**American Association of State Highway and Transportation Officials**

**Special Committee on Research and Innovation**

**FY2021 NCHRP PROBLEM STATEMENT OUTLINE**

**1. Problem Title**

Impact of Incomplete/Missing Annual Pavement Condition Data and Proposed Mitigation Strategies

**2. Background**

Due to external stakeholder requirements and expectations (e.g., MAP 21 and FAST Acts) as well as internal DOT uses, DOTs typically collect pavement condition data (i.e., roughness, cracking and rutting or faulting depending on the pavement surfaces) on an annual cycle. However, disruptions of typical agency activities related to COVID-19 have resulted in data collection challenges, focusing attention on potential impacts of missing a data collection cycle. DOT may also face unforeseen workforce, contracting, data collection or processing challenges or other issues which could result in missed pavement data collection. In these cases, DOTs would benefit from understanding the range of potential impacts as well as potential mitigation strategies available to address these issues. Furthermore, in times of reduced budget, DOTs may desire to reduce the frequency of data collection, however should be informed of the potential impacts of that decision.

**3. Literature Search Summary**

In the recent past, the FHWA sponsored a project which resulted in publications analyzing the impact of pavement monitoring frequency on pavement performance prediction and management system decisions [(Haider et al. 2010, 2011)](https://www.zotero.org/google-docs/?MmcvHb). This study analyzed pavement sections from the Long Term Pavement Performance database and recommended monitoring cracking at a 1-year interval and roughness every 1 to 2 years. The proposed study will further investigate this issue and expand the analysis on the implications of missing a data collection cycle in their transportation management plans. Given that the FHWA reporting requirements are fairly recent, there is not much in the transportation literature about the impact of missing a data collection cycle. Furthermore, little information is available on potential strategies available to mitigate the impact of incomplete condition data.

**4. Research Objective**

Evaluate the impacts of incomplete/missing annual pavement data collection to various aspects of agency asset and performance management, including technical considerations, such as network-level condition summary and performance forecast, maintenance, rehabilitation, and reconstruction decision-making, and condition deterioration and treatment improvement modeling. The study will also consider the effect of incomplete/missing data on the organization and processes, such as federal performance reporting and transportation asset management planning requirements, as well as impacts to other internal and external stakeholders and decision-making processes. As a secondary objective, the study will analyze and derive recommendations on mitigation strategies that DOT could implement to minimize the impact of incomplete condition data.

Proposed research activities include:

1. Conduct a literature review to document:
   * DOT motivations and/or requirements for annual data collection.
   * Potential technical and organizational impacts or issues associated with missing an annual data collection.
   * Techniques available to mitigate the impacts of missing the collection.
   * DOTs known to currently (or in the recent past) complete pavement data collection on a 2 or more year data collection cycle.
2. Building from the literature review, survey State DOTs to capture:
   * DOT motivations and/or requirements for annual data collection
   * Potential technical and organizational impacts or issues associated with missing an annual data collection
   * Techniques available to mitigate the impacts of missing the collection.
   * DOTs that currently (or recently) collected pavement data on a 2 or more year data collection cycle
   * DOTs which have previously missed their established collection cycle
3. Conduct follow up interviews/surveys with DOTs that have longer collection cycles or which had previously missed an annual pavement data collection to understand perceived vs. actual impacts (both technical and organizational) and any mitigation strategies they employ.
4. Summarize literature review, survey results and follow up interviews to guide ongoing research activities
5. From a representative set of DOTs, collect available pavement condition and work history data, pavement deterioration and improvement benefit models
6. Utilize collected data to complete a statistical evaluation of the impact missing a year of data collection with respect to forecasted vs. actual performance results, and ability to identify priority investment areas based on previous year’s data collection, as well as other issues identified through the survey
7. Identify potential strategies to mitigate the impacts of incomplete condition data
8. Document survey results and evaluation outcomes
9. Produce a technical report summarizing impacts of, and potential mitigations for, missing an annual pavement collection cycle

Desired products include:

* Detailed listing of current requirements and/or motivations for annual pavement data collection
* Summary of perceived and actual impacts of missing an annual data collection against the listed motivations, supported with a statistical evaluation of actual DOT datasets where applicable
* A summary of potential mitigation strategies that can be employed to reduce the identified impacts

**5. Urgency and Potential Benefits**

State DOTs perform data collection with a certain frequency based on the data condition type. Due to the unpredicted situation we are facing in 2020 many DOTs have missed their data collection schedule and this would directly affect the uncertainties and potential emerging risks in asset management. State DOTs need effective ways to address this incompletion in data to improve their ability in decision-making and ultimately continue their asset management plans. Studies have shown that monitoring intervals and data collection frequency have an effect on performance predictions. A part of the uncertainty in performance prediction is due to the frequency of distress data collection.

Data curing methods could significantly help state DOTs use their previous data to forecast the missing ones. Private industries can help state DOTs perform data curing and data mining strategies. COVID-19 has caused a pause in asset management procedures, however the gap in data collection can be filled with the improvement in machine-learning products. It is therefore increasingly important for state DOTs to benefit from the technology-based services private industries offer and decrease the risk of incomplete data.

**6. Implementation Considerations and Supporters**

The target audience for the research results is state DOT asset management and data quality management champions, whether self-designated or officially appointed. These individuals are likely already on board with the need for data curing and are aware of its benefits, but have been unable to convince executives or other senior decision-makers to sustainably implement data curing. There is a need for AASHTO and TRB committees to embrace the need for data curing. There is a possibility that TRB’s Pavement Management System committee will be interested in this subject, it is worth contacting them and explaining the objectives.

**7. Recommended Research Funding and Research Period**

Recommended funding: $250,000. This includes $225,000 for a half-time investigator for 18 months.

Recommended research period: 18 months

**8. Problem Statement Author(s)**

The following individuals contributed to development of this problem statement:

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**9.**  **Others Supporting the Problem Statement**

* TBD

**10.**  **Potential Panel Members**

* TBD

**11. Person Submitting the Problem Statement**

* TBD

**References**

[Haider, S. W., Baladi, G. Y., Chatti, K., and Dean, C. M. (2010). “Effect of Frequency of Pavement Condition Data Collection on Performance Prediction:” *Transportation Research Record*, SAGE PublicationsSage CA: Los Angeles, CA.](https://www.zotero.org/google-docs/?BVS3kG)

[Haider, S. W., Chatti, K., Baladi, G. Y., and Sivaneswaran, N. (2011). “Impact of Pavement Monitoring Frequency on Pavement Management System Decisions:” *Transportation Research Record*, SAGE PublicationsSage CA: Los Angeles, CA.](https://www.zotero.org/google-docs/?BVS3kG)