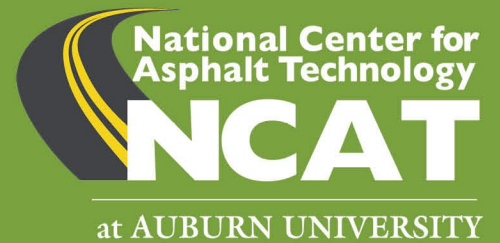


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## **Evaluation of a Rubber Modified Mixture Designed Using a Balanced Design in Lake Yahou Park**

### **Construction and Year 1 Field Evaluation**

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## **1. INTRODUCTION**

Asphalt mixtures have been primarily designed using the Superpave mix design methods, where proportioning of mixture components relies on volumetric property requirements. The increased use of recycled asphalt materials and other asphalt modifiers in asphalt mixtures, such as ground tire rubber (GTR), has triggered the implementation efforts of balanced mix design (BMD). BMD is defined as a mix design procedure that utilizes performance tests to address multiple modes of distress, taking into consideration mix aging, traffic, climate, and location within the pavement structure. A BMD mixture is designed to achieve an optimal balance between rutting resistance and crack resistance rather than relying on volumetric property requirements. Since BMD utilizes testing of the mixture rather than individual components, it encourages innovation for the inclusion of new technologies, such as GTR products, in the design of high-quality asphalt mixtures.

Although it is evident that strong markets have developed for scrap tires in recent years, current estimates indicate that millions of scrap tires remain to be disposed of in landfills or stockpiles. Therefore, there is still potential to increase the use of GTR in asphalt pavements. The Alabama Department of Environmental Management (ADEM), through its Scrap Tire Program, is interested in promoting alternative uses of scrap tires in engineering applications. In 2024, ADEM decided to provide funding assistance to McClellan Development Authority for a demonstration project that included a pavement section constructed with GTR.

## **2. OBJECTIVE**

The objective of this project is to evaluate the performance of a rubber-modified mixture designed using a balanced mix approach compared with a conventional Superpave mix. To accomplish this objective, McClellan Development Authority resurfaced a segment of Lake Yahou Road using a balanced mix with a GTR additive in the southbound lane and the adjacent northbound lane of the same road with a conventional Superpave mix.

This project is divided into five tasks. The following paragraphs describe the tasks and the current progress.

**Task 1. Conduct a verification of the balanced mix design (BMD) with a GTR additive designed by the selected contractor.**

The contractor selected for this project was Wiregrass Construction. Wiregrass provided prepared specimens for the GTR mix design verification. Mix design information for the GTR mix is provided in Table 1. The preliminary BMD criteria required by ALDOT require conducting the Indirect Tensile Cracking Test (IDEAL-CT) for cracking evaluation and the High Temperature Indirect Tensile (HT-IDT) for rutting evaluation. The criteria require an IDEAL-CT,  $CT_{Index}$  of at least 50 for A/B traffic roads, and an HT-IDT, indirect tensile strength (ITS) of at least 20 psi.

NCAT conducted IDEAL-CT and HT-IDT on the samples provided by the contractor. The average  $CT_{Index}$  was 88.5, and the average IDT was 20.1 psi. The results of these tests met the ALDOT BMD criteria. Table 2 summarizes these results.

**Table1. GTR Mix Design**

| Sieve                                     | Design GTR Mix |
|-------------------------------------------|----------------|
| P <sub>1/2</sub> , %                      | 100            |
| P <sub>3/8</sub> , %                      | 92             |
| P <sub>#4</sub> , %                       | 57             |
| P <sub>#8</sub> , %                       | 39             |
| P <sub>#16</sub> , %                      | 31             |
| P <sub>#30</sub> , %                      | 26             |
| P <sub>#50</sub> , %                      | 17             |
| P <sub>#100</sub> , %                     | 9              |
| P <sub>#200</sub> , %                     | 5.6            |
| Total Binder Content (P <sub>b</sub> ), % | 5.3            |
| RAP Binder Ratio                          | 0.33           |

**Table 2. GTR BMD Verification Results**

|                   |      |
|-------------------|------|
| Avg. $CT_{Index}$ | 88.5 |
| St. Dev.          | 6.6  |
| CV (%)            | 7.5  |
| Avg. HT-IDT       | 20.1 |
| St. Dev.          | 22.7 |
| CV (%)            | 3.2  |

## **Task 2. Monitor the Production of the Rubber-Modified Mixture and the Construction of the Test Section.**

The GTR sections were constructed in April 2024. The contractor did not communicate with NCAT regarding the paving schedule in a timely manner. Therefore, NCAT was not present during construction activities to sample plant mixes for further testing. However, the contractor did sample the control and GTR mixes for NCAT to verify compliance with performance test requirements.

## **Task 3. Conduct Performance Tests (Rutting and Cracking) Using Plant Mix Sampled During Construction to Determine Its Compliance with the Performance Requirements.**

The plant mix sampled during construction was brought to NCAT for performance tests to determine if the plant-produced mix met the performance requirements of the cracking and rutting tests. Table 3 and Table 4 summarize the results of the IDEAL-CT and HT-IDT tests. As can be seen from the test results, the plant-produced GTR mix did not meet the performance requirement of 50 for IDEAL-CT,  $CT_{Index}$ . The GTR mix had a  $CT_{Index}$  of 27.5. For comparison purposes, the control mix was also tested and yielded results similar to those of the GTR mix, with an IDEAL-CT  $CT_{Index}$  of 25.8. The GTR mix had an HT-IDT of 57.4 psi, which exceeded the performance requirement of 20 psi. The GTR mix HT-IDT was also higher than the control H-IDT at 48.9 psi. The field monitoring of the sections will be crucial in understanding whether the lack of compliance with performance tests has a negative impact on the long-term performance of the sections.

**Table 3. IDEAL-CT Results from Plant-Produced Mix for Control and GTR Sections**

| Mix ID  | Average | St. Dev | Replicates | COV, % |
|---------|---------|---------|------------|--------|
| Control | 25.8    | 1.4     | 4          | 5.3    |
| GTR     | 29.9    | 8.1     | 4          | 27.2   |

**Table 4. Hot-IDT Results from Plant-Produced Mix for Control and GTR Sections**

| Mix ID  | Average | St. Dev | Replicates | COV, % |
|---------|---------|---------|------------|--------|
| Control | 48.9    | 4.4     | 3          | 9.0    |
| GTR     | 57.4    | 3.2     | 3          | 5.5    |

## **Task 4. Evaluate Field Performance of the Test Section Every Year for Six Years**

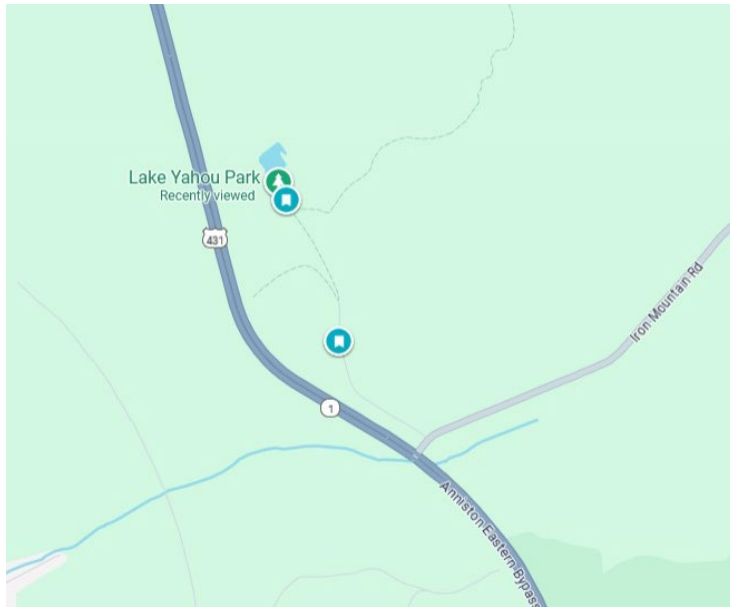
### ***Condition Survey for Lake Yahou Park***

A 0.4-mile segment of Lake Yahou Road in Lake Yahou Park near Anniston, Alabama, was paved in 2024 with a GTR mix. This mix was placed in the southbound lane of Lake Yahou Road, while a conventional mix was placed in the adjacent northbound lane to serve as a Control mix. Figure 1 shows the location of these test sections.

### ***Condition Survey after 1 Year***

The first field performance evaluation was conducted in August of 2025. These sections were evaluated using NCAT's automated pavement condition survey vehicle, as shown in Figure 2. The purpose of this survey was to assess and compare the current pavement condition of the test

sections in terms of IRI, rutting, texture, and cracking. Three data collection runs were made in each lane.



**Figure 1 Test Section Location**



**Figure 2 NCAT's Automated Pavement Condition Survey Vehicle**

The average performance data for IRI and texture are shown in Figure 3. There was no measurable rutting in either section, and both mixes had similar IRI and macrotexture values.

**Table 5 Ride Quality and Texture Results at One-Year Inspection**

| Lane | Mix     | IRI, in/mil | Macrotexture, mm |
|------|---------|-------------|------------------|
| NB   | Control | 113         | 0.61             |
| SB   | GTR     | 116         | 0.56             |

Potential cracking was detected and classified using Pathway Service's software AutoCrack and AutoClass, which classifies cracking by type. At the time of the one-year inspection, the Pathway system did not detect any discernible cracking in the mix sections. Figure 4 shows an example of the surface texture of the mixes. Both mixes were found to be performing well at the time of the one-year inspection.



**Figure 3 Example of Both Mixes at One-Year Inspection (GTR on Left, Control on Right)**



**Figure 4 Example of Surface Texture at One-Year (GTR on left, Control on right)**

#### **Task 5. Prepare Final Report with Findings**

After six years of field monitoring, a final report will be submitted documenting the findings and recommendations.