Period Covered: January 1, 2008 through March 31, 2008 (Quarterly Report)

ALDOT Progress Report for the

# State Planning and Research Program

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| **PROJECT TITLE:** Accelerated Performance Testing on the 2006 NCAT Pavement Test Track | | |
| **PROJECT MANAGER(S):**<br>R. Buzz Powell, PhD, PE<br>(334) 844-6857 | **SPR Project No:** TPF-5(124)<br>ALDOT Research Project<br>No. 930-637P | **Project is:**<br>____ PLANNING<br>__X__ RESEARCH & DEVELOPMENT |
| **Annual Budget** | **Multi Year Project**<br>Total Budget for Project<br>$9,000,000.00<br>Total Cost to Date for Project<br>$79,716.89 | |

## QUARTERLY PROGRESS REPORT

## January 1, 2008 – March 31, 2008

**Project Number:** 930-637P

**Project Title:** Accelerated Performance Testing on the 2006 NCAT Pavement Test Track

**Research Agency:** National Center for Asphalt Technology, Auburn University

**Principal Investigators:** R. Buzz Powell, PhD, PE

### Background

The Pavement Test Track is a full-scale accelerated performance test (APT) facility managed by the National Center for Asphalt Technology (NCAT) at Auburn University. The project is funded and directed by a multi-state research cooperative program in which the construction, trafficking, and pavement evaluation are carried out on 46 different 200-foot test sections around the 1.7-mile oval test track. Each test section is constructed utilizing the asphalt materials and design methods used by individual sponsors. A fleet of heavy trucks is operated on the track in a highly controlled manner in order to apply a design life-time of truck traffic (10 million equivalent single axle loads, or ESALs) in two years. The current project represents the third three-year research cycle of the NCAT Pavement Test Track.

### Objectives

The primary objectives of the project are to: (1) identify pavement structures and materials with superior field performance and lower life cycle costs; and (2) provide information for the calibration and validation of the Mechanistic-Empirical Pavement Design Guide (MEPDG).

**Design and Construction of Test Sections**

When each research cycle is completed, test sections are either left in place for the application of additional traffic or rebuilt in the manner that best meets the needs of sponsors. The third research cycle includes: (1) eight sections built in 2000 (all mix performance sections), 16 sections built in 2003 (12 mix performance sections and four structural sections) and 22 sections built in 2006 (15 mix performance sections and seven structural sections). Mix performance sections are perpetual pavements in which distresses are confined to various combinations of experimental surface mixes. Structural sections are typically thinner, highly instrumented pavements that are intended to provide information for the MEPDG.

## *Trucking Operations*

Trucking operations for the third phase of the NCAT Pavement Test Track began after the completion of the reconstruction activities in November of 2006. A fleet of five trucks runs two shifts a day. An AM driver shift runs from 5:00 AM until approximately 2:00 PM, and a PM driver shift runs from 2:00 PM until approximately 11:00 PM.

At the end of the reporting period, a total of 6,418,864 ESALs (64 percent of the 10 million ESAL goal) had been safely applied to the surface of the 2006 NCAT Pavement Test Track. This means that the eight sections originally placed in 2000 had been subjected to approximately 26 million ESALs and the sixteen sections built in 2003 had been subjected to approximately 16 million ESALs. All mixes in both previous studies were designed for 10 million ESALs.

**Laboratory Performance Testing**

There are 31 unique asphalt mixtures that consist of 27 Superpave and Stone Matrix Asphalt (SMA) mixtures as well as four Permeable European Mix (PEM) and Open Graded Friction Course (OGFC) mixtures. The laboratory testing plan focuses on evaluation of the 27 Superpave and SMA mixtures.

NCAT has finished testing of binder, dynamic modulus, flow number, flow time, and rutting susceptibility using the Asphalt Pavement Analyzer (APA). Analyses of these test results are almost completed. A report will be prepared in the next quarter to summarize the test and analysis results.

Determination of the endurance limit for a rich-bottom mixture used for the perpetual test sections (N8 and N9) is currently underway. The fatigue life of the mixture has been determined for two strain levels (400 and 800 microstrain). The endurance limit has been estimated based on the fatigue lives of the mix at 400 and 800 microstrain. A verification of this endurance limit in the laboratory will be conducted in the next quarter.

The evaluation of the mixture cracking resistance using indirect tensile (IDT) has not been started yet because the equipment is being used for other projects. It is anticipated that the testing will be started by the end of the next quarter.

**Structural Pavement Study**

Dynamic data collection has continued on a weekly basis. Each week, three passes of each truck in each test section are captured. The data are then processed and added to their respective databases.

Testing has begun on the so-called "stopping experiment" as part of the structural study. This study is meant to simulate intersection traffic that comes to a complete stop for a short duration. The long-term objective of the study is to collect pavement response data under stopped traffic that can be used to improve intersection structural design. While the overall plan is to collect data at a variety of test temperatures, testing has thus far only been conducted at one temperature. The study includes testing section N2, N3, N8, N9, N10 and S11. In each section, the fully-loaded drive tandem axle of a Class 9 vehicle is brought to a stop on top of the base pressure plate, followed by an asphalt strain gauge, concluding with the subgrade pressure plate. Each gauge is subjected to loading durations of 30 sec, 60 sec and 90 sec with three replicates at each load duration. Response data are recorded using the high-speed data acquisition system. Figure 1 represents one such test where the creep under the second axle of the drive tandem is clearly evident between with first two axles as the truck pulls forward and the last two axles when the truck backs away from the gauge.

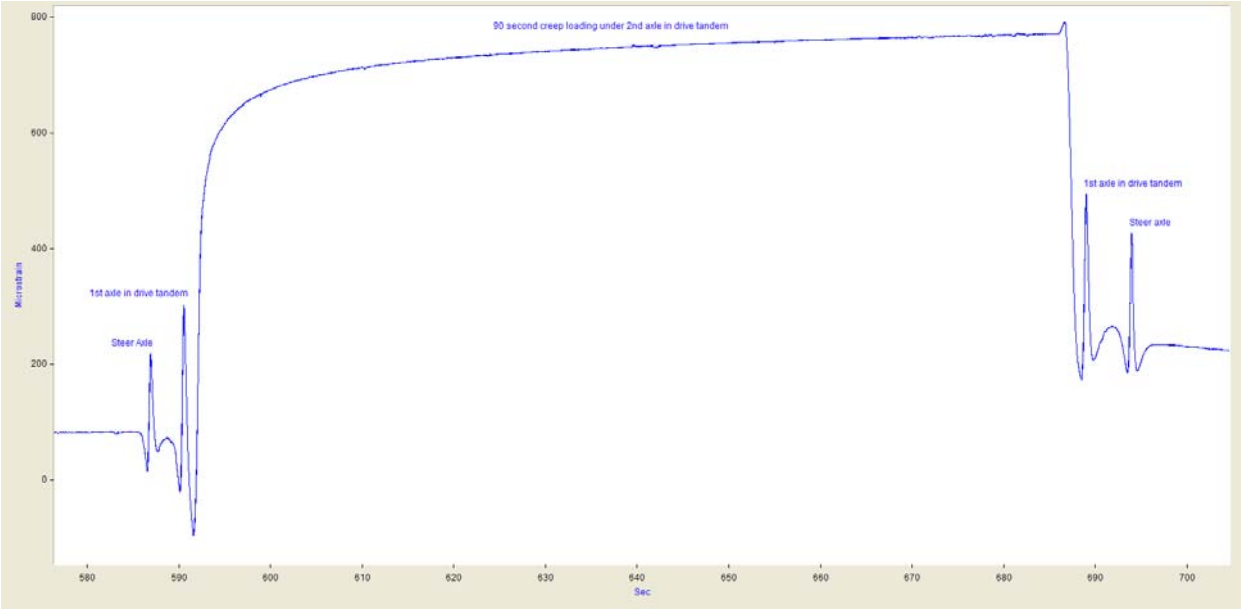


**Figure 1 Section N2 Measured Creep Response with Longitudinal Strain Gauge.**

Two additional test temperatures are planned in the following quarter as pavement temperatures should rise with increasing spring/summer air temperatures.

Work has continued on backcalculation of the constituent pavement layers in each test section. Finalized cross-sections have been selected for each test section and comparisons have been made between measured and predicted pavement responses. Comparisons were generally favorable which allowed a full characterization of the HMA modulus vs. temperature and unbound modulus vs. stress state for each test section.

## Pavement Performance Evaluation

Every Monday, trucking is suspended so that vehicle maintenance can be performed and pavement performance can be quantified. An inertial profiler equipped with a full lane width dual scanning laser "rutbar" is run weekly around the entire track in order to determine individual wheelpath roughness, right wheelpath macrotexture and individual wheelpath rutting for every experimental section. Additionally, three random locations were selected within each section in a stratified manner to serve as the fixed test location for nondestructive wheelpath densities. Transverse profiles are measured along these same locations regularly so that rutting may be calibrated with a contact method. Figures 2 and 3 illustrate rutting performance and International Roughness Index (IRI) of test sections at the NCAT Pavement Test Track at the end of reporting period.

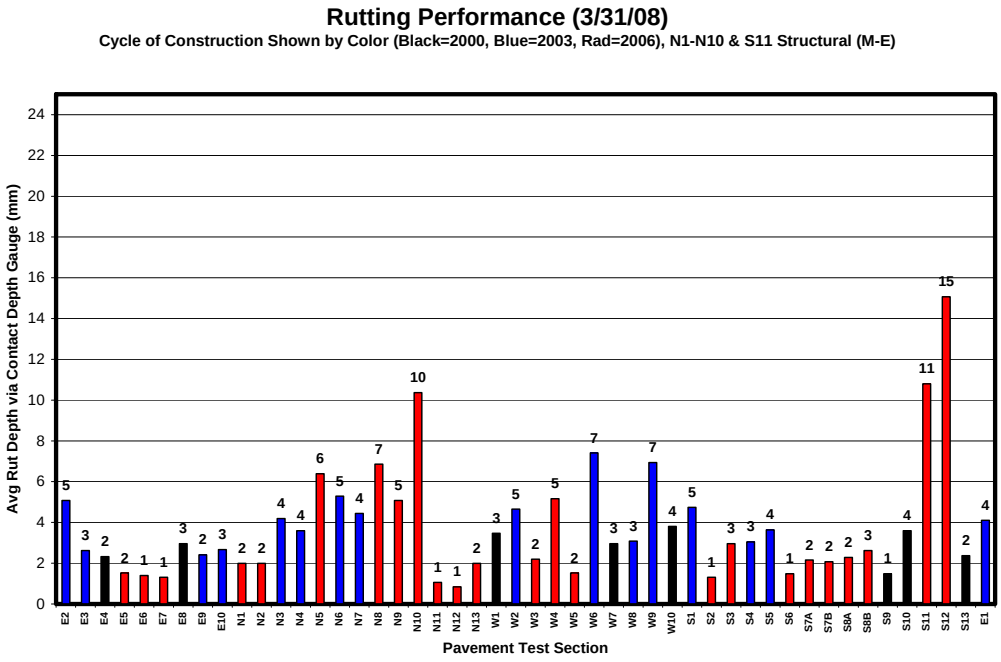


**Figure 2 Rutting Performance of Test Sections at the End of Reporting Period**

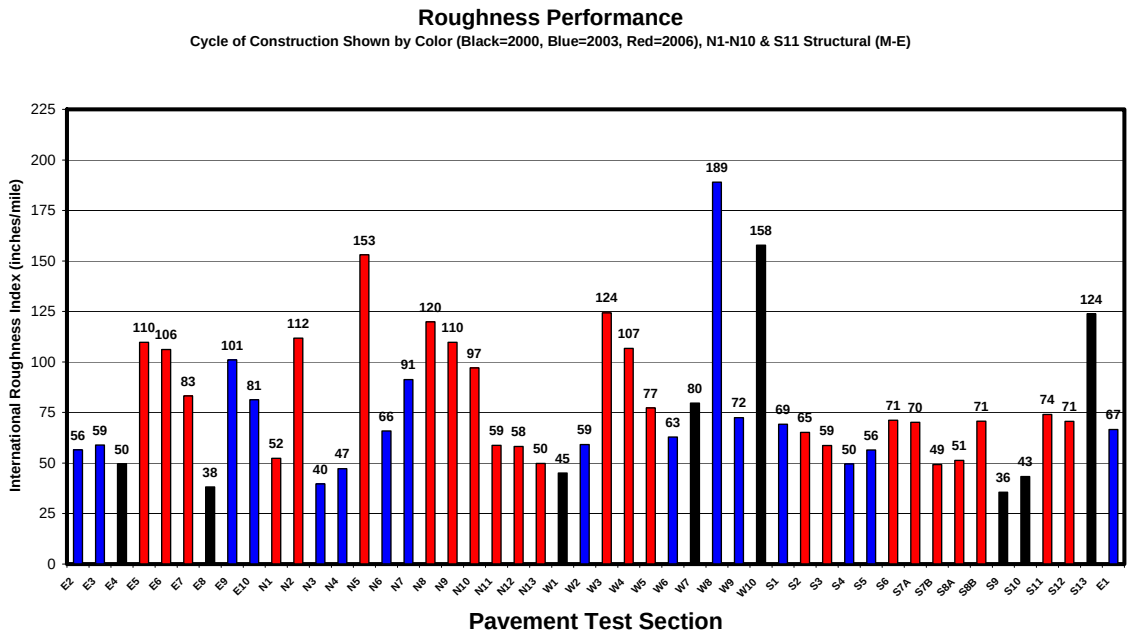


**Figure 3 IRI of Test Sections at the End of Reporting Period**

**STATUS AND COMPLETION DATE**

Percentage of work completed to date for total project 0

Project is:
X on schedule _____ behind schedule, explain:

Expected Completion Date: August 31, 2009

Please note that this project has continued with renewed requests for services and additional funding obligations and may be extended beyond the current Expected Completion Date listed above.