2019 UDOT RESEARCH PROBLEM STATEMENT

**** Problem statement deadline is Feb. 6, 2019. Submit statements to UTRAC@utah.gov. ****

Title: Connected and Autonomous Vehicles: Potential impacts on air-quality **No. (Office Use):** 19.03.13

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Select ONE Subject Area ☐ Materials/Pavements ☐ Maintenance ☒ Traffic Mgmt/Safety ☐ Structures/Geotech ☐ Planning ☐ Perf Mgmt/Data Analytics ☐ Public Transportation ☐ Other

1. Describe the problem to be addressed:

There has been a great deal of discussion in transportation planning practice and academia about the potential impacts of widespread adoption of connected and autonomous vehicle (CAV) technologies. One major limitation, in terms of how we can empirically evaluate how these technologies will affect important transportation performance measures such as congestion, vehicle miles traveled, and air-quality, is the lack of data. It is difficult to model the future without past and present data. This leads researchers and planners to ask, what do we know now, and how can that information be used to better understand the future? First, with this burgeoning subfield of transportation research, it is essential to synthesize the findings of existing research. A comprehensive literature review will be of great use for transportation professionals as it will allow them to more easily envisage the ever-expanding body of work that has been rapidly proliferating into the esoteric space of academic literature. The findings from this exercise can then be used to make estimations of how existing technologies are impacting performance measures air-quality.

2. Write the project objective (25 words or less):

Our study will synthesize the literature on the topic of CAVs. We will use findings from the literature to estimate the impacts of connected buses on air-quality.

3. Explain why this research is important:
(In response, consider addressing specific UDOT goals, applicability in Utah or other states, etc.)

In Carlos's Top Ten, he states that UDOT will be a national leader in the evolution and development of connected and autonomous vehicles in the next few years. CAVs represent a great opportunity to improve upon important limitations of the current transportation system. Removing or mitigating human error and entropy from the equation has the potential to increase the efficiency of our roadways, limit congestion and related emissions, and improve safety. However, as these technologies are making it to market, their effects will be varied, and their adoption must be coordinated and responsive to policy. In Utah, connected buses are already being operated on limited corridors, and the effects of these operations can be evaluated. In addition to the evaluation of limited systems in our region, there is certainly much that can be learned from the academic literature and reports from other regions. It is essential to have a comprehensive yet approachable guide to the existing information so that we can build upon it, as well as avoid reinventing the wheel. Finally, once we identify what is known, this knowledge can be applied to evaluate how existing systems are affecting air-quality. Having a robust system for evaluating the impacts of connected bus systems on air-quality will determine if this is a viable tool for UDOT and UTA to combat air-quality issues in the region.

4. List the major tasks:

1. Conduct a directed and comprehensive literature review. The review will be multi-disciplinary, surveying work from computer science, civil engineering, planning, economics, and behavioral science.
2. Create a reference document that contains concise findings related to the impacts of CAVs, barriers to adoption, policy suggestions for DOTs, and implementation strategies.
3. Create a tool for evaluating air-quality impacts of existing connected bus systems that can also be used to estimate the effects of future projects.

4. Report and article writing. Final report will contain the comprehensive literature review, pared-down findings, lessons, and policy suggestions, and findings from the sketch planning exercise.

5. List the expected deliverables (reports, manual, specification, design method, training, etc.):

1. Literature Review
2. Companion Reference Document
3. Air-Quality Impact Assessment Tool
4. Final Report
5. Peer-reviewed Paper

6. Describe how the research results will be implemented:
(In response, consider addressing UDOT leader support, process or standard improvement, etc.)

As mentioned above, it is a priority of the Department to become a leader in the development and implementation of CAV technologies. This research will help to make the vast existing body of knowledge more accessible by creating a product that is comprehensive yet convenient. Additionally, the findings from the literature review will be used to estimate how connected bus systems are currently affecting air-quality. As the region continues to grow, air-quality issues will become even more paramount, and it is essential to develop appropriate strategies for addressing this issue. Connected bus systems have the potential to alleviate transportation related emissions by making the buses themselves more efficient, as well as by enhancing the attractiveness of this mode by increasing reliability and shortening travel times. Assessing the effects of connected bus systems on efficiency, reliability, and potential mode shift will help UDOT and regional policy makers determine if this is a viable tool for affecting air-quality.

7. Requested from UDOT: $30,000 **Other/Matching Funds:** $10,000 **Total Cost:** $40,000
(or UTA for Public Transportation)

8. Outline the proposed schedule, including start and major event dates:

- Project Start Date: May 1, 2019
- Literature Review: May 2019-December 2019
- Estimation Tool Development: December 2019-March 2019
- Draft Report Complete: February 28, 2020
- Peer Review: March 2020
- Report Revision: March-April 2020
- Project End Date: April 31, 2020