Pinellas Suncoast Transit Authority

Pinellas County Automated Driving Systems Shuttle Demonstration

USDOT/FHWA Automated Driving Systems Demonstration Grant Proposal:

PROJECT NARRATIVE AND TECHNICAL APPROACH

March 20, 2019

March 18, 2019

The Honorable Elaine L. Chao
U.S. Department of Transportation
1200 New Jersey Ave, SE
Washington, D.C. 20590

Dear Madame Secretary:

Enclosed is the completed Automated Driving System Demonstration grant application from Pinellas Suncoast Transit Authority (PSTA).

We are currently seeking to develop an automated driving systems (ADS) demonstration program in Pinellas County to better understand the benefits, requirements, and impact of this emerging technology. We are coordinating closely with local stakeholders to understand the potential applications of this technology to augment and enhance mobility.

Our proposed plan will safely test cutting-edge automated driving systems on city streets to introduce the technology to the citizens of Pinellas County and collect significant testing data. This proposed demonstration will expand on the current plan to implement an ADS demonstration in Downtown St. Petersburg and allow low-speed level four autonomous shuttles to be tested along public roadways within multiple municipalities in Pinellas County to include Clearwater and Dunedin. This proposed plan will be implemented by a collaboration of public and private sector partners and allow for the safe deployment of ADS shuttles to ensure significant data gathering and sharing with USDOT. Please see the enclosed grant application narrative for more details.

Since our demonstration projects are projected to begin in fall 2019, PSTA is striving to secure funding to help us ensure the success of these demonstration programs. If you have any questions or require additional information, please don't hesitate to contact me.

Sincerely,

Brad Miller
Chief Executive Officer
Pinellas Suncoast Transit Authority
3201 Scherer Drive
St. Petersburg, FL 33716
bmiller@psta.net

Summary Table

Project Name/Title	Pinellas County ADS Shuttle Demonstration
Eligible Entity Applying to Receive Federal Funding (Prime Applicant's Legal Name and Address)	Pinellas Suncoast Transit Authority 3201 Scherer Dr. St. Petersburg, FL 33713
Point of Contact (Name/Title; Email; Phone Number)	Jacob Labutka Project Planner Jlabutka@psta.net 727-540-1977
Proposed Location (State(s) and Municipalities) for the Demonstration	Clearwater, FL Dunedin, FL
Proposed Technologies for the Demonstration (briefly list)	Navya AUTONOM shuttle
Proposed Duration of the Demonstration (period of performance)	Minimum of three months per demonstration
Federal Funding Amount Requested	$ 995,385
Non-Federal Cost Share Amount Proposed, if applicable	$ 50,000
Total Project Cost (Federal Share + Non-Federal Cost Share, if applicable)	$ 1,045,385

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Executive Summary

PSTA seeks to develop an automated driving systems (ADS) demonstration program to better understand the benefit, requirements, and impact of this emerging technology. Coordinating closely with residents and businesses, PSTA will explore the potential applications of this technology to augment and enhance mobility. With an emphasis on safety and public engagement, this demonstration will span multiple municipalities in Pinellas County and involve low-speed, level 4 autonomous shuttles along public roadways. The proposed plan will leverage lessons learned from an existing demonstration project being planned in St. Petersburg and test cutting-edge automated driving systems on Pinellas County city streets. During the program, PSTA will collect significant data to surface additional opportunities and challenges related to automated driving systems.

This project seeks to demonstrate ADS in two distinct municipalities: Clearwater and Dunedin. Both proposed locations are filled with pedestrian activity, yet there is a demand for other mobility options. Many who patronize these areas wish to travel up to a mile but are unable to do so comfortably by foot. Though the streets are lower speed the areas have highly trafficked intersections across multiple modes (bikes, pedestrians, cars, etc.) that shuttles would need to pass through. The ADS technology has the potential to improve first/last mile mobility in areas where driving a SOV or deploying additional fixed route buses is not always feasible.

PSTA has assembled a strong team. Key partners include the Cities of Clearwater and Dunedin, Stantec, Beep, and Navya. Clearwater and Dunedin are municipalities where the demonstrations would take place. Stantec will provide support services for the demonstrations' management and deployment. Stantec led the development of the North County AV Feasibility Study which informed the selection of preferred deployment locations for this project. PSTA previously allocated $50,000 as a match for the North County AV Feasibility Study that is spearheaded by a Stantec grant program that selected several locations across North American to develop feasibility studies and concept plan scopes tailored to the assessment of requirements necessary to deploy AV shuttle technology in mixed traffic. In addition, Navya has been identified as the preferred autonomous shuttle manufacturer while Beep, a Florida-based autonomous vehicle research and development company, has been identified as the preferred shuttle operator.

The Clearwater pilot is proposed to be in Clearwater Beach, an area known for its vibrant tourism industry, Clearwater Beach is inhabited by diverse user groups including visitors, workers, and seasonal & long-term residents that have mobility needs within one of the county's most compact and visited areas. The Dunedin pilot is proposed to be along the city's popular Main St. Corridor where there is a high level of pedestrian activity throughout the day. These locations offer an excellent opportunity to introduce ADS technology to the citizens of Pinellas County and demonstrate ADS mobility as a solution to add mobility options to these popular areas.

This project leverages an existing partnership between PSTA, Beep, and Navya for an autonomous shuttle demonstration in Downtown St. Petersburg. The St. Petersburg demonstration is fully funded by PSTA and FDOT with in-kind contributions provided by the City of St Petersburg. The Clearwater and Dunedin project seeks to implement the recommendations proposed in the North County AV Feasibility Study and merge all three planned demonstrations into one program. The same shuttles will be used in all three demonstrations to ensure data consistency, cost-effectiveness, and timely implementation. Each demonstration will last for a minimum of three months and will utilize one to two shuttles for operations. Demonstrations will be evaluated based on criteria that is both vehicle-focused and user-focused. The mechanical operation and safety of the ADS shuttles in service will be evaluated alongside riders' perception and utilization of the technology. ADS shuttle demonstrations in Pinellas County are projected to be implemented starting in the fall of 2019 and conclude by the fall of 2020.

The proposed demonstration would advance a Tampa Bay region-wide initiative to demonstrate ADS and connected vehicle (CV) technologies. Tampa Hillsborough Expressway Authority (THEA) is currently demonstrating CV technology along its roadways to alert drivers of multiple modes (e.g. SOV drivers, transit operators, etc.) to changes in traffic patterns, driver error, etc. Hillsborough Area Regional Transit will be implementing a permanent ADS shuttle service along a dedicated transit corridor in Downtown Tampa this summer. University of South Florida demonstrated an ADS shuttle service on its main campus in north Tampa. The information obtained from these demonstrations and deployments can be utilized to establish a regional deployment strategy of automated and connected vehicle technology. The location of the planned and proposed Pinellas County ADS demonstrations and existing/upcoming deployments in Tampa is shown in Figure 1.

Goals

The proposed project aligns well with the ADS Demonstration Program Goals:

- **Safety:** The proposed demonstrations will address potential ADS safety challenges including mixed-traffic operations, complex roadway design, lack of standards (traffic control devices, data sharing), lack of emergency response protocols, and lack of insurance products. Solutions to these challenges that will be tested in these demonstrations to operate low-speed level 4 autonomous shuttles include identifying constrained rights-of-way for deployment, installing specialized traffic control devices (signage, lane striping, connected traffic signals, etc.), emergency response training, and public outreach before and during deployment. ADS shuttles will be tested as a mobility solution to address transportation safety issues in the popular areas of Clearwater Beach and Dunedin. Automation offers the potential to improve safety for vehicle operators and occupants and other travelers of multiple modes sharing the roadway.

- **Data for Safety Analysis and Rulemaking:** Data that is gathered and analyzed will be utilized to assess the safety of ADS shuttle operations, how the shuttles interact with mixed-traffic environments including operating next to bicycle and pedestrian modes, and rider response to the technology. This data analysis will be used to evaluate the proposed demonstration program and asses the utility of permanent ADS first/last mile and circulator systems in Pinellas County. The data will also be used to analyze how future, long-term advancements in ADS technologies would be deployed in mixed-traffic environments, particularly as automated 40 to 60 foot fixed route buses begin being developed and may start being tested in the U.S. in the coming years. This analysis will be accomplished through a data management workflow:

    - *Gather*: Data will be collected by the vehicle from the physical environment, by operations/maintenance personnel from system maintenance, and by end-users from use statistics.
    - *Process*: Data will be processed and synthesized in order to be uploaded into the secure data commons recommended by USDOT.
    - *Share:* Data will be shared via public web portal in near real time. The following is a preliminary list of data that may be communicated:
        - *User*-focused: Schedule/on time performance, ridership counts, boarding/alighting counts, anonymized O-D information
        - *Vehicle focused:* Vehicle location/heading, safety incidents (i.e. crashes, near missed, disengagements), exposure measures (i.e. some infraction per 100 miles), roadmanship rating, weather conditions
    - *Analyze:* Data will be analyzed to reveal operational insights. Can be segmented into leading and lagging measures to guide future development and create reports.
    - *Store:* USDOT will have access to all uploaded data that will be stored in their secure data to meet data access requirements for a period of at least five years after the award period of performance expires.

- **Collaboration**

The list below are stakeholders involved with the Pinellas County ADS program to date. PSTA will coordinate with other public and private stakeholders prior to deployment to ensure the safety and public utility of ADS shuttles.

- Technology Partners
    - Beep - As a Florida-based AV research and development company, Beep is the preferred operator and will ensure safe implementation of the ADS shuttle demonstration. PSTA will coordinate with Beep to acquire vehicle data.

- Navya - Navya is the preferred vehicle manufacturer and will assist Beep with the route/site assessment. Beep recently announced an exclusive dealer arrangement with Navya to lead testing and pilot deployments of the Navya Autonom shuttle in the state of Florida.
- City of Clearwater - City staff have participated in demonstration planning and identified preliminary route options, shown in Figure 2. The city will assist with coordination with additional local stakeholders prior to deployment.
- City of Dunedin - City staff have participated in demonstration planning and identified preliminary route options, shown in Figure 3. The city will assist with coordination with additional local stakeholders prior to deployment.
- City of St. Petersburg - City staff have assisted with demonstration planning & coordination assistance with local stakeholders. This demonstration is already funded but would be programmed into the shuttle deployment schedule with the proposed north county demonstrations. The route selected is shown in Figure 4 The city will also provide infrastructure enhancements along the route corridor.

- State/Regional Government
  - Pinellas Suncoast Transit Authority - PSTA will oversee the management of the demonstration and coordinate with all stakeholders to ensure the safe deployment of ADS shuttles. PSTA will also spearhead public outreach prior to and during the demonstration to educate the public about the service and technology.
  - Florida Department of Transportation (FDOT) – FDOT will assist with planning for the safe deployment of ADS shuttles on any state roadways selected for demonstration routing. FDOT provided funding for the ADS demonstration in St. Petersburg.

- Demonstration Planning/Program Management Consultant
  - Stantec - Stantec led the development of the North County AV Feasibility Study that has provided several route recommendations for Clearwater and Dunedin. They will provide support services such as project management and stakeholder coordination and outreach in preparation for the demonstration deployment. PSTA has been able to leverage Stantec's experience with other ADS shuttle systems planning. PSTA was one of several agencies selected through a Stantec initiative that provided ADS planning services to agencies at a reduced cost.

Focus Areas

Significant Public Benefits

This project will involve ADS demonstrations in Pinellas County, home to almost one million people and a year-round tourism economy that attracts millions of visitors every year. The deployment sites lie in the City of Clearwater and the City of Dunedin, serving Clearwater Beach and the Downtown/Main St. Corridor, respectively. These coastal towns are highly-trafficked yet are developed with low to moderate levels of density giving lessons learned from these demonstration locations significant applicability to other service areas. These operating environments have similarities to other coastal towns and Main St. corridors across the U.S, which will allow the deployment strategy to be applied to many other large metros and suburban areas across the United States. PSTA has worked with city staff from Clearwater and Dunedin during project planning to ensure both the safety and utility of the demonstrations for the public.

This demonstration would also have significant impact at the local level, serving major tourist destinations, municipal buildings, and shopping and dining venues. There is a desire within communities across Pinellas County to increase accessibility around downtown and tourism-oriented sites in an environmentally-friendly and forward-thinking manner. This is not only a data gathering opportunity for project partners and the USDOT, but an opportunity to implement an automated driving system that serves real-world needs.

Addressing Market Failure and Other Compelling Public Needs

Both Clearwater Beach and downtown Dunedin have become popular destinations for residents and tourists nationwide. Due to the significant popularity of these vibrant areas, traffic has become an increasing concern both in these neighborhoods and throughout the Tampa Bay region. Traffic is especially problematic during special events and high-tourism seasons like spring break. Neighborhoods encourage residents and visitors to utilize other forms of transportation besides driving, especially for shorter first/last mile trips that begin and end within these areas. The significant investments in building and maintaining pedestrian infrastructure within these areas is evidence of how vital walking is as a mode of transportation. A need, however, still exists to transport people across distances that are just beyond a comfortable walk.

Transit services exist within Dunedin and Clearwater, but it is often not a practical choice for people taking short first/last mile trips due to the frequency and coverage of services. Taxi and ridehailing services are not always practical for those traveling within these areas due to availability and affordability. Demonstrating autonomous shuttles within these areas will provide new testing grounds for ADS while also assessing a mobility demand that is not served by the existing market.

Economic Vitality

The technology and staff proposed for this demonstration project adhere to Buy American and Hire American standards in accordance with Executive Order 13788 and 41 U.S.C. sections 8301-8305 (2017). The vehicle technology under consideration is manufactured in the United States and consists of not more than 50% foreign sourced materials. Each project partner employs American workers including contracted staff.

This project has the potential to create jobs in the local market by requiring a dedicated operations and maintenance staff as well as other support services. While project planning and site setup requires national support, operations largely depend on local resources on a short-term or permanent basis depending on task and deployment strategy. This will bring new skills and ideas to the community having positive spillover effects.

Aside from materials sourcing and staffing, this deployment supports the local economy by increasing access to services within the project catchment area. It adds an accessible modal choice to efficiently and safely transport people between residential, commercial and institutional centers. This use-case will also have the effect of increasing patronage to local restaurants, businesses, and other establishments where parking is limited by providing transportation to residents, workers + tourists.

Finally, in other communities, fixed guideway transit has been used to spur development along corridors or in targeted locations. A flexible, but novel, transportation system such as an automated driving system could help accomplish a similar goal. The attractive nature of this technology could be used to incentivize strategic investment to an area. Informed by the data collected through this demonstration, a long-term development vision may be pursued by stakeholders.

Complexity of Technology

This demonstration uses L4 technology operating on mixed-traffic, public rights-of-way. A key aspect of the Operational Design Domain is that the technology operates at low-speeds, defined as not over 25 mph with an average operating speed of 12 mph. There are several reasons for designing this vehicle platform for low-speed operation:

- First, it's one of the risk mitigation factors conceived to limit the severity of a potential crash. Severe crashes are associated with higher speeds.

- Second, low-speeds create a comfortable rider experience for this vehicle platform. The small, 12-person cabin has non-traditional seating and low-speeds facilitate comfortable acceleration/deceleration rates even in emergency situations.

- Third, there exists a mobility gap in low-speed environments such as urban centers, campuses, suburban/rural communities, and others, where high-speed travel is not

possible and land-use patterns do not facilitate walking for all ages and abilities. This low-speed conveyance can fill this specific mobility gap and improve accessibility while augmenting legacy transportation systems.

Diversity of Projects

As lower density, car-oriented cities, Clearwater and Dunedin do not maximize the benefits from shared modes of transportation, largely due to the infrastructure development patterns inherent to suburban communities and transit's inability to economically service these areas. The demonstration of ADS shuttles in these environments will allow public acceptance of this technology to be gauged and will demonstrate demand for high frequency first/last mile automated transit service within popular walkable areas that are within larger car-oriented suburban style cities. The promise of lower operating costs, flexible scheduling, right-sized fleets, accessibility accommodations, and convenient payment systems work to make shared mobility more comfortable and appealing in lower-density environments. These theories will be tested during implementation and lessons learned may be broadly applied to areas of similar development patterns and demographics.

Transportation-challenged Populations

The median age of residents in Pinellas County is 48, which is significantly higher than the national median of 38. This is even higher among residents of Dunedin, 52.2, and Clearwater Beach, 64.5. The demand for transportation services from older populations continues to grow every year. PSTA's paratransit ridership grew over 11% between 2017 and 2018. First/last mile services in areas like these can enhance the mobility of older and disabled residents and visitors. Shuttles deployed will include ramps to accommodate riders with ambulatory devices, and stops will be located at or near existing transit stops to make transfers easy. If there is no existing transit along part of the routing, stops will be located where entry and egress will be easy for all riders.

In addition, transit dependent populations commute to concentrations of employment in Dunedin and Clearwater Beach every day. This ADS demonstration will allow workers to have an additional first/last mile transportation option that connects transit and employment opportunities.

Ensuring that these projects serve transportation-challenged populations like older adults and low-income, transit-dependent workers will allow ADS technology to be introduced to those that would benefit from it most. Feedback received from these populations during the demonstration will be a critical element of creating sustainable and permanent ADS transit services as the technology advances and becomes further integrated in this region's transportation system.

Prototypes

Low-speed automated shuttles have been in operation for the last several years, including the Navya Autonom Shuttle that is the preferred vehicle for this project. They have been operated throughout the world and have a demonstrated safety record. There have been a handful of deployments of this type of shuttle in the U.S., but only a few have operated in mixed-traffic conditions. All deployment sites within Pinellas County would be on low speed, mixed-traffic streets.

Requirements

A. This demonstration project focuses on L4 automated shuttle deployment per the SAE definition.

B. An automated vehicle will be physically implemented in a real-world use-case in the City of Clearwater and City of Dunedin, Florida serving as a first/last mile operation.

C. The project team has designed a data management flow that gathers, processes, shares, analyzes, and stores data per grant requirements. Please see the Data Management Plan for further explanation.

D. The demonstration will feature an accessible human-machine interface on several platforms – onboard the vehicle, via website, and mobile application – that allows users to view the system's schedule, access route information, and select a destination. All shuttles will also have an on-board ambassador to assist riders of all abilities and educate riders about ADS technology.

E. Project stakeholders and partners have chosen use-cases that are general and highly applicable across many US cities. The workflow consists of four phases, each segmented by major tasks that can easily and affordably be scaled to the size of the project. The criteria used to evaluate the deployment sites in Clearwater and Dunedin can be applied to cities of similar development pattern and transit level of service or can easily be tailored to a dissimilar deployment site. There are numerous technology providers competing in the L4 automated shuttle space allowing for adequate servicing and competitive pricing of scaled projects. Technology providers are starting to expand into other vehicle categories and platforms so scaling solutions to projects outside of this project's broad domain is becoming more and more realistic. As projects scale, knowledge transfer will be an important component, whether training owners and/or operators of automated driving systems or educating the public of their uses and benefits. Websites and mobile applications will store and relay a breadth of insightful data, marketing pieces, and other information for public consumption.

In-person demonstrations will continue to be conducted at national conferences and local events with an increasing level of sophistication and interactivity. This is a more costly and complicated method for public outreach but can be far more impactful with journalistic coverage of these demonstrations offering a second level of information sharing and marketing. Before, during and after the proposed demonstration deployment, PSTA will explore opportunities to share the status, results, and lessons learned from this program to other jurisdictions and the public through the hosting of site visits from other agencies and the presentation of data at local meetings and workshops and national conferences.

Approach

A. PSTA has already begun collaborating with partners such as Stantec and the cities of Clearwater and Dunedin to develop preliminary routing options that will help ensure the safe deployment of these shuttles. The North County AV Feasibility Study, which has been in development for the last several months with the technical lead of Stantec, has looked at factors such as route length, road conditions, speed limits, turning movements, and route timing to select the proposed routing options. Beep and Navya have been consulted about this project and both locations meet their initial requirement for shuttles to operate on low-speed roadways. They will conduct an in-depth route assessment once Beep is officially under contract with PSTA and funding is secured for this project to ensure that the preliminary routing options are entirely compatible with the ADS software and standard vehicle operations. This project will be evaluated by analyzing the following preliminary performance metrics in two categories:
    a. Vehicle-focused –safety incidents (i.e. crashes, near misses, disengagements), exposure measures (i.e. some infraction per 100 miles), Roadmanship Rating
    b. User-focused – Schedule/on time performance, ridership counts, boarding/alighting counts, rider experience

B. The technology and staff proposed for this demonstration project adhere to Buy American and Hire American standards in accordance with Executive Order 13788 and 41 U.S.C. sections 8301-8305 (2017). The vehicle technology under consideration is manufactured in the United States and consists of not more than 50% foreign sourced materials. Each project partner employs American workers including contracted staff.

    In coordination with Beep and Navya, PSTA will submit the final routing options to NHTSA in the exemption waiver required for ADS shuttles to operate on public rights of way. This will be done within 60 days of the notice of award.

C. PSTA commits to work with project partners to ensure that all relevant data is provided for the proposed demonstrations.

D. The North County AV Feasibility study considered risk management in its preliminary route recommendations. All ADS demonstration routes will operate on lower speed streets. This is a primary risk mitigation factor conceived to limit the severity of a potential crash. Severe crashes are associated with higher speeds. All vehicle operations must comply with PSTA's on street emergency management procedures. In addition, the Beep Command Center has video monitoring capability of its shuttles during operation and operators can immediately report irregular activities and events to the command center. PSTA will ensure that Beep meets all operational insurance requirements during contract development.

E. Federal resources for the demonstration will be provided in-kind by the City of Dunedin in the form of secured, enclosed storage areas within 650' of the route path with access to electricity, water, and storage for tools and spare parts.

Figure 1: Tampa Bay Area ADS and CV projects

Figure 2: Clearwater Beach ADS Demonstration Preliminary Routing Plan

Figure 3: Downtown Dunedin ADS Demonstration Preliminary Routing Plan

Figure 4: Downtown St. Petersburg ADS Demonstration Routing Plan