**Problem Title**:

Capturing Surface Defects (Oxidation, Weathering, and Raveling) on Bituminous Concrete Pavement Surfaces using Automated Pavement Data Collection.

**Background:**

Surface Defects, including Oxidation, Weathering, and Raveling on Bituminous Concrete Pavement is a critical distress in the determination of pavement deterioration. It is a leading indicator of future pavement deterioration and by extension, the maintenance and preservation treatments needed to address the issue. The early identification and preventive maintenance of the surface has a direct relationship to the life expectancy and life extension of bituminous concrete pavement. For that reason, many agencies rely on some type of surface defect distress to trigger preservation treatments in their pavement management systems. However, automated pavement data collection technologies struggle to properly identify Surface Defects. Common issues with identifying the distress include:

* Determining from the color of the surface the severity of oxidation (i.e. lightening or graying of the surface).
* Identifying polished aggregate or stripped asphalt cement from the aggregate on the surface.
* Identifying the difference between open grade mixes and raveled surfaces.
* Identifying if a bituminous pavement has received a surface coat such as chip seal, microsurfacing, slurry seal, etc.
* Determining any severity of the above distresses is problematic as definitions in most protocols are highly subjective.

Many data collection vendors feel that Raveling is the most promising from the three distresses mentioned, and many are currently testing beta versions of their algorithms to identify this distress. However, in order for pavement management systems to make effective maintenance, preservation, and rehabilitation recommendations on bituminous concrete pavements, identifying Surface Defects to include oxidation, weathering, and raveling, is extremely important. Agencies that have adopted automated pavement data collection technologies must know the limitations that exist in identifying this distress.

**Research Objectives:**

1. Determine the state of the practice among agencies to determine which states track this distress specifically.
2. Determine from the agencies that do track this distress, what is the practice of identifying this distress, either by manual or automated methods.
3. Determine the technical capabilities, both equipment and processing algorithms, of data collection vendors to identify Surface Defects and the current trends in improving the tools to do so.
4. Develop processes and/or tools that an agency can adopt to ensure the accurate collection of Surface Defects.
5. Make recommendations for alternatives that could be used in lieu of Surface Defects to trigger maintenance and preservation treatments for bituminous concrete pavements from a pavement management system.

**Potential Benefits:**

The following are the potential benefits of this study:

1. Agencies can begin to target maintenance, preservation, and rehabilitation treatment recommendations from their pavement management systems.
2. Early identification of this distress is critical to the longevity of bituminous concrete pavements.
3. Data collection vendors can begin to adopt automated methods of collecting this distress instead of relying on manual identification; this will result in faster return of data to the agency.

**Relationship to Existing Body of Knowledge:**

A number of State DOTs collect Surface Defects of some type according to various data collection manuals found online. FHWA has provided the Distress Identification Manual for The LTPP that also provides a definition of these distressesi. Detecting Raveling using automated data collection tools can be found in the literatureii. This research study will focus on ways to improve the automated pavement data collection capabilities to properly identify these distresses.

**Tasks:**

The research will include the following tasks:

1. Conduct a literature review of state of the practice in State DOTs collecting Surface Defects.
2. Conduct a literature review of the technical capabilities, both equipment and processing algorithms, of data collection vendors to identify Surface Defects.
3. Develop processes and/or tools that an agency can adopt to ensure the accurate collection of Surface Defects.
4. Make recommendations for alternatives that could be used in lieu of Surface Defects to trigger maintenance and preservation treatments for bituminous concrete pavements from a pavement management system.
5. Identify Future Research Needs.

**Sponsoring Committee:** AFD20, Pavement Monitoring and Evaluation

**Co-Sponsoring Committees:** AFD10, Pavement Management Systems

**Funding:** $100,000-$150,000

**Research Period:** 12 Months

I Miller, John S., Bellinger, William Y., FHWA-RD-03-031, “Distress Identification Manual for the Long-Term Pavement Performance Program (Fourth Revised Edition)”, June 2003.

ii Tsai, Y., Wang, Z., NCHRP IDEA Project 163, “Development of an Asphalt Pavement Raveling Detection Algorithm Using Emerging 3D Laser Technology and Macrotexture Analysis”, December 2015.