a physical driver would see.

The vehicles have LED signage screens on the outside of the vehicle that communicate with pedestrians and other drivers about the self-driving cars. The screens will display messages such as “waiting for you to cross” and “passengers entering/exiting”. This is a key safety feature as it is important to educate the public on how to react around driverless vehicles. As an added layer of safety, if the vehicle encounters a problem the driver, chaperone and remote operator can control the car directly. Once driverless, the rider has the ability to have the car safely pull over and stop quickly upon the push of a button.

This grant will help the public nationwide understand and feel comfortable with this technology, and enable Peoria to institutionalize the steps necessary to integrate this tool into a comprehensive transit system.

The City will educate members of the community about autonomous technology including the placement of information signs throughout the two proposed districts. Additionally, the city would meet with those within and outside of the geofenced area to educate them about the demonstration project. Community outreach, which includes social media, will create awareness, familiarization and adoption of this technology. Emphasis would be placed that it is a free to use service and the feedback gathered through the ride hailing mobile application would be available to the public. Outreach will further stress the various safety components of the vehicles and how the technology works.

Riders that use the mobile application to hail a ride will be able to provide feedback on the trip. A survey will be sent through the mobile application upon the completion of the trip. Customer satisfaction scores will be captured on how the drivers felt about their safety, smoothness of the ride, how timely it was, overall satisfaction and if they would recommend the service to others. With the award of this funding, Peoria's experience will be a model for replication in suburban America. This geofenced district has a distinct mix of destinations such a restaurants, big box stores, hotels, medical offices (including urgent care facilities) a hockey rink, a MLB spring training complex, and a variety of residential uses including single family and multi-family neighborhoods.

Understanding how an autonomous vehicle interacts with each of these typical suburban elements will be a key part of this demonstration project.

Safety is paramount. Riders will have the car to themselves and their party for the ride. They do not have to share the ride with strangers. Each request is individual, and no one is entering a vehicle with a rider that they do not know. The rider will receive a pin number to enter the vehicle to ensure it is the rider who hailed the vehicle through either the kiosk or mobile application.

There will be display screens on all four sides of the vehicle. The display screens alert drivers behind the vehicle that it is stopping to drop off passengers. Signs are placed throughout the area to include pickup and drop off zones. This service will also benefit the elderly to transport them to medical appointments or businesses. The trip will not start until all passengers have buckled their seat belt. The vehicle has sensors that indicate if the seatbelt has been secured. The vehicle also has a telematic “black box” that records the vehicle’s functions.

Peoria and the selected vendor will work with the community and Peoria city staff to educate them regarding safety. This will include first responder training, traffic management training, outreach, social media and community days. The vendor will also educate the public via press releases for local, state and national media.

The vendor will hire local employees, focusing on veterans for vehicle and technology maintenance. Vehicles are maintained and inspected every evening.

Focus Areas:

This program enhances our current transit plan by helping riders quickly and safely traverses the first or last mile of their trip as well as from point A to point B within the geofenced area at no charge. This can boost the economy and sales in the designated areas as patrons can quickly and easily jump from place to place where there is no public transportation available. Temperatures in Peoria exceed 100 degrees approximately 110 days per year. This technology assists patrons that may not normally leave air conditioned areas on warmer days to experience and navigate what the designated areas have to offer and get to their destination.

This project will enhance economic vitality though such uses as trips from hotels to the stadium, offices to restaurants, university to apartment, and residents to shopping outlets.

The potential vendor uses radar, LIDAR and High Definition (HD) cameras to create a 3-D model of the area. The car uses this technology as sensors. The potential vendor has trained the artificial intelligence model to recognize and categorize 10,000 objects and respond to them based upon the individual item. The technology to operate the car is contained within the vehicle. It is not based on outside signals, such as Wi-Fi, so the potential for a cyberattack is minimal. Additionally, the vehicle is monitored remotely. When there is no longer a safety driver in the vehicle, if there is an issue, a remote operator can make the vehicle come to a safe stop. If a traffic signal is not working, or a sign is down, the vehicle will come to a safe stop and ping the remote operator for

instruction. It also notifies the city of any street condition issue in a manner that would potentially expedite a repair.

The potential vendor has proven the viability of its prototypes in other similar municipal markets.

Transportation challenged populations are currently identified and serviced by the city of Peoria's dial-a-ride program. This program will complement the autonomous vehicle demonstration.

Requirements:

Peoria has had discussions with potential vendors that utilize L3 technology. This technology has been proven in prior markets and is ready for deployment in Peoria. A demonstration could be arranged quickly after the grant has been awarded. The vendors are able to share deployment operational data in real-time. The information available includes: location of the vehicle, passenger count, service uptime, utilization, disengagements, cancellation rates and other useful metrics that will enable the city to make better planning decisions for municipal transit infrastructure and future development. Vendors are also able to share information with third party data storage providers for analysis by the Department of Transportation. The data transfer would be one-way only, digitally secured, and encrypted via redundant cellular networks.

Operational data can be thought of in two levels, higher and lower. Operational data occurs at the higher level and includes things such as GPS location, pick-up and drop-off location, implied speed through GPS triangulation, etc. Telematic data occurs at the

lower level and includes items like steering and braking. As these lower level functions are core to the vehicle's operational safety, this data can neither be transmitted from the vehicle nor shared.

The potential vendor’s ride hailing mobile application has functional inputs and outputs that can be extended to collaborate with system integrations to expose relevant information for use by a third party or the Department of Transportation. Some of the endpoints that are available from the mobile app include: Request an estimated time of arrival, request a ride, cancel a ride, start a ride, end a ride, get ride status, get ride estimated time of arrival, submit a ride rating, service status, route selection, route information, report an issue, ride history, and rating schema. Additional information available to report is trip length and GPS data. The vendor would be able to provide a live stream of data and utilization.

Since Peoria is a fairly typical suburban area, this program could be scaled and applied to similar community in the nation. Each deployment is unique due to differences in geography and nuances of driving culture in each community. However, there are common lessons around deployment that the City can learn from this pilot that can scale to similar geographies as Peoria. The proposed technology is on-demand mobility as a service provided by self-driving vehicles.

The data for safety analysis and rule making will report on disengagements and autonomous vehicle miles driven similar to the requirements of the California department of motor vehicles. Additionally, it will include detailed reporting on any safety incidents or near-safety incidents complete with recommendations for optimizing