

# 2016 UDOT RESEARCH PROBLEM STATEMENT

\*\*\* Problem statement deadline is March 14, 2016. Submit statements to Tom Hales at [tahales@utah.gov](mailto:tahales@utah.gov). \*\*\*

**Title:** Effects of Converting Express Lanes from Restricted to Continuous Access on Safety and Operation No. (office use): 16.03.03

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**Select One Subject Area**

Materials/Pavements

Maintenance

Traffic Mgmt/Safety

Preconstruction

Planning

Public Transportation

## 1. Describe the problem to be addressed.

High Occupancy Toll (HOT) lanes were first introduced by the Utah Department of Transportation (UDOT) in September 2006. At that time Single Occupancy Vehicles (SOVs) were allowed to use the lane by paying a flat monthly fee of \$50 per month. Since this time, the HOT lanes have evolved into the current 63 miles of Express lanes, the longest managed lane system in the United States. The primary purpose for the Express lanes was to provide a system wherein users could pay a toll to experience higher travel time reliability as the lanes were expected to operate at speeds at, or above, 55 mph 90% of the time. Although this goal has been met the majority of the time, recent research has identified that there are times where this goal is not met on the entire corridor. During these times of congestion, when the speeds are below 55 mph, the recent research has also shown that the Express Lanes generally do not operate more than 10-15 mph faster than the General Purpose (GP) lanes. Experience has also shown that although it is relatively easy to enter the Express lane during the peak period, exiting from the Express lane during the peak period is much more difficult to do within the restricted access points because it is difficult to find safe gaps in the GP lane closest to the Express lane. In such cases the drivers exiting the Express lane have two options: 1) slowdown in the Express lane to find a safe gap (knowingly or unknowingly) or 2) take a shorter-than-usual safe gap they accept, thus creating both safety and operational dilemmas for both Express lane users and those in the GP lane next to the Express lane and at the same time potentially lowering the speed of vehicles in the Express lane.

Washington State Department of Transportation (WSDOT) representatives were facing with a similar problem that existed for the SR 167 HOT lanes. They had thought that they could improve safety and operation of the HOT lanes by restricting the entry/exit of the HOT lane to limited access points; however, the reality has not been always true. Recently, WSDOT acquired federal funding to test this theory in the field by converting restricted access points on SR 167 to continuous access. Access rules for the study section changed in August 2014 and the test was completed in 2015. A WSDOT representative (Patty Rubstello) and the researchers of University of Washington (Mark Hallenbeck and John Ishimaru) made a presentation during the 2016 Annual TRB Meeting to report their final findings. They reported the customers generally approved of the access rule change (65%), felt the HOT lanes are now easier to use (75%), and felt the HOT lanes were safer (54% felt safer vs. 27% less safer) according to their motorist survey with 4,000 participants. They reported that travel times increased in both HOT and GP lanes, especially in the first 5 month of operation but they mentioned that the overall trend was towards increasing travel time in the area; so, this increase may not necessary be caused by the change in HOV lane access rule. Other findings included: (1) HOT lane speeds appear to be more affected by GP lane speeds now, and (2) As GP lanes' speeds slow down, neighboring HOT lane speeds tend to slow down faster than previously. Also found was that transit operators liked the access rule change because of ease of entry to and exit from the HOT lane. Based on these findings, WSDOT decided to keep open access to the study sites.

Considering the current performance level of the Express lane on I-15 and the findings from WSDOT's field experiments, it is recommended to conduct a study to evaluate the effects of access rule changes to I-15 Express Lanes on its safety and operational benefits. The concept of continuous HOV lane is not new. The Highway Capacity Manual 6<sup>th</sup> edition that will be published in summer 2016 contains the capacity analysis of managed lanes, one of them being an HOV lane with continuous access. The purpose of this research is to compare the benefits of converting limited access points to continuous access to the Express lane on I-15 to the users of both the Express lane and of the GP lanes using simulation modeling to study the performance and the use of the Surrogate Safety Analysis Model (SSAM), a free software program developed and provided by FHWA to study the safety aspects of the proposed change (or, any other method that can be used to meet the goal of the study) as well as the evaluation of crash records at and near the off-ramps to which exit guidance is given by a sign for the study areas that will be selected for the study.

## 2. Explain why this research is important.

This research will evaluate the safety and operational benefits of converting restricted access to continuous access to the Express lane on I-15. Limited access forces Express lane users to weave in a short distance and this arrangement may be creating a potentially hazardous environment for Express lane users as well as users of the fast lane of the GP lanes, especially when GP lanes are

congested. In recent years, some state DOTs have converted limited access to continuous access to Express lanes or HOV lanes because of the overall benefits of continuous access. The study will provide UDOT with the safety and operational data to consider as they ponder how to improve the performance of the Express lane.

**3. List the research objective(s):**

1. Survey Express lane users' experiences and desires, both paid users and other users such as car poolers, public transit drivers and motor cyclists.
2. Analyze crash potentials near the current limited access openings
3. Compare the safety benefits of converting restricted access to continuous access
4. Compare the operational benefits of converting restricted access to continuous access

**4. List the major tasks:**

1. Kickoff meeting
2. Literature review
3. Develop a user survey regarding Express lane users' experience in the restricted entry/exit segments of the Express Lane
4. Crash analysis at and near the access points of the Express lane to identify potential contribution of restricted access points at the selected study sites
5. Evaluation and selection of simulation software to meet the goal of the study and a segment of I-15 for simulation analysis (most likely VISSIM)
6. Simulation model building of the selected segment of I-15: with restricted access points and with continuous access (at present, the proposers of this study consider three cases: (1) entry and exit restricted, (2) entry restricted but exit continuously free, and (3) entry and exit continuous access.
7. Analysis of conflicts in two cases using the SSAM (Surrogate Safety Analysis Model, a free software program developed and provided by FHWA) or any other appropriate simulation method that will be explored as part of literature review
8. Comparison of benefits of converting restricted access to continuous access to the Express Lane
9. Identification of issues concerning the conversion from restricted access to continuous access
10. Preparation of final report

**5. List the expected results:**

1. Survey results of Express lane users regarding their experience at restricted access points and their view on continuous access to the Express lane and results of statistical analyses of crashes that took place near or on access points to the Express lane
2. Effects of converting restricted access to continuous access on safety and performance of Express lane and general purpose lanes.

**6. Describe how this research will be implemented.**

The results of this study will help UDOT to determine whether they should continue the policy of restricting entry to and exit from the Express lane to restricted access points or change the policy to convert entry/exit from restricted points to continuous access.

**7. Requested from UDOT:** \$69,000  
(or UTA for Public Transportation)

**Other/Matching Funds:** \$

**Total Cost:** \$69,000

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

It is recommended that this project begin in later summer or early Fall 2016 with the initial tasks of finalizing the project scope of work and detailed cost estimates, followed with the literature review. It is anticipated that the project would take 16 to 18 months, including a 4-month report review period.