

Alabama Statewide Airport Pavement Management Program Update



Brewton Municipal Airport (12J)

Final Report

February 2022



Submitted to

Alabama Aeronautics Bureau

Submitted by



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Pavement Management – Evaluation – Testing – Design

**ALABAMA STATEWIDE AIRPORT PAVEMENT MANAGEMENT
PROGRAM UPDATE**

Brewton Municipal Airport, Brewton (12J)

FINAL REPORT

Prepared For:

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February 2022

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Executive Summary

The Aviation Inc. team, which included All About Pavements, Inc., (API) was awarded a contract by the Alabama Department of Transportation’s Aeronautics Bureau (ALDOT) in 2018 to update the existing Alabama Statewide Airport Pavement Management Program (APMP). The scope of this project includes the airside pavement network at Brewton Municipal Airport (12J).

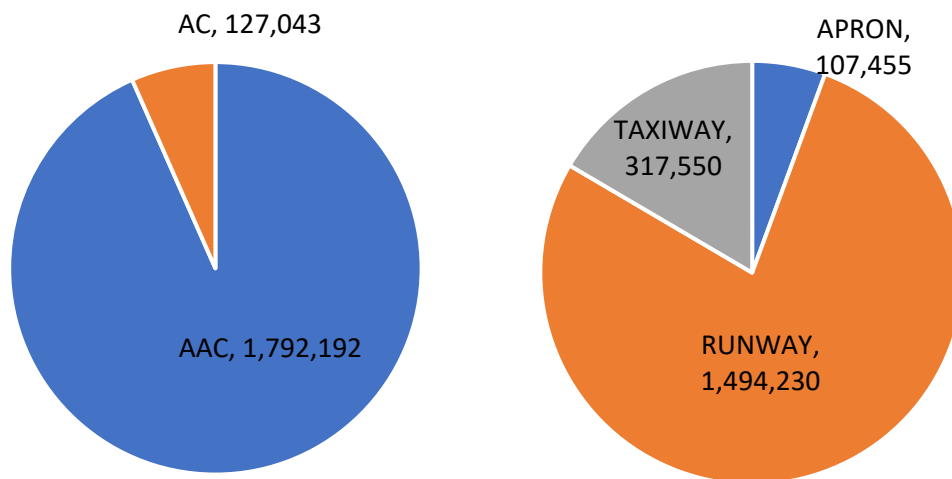
The following APMP tasks were completed to achieve the project objectives at 12J:

- Update the PAVER work history with records review information provided by ALDOT
- Conduct a visual pavement condition survey of the airfield pavements
- Update the PAVER database with inventory and condition data
- Update Maintenance and Rehabilitation (M&R) policies and unit costs
- Develop a 7-Year Pavement Capital Improvement Program (PCIP) with associated cost estimates

ES.1 Pavement Inventory

There are 7 branches and 11 sections within 12J’s pavement network with a total surface area of approximately 1.9 million square feet (sf). Figure ES-1 shows the distribution of the pavement network by surface type and branch use.

Figure ES-1: Pavement Area (sf) by Surface Type and Branch Use.



ES.2 Pavement Condition

Visual pavement inspections were conducted in November 2019 using the Pavement Condition Index (PCI) method as specified in ASTM D5340-12 and FAA AC 150/5380-6C. The PCI is a numerical rating scale from 0 to 100 that provides a measure of the pavement’s functional surface condition. The overall



area-weighted network PCI (AW PCI) for the 12J pavement network is 62, representing a “Fair” condition. The network area-weighted pavement age (AW Age) is 19 years.

Table ES-1 is a listing of the section PCI values and ratings.

Table ES-1: 12J Section PCI Values and Ratings.

| Branch ID | Name | Section ID | Surface | Area, sf | PCI | PCI Category |
|-----------|-------------------|------------|---------|----------|-----|--------------|
| A01 | Apron 01 | 01 | AAC | 107,455 | 64 | Fair |
| R0624 | Runway 06-24 | 01 | AAC | 158,908 | 69 | Fair |
| R0624 | Runway 06-24 | 02 | AAC | 585,172 | 65 | Fair |
| R1230 | Runway 12-30 | 01 | AAC | 607,650 | 52 | Poor |
| R1230 | Runway 12-30 | 02 | AAC | 142,500 | 69 | Fair |
| TA | Taxiway A | 01 | AAC | 176,301 | 56 | Fair |
| TA | Taxiway A | 02 | AC | 46,177 | 91 | Good |
| TA1 | Taxiway A1 | 01 | AAC | 14,206 | 48 | Poor |
| THANG01 | Taxiway Hangar 01 | 01 | AC | 39,088 | 70 | Fair |
| THANG01 | Taxiway Hangar 01 | 02 | AC | 36,898 | 95 | Good |
| TL01 | Taxilane 01 | 01 | AC | 4,880 | 50 | Poor |

ES.3 Pavement Maintenance and Repair Funding Levels

The PAVER database was updated with 2019 condition data, maintenance and repair (M&R) policies, and unit costs; which were then used to evaluate the effect of multiple funding levels on the overall future pavement condition. Figure ES-2 presents the forecasted 12J network PCI values for each funding level.

ES.4 Pavement Capital Improvement Program (PCIP)

The analysis output from the unlimited funding budget scenario was used as a starting point in developing the PCIP. For this scenario, sections were grouped into projects to allow for a logical construction sequence. Table ES-2 summarizes the 7-year PCIP, which has an estimated total cost of approximately \$2.2 million. These recommendations are based on a network-level evaluation. Project-level evaluations should be conducted prior to developing design and bid package documents.

In addition to the major rehabilitation needs that are identified in the PCIP, PAVER was used to develop maintenance activities to repair specific PCI distresses in Year 1. The estimated costs for these maintenance activities are \$2,326 as summarized in Table ES-3.

Figure ES-2: M&R Funding Levels.

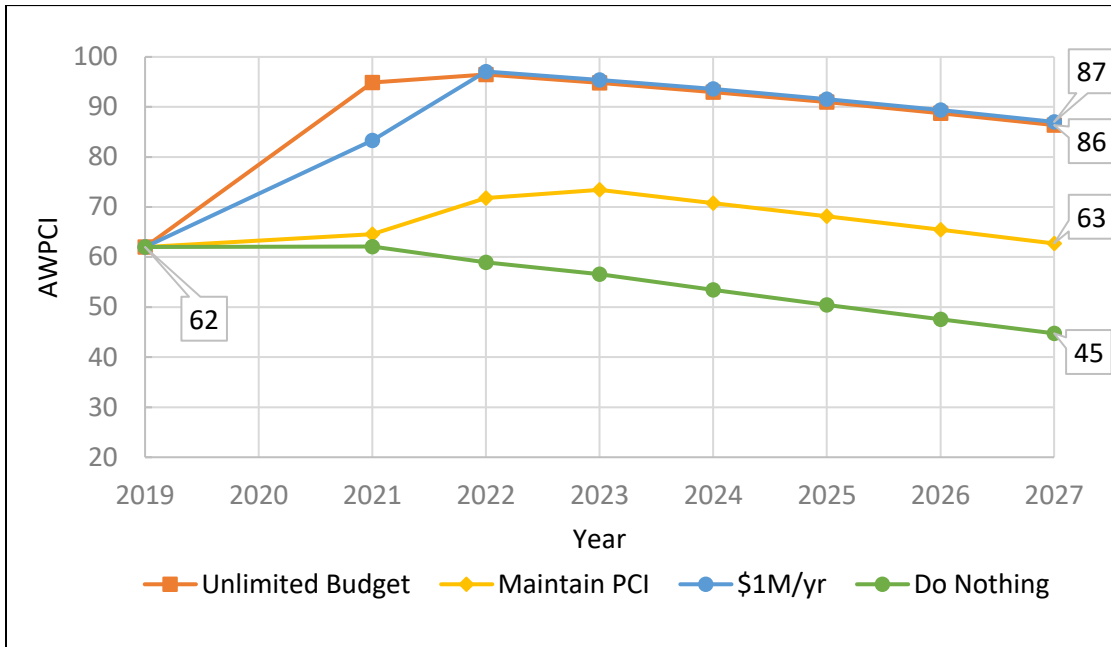


Table ES-2: Summary of Pavement Capital Improvement Program.

| Project Year | CIP Project | Total Project Cost | Total Project Area, sf | AWPCI Before | AWPCI After |
|--------------|---------------------------------------|--------------------|------------------------|--------------|-------------|
| 2021 | 12J_21-01_Taxiway A Preservation | \$40,478 | 46,177 | 87 | 94 |
| | 12J_21-02_Taxiway Hangar Preservation | \$32,344 | 36,898 | 91 | 98 |
| | 12J_21-03_Runway 12-30 Rehabilitation | \$0 | 750,150 | 48 | 100 |
| 2022 | 12J_22-01_Taxiway A Rehabilitation | \$1,152,530 | 190,507 | 45 | 100 |
| | 12J_22-02_Runway 06-24 Rehabilitation | \$0 | 744,080 | 50 | 100 |
| 2023 | 12J_23-01_Apron 01 Rehabilitation | \$736,193 | 151,423 | 55 | 100 |
| 2025 | 12J_25-01_Taxiway A Surface Treatment | \$124,882 | 190,507 | 96 | 99 |
| 2026 | 12J_26-01_Apron 01 Surface Treatment | \$72,553 | 107,455 | 93 | 98 |
| Total | | \$2,158,980 | | | |

Table ES-3: Summary of Localized Maintenance Plan.

| Policy | Work Description | Work Quantity | Work Unit | Work Cost |
|--------------|--------------------|---------------|-----------|----------------|
| Preventive | Crack Sealing - AC | 589 | Ft | \$2,326 |
| Total | | | | \$2,326 |

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1 Introduction

1.1. Overview

The Alabama Department of Transportation's Aeronautics Bureau (ALDOT) is responsible for preserving and enhancing Alabama's air transportation system, which consists of 74 general aviation airports throughout the State. ALDOT implemented an Airport Pavement Management Program (APMP) in 2008 using the PAVER system. ALDOT awarded a project in 2018 to Aviation Inc. (Aviation) to update the System Plan and conduct an Economic Analysis for the Alabama airports. The scope of work also included an update of the APMP for 59 general aviation airports, which was conducted by All About Pavements, Inc., (API), a Aviation team member.

With this update of the APMP, the Alabama airports continue to be eligible for FAA funding for major pavement rehabilitation work under the Airport Improvement Program (AIP) since an APMP meets the pavement maintenance management requirements described in Appendix A of AC 150/5380-6C.

This report discusses the evaluation of the airside pavements at Brewton Municipal Airport (12J), the current and forecasted pavement condition, and the development of the Pavement Capital Improvement Program (PCIP).

1.2. Work Scope

The goals of the Alabama Statewide Airport Pavement Management Update program are as follows:

- Conduct a visual pavement inspection of the asphalt surfaced pavements for 59 of the 74 general aviation airports in Alabama.
- Based on the visual inspection analysis results, develop a 7-year PCIP for each airport.

The scope of work is as shown below:

- Conduct a Records Review
- Update Pavement Network Definition
- Conduct Pavement Condition Surveys
- Update and customize existing APMP PAVER database
- Develop PCIP and associated project cost estimates
- Prepare Draft and Final Reports
- Develop a web-based viewer for reporting APMP data

As required in the Scope of Work, a detailed pavement condition survey was not conducted for any Portland Cement Concrete (PCC) aprons and PCC taxiways longer than 2,000 ft. Instead, a condition rating of "Good", "Fair", or "Poor" was assigned based on the overall pavement condition.

The deliverable products include a PAVER 7.0 database, individual airport evaluation reports, a statewide summary report, and the web viewer. The 12J report will be one of the 59 individual airport reports that will be available on ALDOT's website.



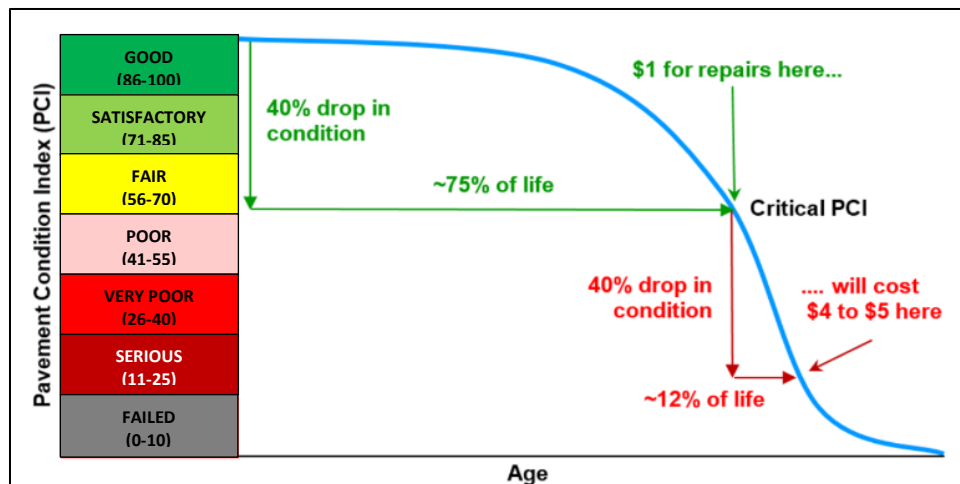
1.3. Pavement Management Concept

An APMP provides an integrated framework for comprehensive evaluation and decision making for managing airfield pavements. The essential components of an effective APMP provide for an objective evaluation of the condition of existing pavements, identification of short-term and long-range major rehabilitation work, necessary improvements in the pavement structural capacity, and the recurring maintenance work that should be completed each year. The APMP will also provide a budget for each of these types of pavement construction.

Historically, most organizations have made maintenance decisions based on past experience, without the benefit of documented data or analysis. This practice does not encourage life cycle cost analysis, nor the evaluation of cost effectiveness of alternate scenarios, and can lead to the inefficient use of funds. With limited allocated funding for Maintenance and Repair (M&R) Program projects, a defined procedure for setting priorities and schedules that will maximize the funds available is more important than ever.

In examining the lifespan of a 20-year pavement, a “Good” to “Fair” condition rating may last only 5 to 15 years. After that point, the rate of deterioration of pavements accelerates sharply as the age of the pavement increases, and within five years, the pavement may deteriorate to the point of failure. In order to extend pavement life, maintenance and repairs need to be scheduled and performed before the pavement surface declines to a “fair” condition. The point at which rehabilitation can be done before the steep decline occurs is called the “critical PCI”, and is generally considered to occur when the Pavement Condition Index (PCI) is between 60 and 70 for general aviation airports. If the work is done before deterioration accelerates, the cost of rehabilitation can be reduced as shown in Figure 1.1.

Figure 1.1: Pavement Management Concept.



2 Airfield Pavement Inventory

2.1. Introduction

12J is a General Aviation (GA) airport located approximately 3 miles south of Brewton. The airport was activated in June 1944 and is owned and operated by the City of Brewton. Figure 2.1 shows an aerial image of the airport.

Figure 2.1: Brewton Municipal Airport.



(Source: Google Earth)

2.2. Pavement Inventory

12J consists of two runways, a taxiway, and an apron. The total pavement area is approximately 1.9 million square feet. Pavement surfaces at 12J include Asphalt Concrete (AC) and Asphalt Overlay on AC (AAC). A complete listing of the pavement sections is included in Appendix A. Runway 06-24 is 5,136 ft. long and 150 ft. wide. Runway 12-30 is 5,001 ft. long and 150 ft. wide.



A records search was undertaken to identify any preservation or rehabilitation work that has occurred at 12J since the last APMP update in 2009. The following records that were provided by ALDOT were reviewed, and the PAVER database was updated with work history information:

- Construction of Access Taxilanes, 2009
- Taxiway Extension, 2016

2.3. Climatic Conditions

Table 3.1 provides a summary of the climatic data for the geographic region that includes 12J. As the table shows, the pavements at 12J are not exposed to any freeze-thaw cycles. The mean air temperature for January ranges from an average low of 34 degrees °F to an average high of 60 degrees °F. The average annual rainfall at 12J is near 69 inches.

Table 2.1: Average Annual Temperatures and Rainfall for 12J.

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| High Temp (°F) | 60 | 64 | 72 | 78 | 85 | 91 | 92 | 92 | 88 | 79 | 71 | 63 |
| Low Temp (°F) | 34 | 36 | 43 | 49 | 58 | 66 | 69 | 68 | 63 | 50 | 42 | 35 |
| Precip. (in) | 6.9 | 5.8 | 7.6 | 4.7 | 5.4 | 6.1 | 7.6 | 5.8 | 5.0 | 3.5 | 5.2 | 5.0 |

Source: www.intellicast.com

2.4. Pavement Network Definition

A key element in developing an APMP system is defining the pavement network, which is the process of dividing an agency's pavements into a hierarchical order that facilitates inspection and M&R planning. The 12J network (e.g. all airside pavements) is then divided into branches, which are a readily identifiable part of the pavement system and have distinct functions. For airports, branches typically consist of individual runways, taxiways and aprons. Figure B1A in Appendix B shows the branches at 12J.

Once branches have been defined, pavement evaluation and analysis techniques require the airfield pavement system to be broken up into discrete sections. A pavement "section" is the smallest management unit that is used when considering the application and selection of maintenance and rehabilitation (M&R) treatments, and is defined in Section 2.1.8 of ASTM D 5340-12 as *"a contiguous pavement area having uniform construction, maintenance, usage history, and condition. A section should also have the same traffic volume and load intensity."* A complete list of the pavement inventory and the corresponding section designations are included in Appendix A. Figure B1B presents the section layout.

To facilitate the visual survey of the airside pavement, each section is further subdivided into conveniently defined sub-section areas, or sample units. Similar sizing is critical as studies have found that maintaining the size of the sample units to within 40 percent of the established norm may reduce the standard error

of the average PCI values. To meet that criteria, ASTM recommends that sample units for asphalt pavements be 5,000 square feet ($\pm 2,000$).

Table 2.2 was used as a guideline in developing sampling rates that reflect typical rates that are used for other large pavement networks. In general, this sampling rate will not provide a 95% confidence level with a standard error of 5 PCI points. A higher level of sampling is recommended before a project-level rehabilitation design is developed for a pavement section or facility.

Sample units that include a one-time occurrence of a distress (i.e. a large patch) or an unusual severity or quantity of a distress seen elsewhere, were designated as “additional” sample units as described in the ASTM D5340 PCI procedure. This allows the PCI to be calculated without extrapolating the aberrant distress throughout the section as a whole. In Appendix B, Figure B1C shows the sample unit layout for 12J.

Table 2.2: PCI Sampling Rate for AC Surfaces.

| Total Samples | Samples to Inspect |
|---------------|------------------------------|
| 1 | 1 |
| 2 | 2 |
| 3 – 6 | 3 |
| 7 – 13 | 4 |
| 14 – 39 | 5 |
| > 39 | 15 percent, but less than 12 |

2.5. Inventory Summary

There are 7 branches (facilities) at 12J that include 11 pavement sections and a total area of approximately 1.9 million square feet of paved surfaces, as shown in Table 2.3.

Table 2.3: 12J Pavement Branches.

| Branch ID | Branch Name | Branch Use | Area, sf | Number of Sections |
|--------------|-------------------|------------|------------------|--------------------|
| A01 | Apron 01 | APRON | 107,455 | 1 |
| R0624 | Runway 06-24 | RUNWAY | 744,080 | 2 |
| R1230 | Runway 12-30 | RUNWAY | 750,150 | 2 |
| TA | Taxiway A | TAXIWAY | 222,478 | 2 |
| TA1 | Taxiway A1 | TAXIWAY | 14,206 | 1 |
| THANG01 | Taxiway Hangar 01 | TAXIWAY | 75,986 | 2 |
| TL01 | Taxilane 01 | TAXIWAY | 4,880 | 1 |
| Total | | | 1,919,235 | 11 |

Table 2.4 shows the distribution of airfield pavement by age with the area-weighted age being 19 years for all airside pavements at 12J.



Table 2.4: 12J Pavement Age.

| Age (Years) | Number of Sections | Percent of Area | Area, sf |
|-------------|--------------------|-----------------|-----------|
| 0 – 5 | 1 | 2% | 46,177 |
| 6 – 10 | 1 | 2% | 36,898 |
| 11 – 15 | 0 | 0% | 0 |
| 16 – 20 | 7 | 93% | 1,792,192 |
| > 20 | 2 | 2% | 43,968 |

Figure 2.2 shows the distribution by surface type. Figure 2.3 presents the distribution by pavement use (e.g. runway, taxiway, and apron).

Figure 2.2: 12J Pavement Area by Surface Type.

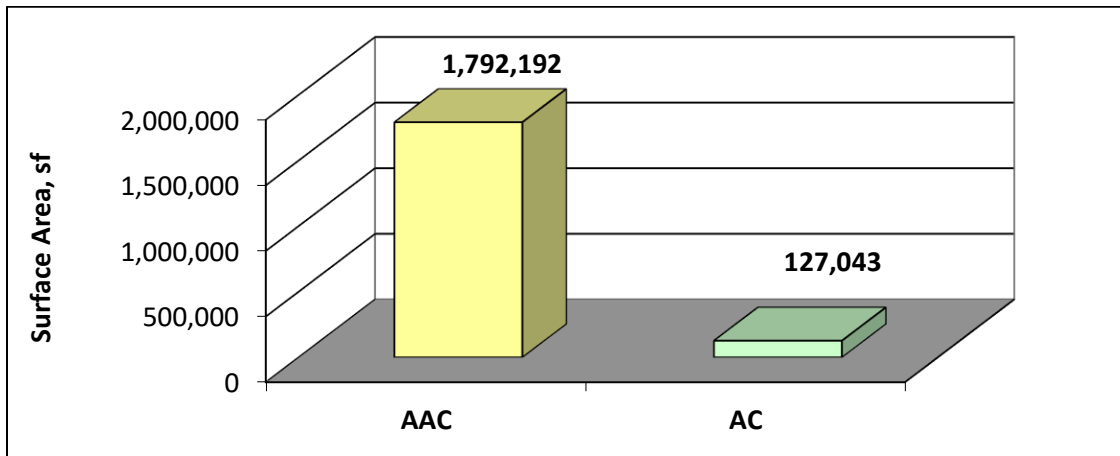
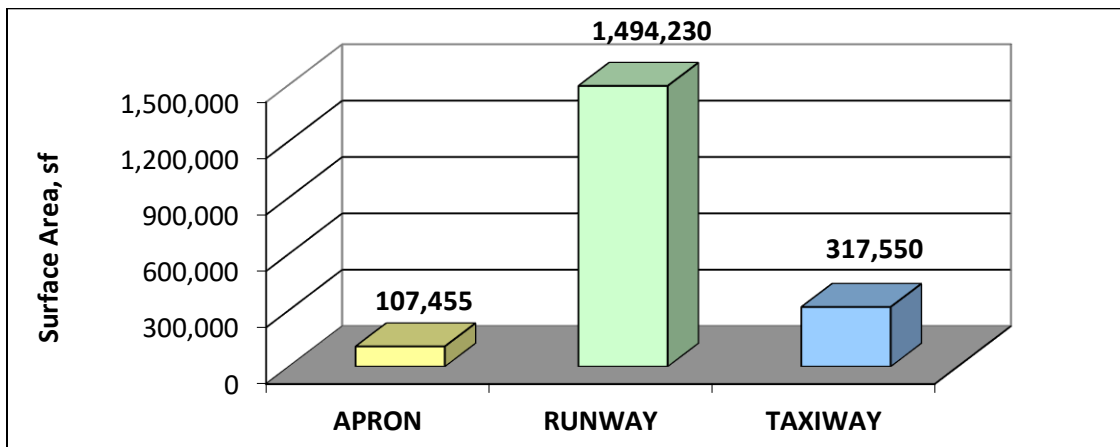


Figure 2.3: 12J Pavement Area by Branch Use.



Maps B1D, B1E, and B1F show the pavement type, branch use, and pavement age, respectively.

3 Pavement Condition

3.1. Introduction

A visual PCI survey of the airside pavements at 12J was conducted in order to assist in the development of a realistic PCIP. The PCI survey measures and records pavement distresses that exist within each of the inspected sample units. This survey was conducted in November 2019 by a 2-person team. The survey was performed in accordance with the methods described in ASTM D 5340-12 and FAA AC 150/5380-7B, using the sampling rates from Chapter 2 of this API report.

During the pavement survey, Quality Control (QC) and data verification were performed on both the individual distresses and the calculated section PCI values. QC included the following activities;

- Review of distress quantities to identify data entry errors (100% review at the sample unit level). General guidance was used from ASTM D5340-12, section 13, which addresses the precision of distress quantities that are recorded during PCI surveys.
- Duplicate surveys were performed to ensure consistency between each of the inspectors in a 2-person PCI survey team.

3.2. Pavement Condition Rating Methodology

The PCI is a measure of the pavement's functional surface condition. It provides insight into the causes of each distress, and whether the distress is primarily caused by load, climatic conditions, and other material related deficiencies. The PCI is a numerical rating (on a scale of 0 to 100) that is based on the type, severity and quantity of each distress that is found in an inspected sample unit.

The PCI survey results are displayed using seven categories and ratings in accordance with the ASTM, but can also be presented using a simplified 3-category rating system for use in comparing with other distress related indices, as shown in Table 3.1.



Table 3.1: Pavement Condition Index Rating Scale.

| | Simplified PCI Color Legend | ASTM PCI Color Legend | PCI Range | PCI Ratings and Definition |
|------|--------------------------------|--------------------------|--------------|--|
| GOOD | | | 86-100 | <u>GOOD</u> : Pavement has minor or no distresses and should require only routine maintenance. |
| | | | 71-85 | <u>SATISFACTORY</u> : Pavement has scattered low-severity distresses that should require only routine maintenance. |
| FAIR | | | 56-70 | <u>FAIR</u> : Pavement has a combination of generally low- and medium-severity distresses. Near-term maintenance and repair needs may range from routine to major. |
| POOR | | | 41-55 | <u>POOR</u> : Pavement has low-, medium-, and high-severity distresses that probably cause some operational problems. Near-term M&R needs range from routine to major. requirement for |
| | | | 26-40 | <u>VERY POOR</u> : Pavement has predominantly medium- and high-severity distresses that cause considerable maintenance & operational problems. Near-term M&R needs will be major. |
| | | | 11-25 | <u>SERIOUS</u> : Pavement has mainly high-severity distresses that cause operational restrictions; immediate repairs are needed. |
| | | | 0-10 | <u>FAILED</u> : Pavement deterioration has progressed to the point that safe aircraft operations are no longer possible; complete reconstruction is required. |

3.3. Distress Types

The ASTM D5340 standard considers 17 distresses, which tend to fall into one of the following four cause categories:

- Load related: AC distresses include alligator cracking, corrugation, depression, polished aggregate, rutting and slippage cracking; PCC distresses include corner breaks, longitudinal cracking, divided slabs, polished aggregate, pumping and joint spalling.
- Climate and durability related: AC distresses include bleeding, block cracking, joint reflection cracking, longitudinal and transverse (L&T) cracking, swelling, raveling, and weathering; PCC distresses include blow-ups, “D” cracking, longitudinal cracking, pop-outs, pumping, scaling, shrinkage cracks, and joint and corner spalling.
- Moisture & Drainage related: AC distresses include alligator cracking, depressions, potholes and swelling; PCC distresses include corner breaks, divided slabs and pumping.
- Other factors: Oil spillage, jet blast erosion, bleeding, patching and concrete slab joint faulting.

As described above, distress may have more than one cause. For example, depressions may be caused by incorrect compaction during construction, or by subgrade softening due to environmental factors. In addition, a distress may be initiated by one cause but may progress to a distress of higher severity by another cause. Therefore, engineering judgment is critical in analyzing the actual causes of the distress.

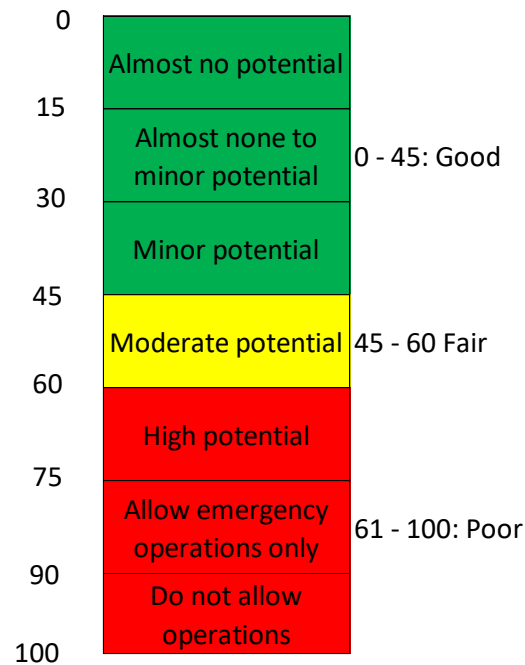
Distress descriptions provided in Appendix C were taken from the “PCI Field Manual,” developed by the U.S. Army Construction Engineering Research Lab (CERL), latest edition. Appendix C provides a detailed explanation of each type of AC and PCC surface distress.

3.4. Additional PCI-based Indices

The distress data used to compute PCI can also be used to calculate additional indices that are helpful in understanding the condition of the pavement and developing PCIP recommendations. One additional index that was computed is the Foreign Object Damage (FOD) potential index.

The FOD index was developed by the US Air Force and is described in detail in the US Army Corp of Engineers Engineering Technical Letter (ETL) 04-09, Pavement Engineering Assessment (EA) Standards. Loose objects on an airfield pavement surface resulting from pavement distresses can be detrimental to aircraft engines, specifically engines that are low to the ground. The objects are ingested into the engines causing costly damage and presenting a safety hazard. Not all pavement distresses create a FOD potential. Therefore, an additional index was identified that uses the results of the PCI distress survey. As shown in Figure 3.1, the scale ranges from 0 to 100 with 0 being no FOD potential. Note that the FOD index uses a simplified three color scale.

Figure 3.1: FOD Potential Rating Scale.





3.5. PCI Survey Results

The airside pavements at 12J include 11 sections with 388 sample units. The sample number of sample units that were surveyed in the field is 73, which is 19 percent of the total samples. Data from the inspected sample units were input into the PAVER database and a resultant PCI for each section was computed.

Figure 3.2 presents the area-weighted PCI by use and the overall airside network.

Figure 3.2: Pavement Condition by Branch Use.

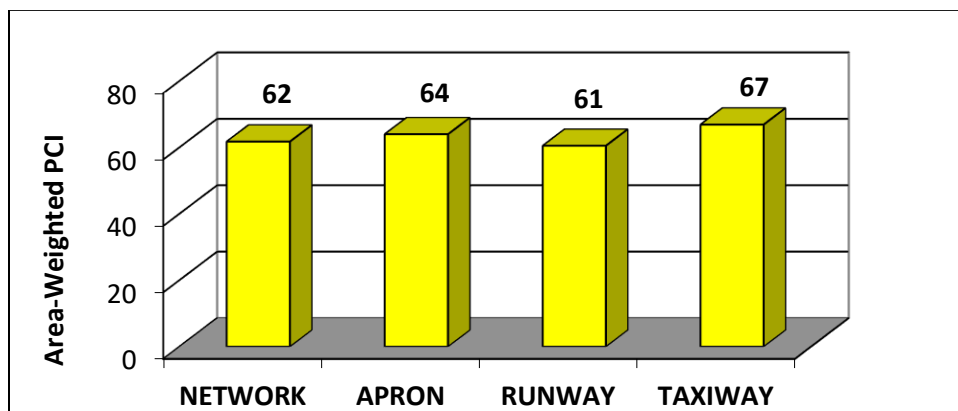


Figure 3.3 shows the distribution of the 12J pavement network by condition. Approximately 33 percent of the network is in “Poor” or worse condition.

Figure 3.3: Pavement Condition by Percent of Area.

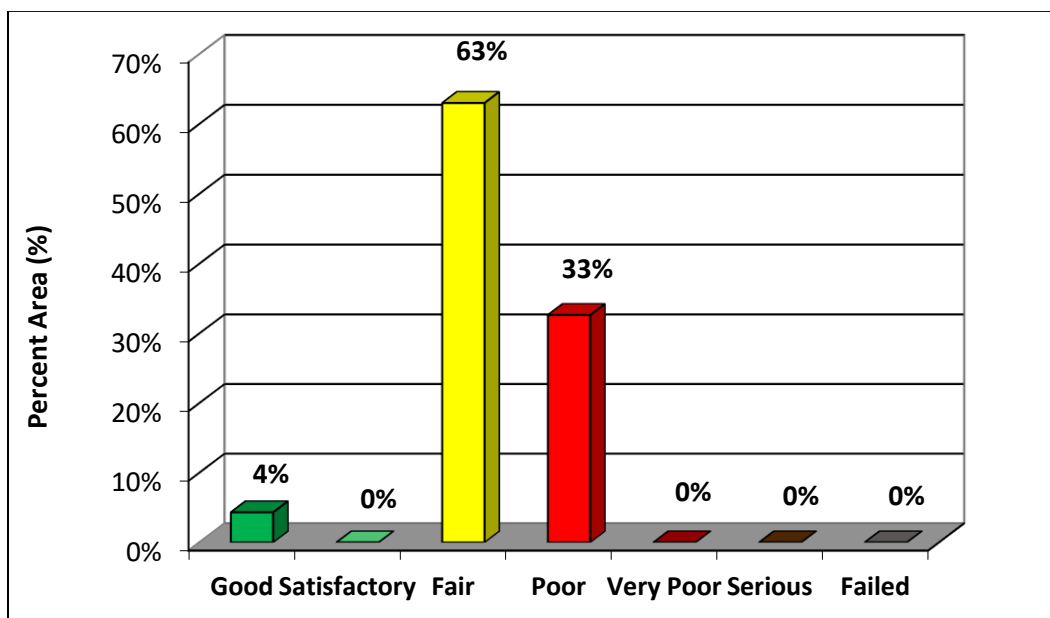


Table 3.2 is a listing of the section PCI.

Table 3.2: Section PCI.

| Branch ID | Name | Section ID | Surface | Area, sf | PCI | PCI Category | FOD |
|-----------|-------------------|------------|---------|----------|-----|--------------|-----|
| A01 | Apron 01 | 01 | AAC | 107,455 | 64 | Fair | 50 |
| R0624 | Runway 06-24 | 01 | AAC | 158,908 | 69 | Fair | 44 |
| R0624 | Runway 06-24 | 02 | AAC | 585,172 | 65 | Fair | 49 |
| R1230 | Runway 12-30 | 01 | AAC | 607,650 | 52 | Poor | 63 |
| R1230 | Runway 12-30 | 02 | AAC | 142,500 | 69 | Fair | 44 |
| TA | Taxiway A | 01 | AAC | 176,301 | 56 | Fair | 59 |
| TA | Taxiway A | 02 | AC | 46,177 | 91 | Good | 19 |
| TA1 | Taxiway A1 | 01 | AAC | 14,206 | 48 | Poor | 67 |
| THANG01 | Taxiway Hangar 01 | 01 | AC | 39,088 | 70 | Fair | 43 |
| THANG01 | Taxiway Hangar 01 | 02 | AC | 36,898 | 95 | Good | 14 |
| TL01 | Taxilane 01 | 01 | AC | 4,880 | 50 | Poor | 65 |

Figure B2A and B2B in Appendix B are maps of the section PCI in 7- and 3-scale categories, respectively. Figure B2C is a map of the FOD rating. Appendix D contains a detailed report of the PCI values and distress type, quantity, and severity data for each sample unit that was surveyed in a section. Appendix E is a summary report of the extrapolated distress data at the section level.

Appendix F contains current section and branch PCI data and forecasted section PCI values. FOD values by section and branch are also presented. Figure B2D in Appendix B shows the locations of the photos that were taken during the survey. Photos are included in Appendix J.

3.6. PCC Pavements

As stated earlier, the project scope did not include a detailed pavement condition survey for any Portland Cement Concrete (PCC) aprons. For these pavements, a rating of “Good”, “Fair”, or “Poor” was assigned based on the overall pavement condition. There are no PCC aprons at 12J.

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4 Pavement Capital Improvement Program

4.1. Introduction

PCI data were collected and entered into the PAVER database. In addition, the database customization included the following components, which are described in detail in this chapter.

1. Performance Modeling
2. Maintenance & Repair (M&R) Triggers (Critical PCI)
3. M&R Policies
4. Unit Costs

Once the database was customized, it was used to run budget analysis scenarios and develop a 7-year PCIP.

4.2. Performance Modeling

To determine long-term M&R needs, a APMP must be able to predict future pavement condition. Future pavement condition is predicted using equation models that are generated from current and historical PCI data. Equation models are developed by grouping pavements based on similar performance characteristics such as region, construction history, surface type, traffic, priority and use. Mathematical techniques such as straight-line extrapolation and regression that include boundary and outlier filters are used to develop models that provide the best fit equation for the pavement condition data. PAVER's Prediction Modeling module was used to develop pavement performance models that are commonly referred to as 'Family Curves'.

Prediction models are used at the section level to compute future conditions based on the typical performance of the pavement sections that are included in each model. Future condition is computed by defining its position relative to the prediction model. The section prediction curve, or equation, is drawn through the current PCI-age point for each specific section. Since the shifted curve will run parallel to the computed prediction model, the predicted condition can be computed for any future age. Figure 4.1 is an illustration of this process.

Prediction models provide an effective way to compute future pavement performance based on past and current conditions, and pavement maintenance and rehabilitation practices. As new PCI inspection surveys are conducted, these models should be updated accordingly. In the case of the Alabama statewide airport pavement network, the best fit family curves were developed for each region by grouping pavements according to branch use (e.g. runway, taxiway) and surface type (e.g. AC, AAC, and APC). The family curves for ALDOT were developed based on branch use and are presented in Figure 4.2.



Figure 4.1: PCI Forecasting.

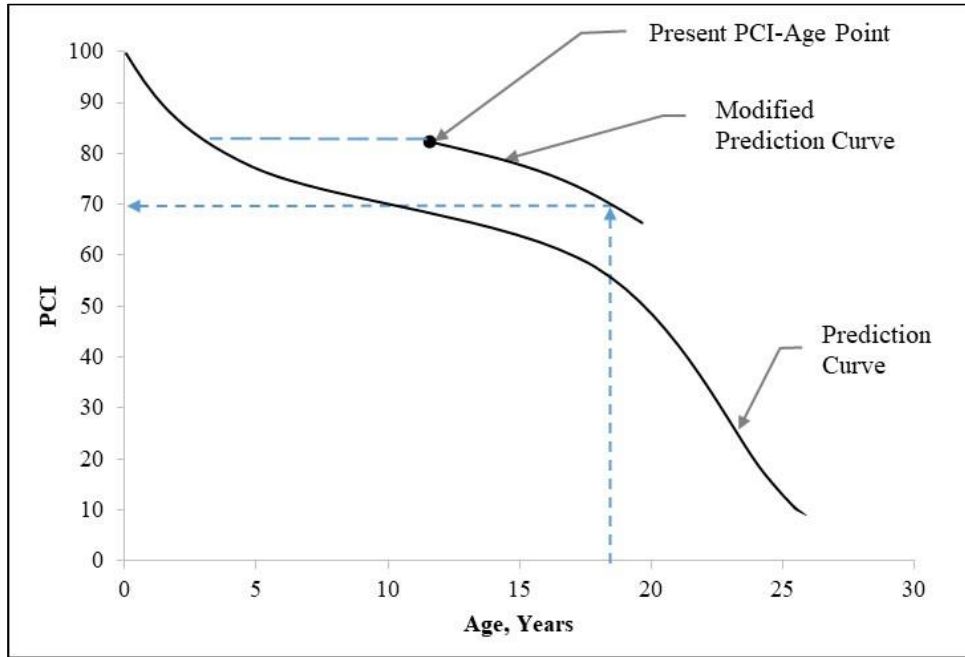
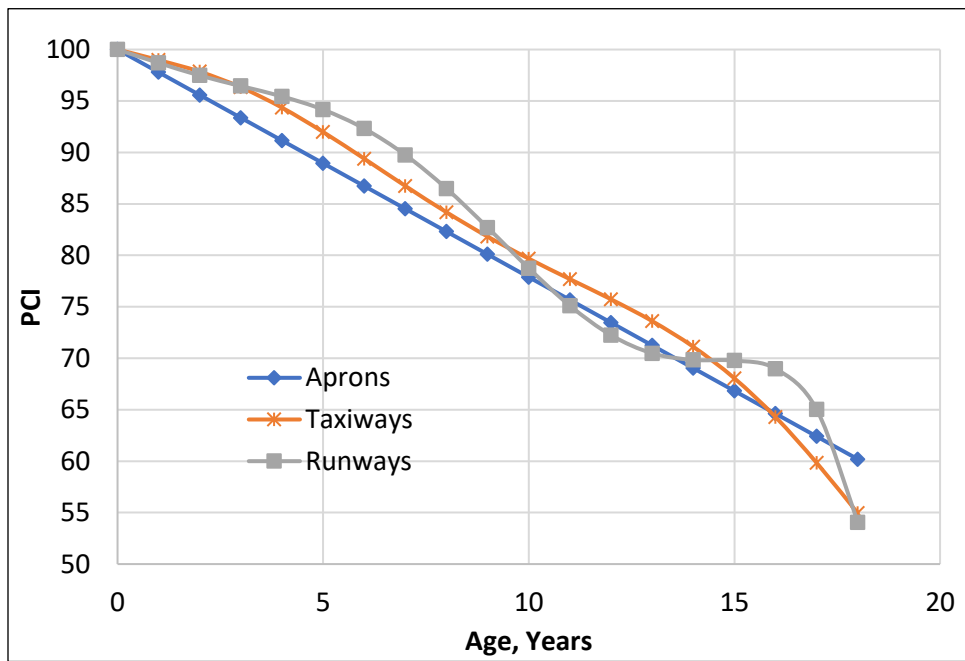


Figure 4.2: Family Curves.



4.3. Critical PCI Values

The Critical PCI value is defined as “the PCI value at which the rate of PCI loss increases with time, or the cost of applying localized preventive maintenance increases significantly.” This definition is incorporated into PAVER in defining and measuring the critical PCI values. These values, or M&R triggers, are assigned for each prediction model. As such, the critical PCI values are directly related to the branch use.

These critical PCI levels are selected based on several factors including a review of performance models; experience; other airport triggers; and acknowledge that time is required for funding approval and design. Note that preventive maintenance is recommended, and it should generally be performed above the critical PCI (trigger) values and Major M&R is generally performed below them. The critical PCI (CP) values were set at 70 for runways and taxiways, and 65 for other pavements.

4.4. M&R Policies and Unit Costs

M&R policies refer to the activities that are applied at different condition levels to maintain and repair a pavement section.

Maintenance activities are localized activities which are typically assigned in the first year of the M&R plan based on the observed distresses. Safety (stopgap) maintenance addresses distresses that would affect operational safety if left unrepaired and is applied to pavements below the critical PCI. Preventive maintenance activities are aimed at slowing the rate of deterioration through consistent maintenance of existing pavements and are generally applied to pavements above the critical PCI. Appendix G presents the policies for preventive and safety maintenance.

Repair activities are conducted for larger areas, typically at the section level and are assigned based on the critical PCI. Repair activities broadly consist of three categories: preservation, rehabilitation, and reconstruction. Pavement preservation involves activities like surface treatments that are used to extend pavement service life and to delay more expensive rehabilitation work. These are applied when the pavement is in relatively good condition and does not exhibit any structural distress. Rehabilitation activities are used to repair pavements below or around the critical PCI and typically include mill and overlay. Reconstruction is recommended when the pavement has deteriorated to a level where rehabilitation is no longer cost effective.

Table 4.1 lists the pavement activity types, the individual activities within each type, and their associated 2020 unit costs. A more detailed description of the M&R activities and the development of the M&R unit costs is presented in Appendix H.

In accordance with ALDOT’s focus on preservation, surface treatment is applied to all resurfaced and reconstructed runways, taxiways, and aprons three years after construction work is complete. Taxilanes and T-Hangar pavements are excluded from this requirement. This policy is applicable for projects in the PCIP between 2021 and 2024. For cost estimating, this surface treatment is assumed to have the same cost as the runway surface treatment.

**Table 4.1: M&R Activities and Unit Costs.**

| Activity Type | PCI | Activity | Cost/sf |
|----------------|---------|--|---------|
| Maintenance | Note 1 | Seal Cracks – AC (\$/lf) | \$3.95 |
| | | AC Full-Depth Patching | \$25.05 |
| | | AC Partial-Depth Patching | \$16.28 |
| Preservation | 75-90 | Runway Surface Treatment | \$0.57 |
| | | Taxiway and Apron Surface Treatment | \$0.85 |
| Rehabilitation | > CP | 2" AC OL ² | \$3.91 |
| | 55 - CP | Mill 2" & 2" AC OL | \$4.27 |
| | 45 - 55 | Mill 2" & 2" AC OLP (With Pre-Overlay Repairs) | \$5.37 |
| Reconstruction | 0 - 45 | AC Reconstruction | \$9.87 |

¹ Preventive > CP; Safety (Stopgap) < CP

² For sections with structural distress and PCI > CP

4.5. Pavement CIP Development

The PAVER database, updated with condition data and customized with condition performance priorities, policies, and costs; was used to evaluate the effect of multiple funding levels on the overall future pavement condition. This output was further used to develop the PCIP. Figure 4.3 illustrates the process that PAVER uses in the funding analysis.

The following M&R funding levels were used for the 12J pavement network to help establish the 7-Year PCIP. Figure 4.4 presents the network area-weighted average PCI for each of the following funding scenarios at the end of the analysis period:

- **Unlimited Funding:** Unlimited funding is available for all pavement needs. The PCI increases to 86 by 2027.
- **Maintain PCI:** Maintain existing PCI of 62.
- **Constrained Funding:** This scenario constrains the funding to \$1 million each year (total of \$7 million). The PCI remains steady at 63 in 2027.
- **Do Nothing:** Performing no M&R would reduce the network PCI from 62 to 45 by 2027.

Figure 4.3: Budget Analysis Process.

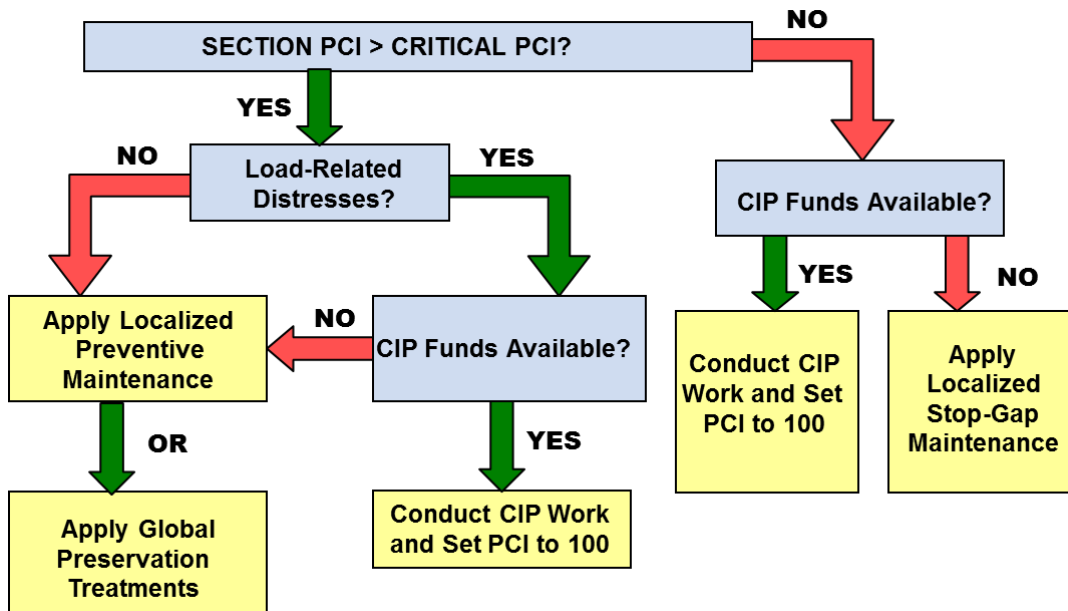


Figure 4.4: M&R Funding Levels.

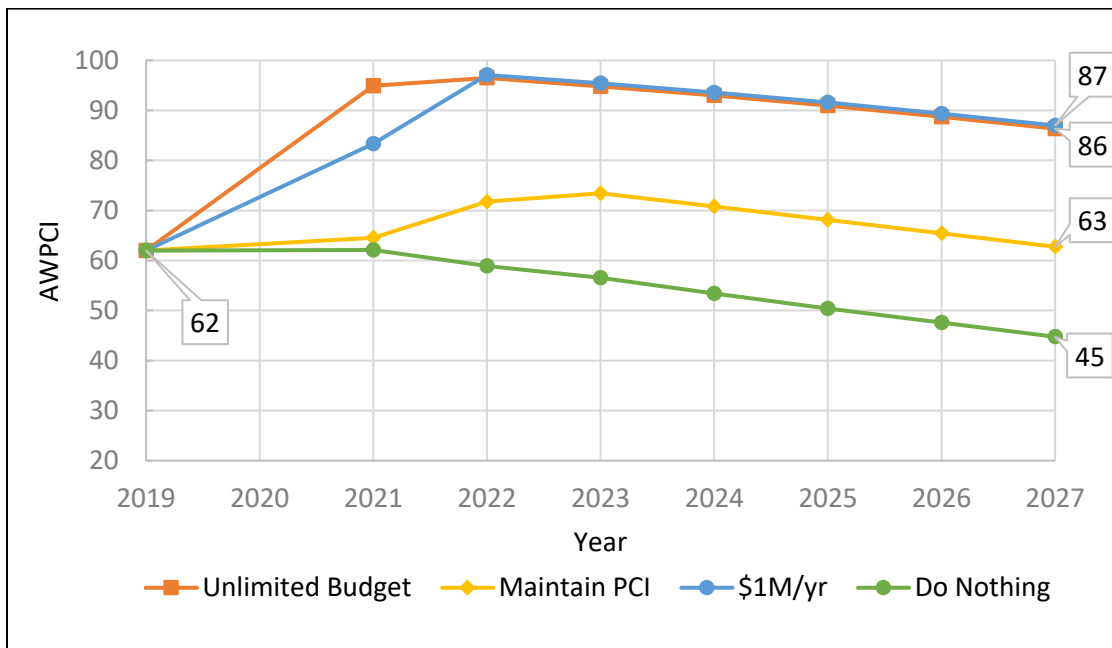


Table 4.2 summarizes the annual funding required for the above analyses. For the unlimited analysis, all pavement needs are funded in the year they are required. Therefore, the unfunded costs are zero. The total funded amount over the 7-year period is approximately \$1.7 million. For the annual funding level of \$1 million per year, funding is prioritized based on the prioritization matrix. When the needs exceed the funding for any year, the remaining sections are transferred to the succeeding year and the amount



for these activities are represented as “unfunded”. There are no “unfunded” repairs in 2027 for this funding level.

Table 4.2: Summary of M&R Funding Level Analyses.

| Year | Unlimited | Maintain PCI | Constrained \$1M/year | Do Nothing |
|---------------------|--------------------|--------------------|--------------------------|--------------------|
| 2021 | \$1,544,000 | \$153,000 | \$980,000 | \$0 |
| 2022 | \$173,000 | \$490,000 | \$786,000 | \$0 |
| 2023 | \$2,387 | \$198,171 | \$2,000 | \$0 |
| 2024 | \$3,000 | \$10,000 | \$3,000 | \$0 |
| 2025 | \$4,000 | \$19,000 | \$4,000 | \$0 |
| 2026 | \$5,662 | \$32,315 | \$5,340 | \$0 |
| 2027 | \$7,039 | \$46,587 | \$6,704 | \$0 |
| Total | \$1,740,000 | \$948,000 | \$1,787,000 | \$0 |
| 2027 Backlog | - | \$2,078,000 | - | \$3,560,000 |

Map B3A in Appendix B presents the 2027 forecasted PCI by section when the M&R activities recommended in the CIP are not conducted.

4.6. Pavement Capital Improvement Program

The unlimited funding analysis contains rehabilitation activities for sections from the same branch spread out over the seven-year period, which is not always operationally feasible to construct. The analysis output was treated as a starting point in developing the CIP. Sections were often integrated together to account for construction feasibility and other factors, resulting in larger projects which were more realistic. In addition, each project could contain sections whose condition did not trigger rehabilitation but were included to provide a logical plan which would avoid creating “islands” of newer pavement within a particular feature. For example, if the PAVER analysis showed rehabilitation was required for eight out of 10 sections on a runway, the entire runway would be recommended for rehabilitation to provide a continuous new pavement surface.

Table 4.3 shows the projects and the associated costs for the recommended 7-year PCIP. Table 4.4 is a more detailed view of the PCIP. This table lists the individual pavement section, section level M&R work, section repair cost, surface area and the PCI before the M&R is applied. The costs that are presented represent an annual escalation rate of 3% for the unit costs. The total 7-year PCIP cost is approximately \$2.2 million. Map B3B shows the recommended repair types, while Map B3C presents the recommended projects and activities in the PCIP. Appendix I1 presents a summary of the recommended activities and cost by year for each section at 12J.

Table 4.3: Summary of 7-Year PCIP by Project.

| Project Year | CIP Project | Total Project Cost | Total Project Area, sf | AWPCI Before | AWPCI After |
|--------------|---------------------------------------|--------------------|------------------------|--------------|-------------|
| 2021 | 12J_21-01_Taxiway A Preservation | \$40,478 | 46,177 | 87 | 94 |
| | 12J_21-02_Taxiway Hangar Preservation | \$32,344 | 36,898 | 91 | 98 |
| | 12J_21-03_Runway 12-30 Rehabilitation | \$0 | 750,150 | 48 | 100 |
| 2022 | 12J_22-01_Taxiway A Rehabilitation | \$1,152,530 | 190,507 | 45 | 100 |
| | 12J_22-02_Runway 06-24 Rehabilitation | \$0 | 744,080 | 50 | 100 |
| 2023 | 12J_23-01_Apron 01 Rehabilitation | \$736,193 | 151,423 | 55 | 100 |
| 2025 | 12J_25-01_Taxiway A Surface Treatment | \$124,882 | 190,507 | 96 | 99 |
| 2026 | 12J_26-01_Apron 01 Surface Treatment | \$72,553 | 107,455 | 93 | 98 |
| Total | | \$2,158,980 | | | |

Cost excluded from PCIP as directed by ALDOT

Table 4.4: Summary of 7-Year PCIP by Project and Section.

| Branch | Section | Area, sf | PCI Before Rehab | Activity | Activity Type | Cost |
|--|---------|----------|------------------|-----------------------------------|----------------|--------------------|
| 12J_21-01_Taxiway A Preservation | | | | | | \$40,478 |
| TA | 02 | 46,177 | 88 | Taxiway & Apron Surface Treatment | Preservation | \$40,478 |
| 12J_21-02_Taxiway Hangar Preservation | | | | | | \$32,344 |
| THANG01 | 02 | 36,898 | 92 | Taxiway & Apron Surface Treatment | Preservation | \$32,344 |
| 12J_21-03_Runway 12-30 Rehabilitation | | | | | | See Note |
| R1230 | 01 | 607,650 | 47 | Mill 2" & 2" AC OLP | Rehabilitation | \$0 |
| R1230 | 02 | 142,500 | 64 | Mill 2" & 2" AC OL | Rehabilitation | \$0 |
| 12J_22-01_Taxiway A Rehabilitation | | | | | | \$1,152,530 |
| TA | 01 | 176,301 | 47 | Mill 2" & 2" AC OLP | Rehabilitation | \$1,003,716 |
| TA1 | 01 | 14,206 | 42 | AC Reconstruction | Reconstruction | \$148,815 |
| 12J_22-02_Runway 06-24 Rehabilitation | | | | | | See Note |
| R0624 | 01 | 158,908 | 56 | Mill 2" & 2" AC OL | Rehabilitation | \$0 |
| R0624 | 02 | 585,172 | 51 | Mill 2" & 2" AC OLP | Rehabilitation | \$0 |
| 12J_23-01_Apron 01 Rehabilitation | | | | | | \$736,193 |
| A01 | 01 | 107,455 | 57 | Mill 2" & 2" AC OL | Rehabilitation | \$501,216 |
| THANG01 | 01 | 39,088 | 57 | Mill 2" & 2" AC OL | Rehabilitation | \$182,323 |
| TL01 | 01 | 4,880 | 40 | AC Reconstruction | Reconstruction | \$52,654 |
| 12J_25-01_Taxiway A Surface Treatment | | | | | | \$124,882 |
| TA | 01 | 176,301 | - | Surface Treatment | Preservation | \$115,570 |
| TA1 | 01 | 14,206 | - | Surface Treatment | Preservation | \$9,312 |
| 12J_26-01_Apron 01 Surface Treatment | | | | | | \$72,553 |
| A01 | 01 | 107,455 | - | Surface Treatment | Preservation | \$72,553 |
| Total | | | | | | \$2,158,980 |



Cost excluded from PCIP as directed by ALDOT

The FAA, under the Airport Improvement Program (AIP) provides approximately 90 percent of eligible costs for planning and development of public-use airports included in the NPIAS as grants. The remaining 10 percent of costs are shared between ALDOT and the airport sponsor. The following is the distribution of the 7-yr PCIP cost of \$2.2 million for 12J:

- FAA (90%): \$2.0 million
- ALDOT (5%): \$0.1 million
- Airport Sponsor (5%): \$0.1 million

The recommendations within the PCIP are based on a network-level study and should be used for planning purposes only. A detailed project-level assessment should be conducted for each project to determine the appropriate repair activities and develop more accurate cost estimates.

Table 4.5 summarizes the maintenance activities that are recommended for Year 1 (2021). The estimated cost is approximately \$2,326. A complete listing of the maintenance activities by section is presented in Appendix I2. This may be used as a basis for establishing an annual maintenance budget for the 12J pavements.

Table 4.5: Summary of Year-1 Maintenance Plan.

| Policy | Work Description | Work Quantity | Work Unit | Work Cost |
|--------------|--------------------|---------------|-----------|----------------|
| Preventive | Crack Sealing - AC | 589 | Ft | \$2,326 |
| Total | | | | \$2,326 |

APPENDIX A
INVENTORY



Appendix A
Pavement Inventory Report
 Brewton Municipal Airport (12J)

| Branch ID | Name | Branch Use | Section ID | Rank ¹ | Length (ft) | Width (ft) | Area (sf) | LCD ² | Surface ³ |
|-----------|---------------------------|------------|------------|-------------------|-------------|------------|-----------|------------------|----------------------|
| A01 | Apron 01 Brewton | APRON | 01 | S | 440 | 261 | 107,455 | 1/2/2003 | AAC |
| R0624 | Runway 06-24 Brewton | RUNWAY | 01 | P | 1,050 | 150 | 158,908 | 1/2/2003 | AAC |
| R0624 | Runway 06-24 Brewton | RUNWAY | 02 | P | 3,915 | 150 | 585,172 | 1/2/2003 | AAC |
| R1230 | Runway 12-30 Brewton | RUNWAY | 01 | P | 4,051 | 150 | 607,650 | 1/2/2003 | AAC |
| R1230 | Runway 12-30 Brewton | RUNWAY | 02 | P | 950 | 150 | 142,500 | 1/2/2003 | AAC |
| TA | Taxiway A Brewton | TAXIWAY | 01 | P | 3,480 | 50 | 176,301 | 1/2/2003 | AAC |
| TA | Taxiway A Brewton | TAXIWAY | 02 | P | 965 | 40 | 46,177 | 6/1/2016 | AC |
| TA1 | Taxiway A1 Brewton | TAXIWAY | 01 | S | 200 | 50 | 14,206 | 1/2/2003 | AAC |
| THANG01 | Taxiway Hangar 01 Brewton | TAXIWAY | 01 | T | 940 | 55 | 39,088 | 1/1/1944 | AC |
| THANG01 | Taxiway Hangar 01 Brewton | TAXIWAY | 02 | T | 300 | 160 | 36,898 | 6/1/2011 | AC |
| TL01 | Taxilane 01 Brewton | TAXIWAY | 01 | T | 110 | 68 | 4,880 | 1/1/1944 | AC |

¹ P = Primary pavement, S = Secondary pavement, T = Tertiary pavement

² LCD = Last construction date. The date of the last major pavement rehabilitation (e.g. AC overlay)

³ AC = Asphalt Cement Concrete, AAC = Asphalt Overlay AC, PCC = Portland cement Concrete, APC = Asphalt Overlay PCC

APPENDIX B

PMP Maps

B1: Inventory Maps

B1A: Branch Identification

B1B: Section Identification

B1C: Sample Unit Layout

B1D: Pavement Type

B1E: Branch Use

B1F: Pavement Age

B2: Surface Condition Maps

B2A: 7-Color PCI

B2B: 3-Color PCI

B2C: FOD Rating

B2D: Survey Photo Locations

B3: Pavement Capital Improvement Plan (PCIP) Maps

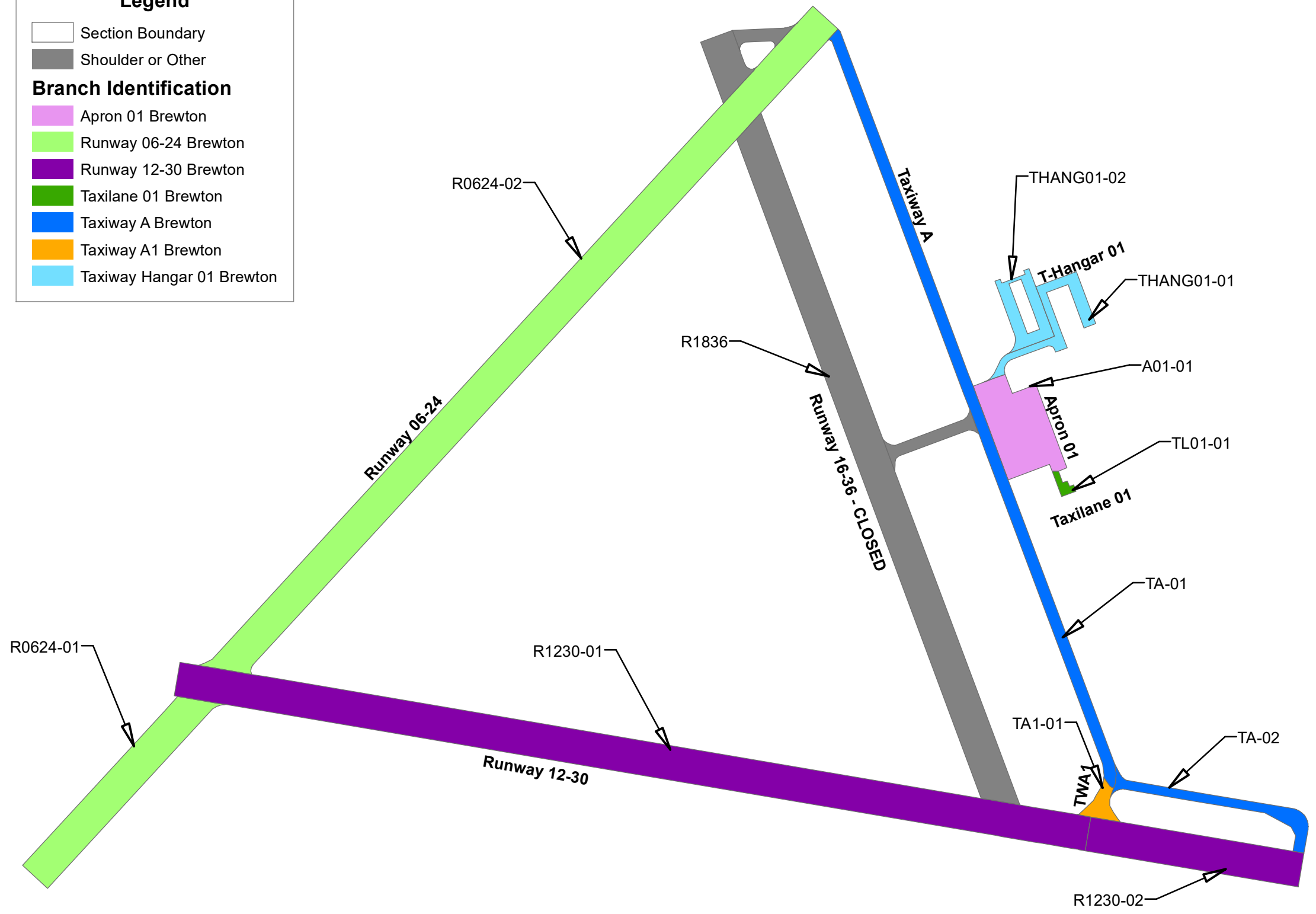
B3A: 2027 Forecasted PCI without PCIP

B3B: M&R Needs

B3C: PCIP Recommendations

Legend

- Section Boundary
- Shoulder or Other
- Branch Identification**
- Apron 01 Brewton
- Runway 06-24 Brewton
- Runway 12-30 Brewton
- Taxilane 01 Brewton
- Taxiway A Brewton
- Taxiway A1 Brewton
- Taxiway Hangar 01 Brewton



**Alabama Statewide
Pavement Management Program Update
Brewton Municipal (12J) Airport
Brewton, AL**

Figure B1A

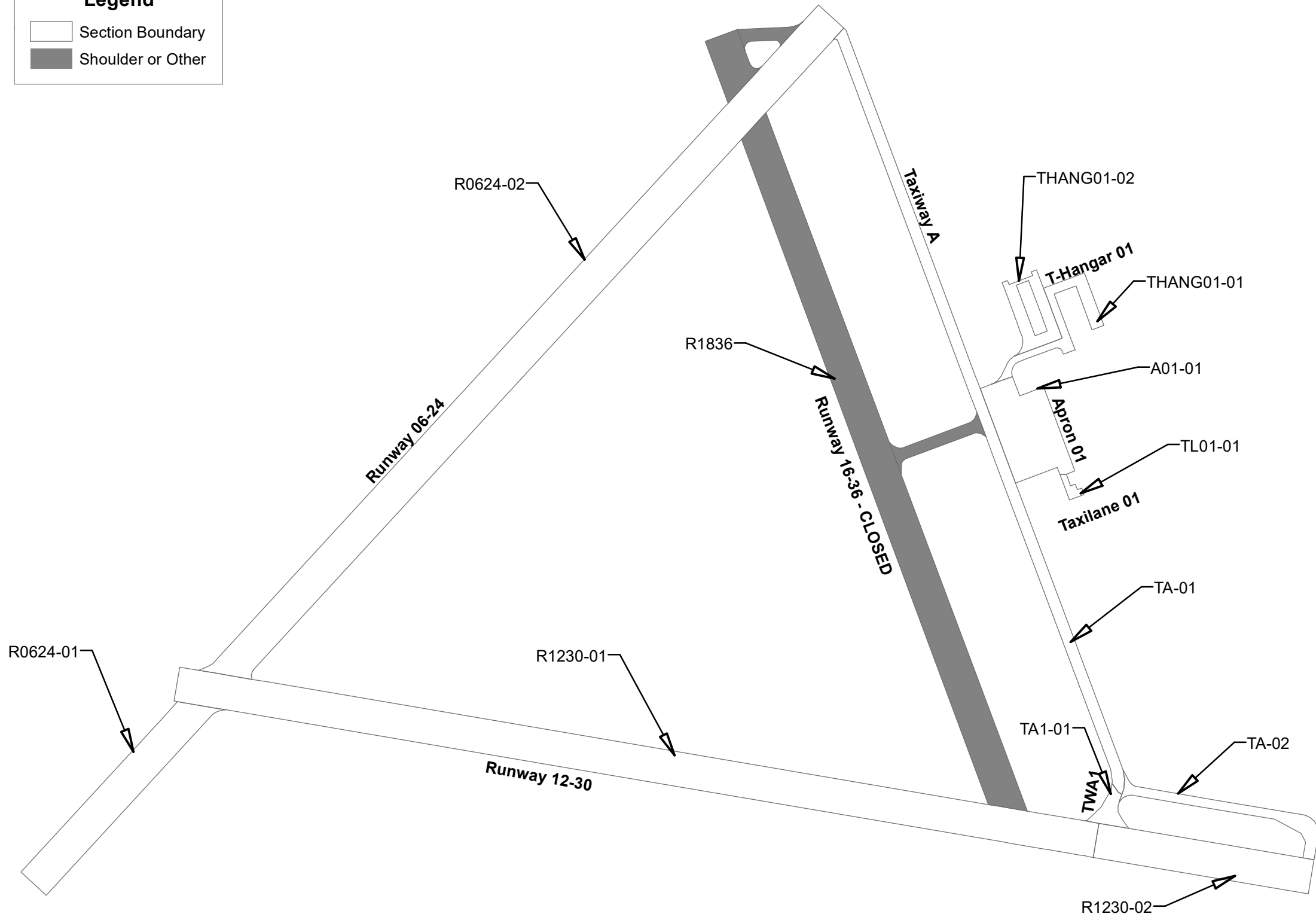
Branch Identification

| | | |
|--------------------------|-------------------------------|-----------------------------|
| ENGINEER KP/MR | DATE February 2022 | MAP NUMBER Page 1 |
| REVISED JMA | SCALE 1 in = 500 ft | FINAL |

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Legend

- Section Boundary
- Shoulder or Other



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Brewton, AL**

Figure B1B

Section Identification

| | | | |
|--------------------------------------|---|--------------------------------------|-------------------------------------|
| | <small>ENGINEER</small> KP/MR | <small>DATE</small> February 2022 | <small>MAP NUMBER</small> Page 2 |
| <small>REVISOR</small> JMA | <small>SCALE</small> 1 in = 500 ft | FINAL | |

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Legend

- Section Boundary
- Shoulder or Other

Sample Unit Layout

- SU Boundary
- Inspected



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Brewton, AL**

Figure B1C

Sample Unit Layout

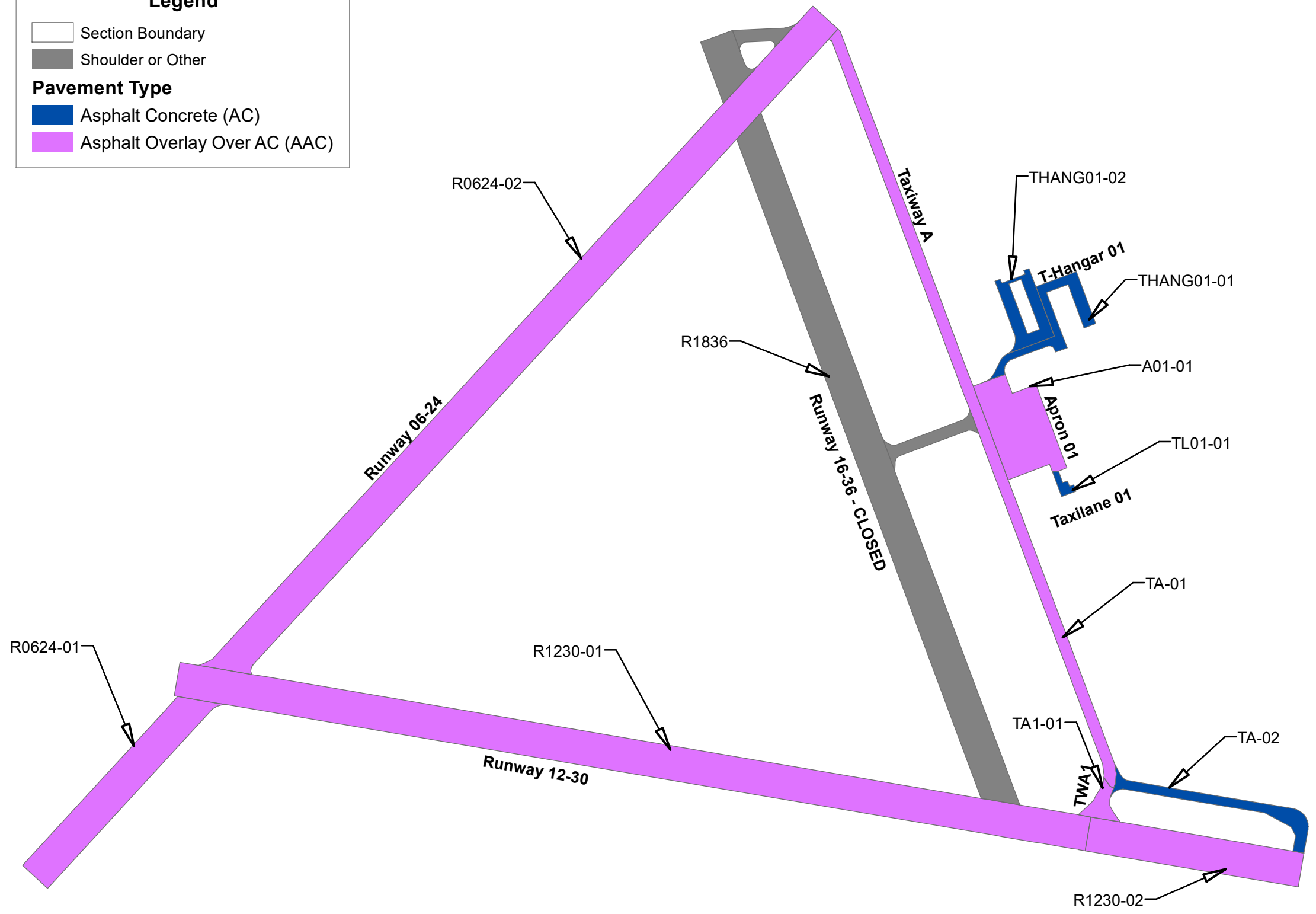
| | | | |
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| | REVISED JMA | SCALE 1 in = 500 ft | FINAL |

Legend

- Section Boundary
- Shoulder or Other

Pavement Type

- Asphalt Concrete (AC)
- Asphalt Overlay Over AC (AAC)



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Brewton, AL**

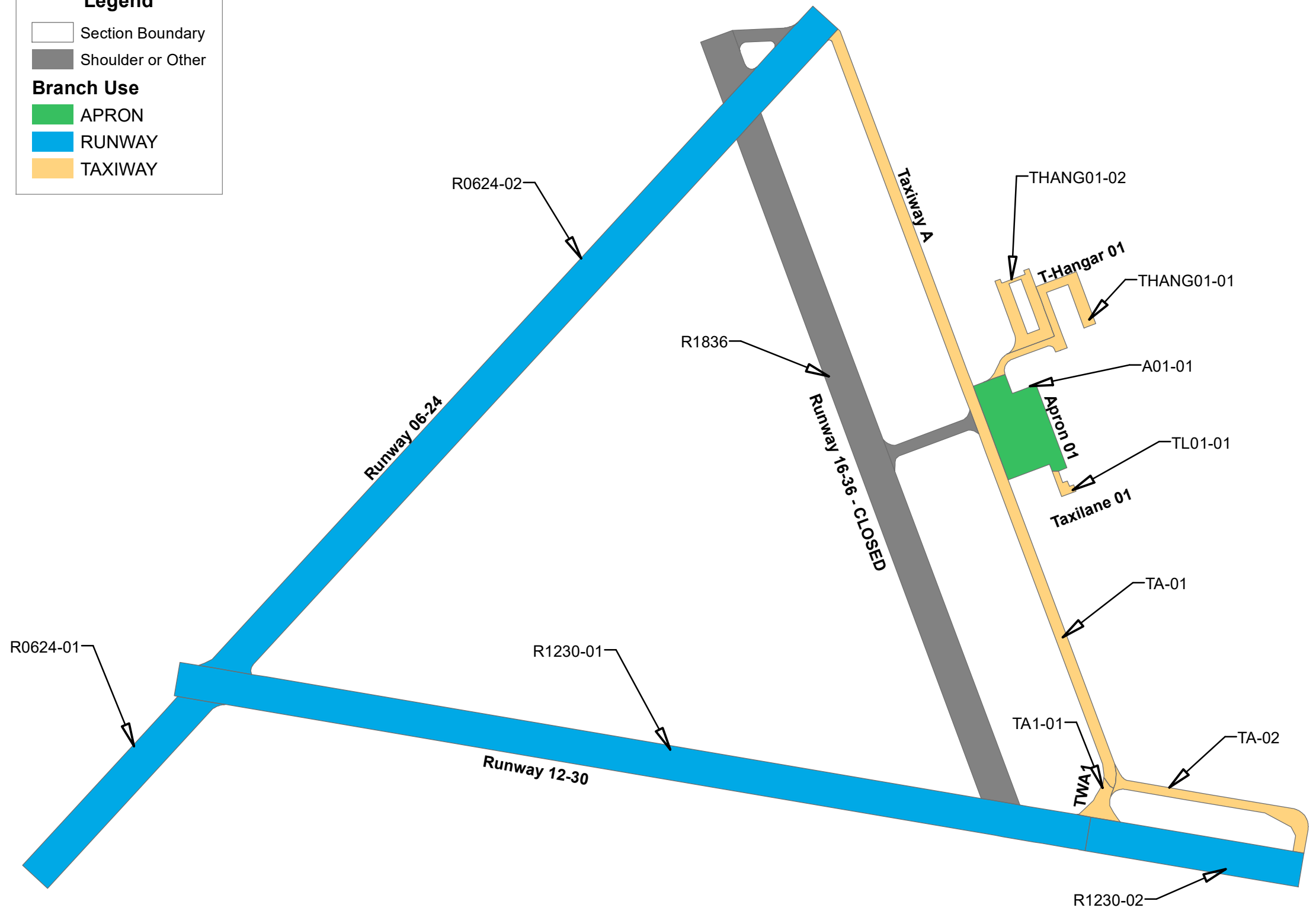
Figure B1D

| | | |
|--------------------------|------------------------|----------------------|
| Pavement Type | | |
| ENGINEER KP/MR | DATE February 2022 | MAP NUMBER Page 4 |
| REVISED JMA | SCALE 1 in = 500 ft | FINAL |

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Legend

- Section Boundary
- Shoulder or Other
- Branch Use**
- APRON
- RUNWAY
- TAXIWAY



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Brewton, AL**

Figure B1E

| Branch Use | | |
|--------------------------|------------------------|----------------------|
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| REVISED JMA | SCALE 1 in = 500 ft | FINAL |

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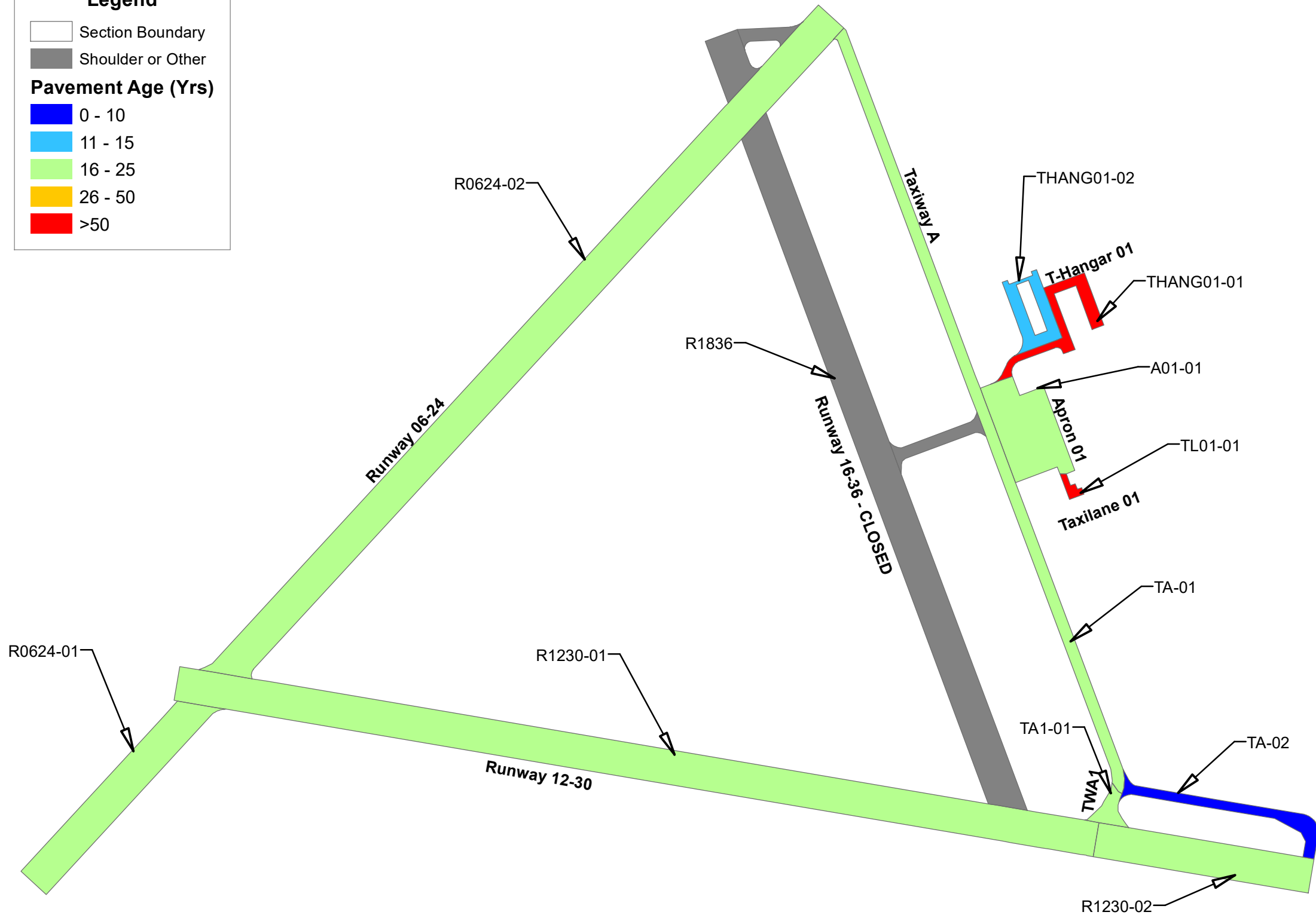
Legend

Section Boundary

Shoulder or Other

Pavement Age (Yrs)

- 0 - 10
- 11 - 15
- 16 - 25
- 26 - 50
- >50



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Brewton Municipal (12J) Airport
Brewton, AL

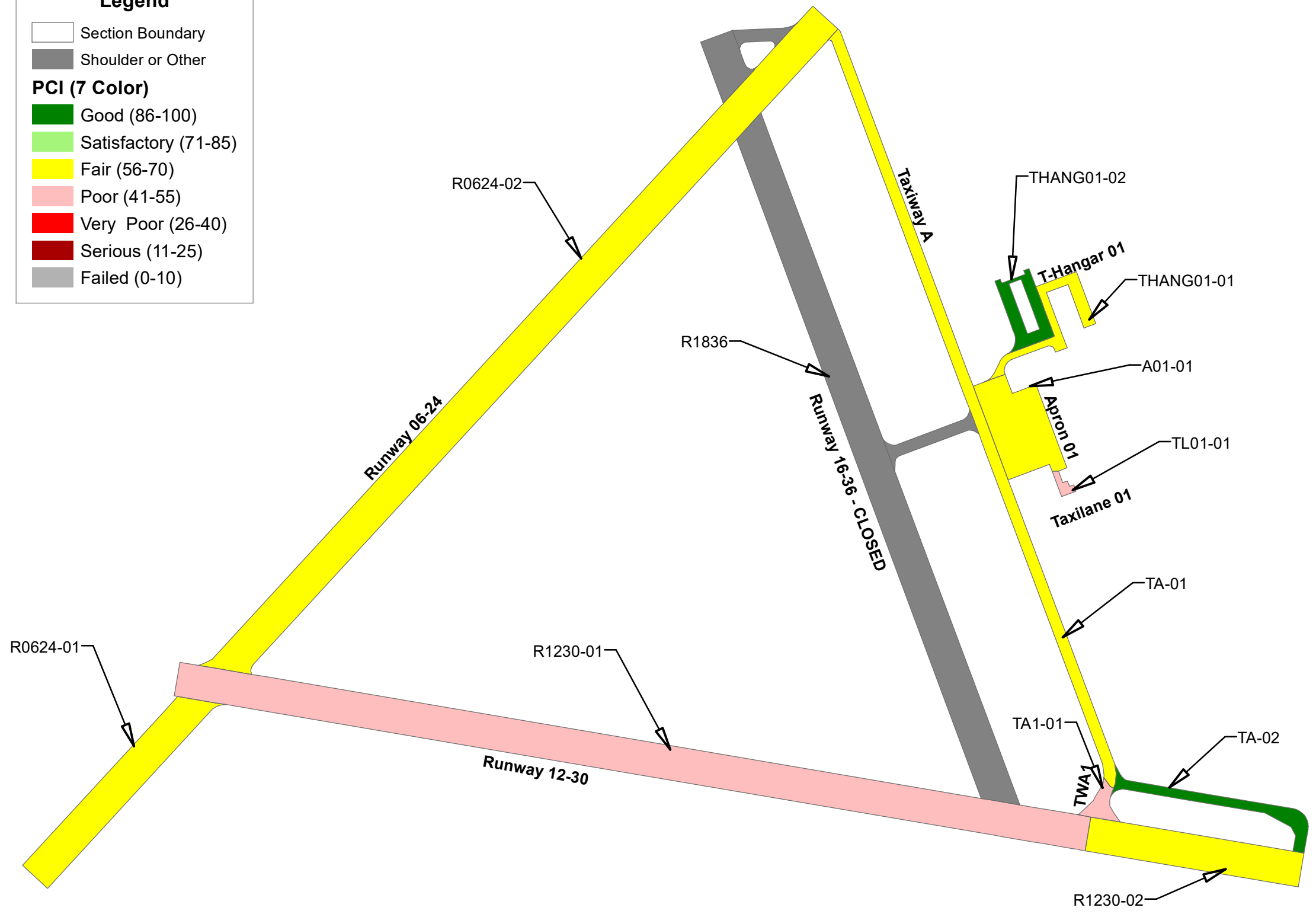
Figure B1F

Pavement Age

| | | | |
|--|---------------|---------------|------------|
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| | KP/MR | February 2022 | Page 6 |
| REVISED | SCALE | FINAL | |
| JMA | 1 in = 500 ft | | |

Legend

- Section Boundary
- Shoulder or Other
- PCI (7 Color)**
- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)



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Brewton Municipal (12J) Airport
Brewton, AL**

Figure B2A

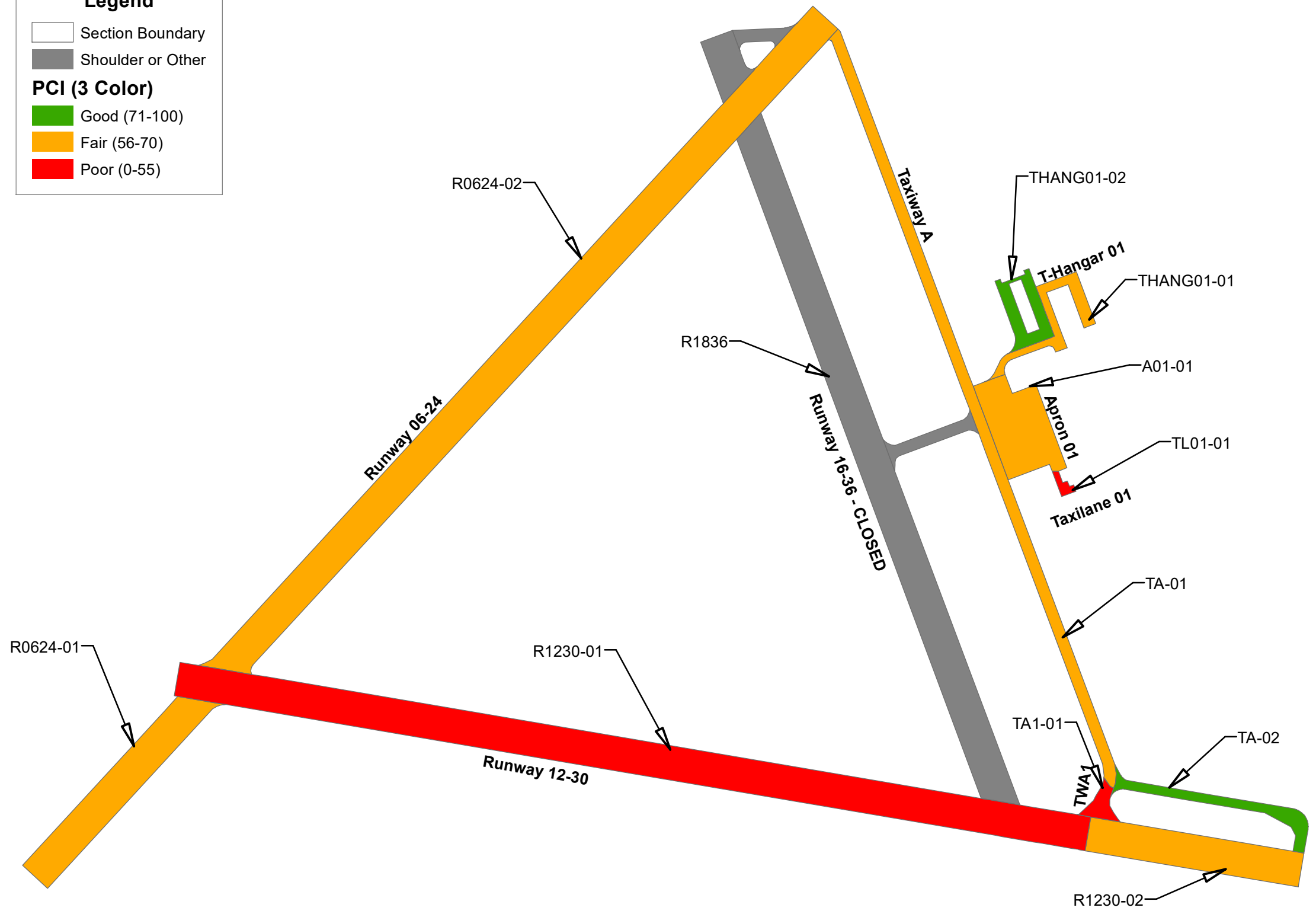
7-Color PCI

| | | | |
|--------------------------------------|---|--------------------------------------|-------------------------------------|
| | <small>ENGINEER</small> KP/MR | <small>DATE</small> February 2022 | <small>MAP NUMBER</small> Page 7 |
| <small>REVISOR</small> JMA | <small>SCALE</small> 1 in = 500 ft | FINAL | |

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Legend

- Section Boundary
- Shoulder or Other
- PCI (3 Color)**
- Good (71-100)
- Fair (56-70)
- Poor (0-55)



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Brewton, AL**

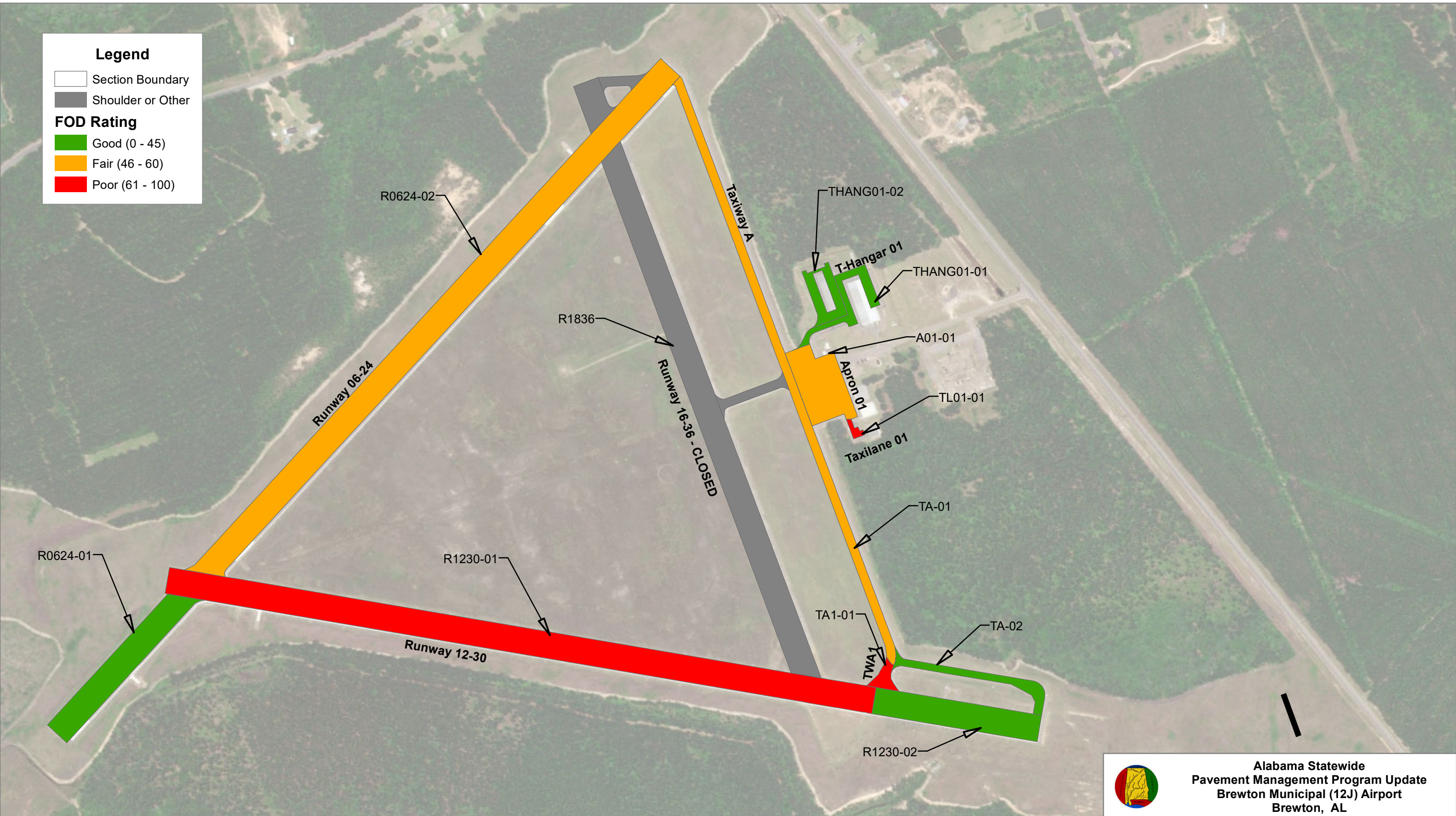
Figure B2B

3-Color PCI

| | | |
|--|--|------------------------------|
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| <p>REVISED JMA</p> | <p>SCALE 1 in = 500 ft</p> | <p>FINAL</p> |

Legend

- Section Boundary
- Shoulder or Other
- FOD Rating**
- Good (0 - 45)
- Fair (46 - 60)
- Poor (61 - 100)



**Alabama Statewide
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Brewton, AL**

Figure B2C

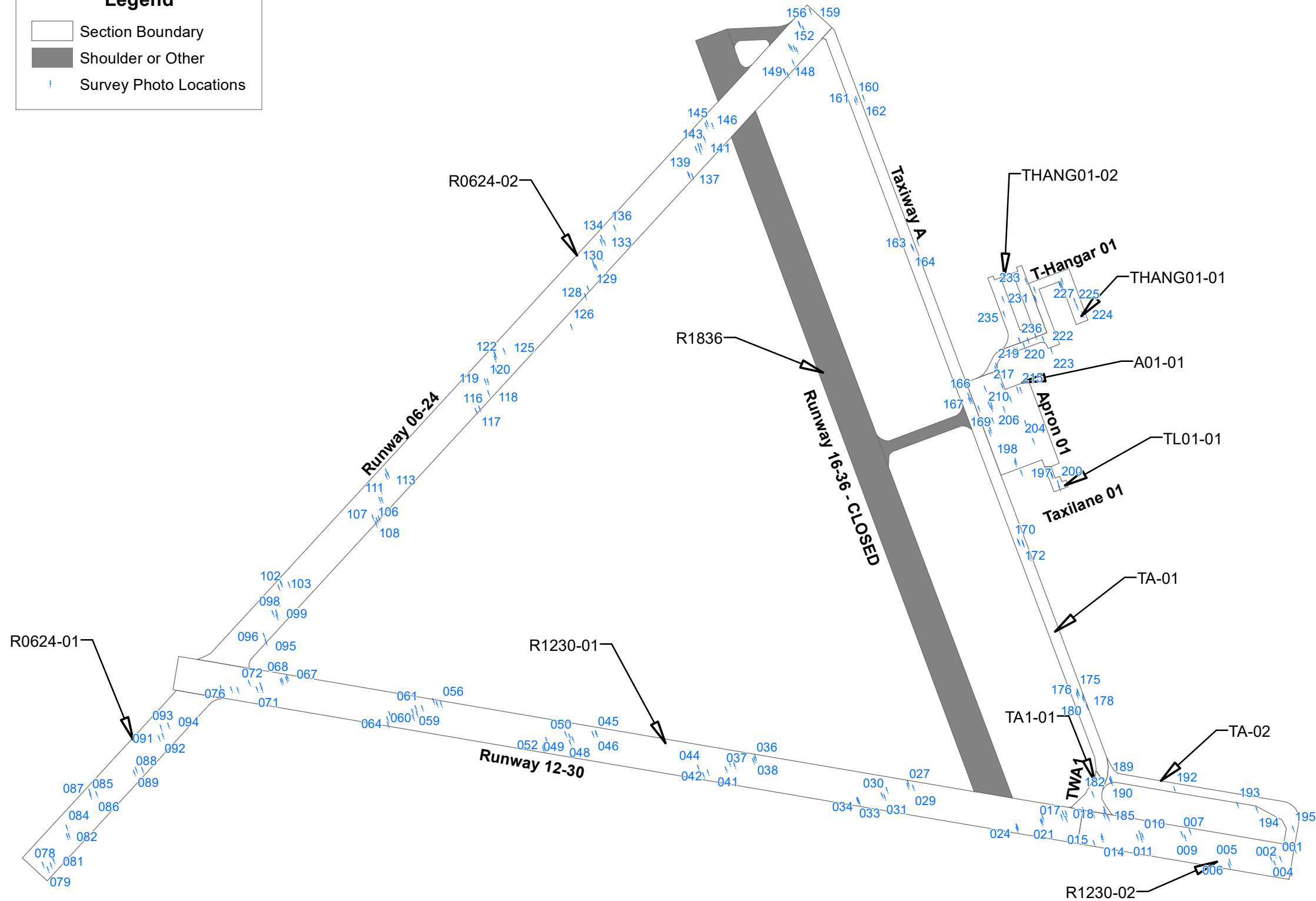
| FOD Rating | | |
|--------------------------|------------------------|----------------------|
| ENGINEER KP/MR | DATE February 2022 | MAP NUMBER Page 9 |
| REVISED JMA | SCALE 1 in = 500 ft | FINAL |

JVIATION
 ENGINEERING & PLANNING

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Legend

- Section Boundary
- Shoulder or Other
- Survey Photo Locations



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Figure B2D

Survey Photo Locations

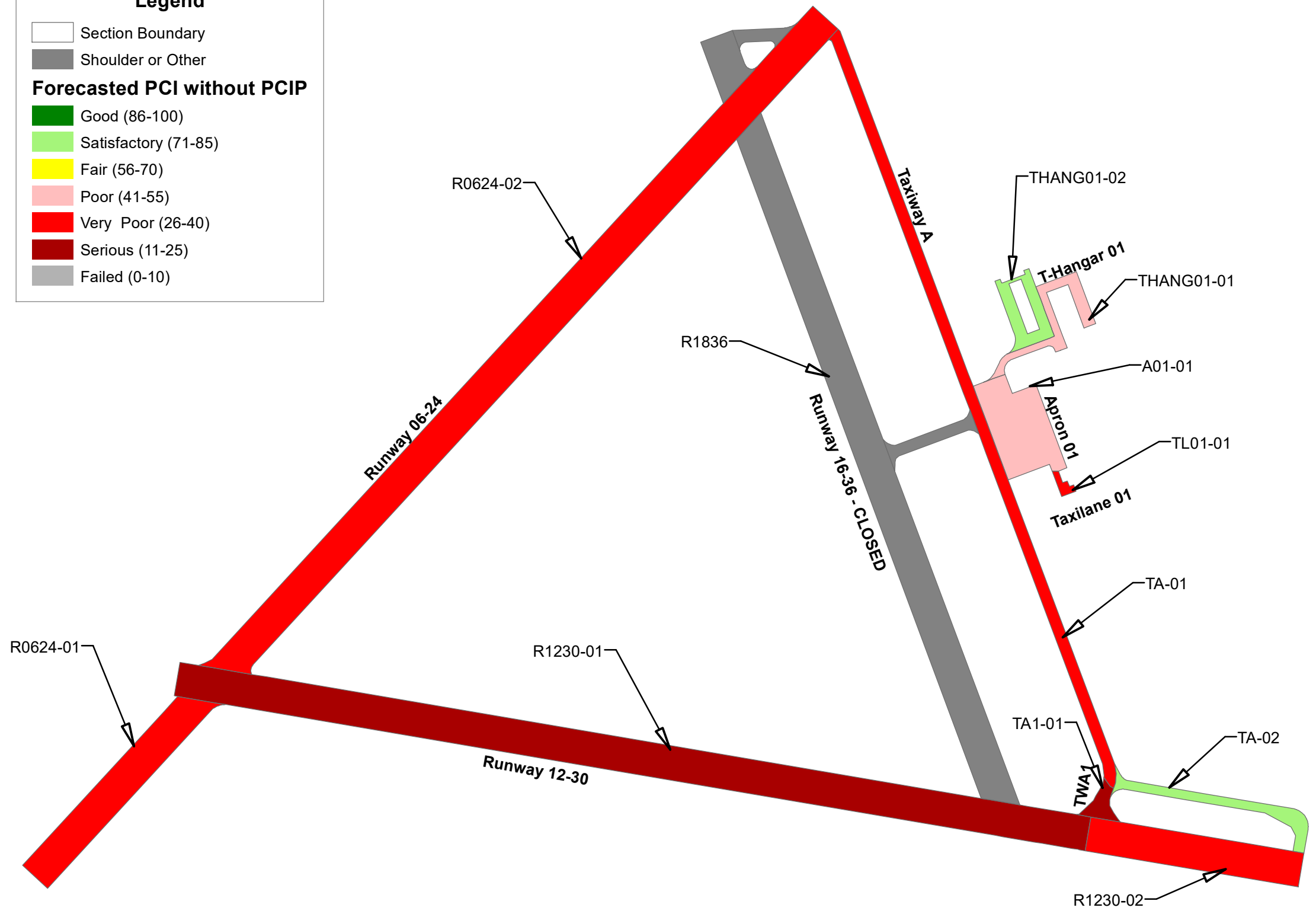
| | | | |
|--|--------------------------|------------------------|-----------------------|
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| | REVISED JMA | SCALE 1 in = 500 ft | FINAL |

Legend

- Section Boundary
- Shoulder or Other

Forecasted PCI without PCIP

- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)



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Figure B3A

2027 Forecasted PCI without PCIP

| | | | |
|--|--------------------------|------------------------|-----------------------|
| <p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p> | ENGINEER KP/MR | DATE February 2022 | MAP NUMBER Page 11 |
| | REVISED JMA | SCALE 1 in = 500 ft | FINAL |

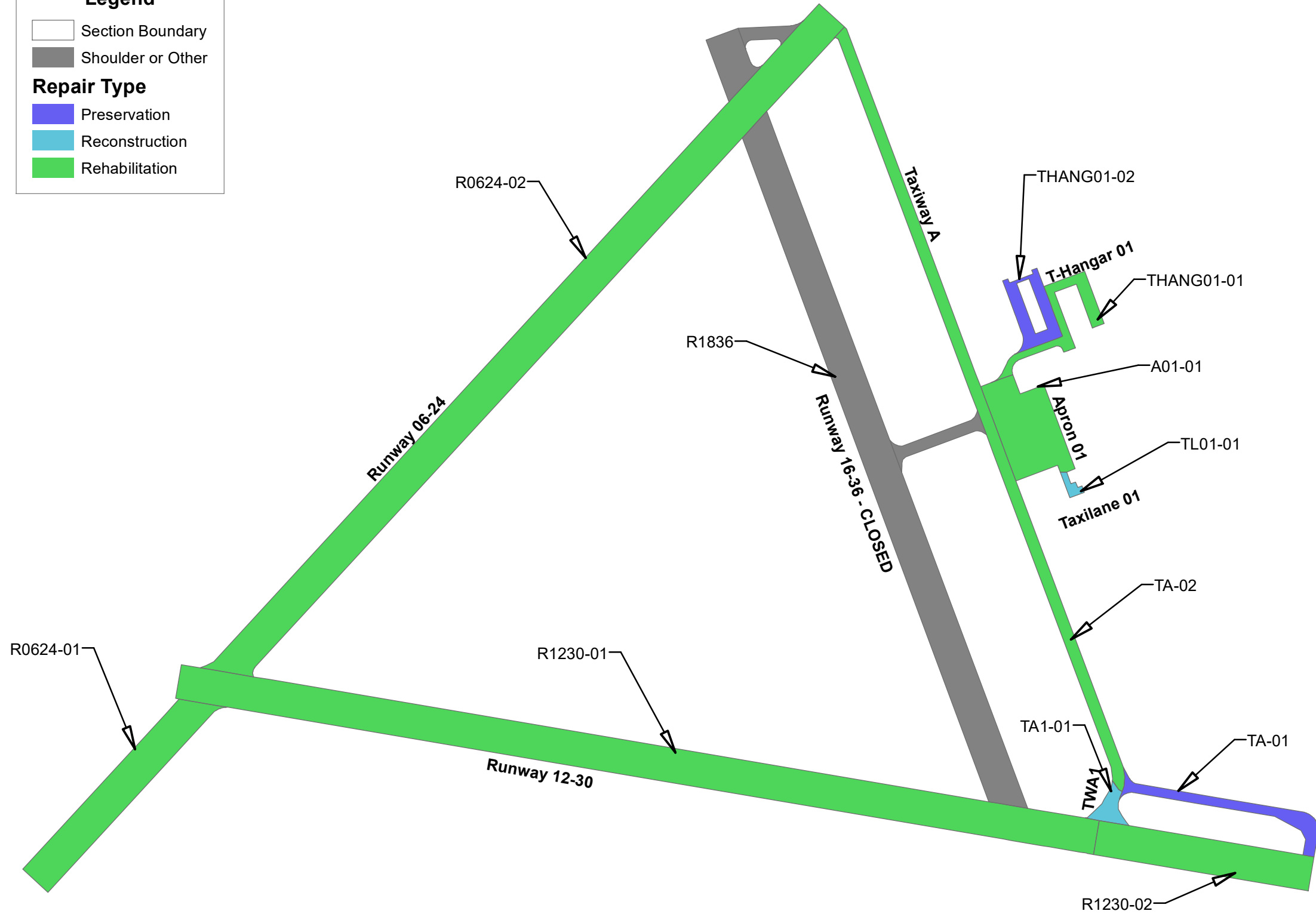
All sections recommended for Rehabilitation or Reconstruction between 2021 and 2024 also receive Surface Treatment in the 3rd year of paving.

Legend

- Section Boundary
- Shoulder or Other

Repair Type

- Preservation
- Reconstruction
- Rehabilitation



**Alabama Statewide
Pavement Management Program Update
Brewton Municipal (12J) Airport
Brewton, AL**

Figure B3B

| | | |
|--|--------------------------|-------------------|
| <p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p> | Repair Type | |
| | ENGINEER KP/MR | DATE July 2021 |
| REVISED JMA | SCALE 1 in = 500 ft | FINAL |

All sections recommended for Mill & AC Overlay or AC Reconstruction between 2021 and 2024 also receive Surface Treatment in the 3rd year of paving

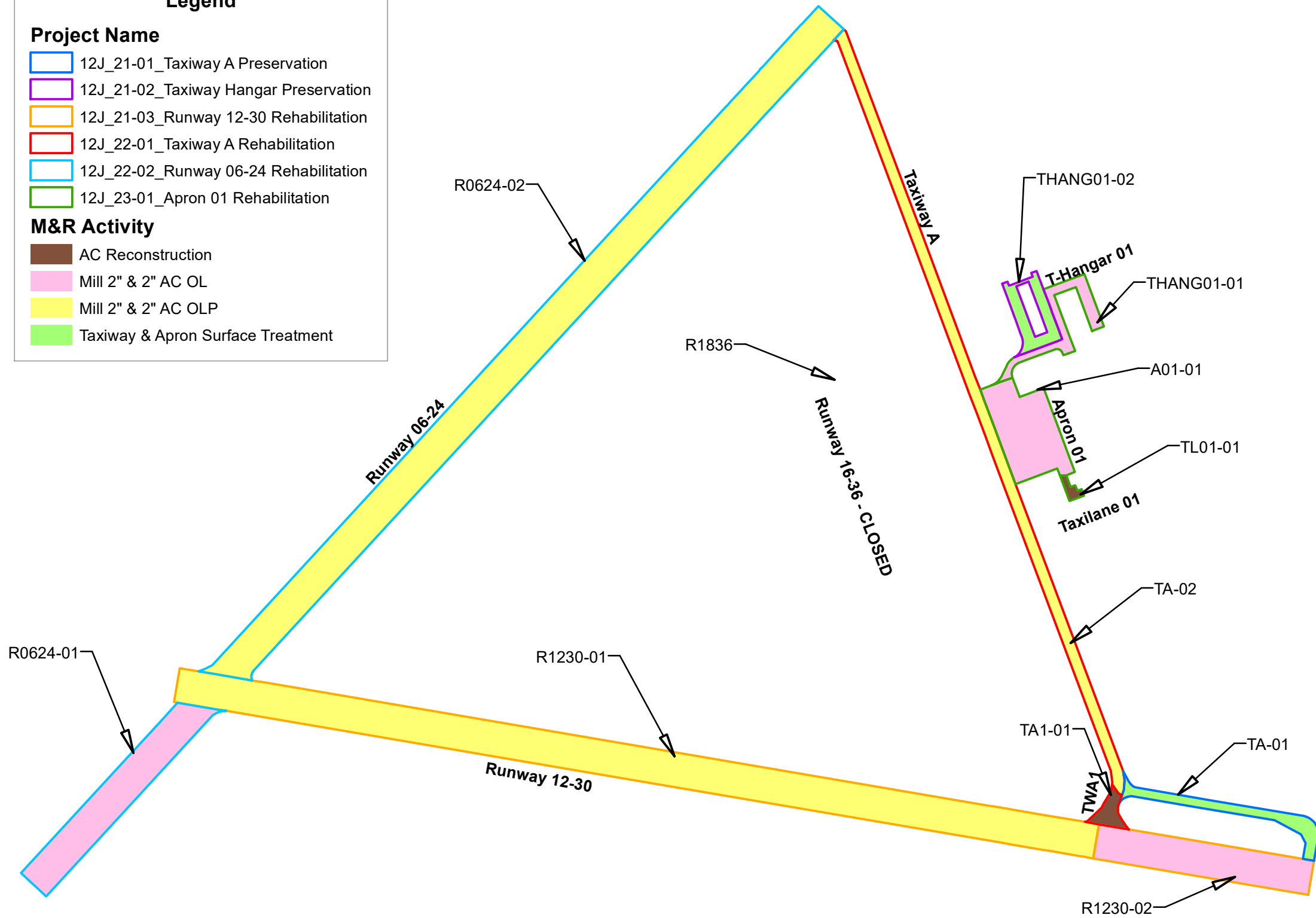
Legend

Project Name

- 12J_21-01_Taxiway A Preservation
- 12J_21-02_Taxiway Hangar Preservation
- 12J_21-03_Runway 12-30 Rehabilitation
- 12J_22-01_Taxiway A Rehabilitation
- 12J_22-02_Runway 06-24 Rehabilitation
- 12J_23-01_Apron 01 Rehabilitation

M&R Activity

- AC Reconstruction
- Mill 2" & 2" AC OL
- Mill 2" & 2" AC OLP
- Taxiway & Apron Surface Treatment



**Alabama Statewide
Pavement Management Program Update
Brewton Municipal (12J) Airport
Brewton, AL**

Figure B3C

PCIP Recommendations

| | | | |
|--|----------|---------------|--------------|
| <p>All About Pavements, Inc. (API) <small>www.allaboutpavements.com Telephone: 217-586-2765 FAX: 217-586-1967</small></p> | ENGINEER | DATE | MAP NUMBER |
| | KP/MR | July 2021 | Page 13 |
| | REVISED | SCALE | |
| | JMA | 1 in = 500 ft | FINAL |

APPENDIX C

OVERVIEW OF PAVEMENT DISTRESSES



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VWgdfcd|UfYc hYg fZW|b|| UnlgUgfygcZdfUY VWG'5ZfYfYUfX
HZZWcU| hYVWgWbWZfa| |'aUngXWg UfU| YdWghUfY Ycd
UdUmbfngV| | W|Wbk|YcfhYg |bcZbU|| Ucf" HYd|WgUfY YghU&
ZYhd| 'dbhYcd| YgY" 5~|| UcfVWWh| 'cWfGdbn|bUfYghUfYg V|W|X|c'
fYUfX|HZZWcU| |zg W|gk\ Y' d|hgZbX|gWghXfXUa UcfG| W|fU XgUg'

Gj Yf|ng

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cfdbnUzk |HfVbNWh| VWG' HYVWgUfYbdcgU'X'
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b|kcf_ 'cZVWghUa UfY|| \hngUYXA Y| a!gj Y|nU|| UcfVWWh| '
|gX|bXvUkY! X|bXUmbcZfHfVbNWh| VWGk\ YfU' d|Wg
UfYgUfYm YX| |dUW|ccXU| |f|Uf|hf cW|k Yb|d|Wg/
- ◆ <|| \! \Ugd|fygXgc hUfYd|WgUfYkY X|bXUxgdU'XUfYX'Yg"
Gca YcZhYd|Wga Uf|cW|bWf|HZZWbXa UfU|g: CS'dbn|U'

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-hcWAgk\ YUg|UH`ghYj c|XgZhYa| |Xfb| \dkYhYUxhYbYdbXgci h
cbe hYg fZWCZhYdj Ya YhQBWhYVYXh| dcWg|gbcifY YgVYXfb| WX
kYhYZig|UicfRfk|` UWai` UYcbhYg fZW'

**Gj YhNg BcX|fygcZgj Y|nifYXW|bX'6 YXh| 'gci`XWbdXk\ Y|hg
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lgW|gXa U|bn|ng|fb U|YcZhYUg|U|H|WVYU|X|g|bd|c|U|K|g|c|V|W|X|H|Y
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Z|'X|W|V|g|U|j|Y|Z|'Y|b|g|U|g|U|W|f|n|W|V|h|c|b|/
- ◆ A Y|a|a|! X|b|X|V|n|W|V|g|h|U|f|Y|a|c|X|U|Y|n|g|U|Y|X|g|a|Y|: C|S|'d|h|U|E|Z|
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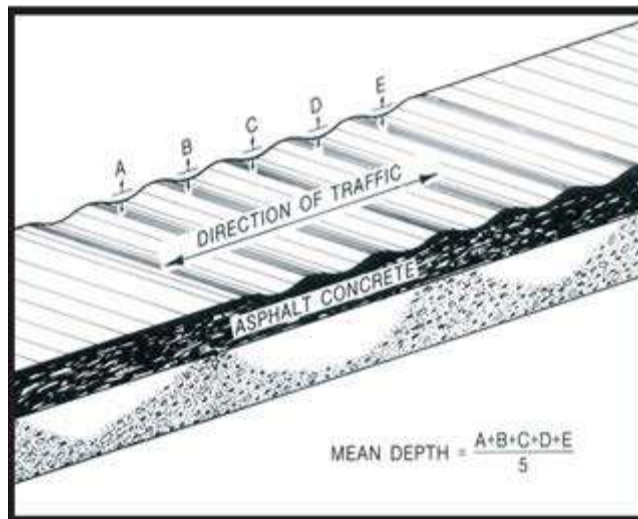
Corrugation

Description

Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.

Severity Levels

- @** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.
- A** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.
- <** Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 5 feet (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.



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9" C| G| UYB7L

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Gj YfNg Bc X| fYgZgj Y| mifYXWbX' Hgg Z| Vh| c| bYUWhUic| g| UY
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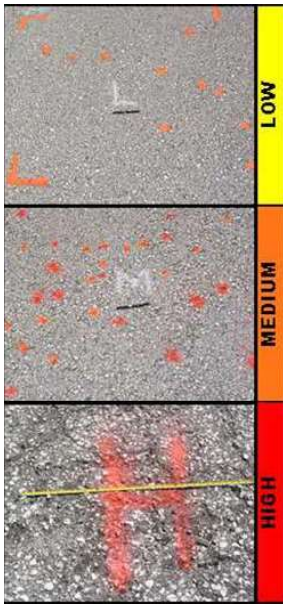
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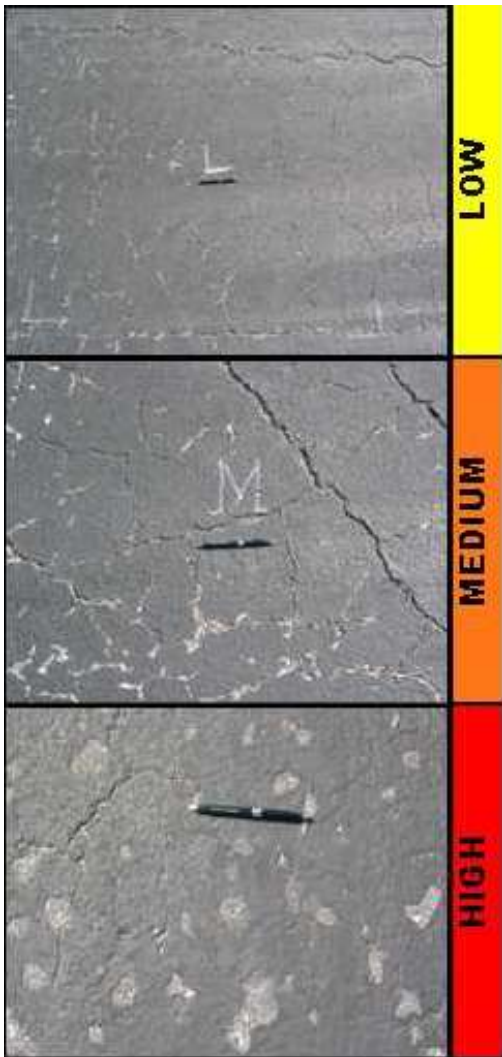
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A

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dUMB VWWh \UgXjYcdXzhYWUgUfY%#]Wfl'aaIk]Xcf[fUP'

<

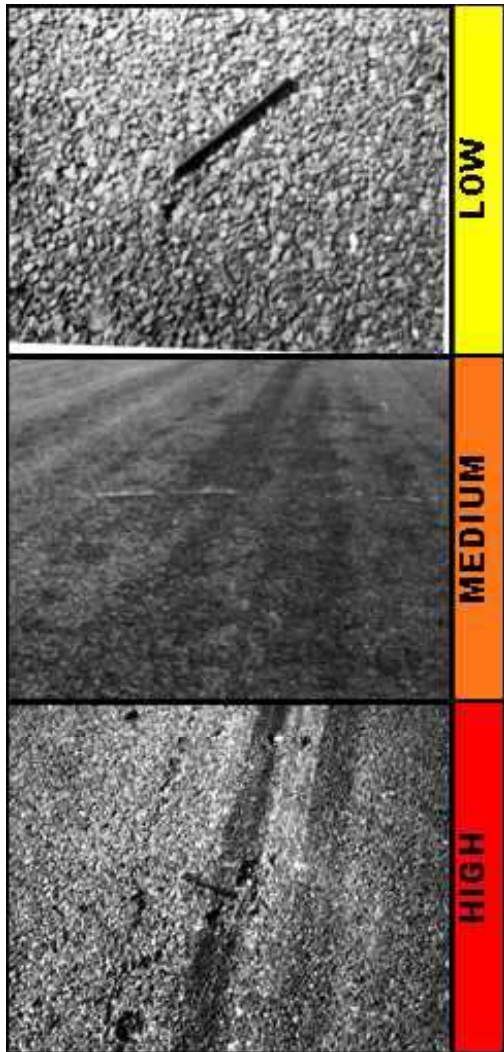
f2H YgUyXlfUlg j Y% dVfHfE-bhYWgCZAUrk hYgfZWWg'
dY]h 'cZ

Dfci g: f]Mkb7ci fgYGjYfhi@jYg

@ ÷bU%gi UYZdfl#Sgi UYa VffFYGHUj YgãdYhYbi aWfçZ
U[[f]UYd]Wgãlgg] lgVlkYb) Ux&SUX#chYbi aWfçZãlgg]`
U[[f]UYWg]Gg]Xg]ch] VWX%

A ÷bU%gi UYZdfl#Sgi UYa VffFYGHUj YgãdYhYbi aWfçZ
U[[f]UYd]Wgãlgg] lgVlkYb&UX(SUB#chYbi aWfçZãlgg]`
U[[f]UYWg]Gg]gf]f]Uf]h]b%ãihXg]ch] VWX& ÷MWhçZhYfU

< ÷bU%gi UYZdfl#Sgi UYa VffFYGHUj YgãdYhYbi aWfçZ
U[[f]UYd]Wgãlgg] lgjY(SUB#chYbi aWfçZãlgg] U[[f]UYWg]Gg]
gf]f]Uf]h]b& ÷MWhçZhYfU



%" Fi Hh 157L

5 fi hg Ug fZWXfYgcb]bhYk\Y'dh^\ckYVZ]ba Un]gUBWgfi lgUY
bc]MUYcbnUfUUbUzk\YbhYk\Y'dhgUYZ`Yk]h kUM`Dj Ya Yh
id]Zia UicWfUch] hYgXgcZhYfi HFi Hh] g]hagZca Uda UbhXZfa U]cb
]bUicZhYdj Ya YhUmfcfg V![fUXZig UnWgXVhWgc`XU]cbcf`UMU`
agj Ya YhcZhYa Uf]UgX Yc hZ]WdUg`Q] hZ]Wfih Hh] Wb`YXle`a Ucf
gi VffUZ]i fycZhYdj Ya Yh

Gj YfHgUgXcbfi hXchL

- ◆ @ck! YghUb`]bW]bXch/
- ◆ A Y]ia! VlkYb` Ux%]bW]bXch/
- ◆ <]]\! YVWg%]bW]bXch"

FYUfcdhcg

- ◆ @ck! BcU]cb/
- ◆ A Y]ia! dWU]bXf`cj YUth
- ◆ <]]\! dWU]bXf`cj YUth



:]ifY7!."57Fi Hh"

% "G|dd|Y7fUW|b| B57L

G|dd|Y7fUW|b| from the direction of traffic. They are produced when braking or turning wheels cause the **dj Ya Yhg fAWc:g|XUXXZfa "H|g|g|U|ncW|fg| \Yb|Y|g|U|ck|g|h|' g|f|W|a|| 'cf|dc|f|V|b|X|W|k|Y|b|Y|g|f|W|U|X|b|h|U|f|c|Z|d|j|Y|Y|h|g|V|f|Y'**

Gj Y|f|g| No degrees of severity are defined. It is sufficient to indicate that a slippage **V|W|Y|g|g|'**

FYUfD: M|g|

- ◆ **8|cb|h|d|/'**
- ◆ **D|f|U|c|f|Z|~|X|h|d|U|W|'**



: ||ifY7% G|dd|Y7fUW|b|"

%"GkY]h] f57L

8Yg]d]b

5'gkY'lgWfUW]h]XVn]bi dkUfXV' [Y]bhYdj Ya YH]g]fZW'5'gkY'aUn
cWf]g]f]dn]ej YUgaU' fU]cf]g]U]d]h] YZ]f]U]X]U]k]j]Y'9]h]Y]h]d]N]c]Z]g]k]Y' WbWY
UW]a]d]h]Y]X]V]n]j]f]Z]W]W]U]h] "5'gkY'lg]g]U]m]W]g]X]V]n]j]g]U]W]b]h]Y
g]V]f]U]X]c]f]V]n]k]Y]h] g]c]Z]V]h]U]g]a]U' g]k]Y' WbU]g]c]W]f]c]b]h]Y]g]f]Z]W]c]Z]b]g]d]U]h]
c]j]Y]U]h]j]Y]D]7]H]g]U]F]g] h]c]Z]U]V]c]k]! i]d]h]Y]D]7]g]U"

GjY]h]m]@]j]Y]g

GkY'lgWfYnj]lgVYU]X]U]g]U]a]h]c]f]Z]W]c]b]h]Y]d]j]Ya]Y]H]g]f]X]e]i]U]h]m]g]
X]h]f]a]j]X]U]h]Y]b]c]f]a]U]U]Q]W]Z]i]g]h]X]Z]f]h]Y]d]j]Ya]Y]h]g]m]j]b]i]b]X]f'
@ W]h]g]X]M]U]c]b]'f]d]k]!g]j]Y]l]n]j]k]Y'g]a]U]h]c]h]U]k]U]g]V]c]V]g]j]U]V]Z]V]h]Y]f'
Y]lg]b]W]W]b]V]W]b]f]a]X]V]n]j]h]j]U]j]X]j]W]c]j]Y]h]Y]g]m]j]b]U]h]Y]b]c]f]a]U'
U]Q]W]Z]i]g]h]X]Z]f]h]Y]d]j]k]j]c]W]f]Z]h]Y]g]k]Y'lg]d]f]g]h]!

GkY'WbV]c]V]g]j]Y]k]h]c]i]h]Z]V]W]h]U]b]X]U]g]U]g]l]h]Z]W]h]Z]W]c]b]h]Y'
A d]j]Ya]Y]H]g]f]X]e]i]U]h]m]g]X]h]f]a]j]X]U]h]Y]b]c]f]a]U]U]Q]W]Z]i]g]h]X]Z]f]h]Y]d]j]Ya]Y]h]
g]m]j]b]i]b]X]f]W]h]g]X]M]U]c]b]'

GkY'WbV]f]D]j]n]c]V]g]j]Y]X]U]X]g]j]Y]Y]m]Z]Z]U]g]h]Y]d]j]Ya]Y]H]g]f]X]e]i]U]h]m]h]Y'
< h]c]f]a]U]U]Q]W]Z]i]g]h]X]Z]f]h]Y]d]j]Ya]Y]h]g]m]j]b]i]b]X]f]W]h]g]X]M]U]c]b]'



%"KXhY[h] 157L

8Yg[d]db

H YkY[h] UkUicZhYUgUHMpXfUXZBYU[f]UYaUqI Zca hYdjYaYh
gfAW

GjY[h]e@jYg

5gUhg fAWW[h]bb[l'g'ck'g[hgcZU[h] k\jWaUuYUWYUUXVn
V\UWUWU[h]dg' @cg[hYZBYU[f]UYaUqI l'gd[MVYUXXaUuY
@ UW\dhYXVnZ[h] cZhYUgUHWc" 9N YgcZhYUgYU[f]UYgUY
V[h]bb[l'VYIdgXfNgU\$) jWYgcf%aaE' DjYaYhaUuY
fYUj Ynbk f[h]bk Ug* 'adhg'X!

A @cg'cZBYU[f]UYaUqI l'gd[MVYUXX YgcZUgYU[f]UY\jYVb'
YIdgXi dlc%# k]X hZhYch YgigXcZhYUgYU[f]UYX Yc hYcg'
cZBYU[f]UYaUqI "

< 9N YgcZUgYU[f]UY\jYVb'YIdgX fNMhU%# k]X hZhYch Ygi
gXcZhYUgYU[f]UYHY YlgWgXUUYcg'cZBYU[f]UYaUqI
Y[h] l'cd[h]U'cfgaYcg'cZUgYU[f]UY'



%!"6dk!I d!D77L

8YgAd]b

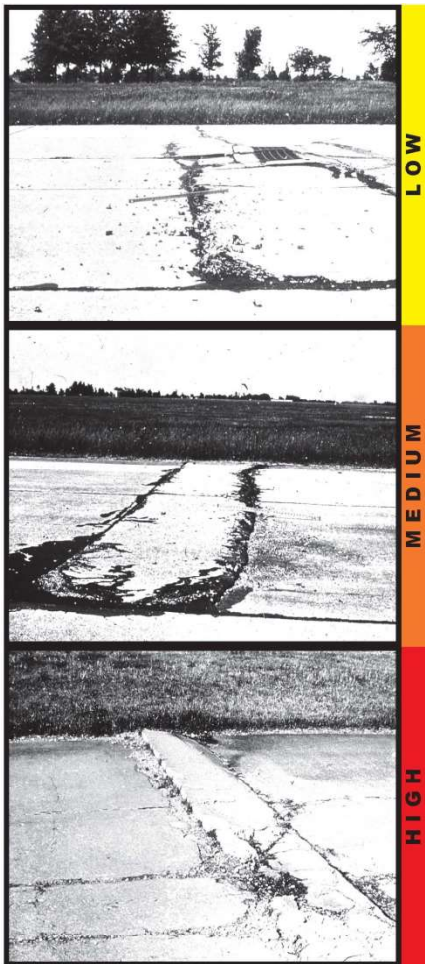
6'dki dg'cWf]b\dkYhYzi gUmHUmhg YgVWcf'c]HhUhgbdk]Y
Yci [\ lc'dfa]h]d]hgdbVnhYWBWYgUG'H Y]hgZ]W]hk]Xh'lgigUm
W]gXV]h]Z]H]U]bc]Z]W]adYg]VYaUm]Ug]bc'hY'c]hg]W]K\Y]Yd]hgdb'
W]b]d]f]Y]Y]Y]ci [\ d]Y]g]f]Z]U]c]W]n]X]i]d]k]U]X]a]j]Y]a]Y]h]c]Z]h]Y]g]U]V]X]Y]g'
f]i]W]h]U]c]f]g]U]M]h]k]'c]W]f]b]h]Y]j]M]h]c]Z]h]Y'c]h]G'dki dg'W]b]U]g]c]W]f]U]h
i]h]h]m]W]g]U]X]U]b]U]Y]b]Y]g]H]g]h]d]c]Z]h]Y]g]g]U]a]c]g]U]k]U]g]f]U]U]f]X
]a]a]Y]U]Y]m]W]U]g]c]Z]g]Y]Y]X]a]U]Y]d]h]U]U]c]U]M]Z]h]G'dki dg'U]Y]b]W]X]X]Z]f
f]Z]f]W]k\Y]b]W]g]X]g]U]h]g]U]Y]V]h]Y]U]i]U]X]Z]f]f]X]d]h]h]"

GjY]h]e]j]Yg

@ 6i W]h] 'cf g'UM]h] \Ug]b]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y]Z]U]X]d]b]n]U]g]h] \h
U]a]c]i]h]c]Z]i [\ b]g]Y]g]g'

A 6i W]h] 'cf g'UM]h] \Ug]b]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y]Z]U]h]U]g]h]Z]W]h
U]a]c]i]h]c]Z]i [\ b]g]Y]g]g'

< 6i W]h] 'cf g'UM]h] \Ug]b]f]b]W]X]h]Y]d]j]Y]a]Y]h]b]c]d]M]U]j]Y'



%" 7fUWg"@cb|JiXpUZHFUbgYgYUbxS|U|cbU'D77L

H YgVWgXj|XhYgU|bc|kc'cfhfYd|WgZUXIfYigUmWgXVhU
WáVhU|bcZcdXFNH|cbZAF|h'gYgZUXgfb_UYgYgYg"@ck'gYVlm
VWgUfYbdHhgXfXaUcfgiVifUXgYgYg'A Yfi a'cf\\|\\gYVlmVWgUfY
igUnkcf|h|VWgUxifVhgXfXaUcfgiVifUXgYgYg'

GjYfing

- ◆ @ck!%i hZ`YXVWg%#|bWlc%&|bWk|Xk|h bcZi |h|'cf gU|h|/E
VWgYghU%&|bWk|Xk|h`ck'gYVlmigU|h|/cf'EZ`YXVWgcz
Unk|Xk|h ZfM'cZfa|h|bUgUgUfinaUbfUx|bcZi |h|'cf
gU|h|/
- ◆ A Yfi a !%i hZ`YXVWgVhYb%&|c%|bWk|Xk|h bcZi |h|'cf
gU|h|'cf&Z`YXVWgczUnk|h Zi |h|`YghU%#|bWcfa Yfi a'
gYVlmigU|h|/
- ◆ <|\\!%i hZ`YXVWgk|h Uk|h|fNfHb%|bW&ei hZ`YXVWgcz
Unk|h k|h Zi |h| |fNfHb%&|bWcfa Yfi a'gYVlmZi |h|/cf'E
Z`YXVWgczUnk|h Zi |h| |fNfHb%&|bWcf|\\|\\gYVlmZi |h|"

FYUfcd|cbg

- ◆ @ck!BcU|b'cf gUVWg/
- ◆ A Yfi a !gUVWg/
- ◆ <|\\!gUVWgZUdnUZ`Xh'dUWcfYfUWhYgU'



: ||ifY7%&'D77HUb|YgY7fUWg'

§' Si fUj]m7fUWgID77L

8YgAdjb

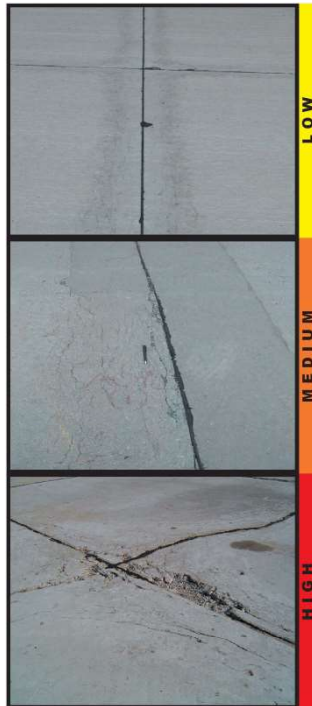
Si fUj]m7fUWg]gWgXVnhYbUj]m7cZhYWBWYk]hgUXXj]fdaYbU' ZWfjgWUgZYVhUkVWg'-hi gUnldNfgUdUMb'cZMwgi bhd' parallel to a joint or linear crack. A dark coloring can usually be seen around the fine XfUj]m7fUWg'H]ghd'cZMwgd' aUnjYbU'mXk'Xgh]fU]bcZhY WBWYk]h]b'c'§ZYfSS'c*SSa]`jaYgicZhY^cbidVW'

GjY]m7Yg

@ ÍSÍ VVW] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h`]hYcf bcXgh]fU]bcf: CS'dh]U' cfÍSÍ VVW] \gWfYX]bU]a]PX fUcZhYgUzgWg]bcYcfk'Wb]gcfUd]`cb'c]h]i]h]WgUfY a]gh] UXXgh]fU]cb\UgWfYX'GaY: CS'dh]U'

A ÍSÍ VVW] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h`]hYcf bcXgh]fU]bcf: CS'dh]U' cfÍSÍ VVW] \gWfYX]bU]a]PX fUcZhYgUzgWg]bcYcfk'Wb]gcfUd]`cb'c]h]i]h]WgUfY a]gh] UXXgh]fU]cb\UgWfYX'GaY: CS'dh]U'

< ÍSÍ VVW] \gXjYodXgYFUWg]MVYUaci hZgUVfUk]h` Xgh]fU]bcZ: CS'dh]U'



8% >chhGU'SUa U YID77L

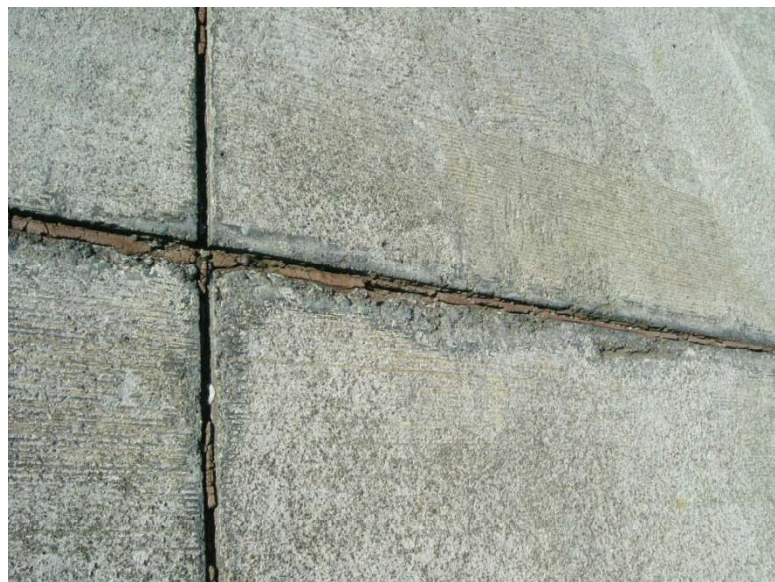
>chhGU'SUa U YgU'mWYh'bz\|WYhUV'gg]' cfcVgk UWai 'UY'bhY^chh'g
cfU'ck'g| h'ZUH'bz'fU'bc'ZkU'f''5Wai 'U'bc'Z'W'ad'Yg'VYa'U'f'U'g'lb'
hY'ch'hd'Y'Y'gh'Yg'U'Z'ca 'Y'd'f'f'U' X'a'U'f'g' h'b'V'W'ld'z'g'U'f'ld'z'f'
gU'ld''D'J'U'V'Y'ch'f'f'Y'V'b'X'X'c'h'Y'X'Y'g'z'h'Y'g'U'g'd'f'W'g'^'ch'g'Z'ca h'Y
U'W'ai 'U'bc'Z'a'U'f'U'g'U'X'U'g'c'd'Y'Y'g'k'U'f'Z'ca 'g'X'ld' X'kb'U'X'g'Z'f'ld' h'Y
Z'i'b'U'ld'bg' d'bf'ld' h'Y'g'U'f' H'd'W'ld'g'z'ch'g'U'X'a U'Y'U'f'Y'%g'ld'ld' h'Y
'ch'g'U'U'h'f'8'X'ld'g' d'bc'Z'ch'g'U'U'h'f' H'k'X'ld'f'ck'h'/(E'U'X'ld'ld' 'c'Z'h'Y'Z'Y')E
'cg'ic'Z'cb'X'c'h'Y'g'U'V'X'Y'g'U'X'*E'U'W'c'f'U'g'b'W'c'z'g'U'U'h'ld'bh'Y'ch'h'

Gj Yfing

- ◆ @ck ! |b| YfU'nf|cc'X'W'Y'ld'bh'fci [\ 'ci'h'Y'g'U'ld'bz'k'ld' 'GU'U'h'g'd'Z'f'a'ld'] .
k'Y'k'ld'h' d'bn'U'a |b'c'f'U'a'ci' b'ic'Z'U'nc'Z'h'Y'U'g'Y'ld'g'c'Z'X'a U'Y'd'Y'g'h'
- ◆ A'W'ia ! |b| YfU'nf|f'W'Y'ld'bh'fci [\ 'ci'h'Y'g'U'ld'bz'k'ld' h'd'Y'c'f'ad'f'c'Z'
U'nc'Z'h'Y'U'g'Y'ld'g'c'Z'X'a U'Y'd'Y'g'h'ic'W'f'ld'] l'c'U'a'c'X'U'Y'X'f'Y''
GU'U'h'b'X'g'laa Y'U'Y'Y'd'U'W'a Y'h'k'ld'h'b'&'n'f'g'
- ◆ <||\ ! |b| YfU'nf|c'f'W'Y'ld'bh'fci [\ 'ci'h'Y'g'U'ld'bz'k'ld' h'd'Y'c'f'ad'f'c'Z'
U'nc'Z'h'Y'U'g'Y'ld'g'c'Z'X'a U'Y'g'd'Y'g'h'ic'W'f'ld'] l'c'U'g'Y'Y'X'f'Y'' GU'U'h'
b'X'g'laa Y'U'Y'Y'd'U'W'a Y'h'

FYU'fcd'hd'g

- ◆ @ck ! Bc'U'ld'b'
- ◆ A'W'ia ! g'U'^'ch'g'
- ◆ <||\ ! g'U'^'ch'g'



: ||ifY7% 'D77 >chhGU'SUa U Y'

88! GaU DUWID77L

5' dUWlgUBfUk\ YfhYcfll jBU'dj Ya Yh
has been removed and replaced by a filler

aUfJU': cfWbXllcbY U UjcbzdUWll lg'
Xj jXXllc lkc lndg' gaU fngghU) 'gei UfY
ZNLUXUf Yfj Y) 'gei UfYZNL'@uf YdUWg'
UfYXgUfVXj bhYbl hgXllcb'

Gj Yllng

- ◆ @k! DUWlgZblcbll kY'zkjh'
'llhYcfbcXllcfUjcb/
- ◆ A Yjia ! DUW\lgXllcfUWZUWf
acXllUfYgdU' ll WbVYgXbUfcbXhY
Y'Y'gDUWa UfJU' WbVYg'cX'Y'Z
kjh WbgXllUfY'Z'fifh jcf: C8'
dnlhU/
- ◆ <ll\! DUW\lgXllcfUWZ'YhYVn
gdU' ll UfcbXhYdUWcfWllll'
kjhj bhYdUWZc UgU'k\ jWkUfUllg'
fYUWa Yh

FYUfcdllcbg

- ◆ @k ÈScBchll/
- ◆ A Yjia ! FYUWdUWcf fYUWWhY
gU'
- ◆ <ll\ ÈFYUWdUWcf fYUWWhYgU'



: llifY7% 'D77 GaU DUW'

&" @Uf YDUWID77L

Patching is the same as defined **ZfUgaU`dUW`
**ckYVzhYufUcZhYdUWlgacfyhUb) 'gi UfY
ZNF5 i f]hMhlgUdUWhUgfydUWkhY
cf]]bU'dj Ya YHMMgycZdUWa YhcZ
i bXf fci bXi f]]ng'HYgj Yf]m'j YgcZLi f]]m
WfYhYga Yg hcgYZffYi 'Uf dUW]d."****

Gj Yf]ng

- ◆ **@ck ? DUWlgZb]]cb]d kY'zkjh `]hYcf
bcXNFcfU]cb/**
- ◆ **A Y]i a ! DUW\UgXNFcfUWZbXf
acXfUYgdU]d VbVYgYbUfci bXhY
Y] Yg'DUWa Uf]U VbVYg'cX Y'zkjh`
WbgXfUYVZf]f]]bcf: CS'dh]]U/**
- ◆ **<] \ ! DUW\UgXNFcfUWZ]hYfVn
gdU]d Ufci bXhYdUWcfVW]d k]h]b'
hYdUWZc Ug]]k\]WkUffU]g
fyUWa Yh**

FYUfcd]cbg

- ◆ **@ck E8cBch]d /**
- ◆ **A Y]i a ! FYUWdUWcfFYUWWhYgU'**
- ◆ **<] \ E'FYUWdUWcfFYUWWhYgU'**



:]]ifY7%` 'D77 @Uf YDUW'

&" Dddi lgiD77L

5' dddi hlgUga U' d]WwZdj Ya YhhUMFU_g`cogYZca hYg fAWX Ylc ZYhV
hUk UWcb]bWa VbU]cbk]h Y d]h]j YU [fY]Ug' Dddi lgi g UnfU] YZca`
Uddid ja UYn]f]bWlc(]bWYg]bX]a YfU]XZca %&]bWlc &]bWgX]d"

Gj Yfng

No degrees of severity are defined for popouts. <ckY Yzddi lgaig hVYfNgj Y
VZfYh Yn]fYw hX]g U]g]Yg]Yz] YU Yddi hX]ghiaig hVWX
Uddid ja UYn]fYddi lgidf gi UYn]fXg YhYb]fYgUVfU



:]]ifY7%. 'Dddi lgi'

&" GUVh ID77L

**AUVWVh 'cfVUth fYZfgUbkcf 'cZgUdczZbZcf\UFjBYWVghU
YfXcbnhfi [\ hYiddf g fZWCZhYWBWYHYWVgN6Xc]bMgNth
Uj 'YgZ/8\$X|fyg'AUVWVh 'cfVUth |lgjUmWgXVnj YZhg |hY
WBWYUxAltXk:cGUh 'cZhYgfZWK\|W|ghYVU_XkbcZhYgU
g fZWC Uxh of approximately 1/4 to 1/2 in W'GUh 'aUthg VVWgXVn
|adcfWghj VcbUXdcfU|f|UY'5bchYfW|bhXgi fWcZgdYgghY
fU|bVWkYbhYU_UlgfUc'UX? &E|bga YW YlgUXWUba |bUglb'
ga YU|f|Uhg'UcXVZfa YVnhYVU|bVWkYbhYU_UlgUxU|f|UY
fg |bYd|gcbghUWgYUUVU_Xkb|bhYWBWY'**

GjYfng

- ◆ @k! 7Uth 'cfaUVWVh Ylggj Yg|bZVthgUVfUHYg fZW|gb
|ccXWV|cbk|hbc'GUh 'HYWVdUmbaig|WkY X|bXUX
Yg|nfW|bhX
- ◆ AYia ! GUVggVUXj YUhd |aUfM)1 'cf'YgZZhYgfZWK|h'gaY
: CS'dh|U/
- ◆ <||\! GUVggj YfngVUXWgh U||\: CS'dh|U'U'gUmācfYhU
)1 'cZhYgfZW|gUWEX



&": U 'Hb' 1D77L

GhVa Yhcf Zi 'Hh 'lg UxZZfYbWcZYj U'cbUu'c'hhcf VUWUg gXVnd YjU' c'fVhg' 'Hh'cb'

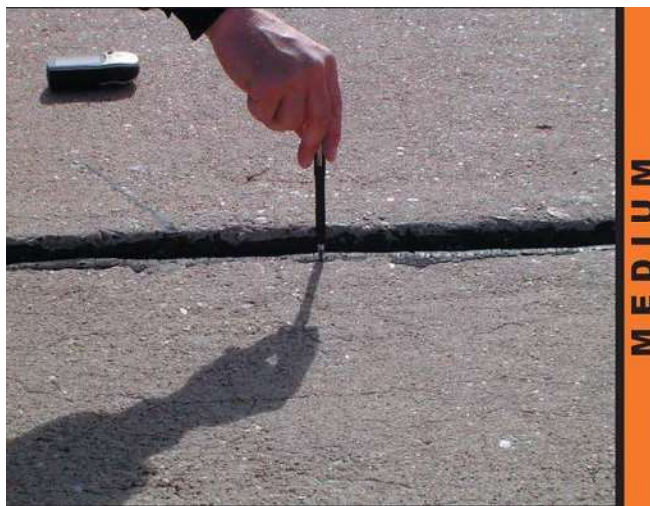
Gj YHhg

Severity levels are defined by the difference in elevation across the fault and the

| | Fi bkUng#U jkUng | 5dfcbg |
|---|-------------------------|-----------------|
| @ | 0% 'bW | % 'E%'bW |
| A | % 'E%'bW | %'bW |
| < | 2%'bW | 2%'bW |

FYUfCd'cbg

- ◆ **@k! BcU'cb'**
- ◆ **A Y'a 'E; f'bh Udh hY'cbh**
- ◆ **<|| 'E; f'bh 'c'cbh'cXUhg'f'f'cb'**



&" G UMFYXGUVFD77L

=hfgNMh VUWgUYVUWghUMFU]hcZifcfacydWgVWU gczj YcUjh' UxwfhDSgiUYgdhffHY\| \!severity level of this distress type, as defined below, lghZfYXlc UgUg UMFYXgU'ZU`dWgcfVUWgUYWUjbxkjh bUWbf VUZhYXgUgUgUWU]cfhXUgUgY YWbfVU"

Gj Yfng

- ◆ **@k! Slab is broken into four or five pieces with the vast majority of the cracks fjh Y,) dWfhcZck!gj Yfhn**
- ◆ **AWja !(1) Slab is broken into four or five pieces with over 15 percent of the VUWgZaYja gj Yfhn\| \!gj YfhnVUWg/cfEgU]gVc_Y]hc'gl' cfacydWgkjh'gj Y,) dWfhcZhYVUWgZck! /**
- ◆ **<|\! 5hlg^Y Y'Zgj YfhnYgU]gWYXg UMFYXgU]gVc_Y]hc' four or five pieces with some or all of the cracks of high severity; (2) slab is Vc_Y]hc'gl' cfacydWgkjh'gj Y%) dWfhcZhYVUWgZaYja! cf \|\!gj Yfhn**

FYUfcdhbg

- ◆ **@k EGU'7UWg/**
- ◆ **AWja !: i`Xdh dUWcfYUWYgU'**
- ◆ **<|\!: i`Xdh dUWcfYUWYgU'**



&" Gfb_ qY7fQWfD77L

Gfb_ qY7fQWfD77L
Yf]bYf]WghUf]YigUnibnUZkZf]hd| UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd| UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd| UbXXcbdi
Yf]bYf]WghUf]YigUnibnUZkZf]hd| UbXXcbdi

GjYf]Dg

No degrees of severity are defined. It is sufficient to indicate that shrinkage cracks exist.

FYUfcdhbg

- ◆ **8cBch|d**



"

' \$' >chGdUgfD77L

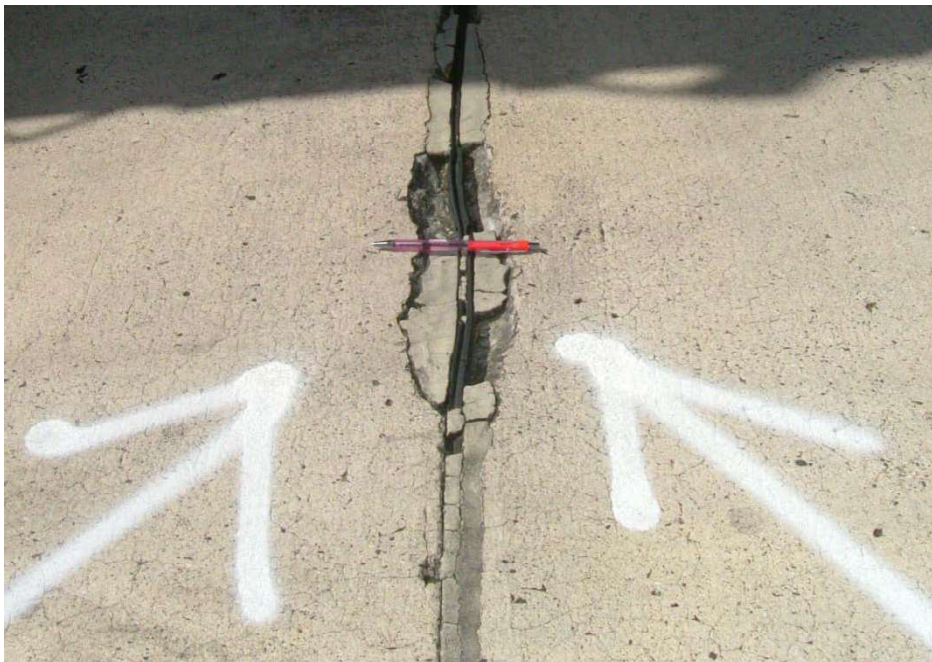
>chigU'h lghYXghN fU'bcZhYgUVX Ygkjh b&ZYh'ZhYgXyZHY'chH'
5'chigU i gUmXygdhN Nbxj YhU nhtci [\ hYgUzV hHhGhY'chHh
UbU' Y'GU'h' ng' l'Zca YWgjj YgYggUthY'chH'WU gXVn' b' f'U'cb'
cZb'AdYgVYaUhfU'gcf'U'W'U'g' K'U' W'U'Y'chH'U' gXVn
cj Ykcf' h' l'W'V'X'k' h' l'U'W'U'g'U'ch'Y'W' g'Z'g'U' h' "

Gj Yhng

- ◆ @k! gj Y&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]WgXVbXVn
'ck'cfa Y]a' gj Y]h'W'g'k'h' \]h'Y'cf'bc': CS'dhH]U'zcf'g&Y'ghU'
&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]W'g'k'h' \]h': CS'cf]Y
XaU'Y'dhH]U'/
- ◆ A Y]a' ! gj Y&ZYh'ch' UxlgVc_Y]bc'acfyhUb' 'd]W'g'X'V'b'X'V'n'[\h'
cfa Y]a' W'W'g'cf'ga'Y: CS'dhH]U'Y' l]h'zcf'g&Y'ghU'&ZYh'ch'
UxlgVc_Y]bc'd]W'g'cf'Z]U'a' Y]X'k'h' ga' YcZhYd]W'g'cg'Y'cf'U'gh'z'
W'gh' W'gh'X'V'Y: CS'cf]Y'X'a'U'Y'dhH]U'/
- ◆ <[\! gj Y&ZYh'ch' UxlgVc_Y]bc'acfyhUbhfYd]W'g'X'V'b'X'V'n'cb'Y'
cf'ac'Y'[\ 'gj Y]h'W'g'k'h' \] \: CS'dhH]U'

FYUfCd]bg

- ◆ @k! BcU]cb/
- ◆ A Y]a' ! d]Z'fa' U'd]h]U'X'h' d]W'
- ◆ <[\! d]Z'fa' U'd]h]U'X'h' d]W'



'% 7cbfGdUgd77L

7cbfGdUd ghYfjYh'cfVNUXkbcZhYgUkjhJbUdIdJaUYn&ZncZ
hYVbM'5 VbfgU XZNgZca UwbYVNU JbUthYgdUd'YgXdkkUX
lcJbfgVhY'chk\]YhYVNU YNbgjYfU'nhci[\ hYgU'

GjYfng

- ◆ @ck! YhY%hYgdU'lgMc_Yb]bc'dYcfkcd]WgXVbXVnck'gjYfhn
VWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/
- ◆ AYfja È%hYgdU'lgMc_Yb]bc'kcd'afYd]WgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'
- ◆ <J[\ È%hYgdU'lgMc_Yb]bc'kcd'afYd]WgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'
gjYfhnVWgkjh`JhYcfbc: CS'ddHJU/cf&hYgdU'lgXVbXVnchYaYfja'

FYUfCdHbg

- ◆ @ck! BcUfcb/
- ◆ AYfja! dffUXh'dUW
- ◆ <J[\! dffUXh'dUW



' &'5GF 'ID77L

5GF 'lgWU gXVhWwWw JW'fUWfcbVWkYbU_UlgUkXWUfcbfUWUj Yg'JWa JbMUG
k\JWZfa U|Y' HY|YUgcfVgkUfZUg gh' Y dHgdbk\JWa UnNa UYhY
WbWfYUkXUWfHgi WfYg' 5`_UlgfYacgicZb'JfcXVWVnhYcbfUk
Ww YHkjh|bhYdj Ya YH' 5GF 'WUWj' a UnYUWYUfXVhWwWw JW'dj Ya YH
XjWg'

JlgU'JbWUWfghU'5GF'a UnYdYgHh|bWXY'

% 7UWj' cZhYWbWfYdj Ya YHfZb'JbUa UfdUMB

& K\JZVfckb'fufcfchYWcfX|Y'cfgh|Jh' a UnYdYgHhUfYUW
g'fWY

" 5|[fYUyddi|g

(" bWUg|bWbWfYj'c'ia YfU dHgdb'Uha UnfYg' HbXgdf|bcZUXWf'cf
JH'fU'g'f WfYg'cf d'ng'WUYa Yb'9'Ua d'Yg'Z'f dHgdb'JWXYg'cj |h' cZ
Ugd Uhdj Ya Yb'g'|\hWb|Jh'zg'U'Z'f |h' z'c'ha |gU|| ba YH'U'X'U'f'g'bc'z
'c'h'g'U'g'cf Y dHgdb'c'h'f' Yg'

6WU g'5GF 'ga Uf|U'XVhWwWw5GF 'gl' YbMU'ndYgHh'fci [\c'ihYdj Ya Yh
g'Wfcb' 7cfh' UxWbWfYc'nf'cf fU'JWU'ng'g'gh'Ycb'n'W'Jh'j Ya YhcXc'
Wb'fa hYdYg'Wc'Z5GF' HYZ`ck|h' g'c' X'VY_Yh'ba |bXk\Yb|Xb|Jh' |
hYdYg'Wc'Z5GF h'fci [\j'lgU'Jg'Wfcb

%; YbMU'n5GF Xg'Yg'g'fYbdc'Vg'j YX|bhYz'f'Zk' n'f'g'U'f'W'g'f' W'cb' b'
Wb'g'z'd'U'g'f'f' U'Y'W'W'j' W'c'W'f'h'Y'X'c'Z'W'g'f' W'cb'U'X'g'U'd'f'Y'h'
k|h|bhYz'f'g'f'f'

& 5GF 'lgXVhWwWwZca 8!7UWj' VnhYdYg'Wc'ZUWj' d'f'W'X'W'f'c'
hY'c'h'W' 8!7UWj' d'f'X'ca |b'f'h'W'Y'Y'od'g'U'g'f'Y'g'Z'd'f'U'Y'W'W'g'c'
'c'h'W'g'U'X'Jb'f'W'W'j' k|h|bhYg'W'

" 5GF 'lgXVhWwWwZca 'A'U'f'7UWj' #G'U'j' VnhYdYg'Wc'Zj'lg'U'g'f'bg'z
Y dHgdb'

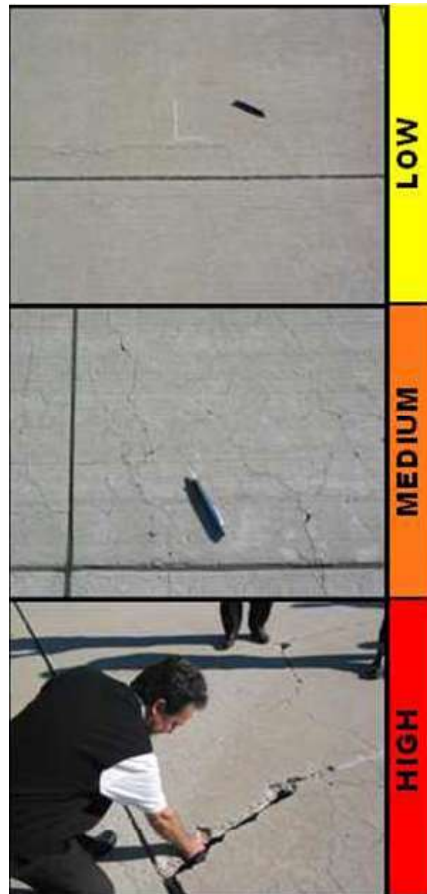
GjYfhi@jYg

@ A|jaUlebc: cf||bCVVNSUaU|YECSE'ddnh|UZca VWGf'clhgcf5GF' fYUXdddi lg/VWGUhYg fZWFYH| \HfYXa|b|hn?aa'cf~Yg|@|hY lebcY|NSWcZag Ya YH|bdj Ya YHcf g ffdi b|h|' g| VifgcfYYa Ylg'

Gca Y: CS'ddnh|U/|b|N|gXgkY|h|'cfchY: CS'fYagU'a YhcXgaUnWY f|i|fYX AUnWY|NSWcZg'Uvag Ya YH|b|cf ga YXa U|Yc UXW|h| g| VifgcfYYa Ylg'

A A Y|i a'5GF Xg|Ng|g|N|Z|f|h|UXZca ~ck Vm|U|h|'dbYcfadYcZhY ZE~ck|h|. |b|N|gX: CS'ddnh|U|b|N|gX|W|h|'cZhYgU'zga YZU|a Ylg' Udh| VWGcfU|W|h|fYg|N|d|g|fYg|h|g fZWFddi lg'Z|W|N|Y|a Un cW|Z|U|b|c|Z|k|N|VWGUfYXa|b|hn?aa'cfk|N|h|U|a UnY gVaj|N|X|h|U| \HfVWUg'

< ObYcfVh'cZhYZE~ck|h| Y|g| %|@|cgYcfalg|h| W|N|Y|ZU|a Ylgk\|W dca\||\ : CS'ddnh|U|Z &EGU'g fZWF|H|f|h|U|X|Z|b|N|d|g| h|Z|W|h|n X|f|U|X|U|X|dj Ya YH'f|i|fYg|aa Y|U|f|U|f' a UnUgc'f|i|fY|U|g|le' UXW|h|g| VifgcfYYa Ylg'



APPENDIX D

DETAILED PAVEMENT CONDITION DATA



5@SCH5888 %
; YMFUASUY

DJY%Z%

| | | | |
|--------------|-------------|----------|---|
| BYkcf. | %& | BuY | 6FKlabAihjU5jcbfh |
| 6FUBW | 58% | BuY | 5dcb\$%6FKlab I g 5DFCB 5fYU %&Z)) G e h |
| GMjcb | % | cZ % | : fca. HJkUn5 H. H<UjUf\$% @Gj7cbgY %8888 |
| GfZUW | 557 | : Ua]m | 5@SCH5dcbg NcbY 7UWcfm FUb. G |
| 5fYU | %&Z)) G e h | @Y[h. | (((\$: h KPh. &% h |
| GUg | | GUW@Y[h. | : h GUVKPh. : h >ch@Y[h. : h |
| Gcd XF. | | GfYHhdY | ; fUX \$ @Uyg \$ |
| GMjcb7caaYlg | | | |

| | | | |
|---------|--------|----------|---|
| Kcf_SUY | %00%((| Kcf_HndY | Bk7cbgA Ucb! hJU 7cXY BI!B gAUcfA/ F. HiY |
| Kcf_SUY | %8888 | Kcf_HndY | CjYUa57G6VfU 7cXY C@5G gAUcfA/ F. HiY |

| | | | |
|----------------|--------|----------|-------------|
| @Gj7cbgY | %4+88% | HUCladyg | \$ GfjYmX) |
| 7cbYhcg | D7= *(| | |
| -hgNjcb7caaYlg | | | |

| | | | |
|----------------|-----|---------|--------------------------|
| QadYBi aVF. | \$& | HndY | F 5fYU)8888G e h D7=)- |
| QadY7caaYlg | | | |
| (' 6@C7: 7F | @ | %8888 | G e h |
| (, @/ H7F | @ | 88'88 | : h |
|) + K95H 9F-B; | @ | 888888 | G e h |
|) + K95H 9F-B; | A | %888888 | G e h |

| | | | |
|----------------|----|----------|--------------------------|
| QadYBi aVF. | \$ | HndY | F 5fYU)8888G e h D7= +& |
| QadY7caaYlg | | | |
| (, @/ H7F | @ | 88'88 | : h |
| (, @/ H7F | A | -)'88 | : h |
|) + K95H 9F-B; | @ | , 8888 | G e h |
|) + K95H 9F-B; | A | ' 888888 | G e h |

| | | | |
|----------------|---|---------|--------------------------|
| QadYBi aVF. | % | HndY | F 5fYU)8888G e h D7=)* |
| QadY7caaYlg | | | |
| (' 6@C7: 7F | @ | %888888 | G e h |
| (' 6@C7: 7F | A |)8888 | G e h |
| (, @/ H7F | A | *888 | : h |
|) + K95H 9F-B; | @ | 888888 | G e h |
|) + K95H 9F-B; | A | +8888 | G e h |

| | | | |
|----------------|---|----------|--------------------------|
| QadYBi aVF. | % | HndY | F 5fYU)8888G e h D7=)+ |
| QadY7caaYlg | | | |
| (' 6@C7: 7F | @ | %888888 | G e h |
| (, @/ H7F | @ | %888888 | : h |
| (, @/ H7F | A | %)'88 | : h |
|) + K95H 9F-B; | @ | 88888888 | G e h |
|) + K95H 9F-B; | A | %888888 | G e h |

| | | | |
|----------------|---|----------|----------------------------|
| QadYBi aVF. | % | HndY | F 5fYU)))8888G e h D7= +* |
| QadY7caaYlg | | | |
| (, @/ H7F | @ | *, '88 | : h |
| (, @/ H7F | A | 888888 | : h |
|)\$ D5H<-B; | @ | ' 8888 | G e h |
|) + K95H 9F-B; | @ | 88888888 | G e h |
|) + K95H 9F-B; | A | - 888888 | G e h |

| BYkcf. | % | BuY | GfKlab | U5jibh | | | |
|-----------------|----------|-----------------------|--------------------|----------------|-----------------|----------|-----------------|
| GfUW | FS & | BuY | FilkUn!& GfKlab | I g | FIEK5M | 5fU | +((S) \$Gz h |
| GWfch | \$& | cZ & | : fca. FilkUn!& \$ | | H. FilkUn!& 9IX | | @g7chd! %\$\$\$ |
| GfUW | 557 | : Ua]m | 5@SCHFKg | NbY | 7UH]cfm | | Fub. D |
| 5fU |) |),)Z&Gz h | @V[h. | 'z% : h | K]Ph. | %\$: h | |
| GUg | | GU@V[h. | : h | GUVK]Ph. | : h | >ch@V[h. | : h |
| Gci Xf. | | GfYVHdY | | ; fUX \$ | | @bYg \$ | |
| GWfcb7caa Ylg | | Gf]Hclkc'gN]dgYhYgXcZ | FilkUn!& \$]b\$\$% | | | | |
| Kcf_8UY | %##((| Kcf_HdY | Bk7chd] V]b! :h]U | | 7cX BI !-B | | =gAUcfA/ F. HiY |
| Kcf_8UY | %\$\$\$ | Kcf_HdY | CjYUa57GdV]U | | 7cX C@5G | | =gAUcfA/ F. HiY |
| @g]hgd'8UY | %#-\$\$% | HRUcladYg | % | | GfjYhX | % | |
| 7ch]hcg | D7= * | | | | | | |
| -bgN]cb7caa Ylg | | | | | | | |
| QadYBi aVf. | \$ | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= ++ | |
| QadY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | (\$\$\$ Gz h | | | |
| (, @/ H7F | | @ | | ' \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | ' \$\$\$ Gz h | | | |
| QadYBi aVf. | % | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= ** | |
| QadY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | % \$\$\$ Gz h | | | |
| (, @/ H7F | | @ | | ' '\$\$: h | | | |
|) + K95H 9F-B; | | @ | | % \$\$\$ Gz h | | | |
| QadYBi aVf. | % | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= +\$ | |
| QadY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | -) \$\$\$ Gz h | | | |
| (, @/ H7F | | @ | | ') \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$ \$Gz h | | | |
| QadYBi aVf. | %& | HdY | F | 5fU |) \$\$\$ \$Gz h | D7=)- | |
| QadY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$ \$Gz h | | | |
| (' 6@C7? 7F | | A | | \$\$\$ \$Gz h | | | |
| (, @/ H7F | | @ | | ' \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | & \$\$\$ Gz h | | | |
| QadYBi aVf. | % | HdY | F | 5fU | (+) \$\$\$ Gz h | D7=)* | |
| QadY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | % \$\$\$ Gz h | | | |
| (, @/ H7F | | @ | | ' \$' \$\$: h | | | |
| (, @/ H7F | | A | | % \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | , \$\$\$ Gz h | | | |
|) + K95H 9F-B; | | A | | * \$\$\$ Gz h | | | |
| QadYBi aVf. | % | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= +(| |
| QadY7caa Ylg | | | | | | | |
| (, @/ H7F | | @ | |) % \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | +) \$\$\$ Gz h | | | |
| QadYBi aVf. | & | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= +\$ | |
| QadY7caa Ylg | | | | | | | |
| (, @/ H7F | | @ | | (% \$\$\$: h | | | |
| (, @/ H7F | | A | | ' \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | % \$\$\$ Gz h | | | |
| QadYBi aVf. | ' % | HdY | F | 5fU |) \$\$\$ \$Gz h | D7= *- | |
| QadY7caa Ylg | | | | | | | |
| (, @/ H7F | | @ | |) \$' \$\$: h | | | |

| | | | | | |
|------------------------|-------------|----------|------------------|-----------------------|---------------|
|)+ | K95H 9F-B; | @ | %\$\$\$ G\$ h | | |
|)+ | K95H 9F-B; | A | ' \$\$\$ G\$ h | | |
| QádYBi aVF. '+ | HndY | F | 5fYU |) \$\$\$ G\$ h | D7=)+ |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | & \$\$\$ G\$ h | | |
| (' 6@C7? 7F | | A | \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | ', \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | & \$\$\$ G\$ h | | |
| QádYBi aVF. (' | HndY | F | 5fYU |) \$\$\$ G\$ h | D7= *' |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | '+) \$\$\$ G\$ h | | |
|)+ | K95H 9F-B; | @ | & \$\$\$ G\$ h | | |
| QádYBi aVF.)\$ | HndY | F | 5fYU |) \$\$\$ G\$ h | D7=)- |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | % \$\$\$ G\$ h | | |
| (' 6@C7? 7F | | A | \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | & \$\$\$: h | | |
| (, @/ H7F | | A | ' \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | & \$\$\$ G\$ h | | |
| QádYBi aVF.)+ | HndY | F | 5fYU |) \$\$\$ G\$ h | D7= *- |
| QádY7caaYhg | | | | | |
| (, @/ H7F | | @ | (* \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | \$\$\$ G\$ h | | |
|)+ | K95H 9F-B; | A | ' \$\$\$ G\$ h | | |
| QádYBi aVF. *(| HndY | F | 5fYU |) \$\$\$ G\$ h | D7= *' |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | ' \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | & \$\$\$ G\$ h | | |
| QádYBi aVF. +% | HndY | F | 5fYU |) \$\$\$ G\$ h | D7=)- |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | ') \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | ' \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | \$\$\$ G\$ h | | |
| QádYBi aVF. ++ | HndY | F | 5fYU |) \$\$\$ G\$ h | D7= *(|
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | % \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | '* \$\$\$: h | | |
| (, @/ H7F | | A | \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | % \$\$\$ G\$ h | | |
| QádYBi aVF. ,(| HndY | F | 5fYU |) \$\$\$ G\$ h | D7= *' |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | % \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | '* \$\$\$: h | | |
|)\$ D5H<-B; | | @ | & \$\$\$ G\$ h | | |
|)+ | K95H 9F-B; | @ | \$\$\$ G\$ h | | |
| QádYBi aVF. -% | HndY | F | 5fYU |) \$\$\$ G\$ h | D7=)- |
| QádY7caaYhg | | | | | |
| (' 6@C7? 7F | | @ | % \$\$\$ G\$ h | | |
| (, @/ H7F | | @ | '+) '\$\$: h | | |
| (, @/ H7F | | A | % \$\$\$: h | | |
|)+ | K95H 9F-B; | @ | \$\$\$ G\$ h | | |
| QádYBi aVF. -, | HndY | F | 5fYU |) \$\$\$ G\$ h | D7= +, |
| QádY7caaYhg | | | | | |
| (, @/ H7F | | @ | ' '\$\$: h | | |
|)+ | K95H 9F-B; | @ | % \$\$\$ G\$ h | | |

| BYkcf. | % | BláY | GfKlabAihjVU5jibh |
|-----------------|---------------------------------------|-------------------------|--|
| GfUW | FS & | BláY | FilkÚn!& GfKlab I g FIEK5M 5fU +((Z) \$Gé h |
| GWfch | \$% | cZ & | : fca. FilkÚn\$ 9bX H. FilkÚn& \$ @gh7cbg! %\$\$\$ |
| GfUW | 557 | : Ua]m 5@SCHFKg | NbY 7UH[cfm FUb. D |
| 5fU | %, ž\$ Gé h | @V[h. | %\$: h K]h. %\$: h |
| GUg | | GU@V[h. | : h GUVK]h. : h >ch@V[h. : h |
| Gci XE. | | GfYVHdY | ; fUX \$ @bYg \$ |
| GWfcb7caa Ylg | Gf]hlc'gNldgYhYgXcZFilkÚn!& \$]b\$\$% | | |
| Kcf_8UY | %#%((| Kcf_HdY Bk7cbgVcb! :h]U | 7cX BI !-B =AUcfA/ F. HiY |
| Kcf_8UY | %\$\$\$ | Kcf_HdY GYFÚn57GfVfU | 7cX C@5G =AUcfA/ F. HiY |
| @gh:hg!8UY | %#\$\$\$ | HRUCladYg ' & | GfjYhX) |
| 7cb]hbg | D7= *- | | |
| -bgN]cb7caa Ylg | | | |
| GládYBi aVF. | \$% | HdY F | 5fU) \$\$\$ \$Gé h D7= +' |
| GládY7caa Ylg | | | |
| (, @/ H7F | | @ | ' (\$\$\$: h |
|) + K95H 9F-B; | | @ | ' '\$\$\$ Gé h |
|) + K95H 9F-B; | | A | ' '\$\$\$ Gé h |
| GládYBi aVF. | \$- | HdY F | 5fU) \$\$\$ \$Gé h D7= *\$ |
| GládY7caa Ylg | | | |
| (' 6C7? 7F | | @ | ' \$\$\$ \$Gé h |
| (, @/ H7F | | @ | ' '\$\$: h |
|) + K95H 9F-B; | | @ | \$ \$\$\$ \$Gé h |
| GládYBi aVF. | % | HdY F | 5fU) \$\$\$ \$Gé h D7= +& |
| GládY7caa Ylg | | | |
| (, @/ H7F | | @ | ' +\$\$\$: h |
|) + K95H 9F-B; | | @ | \$\$\$ \$Gé h |
|) + K95H 9F-B; | | A | (\$\$\$ \$Gé h |
| GládYBi aVF. | \$\$ | HdY F | 5fU) \$\$\$ \$Gé h D7= *- |
| GládY7caa Ylg | | | |
| (, @/ H7F | | @ | (- \$\$\$: h |
|) + K95H 9F-B; | | @ | \$ \$\$\$ \$Gé h |
|) + K95H 9F-B; | | A | \$\$\$ \$Gé h |
| GládYBi aVF. | & | HdY F | 5fU) \$\$\$ \$Gé h D7= +\$ |
| GládY7caa Ylg | | | |
| (, @/ H7F | | @ | ' - \$\$\$: h |
|) + K95H 9F-B; | | @ | \$ \$\$\$ \$Gé h |
|) + K95H 9F-B; | | A | , \$\$\$ \$Gé h |

| BYkcf. | % | BLAY | GfKlabAihjU5jibh |
|---------------------|---------------|--------------------------|--|
| GfUW | F%\$ | BLAY | FihkUm% \$GfKlab I g FIEK5M 5fU +)S%)\$G h |
| GWfch | \$& | cZ & | : fca. GfKb\$% H. FihkUm\$9IX @gh7chj' %\$\$\$ |
| GfUW | 557 | : Ua]m 5@SCHFKg | NbY 7UH(cfm FUb. D |
| 5fU | %\$ \$\$\$G h | @Y[h. | -) \$: h K]Ph. %\$: h |
| GUg | | GU@Y[h. | : h GUVK]Ph. : h >ch@Y[h. : h |
| Gci Xf. | | GfYWHdY | ; fUX \$ @byg \$ |
| GWfcb7caa Ylg | | | |
| Kcf_8UY %\$\$\$ | | Kcf_HdY Bk7chj' Ucb' h]U | 7cX BI !-B =gAUcfA/ F. HiY |
| Kcf_8UY %\$\$\$ | | Kcf_HdY GYFua57Gh WfU | 7cX C@5G =gAUcfA/ F. HiY |
| @gh:hgj'8UY %\$\$\$ | | HRUCladYg ' \$ | GfjYhX) |
| 7ch]jchj D7= *- | | | |
| -hg]Wfcb7caa Ylg | | | |
| QadYBi aVf. % | | HdY F | 5fU) \$\$\$G h D7= *(|
| QadY7caa Ylg | | | |
| (, @/ H7F | | @ | %\$\$\$: h |
| (, @/ H7F | | A | \$\$\$: h |
|)+ K95H 9F-B; | | @ | \$\$\$\$ G h |
|)+ K95H 9F-B; | | A | ' \$\$\$ G h |
| QadYBi aVf. \$ | | HdY F | 5fU) \$\$\$G h D7= +* |
| QadY7caa Ylg | | | |
| (, @/ H7F | | @ | %\$\$\$: h |
| (, @/ H7F | | A | %\$\$\$: h |
|)+ K95H 9F-B; | | @ | \$\$\$\$ G h |
| QadYBi aVf. % | | HdY F | 5fU) \$\$\$G h D7= +' |
| QadY7caa Ylg | | | |
| (, @/ H7F | | @ | ' \$\$\$: h |
|)+ K95H 9F-B; | | @ | \$\$\$\$ G h |
|)+ K95H 9F-B; | | A |) \$\$\$ G h |
| QadYBi aVf. % | | HdY F | 5fU) \$\$\$G h D7= * & |
| QadY7caa Ylg | | | |
| (, @/ H7F | | A | ' &' \$: h |
|)+ K95H 9F-B; | | @ | \$\$\$\$ G h |
|)+ K95H 9F-B; | | A | ' \$\$\$ G h |
| QadYBi aVf. & | | HdY F | 5fU) \$\$\$G h D7= *- |
| QadY7caa Ylg | | | |
| (' 6@C7: 7F | | @ | (\$\$\$ G h |
| (, @/ H7F | | @ | ' \$' \$: h |
| (, @/ H7F | | A | %\$\$\$: h |
|)+ K95H 9F-B; | | @ | %\$\$\$ G h |

| BYkcf. | % | BuY | GfKlab | U5]ibfh | | | |
|------------------|-----------|-----------|-----------|--------------|--------------|----------|----------------|
| GfUW | F%\$ | BuY | FibkUn%\$ | S6fKlab | Ig | FIEK5M | 5fU |
| GWfch | \$% | cZ & | : fca. | FibkUn%\$ | H. | GWfcb\$& | @Uj7chj' %\$ |
| GfUW | 557 | : Ua]m | 5@SCHFKg | NbY | 7UH | cfm | Fub. D |
| 5fU | *\$z)\$Gh | @V[h. | (z)%h | K]h. | %\$: | h | |
| GUg | | GU@V[h. | : h | GUVK]h. | : h | >ch@V[h. | : h |
| Gci Xf. | | GfYVHhV | | ; fUX \$ | | @Ujg \$ | |
| GWfcb7caa Ylg | | | | | | | |
| Kcf_8UY | %\$%((| Kcf_HndY | Bk7chj | Vjcb' h]U | 7cXV | BI !-B | =AUcfA/ F. HiY |
| Kcf_8UY | %\$ | Kcf_HndY | CjYUa | 57GhVfU | 7cXV | C@5G | =AUcfA/ F. HiY |
| @Uj7chj'8UY | %\$+5\$% | HRUcladYg | % | | GfjYhX | % | |
| 7chj]chjg | D7=)& | | | | | | |
| -hg]Wjcb7caa Ylg | | | | | | | |
| QladYBi aVf. | \$ | HndY | F | 5fU |) \$\$\$\$Gh | D7= * | % |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$\$ Gh | | | |
| (, @/ H7F | | @ | |)'\$\$: h | | | |
| (, @/ H7F | | A | | %)\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
|) + K95H 9F-B; | | A | | ' \$\$\$ Gh | | | |
| QladYBi aVf. | % | HndY | F | 5fU |) \$\$\$\$Gh | D7=)- | |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$\$ Gh | | | |
| (, @/ H7F | | A | | ' \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
|) + K95H 9F-B; | | A | | \$\$\$ Gh | | | |
| QladYBi aVf. | %% | HndY | F | 5fU |) \$\$\$\$Gh | D7= ', | |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$\$ Gh | | | |
| (' 6@C7? 7F | | A | | %) \$\$\$ Gh | | | |
| (, @/ H7F | | A | | \$\$\$\$: h | | | |
| (, @/ H7F | | < | | \$\$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
| QladYBi aVf. | % | HndY | F | 5fU |) \$\$\$\$Gh | D7=)' | |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$\$ Gh | | | |
| (, @/ H7F | | @ | | \$\$\$\$: h | | | |
| (, @/ H7F | | A | | \$\$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
|) + K95H 9F-B; | | A | | * \$\$\$ Gh | | | |
| QladYBi aVf. | % | HndY | F | 5fU |) \$\$\$\$Gh | D7= (- | |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | \$\$\$\$ Gh | | | |
| (, @/ H7F | | @ | | \$\$\$\$: h | | | |
| (, @/ H7F | | A | | \$\$\$\$: h | | | |
| (, @/ H7F | | < | |) \$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
| QladYBi aVf. | %& | HndY | F | 5fU |) \$\$\$\$Gh | D7=)+ | |
| QladY7caa Ylg | | | | | | | |
| (' 6@C7? 7F | | @ | | ' \$\$\$ Gh | | | |
| (, @/ H7F | | @ | | , \$\$\$: h | | | |
| (, @/ H7F | | A | | \$\$\$\$: h | | | |
|) + K95H 9F-B; | | @ | | \$\$\$\$ Gh | | | |
|) + K95H 9F-B; | | A | | ' \$\$\$ Gh | | | |

| | | | | | |
|-----------------------------|-------------|----------|--------------------|--------------------------|--------------------|
| QladYBi aVF. % | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7= ' - |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | |) \$\$\$ Gz h | | |
| (' 6@C7? 7F | A | | %) \$\$\$ Gz h | | |
| (, @/ H7F | @ | | %) \$\$\$: h | | |
| (, @/ H7F | A | | ' \$\$\$: h | | |
|) + K95H 9F-B; | @ | | %) \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | | + \$\$\$ Gz h | | |
| QladYBi aVF. & | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7=) - |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | | %) \$\$\$ Gz h | | |
| (, @/ H7F | @ | | \$\$' \$\$: h | | |
| (, @/ H7F | A | | \$\$\$ \$\$: h | | |
|) + K95H 9F-B; | @ | | %) \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | | ' \$\$\$ Gz h | | |
| QladYBi aVF. ' % | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7=) & |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | | +) \$\$\$ Gz h | | |
| (' 6@C7? 7F | A | | +) \$\$\$ Gz h | | |
| (, @/ H7F | @ | | & \$\$\$: h | | |
| (, @/ H7F | A | | \$\$\$ \$\$: h | | |
|) + K95H 9F-B; | @ | | %) \$\$\$ Gz h | | |
| QladYBi aVF. ' , | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7=) ' |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | | (\$\$\$ Gz h | | |
| (, @/ H7F | @ | | %) \$\$\$: h | | |
| (, @/ H7F | A | | \$\$\$ \$\$: h | | |
|) + K95H 9F-B; | @ | | %) \$\$\$ Gz h | | |
| QladYBi aVF. () | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7=) & |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | | \$\$' \$\$\$ Gz h | | |
| (' 6@C7? 7F | A | | +) \$\$\$ Gz h | | |
| (, @/ H7F | @ | |) \$\$\$: h | | |
| QladYBi aVF.) & | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7= * % |
| QladY7caa Ylg | | | | | |
| (, @/ H7F | @ | |) ()' \$\$: h | | |
| (, @/ H7F | A | |) \$\$\$: h | | |
|) + K95H 9F-B; | @ | | \$\$\$ \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | |) \$\$\$ Gz h | | |
| QladYBi aVF.) - | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7= (' |
| QladY7caa Ylg | | | | | |
| (' 6@C7? 7F | @ | | \$\$\$ \$\$\$ Gz h | | |
| (' 6@C7? 7F | A | | \$\$\$ \$\$\$ Gz h | | |
| (, @/ H7F | @ | | ' \$\$\$: h | | |
|) + K95H 9F-B; | @ | | & \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | | (\$\$\$ Gz h | | |
| QladYBi aVF. ** | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7= * % |
| QladY7caa Ylg | | | | | |
| (, @/ H7F | @ | |) (\$\$\$: h | | |
| (, @/ H7F | A | | \$\$ \$\$: h | | |
|) + K95H 9F-B; | @ | | \$\$\$ \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | | , \$\$\$ Gz h | | |
| QladYBi aVF. +' | HndY | F | 5fYU |) \$\$\$\$\$ Gz h | D7= * + |
| QladY7caa Ylg | | | | | |
| (, @/ H7F | @ | | ') \$\$\$: h | | |
| (, @/ H7F | A | | %) \$\$\$: h | | |
|) + K95H 9F-B; | @ | | \$\$\$ \$\$\$ Gz h | | |
|) + K95H 9F-B; | A | | , \$\$\$ Gz h | | |

| | | | | | | | |
|--------------------|-------------------|---------------------------------|------------------------|-----------------------|-------------------------|-----------------------|-------------------|
| BVkf. | % | BuY | GfklbAihjU5jkbh | | | | |
| GfUW | H5 | BuY | HI]kúis'Gfklb | Ig | H5L-K5M | 5fU | 888+, G: h |
| GfUW | 57 | : Ua]m 5@SCH57HI]kúig | NbY | | 7U]cfm | | Fb. D |
| 5fU | (*2%+ G: h | @Y[h. | -*) : h | K]h. | (S: h | | |
| GUg | | GU@Y[h. | : h | GUVK]h. | : h | >ch@Y[h. | : h |
| Gci Xf. | | GfYWHdY | | ; fUX \$ | | @bYg \$ | |
| GfUW | 7caaYlg | | | | | | |
| Kcf_SUY | *#48% | Kcf_HdY Bk 7chj Vcb' h]U | | 7cX BI!B | | =AUcfA/ F. HfY | |
| @GfUW | 8SUY | %#48% | HRUAdYg | % | GfjYhX | (| |
| 7chj Vcb | D7= | -% | | | | | |
| hgNW | 7caaYlg | | | | | | |
| GAdYBi aVf. | \$% | HdY | F | 5fU |)' ('SSG: h | D7= | -' |
| GAdY7caaYlg | | | | | | | |
| (, | @/ H7F | @ | |) \$\$\$: h | | | |
|)+ | K95H 9F-B; | @ | | +\$\$\$\$ G: h | | | |
| GAdYBi aVf. | \$(| HdY | F | 5fU | (\$\$\$\$\$ G: h | D7= | -) |
| GAdY7caaYlg | | | | | | | |
| (, | @/ H7F | @ | | %\$\$\$: h | | | |
|)+ | K95H 9F-B; | @ | |)\$\$\$\$ G: h | | | |
| GAdYBi aVf. | \$- | HdY | F | 5fU | (\$\$\$\$\$ G: h | D7= | -+ |
| GAdY7caaYlg | | | | | | | |
|)+ | K95H 9F-B; | @ | | +\$\$\$\$ G: h | | | |
| GAdYBi aVf. | \$\$ | HdY | F | 5fU | (, \$'\$\$G: h | D7= | , & |
| GAdY7caaYlg | | | | | | | |
| (, | @/ H7F | @ | | %\$\$\$: h | | | |
|)+ | K95H 9F-B; | @ | | *\$\$\$\$ G: h | | | |
|)+ | K95H 9F-B; | A | | '\$\$\$\$ G: h | | | |

| BYkcf. | % | BuY | GfKlabAihjVU5jibh |
|--------------------|-----------|-----------------------|--|
| GfUW | H5 | BuY | HIjkUis6fKlab I g H5L-K5M 5fU 888+, Gc h |
| GMfch | % | cZ & | : fca. FibkUis!& H. GMfcb5& @gh7cbg! %8888 |
| GfUW | 557 | : Ua]m 5@SCH57HIjkUg | NbY 7UH[cfm FUb. D |
| 5fU | %z\$%Gc h | @V[h. | 'z, \$: h K]h.)\$: h |
| GUg | | GU@V[h. | : h GUVK]h. : h >ch@V[h. : h |
| Gci Xf. | | GfYVHhV | ; fUX \$ @Ug \$ |
| GMfcb7caa Ylg | | | |
| Kcf_8UY %888((| | Kcf_HhV Bk7cbgVcb!h]U | 7cXV BI!B =AUcfA/ F. HiY |
| Kcf_8UY %8888 | | Kcf_HhV GfYUa57GfVfU | 7cXV C@5G =AUcfA/ F. HiY |
| @gh7cbg!8UY %4#88% | | HhUcladYg ') | GfjYhX) |
| 7cb]cbg D7=)* | | | |
| -bg]cb7caa Ylg | | | |
| QladYBiaVf. \$ | | HhV F | 5fU)8888Gc h D7= (' |
| QladY7caa Ylg | | | |
| (' 6@C7: 7F | | @ | %8888 Gc h |
| (' 6@C7: 7F | | A | (888 Gc h |
| (, @/ H7F | | @ | %888 : h |
| (, @/ H7F | | A | &888 : h |
|)& F5J9@B; | | @ | '888 Gc h |
|)+ K95H 9F-B; | | @ | &888 Gc h |
|)+ K95H 9F-B; | | A | %8888 Gc h |
| QladYBiaVf. % | | HhV F | 5fU)8888Gc h D7=)) |
| QladY7caa Ylg | | | |
| (' 6@C7: 7F | | @ | %8888 Gc h |
| (, @/ H7F | | @ | (888 : h |
| (, @/ H7F | | A | 8888 : h |
|)& F5J9@B; | | @ | 8888 Gc h |
|)+ K95H 9F-B; | | @ | &8888 Gc h |
|)+ K95H 9F-B; | | A | %8888 Gc h |
| QladYBiaVf. % | | HhV F | 5fU)8888Gc h D7=)) |
| QladY7caa Ylg | | | |
| (' 6@C7: 7F | | @ | &8888 Gc h |
| (, @/ H7F | | @ |)888 : h |
| (, @/ H7F | | A | %888 : h |
|)+ K95H 9F-B; | | @ | '8888 Gc h |
|)+ K95H 9F-B; | | A | +8888 Gc h |
| QladYBiaVf. \$ | | HhV F | 5fU)8888Gc h D7= *(|
| QladY7caa Ylg | | | |
| (, @/ H7F | | A | &888 : h |
|)+ K95H 9F-B; | | @ | &8888 Gc h |
|)+ K95H 9F-B; | | A | %8888 Gc h |
| QladYBiaVf. ' & | | HhV F | 5fU)8888Gc h D7= *' |
| QladY7caa Ylg | | | |
| (, @/ H7F | | A | &888 : h |
|)+ K95H 9F-B; | | @ | '8888 Gc h |
|)+ K95H 9F-B; | | A | %8888 Gc h |

| BYkcf. | % | BuY | GfYkdbAibjVU5jcbh |
|---------------|----------|---------------------------|--|
| GfUW | H5% | BuY | HIjkUis%GfYkdb I g H5L-K5M 5fU %ZS G h |
| GfUW | 557 | : Ua]m 5@SCH57HIjkUg NcbY | H. HIjkUis @Uj7cbg' %SSS FUb. G |
| 5fU | %ZS G h | @V[h. | SS:h K]h.)S:h |
| GUg | GUV@V[h. | : h | GUVK]h. : h >ch@V[h. : h |
| Gci XE. | GfYVHdY | | ; fUX \$ @Ujg \$ |
| GfUW | 7caa Ylg | | |
| Kcf_8UY | %ZS((| Kcf_HdY Bk7cbg' Vcb' h]U | 7cX BI!B =AUcfA/ F. HiY |
| Kcf_8UY | %SSS | Kcf_HdY GYfUa57GfVfU | 7cX C@5G =AUcfA/ F. HiY |
| @Uj7cbg'8UY | %ZS% | HUCladYg ' | GfjYX & |
| 7cbg' D7= (, | | | |
| -bg'7caa Ylg | | | |
| QadYBiaVF. | \$% | HdY F | 5fU)&'SSG h D7= (%) |
| QadY7caa Ylg | | | |
| (' 6@C7: 7F | | @ | 'SSSS G h |
| (' 6@C7: 7F | | A | 'SSSS G h |
| (, @/ H7F | | A | SSSS :h |
|)+ K95H 9F-B; | | @ | 'SSSS G h |
| QadYBiaVF. | \$ | HdY F | 5fU (-)SSG h D7=) |
| QadY7caa Ylg | | | |
| (, @/ H7F | | @ |),'SS :h |
| (, @/ H7F | | A | &)'SS :h |
|)& F5J9@B; | | A | SSSS G h |
|)+ K95H 9F-B; | | @ | 'SSSS G h |
|)+ K95H 9F-B; | | A |)SSSS G h |

| | | | | | | | |
|---------------------|-------------------|---------------------------------|------------------------------|-----------------|----------------------|-----------------------|-------------------------|
| BVkf. | % | BuY | GfYkAbAihjU5]ibh | | | | |
| GfUW | H 5B, % | BuY | HI]kUia U]if\$%GfYkAb | I g | H5L-K5M | 5fU | +)ž,* G h |
| GfUW | 57 | : Ua]m 5@SCH57HI]U]g | NbY | | 7U]cfm | | @g]7cbg]i *#488% |
| 5fU | 'ž-, G h | @Y]h. | '\$\$: h | K]h. | \$\$: h | | |
| GUg | | GU@Y]h. | : h | GUVK]h. | : h | >ch@Y]h. | : h |
| Gci Xf. | | GfYWHdY | | ; fUX \$ | | @bg \$ | |
| GfUW | 7caa Ylg | | | | | | |
| Kcf_8UY | *#488% | Kcf_HdY Bk 7cbg]U]b' h]U | | 7cX BI!B | | =AUcfA/ F. HiY | |
| @g]7cbg]i | 8UY %#488% | HRUAdYg + | | GfjYhX (| | | |
| 7cbg]i | D7= -) | | | | | | |
| hg]U]b | 7caa Ylg | | | | | | |
| QadYBi aVf. | \$% | HdY | F | 5fU | ', +('\$\$G h | D7= -% | |
| QadY7caa Ylg | | | | | | | |
|)+ | K95H 9F-B; | @ | | *\$\$G h | | | |
|)+ | K95H 9F-B; | A | |)\$\$G h | | | |
| QadYBi aVf. | \$ | HdY | F | 5fU |)(\$\$G h | D7= -- | |
| QadY7caa Ylg | | | | | | | |
|)+ | K95H 9F-B; | @ | | (\$\$G h | | | |
| QadYBi aVf. | \$ | HdY | F | 5fU | (- \$\$G h | D7= -* | |
| QadY7caa Ylg | | | | | | | |
|)+ | K95H 9F-B; | @ | | *\$\$G h | | | |
|)+ | K95H 9F-B; | A | | %\$\$G h | | | |
| QadYBi aVf. | \$ | HdY | F | 5fU |))%\$\$G h | D7= -) | |
| QadY7caa Ylg | | | | | | | |
|)+ | K95H 9F-B; | @ | | (\$\$G h | | | |
|)+ | K95H 9F-B; | A | | '\$\$G h | | | |

| BYkcf. | % | BuY | GfYkdbAihjU5jibh |
|----------------------|-----------|--------------------------|---|
| GfUW | H 5B % | BuY | HI]kUia U]f\$%GfYkdb I gY H5L-K5M 5fYU +)ž,* Gē h |
| GWfch | % | cZ & | : fca. 5dib\$% H. 9(YcZDjYh @Uj7cbgH' %%%((|
| GfZAW | 57 | : Ua]m 5@SCH57HI]U]g | NbY 7UH]cfm FUb. H |
| 5fYU | '-ž, Gē h | @Y[h. | -(\$: h K]h.)) : h |
| GUg | | GU@Y[h. | : h GUVK]h. : h >ch@Y[h. : h |
| Gci Xf. | | GfYWHuY | ; fUX \$ @Ujg \$ |
| GWfcb7caa Ylg | | | |
| Kcf_8UY %%%((| | Kcf_HndY Bk7cbgU]cb' h]U | 7cXV BI !-B =gAUcfA/ F. HfY |
| Kcf_8UY %%%SS | | Kcf_HndY GfZAWGU!FYjYU]H | 7cXV GGF9 =gAUcfA/ F. : UgY |
| @Uj7cbgH' 8UY %%%SS% | | HUCladYg - | GfjYhX * |
| 7cbgH' D7= +\$ | | | |
| -bgH'cb7caa Ylg | | | |
| QladYBi aVF. % | | HndY F | 5fYU)%SS\$Gē h D7= *- |
| QladY7caa Ylg | | | |
| (, @/ H7F | | @ | (SS\$: h |
| (, @/ H7F | | A | ,'SS\$: h |
|)& F5J9@B; | | @ | SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ | %SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | SS\$SS\$ Gē h |
| QladYBi aVF. S& | | HndY F | 5fYU (* ('SS\$Gē h D7= *- |
| QladY7caa Ylg | | | |
| (, @/ H7F | | A | %SS\$: h |
|)& F5J9@B; | | @ | %SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ | , SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | &' ('SS\$ Gē h |
| QladYBi aVF. \$ | | HndY F | 5fYU))SS\$SS\$Gē h D7= +' |
| QladY7caa Ylg | | | |
| (, @/ H7F | | @ | %SS\$: h |
|)& F5J9@B; | | @ | SS\$SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ |)SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | %SS\$SS\$ Gē h |
| QladYBi aVF. \$ | | HndY F | 5fYU))SS\$SS\$Gē h D7= ,% |
| QladY7caa Ylg | | | |
|)& F5J9@B; | | @ | - SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ | ' SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | %SS\$SS\$ Gē h |
| QladYBi aVF. \$ | | HndY F | 5fYU (SS\$SS\$Gē h D7=)+ |
| QladY7caa Ylg | | | |
| (' 6@C7? 7F | | A | (SS\$SS\$ Gē h |
| (, @/ H7F | | @ | %SS\$SS\$: h |
| (, @/ H7F | | A | %SS\$SS\$: h |
|)& F5J9@B; | | @ | (SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ | *SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | SS\$SS\$SS\$ Gē h |
| QladYBi aVF. \$ | | HndY F | 5fYU))SS\$SS\$Gē h D7= *- |
| QladY7caa Ylg | | | |
| (, @/ H7F | | @ | (SS\$: h |
| (, @/ H7F | | A | SS\$: h |
|)& F5J9@B; | | @ | %SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | @ | %SS\$SS\$ Gē h |
|)+ K95H 9F-B; | | A | %SS\$SS\$ Gē h |

| | | | | | | | |
|----------------|----------|-----------|-------------------------|-----------------|--------|------------|----------------|
| BVkc. | % | | BuY | GfKdbAibjU5jcbh | | | |
| GfUW | H2% | | BuY | HI]UBS%GfKdb | Ig | H5L-K5M | 5fU |
| GWch | \$% | cZ % | : fca. | 5dcb\$% | | H. | 9YcZDjYaYh |
| GfUW | 57 | : Ua]m | 5@SCH57HI]UBg | NbY | | 7UH]cfm | FUb. H |
| 5fU | | (ž, \$Geh | @Y[h. | %\$: h | K]Ph. | * | : h |
| GUg | | GU@Y[h. | : h | GUVK]Ph. | : h | >ch@Y[h. | : h |
| Gci XE. | | GfYWHdY | | ; fUX \$ | | @Ug | \$ |
| GWcb7caa Ylg | | | | | | | |
| Kcf_8UY | %#%((| | Kcf_HdY Bk7cbjUcb! :hU | | 7cX | BI!-B | =AUcfA/ F. HiY |
| Kcf_8UY | %#SS | | Kcf_HdY GfUWGU! FYj YUH | | 7cX | GGF9 | =AUcfA/ F. :Ug |
| @gihgl'8UY | %#SS% | | HUCladyg % | | GfjYX | % | |
| 7cb]cbg | D7=)\$ | | | | | | |
| -bg]cb7caa Ylg | | | | | | | |
| QadYBi aVF. | \$% | | HdY | F | 5fU | (, \$SSGeh | D7=)\$ |
| QadY7caa Ylg | | | | | | | |
| (' | 6@C7? 7F | | @ | | %SSSS | Geh | |
| (' | 6@C7? 7F | | A | | %SS'SS | Geh | |
| (, | @/ H7F | | A | |)SS | : h | |
|)& | F5J9@B; | | @ | | %SSSS | Geh | |
|)+ | K95H9FB; | | A | | %SSSS | Geh | |

APPENDIX E
DISTRESS SUMMARY REPORT



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| ° | | °°# | | | | h° u#- OS" | #) | O | | o7 | |
| ° | | °°# | | | | ‡ - ° u- kOS" | #) | O | | o7 | |
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| k | | °°# | | | | "O#MK°#NOS" | #) | O | | o7 | |
| k | | °°# | | | | OV8ey) @° Ouk° Vof- lo° #k° #NOS" | #) | O | | 7 | |
| k | | °°# | | | | ‡ - ° u- kOS" | #) | O | | o7 | |
| k | | °°# | | | | ‡ - ° u- kOS" | #) | U | | o7 | |
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APPENDIX F

PAVEMENT CONDITION REPORTS

F1: Section Forecasted Pavement Condition Rating

F2: Branch PCI Rating

F3: Branch FOD Rating



Appendix F1
Forecasted Section PCI
 Brewton Municipal Airport (12J)

| Branch ID | Section ID | Forecasted PCI | | | | | | |
|-----------|------------|----------------|------|------|------|------|------|------|
| | | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
| A01 | 01 | 61 | 59 | 57 | 55 | 53 | 50 | 48 |
| R0624 | 01 | 64 | 56 | 51 | 47 | 43 | 38 | 34 |
| R0624 | 02 | 55 | 51 | 47 | 43 | 38 | 34 | 30 |
| R1230 | 01 | 47 | 43 | 39 | 34 | 30 | 26 | 21 |
| R1230 | 02 | 64 | 56 | 51 | 47 | 43 | 38 | 34 |
| TA | 01 | 50 | 47 | 45 | 41 | 38 | 34 | 31 |
| TA | 02 | 88 | 85 | 83 | 81 | 79 | 77 | 75 |
| TA1 | 01 | 45 | 42 | 39 | 35 | 32 | 28 | 24 |
| THANG01 | 01 | 66 | 62 | 57 | 52 | 48 | 45 | 43 |
| THANG01 | 02 | 92 | 90 | 87 | 85 | 82 | 80 | 78 |
| TL01 | 01 | 46 | 44 | 40 | 37 | 33 | 30 | 26 |

2/1/2021

Branch Condition Report

Page 1 of 2

Pavement Database: ALDOT_Combined_201201

| Branch ID | Number of Sections | Sum Section Length (Ft) | Avg Section Width (Ft) | True Area (SqFt) | Use | Average PCI | Standard Deviation PCI | Weighted Average PCI |
|-----------|--------------------|-------------------------|------------------------|------------------|---------|-------------|------------------------|----------------------|
| A01 | 1 | 440.00 | 261.00 | 107,455.00 | APRON | 64.00 | 0.00 | 64.00 |
| R0624 | 2 | 4,965.00 | 150.00 | 744,080.00 | RUNWAY | 67.00 | 2.00 | 65.85 |
| R1230 | 2 | 5,001.00 | 150.00 | 750,150.00 | RUNWAY | 60.50 | 8.50 | 55.23 |
| TA | 2 | 4,445.00 | 45.00 | 222,478.00 | TAXIWAY | 73.50 | 17.50 | 63.26 |
| TA1 | 1 | 200.00 | 50.00 | 14,206.00 | TAXIWAY | 48.00 | 0.00 | 48.00 |
| THANG01 | 2 | 1,240.00 | 107.50 | 75,986.00 | TAXIWAY | 82.50 | 12.50 | 82.14 |
| TL01 | 1 | 110.00 | 68.00 | 4,880.00 | TAXIWAY | 50.00 | 0.00 | 50.00 |

Pavement Database: ALDOT_Combined_201201

| Use Category | Number of Sections | Total Area (SqFt) | Arithmetic Average PCI | Average STD PCI | Weighted Average PCI |
|---------------------|---------------------------|--------------------------|-------------------------------|------------------------|-----------------------------|
| APRON | 1 | 107,455.00 | 64.00 | 0.00 | 64.00 |
| RUNWAY | 4 | 1,494,230.00 | 63.75 | 6.98 | 60.52 |
| TAXIWAY | 6 | 317,550.00 | 68.33 | 18.84 | 66.89 |
| ALL | 11 | 1,919,235.00 | 66.27 | 14.71 | 61.77 |

2/1/2021

Branch Condition Report

Page 1 of 2

Pavement Database: ALDOT_Combined_201201

| Branch ID | Number of Sections | Sum Section Length (Ft) | Avg Section Width (Ft) | True Area (SqFt) | Use | Average FOD Index | Standard Deviation FOD Index | Weighted Average FOD Index |
|-----------|--------------------|-------------------------|------------------------|------------------|---------|-------------------|------------------------------|----------------------------|
| A01 | 1 | 440.00 | 261.00 | 107,455.00 | APRON | 36.00 | 0.00 | 36.00 |
| R0624 | 2 | 4,965.00 | 150.00 | 744,080.00 | RUNWAY | 33.00 | 2.00 | 34.15 |
| R1230 | 2 | 5,001.00 | 150.00 | 750,150.00 | RUNWAY | 39.50 | 8.50 | 44.77 |
| TA | 2 | 4,445.00 | 45.00 | 222,478.00 | TAXIWAY | 26.50 | 17.50 | 36.74 |
| TA1 | 1 | 200.00 | 50.00 | 14,206.00 | TAXIWAY | 52.00 | 0.00 | 52.00 |
| THANG01 | 2 | 1,240.00 | 107.50 | 75,986.00 | TAXIWAY | 17.50 | 12.50 | 17.86 |
| TL01 | 1 | 110.00 | 68.00 | 4,880.00 | TAXIWAY | 50.00 | 0.00 | 50.00 |

Pavement Database: ALDOT_Combined_201201

| Use Category | Number of Sections | Total Area (SqFt) | Arithmetic Average FOD | Average STD FOD Index | Weighted Average FOD In |
|---------------------|---------------------------|--------------------------|-------------------------------|------------------------------|--------------------------------|
| APRON | 1 | 107,455.00 | 36.00 | 0.00 | 36.00 |
| RUNWAY | 4 | 1,494,230.00 | 36.25 | 6.98 | 39.48 |
| TAXIWAY | 6 | 317,550.00 | 31.67 | 18.84 | 33.11 |
| ALL | 11 | 1,919,235.00 | 33.73 | 14.71 | 38.23 |

APPENDIX G

SAFETY AND PREVENTIVE MAINTENANCE POLICIES



Appendix G1
Localized Safety (Stopgap) Repair Policy

| Distress | Distress Severity | Description | Code | Work Type | Work Unit |
|----------|-------------------|--------------|-------|------------------------------|-----------|
| 41 | High | ALLIGATOR CR | PA-FD | Patching - AC Full-Depth | SqFt |
| 43 | High | BLOCK CR | CS-AC | Crack Sealing - AC | Ft |
| 45 | High | DEPRESSION | PA-FD | Patching - AC Full-Depth | SqFt |
| 47 | High | JT REF. CR | CS-AC | Crack Sealing - AC | Ft |
| 48 | High | L & T CR | CS-AC | Crack Sealing - AC | Ft |
| 50 | High | PATCHING | PA-FD | Patching - AC Full-Depth | SqFt |
| 53 | High | RUTTING | PA-FD | Patching - AC Full-Depth | SqFt |
| 54 | High | SHOVING | PA-PD | Patching - AC Partial-Depth | SqFt |
| 55 | NA | SLIPPAGE CR | PA-PD | Patching - AC Partial-Depth | SqFt |
| 56 | High | SWELLING | PA-FD | Patching - AC Full-Depth | SqFt |
| 61 | High | BLOW-UP | SL-PC | Slab Replacement - PCC | SqFt |
| 61 | Medium | BLOW-UP | PA-PF | Patching - PCC Full Depth | SqFt |
| 62 | High | CORNER BREAK | PA-PF | Patching - PCC Full Depth | SqFt |
| 63 | High | LINEAR CR | PA-PF | Patching - PCC Full Depth | SqFt |
| 63 | Medium | LINEAR CR | CS-PC | Crack Sealing - PCC | Ft |
| 64 | High | DURABIL. CR | SL-PC | Slab Replacement - PCC | SqFt |
| 64 | Medium | DURABIL. CR | PA-PF | Patching - PCC Full Depth | SqFt |
| 66 | High | SMALL PATCH | PA-PP | Patching - PCC Partial Depth | SqFt |
| 67 | High | LARGE PATCH | PA-PF | Patching - PCC Full Depth | SqFt |
| 70 | High | SCALING | SL-PC | Slab Replacement - PCC | SqFt |
| 71 | High | FAULTING | GR-PP | Grinding (Localized) | Ft |
| 72 | High | SHAT. SLAB | SL-PC | Slab Replacement - PCC | SqFt |
| 74 | High | JOINT SPALL | PA-PP | Patching - PCC Partial Depth | SqFt |
| 75 | High | CORNER SPALL | PA-PP | Patching - PCC Partial Depth | SqFt |
| 76 | High | ASR | SL-PC | Slab Replacement - PCC | SqFt |

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|---|--------|-------------|-------|------------|--------|
| | U | ° 08 u k#h | h° °) | h °° #7) | o7 |
| | = | ° 08 u k#h | h° °) | h °° #7) | o7 |
| | V° | "O) 08" | h° °c | h °° #h) | o7 |
| | = | "O #Mk" | h° °) | h °° #7) | o7 |
| | U | "O #Mk" | #o° # | # ° ° °° # | 7 |
| | O | # hky8 u@V | h° °c | h °° #h) | o7 |
| | = | # hky8 u@V | h° °c | h °° #h) | o7 |
| | U | # hky8 u@V | h° °c | h °° #h) | o7 |
| | U |) - h k α@V | h° °) | h °° #7) | o7 |
| | O |) - h k α@V | h° °) | h °° #7) | o7 |
| | = |) - h k α@V | h° °) | h °° #7) | o7 |
| | = | Kk 7 #k' | #o° # | # ° ° °° # | 7 |
| | U | Kk 7 #k' | #o° # | # ° ° °° # | 7 |
| | = | O u#k" | #o° # | # ° ° °° # | 7 |
| | U | O u#k" | #o° # | # ° ° °° # | 7 |
| | V° | \ @h08 | h° °) | h °° #7) | o7 |
| | = | h u# 08" | h° °) | h °° #7) | o7 |
| | U | h u# 08" | h° °) | h °° #7) | o7 |
| | = | k° † - 08" | h° °c | h °° #h) | o7 |
| | = | kyu08" | h° °) | h °° #7) | o7 |
| | O | kyu08" | h° °) | h °° #7) | o7 |
| | U | kyu08" | h° °) | h °° #7) | o7 |
| | V° | α@h° 8 #k | h° °) | h °° #7) | o7 |
| | O | ‡ - 08" | h° °) | h °° #7) | o7 |
| | U | ‡ - 08" | h° °) | h °° #7) | o7 |
| | O | "O‡ yh" | h° h | h °° #7) | o7 |
| | U | "O‡ yh" | h° h | h °° #7) | o7 |
| | = | "O‡ yh" | h° h | h °° #7) | o7 |
| | U | # kV k'k° N | h° h | h °° #7) | o7 |
| | = | # kV k'k° N | h° h | h °° #7) | o7 |
| | O | # kV k'k° N | #oh# | # ° ° °° # | 7 |
| | U | @ ° k#k" | #oh# | # ° ° °° # | 7 |
| | = | @ ° k#k" | h° h | h °° #h) | o7 |
| | U |)yk° "O#k | h° h | h °° #7) | o7 |
| | = |)yk° "O#k | α@h | o k °° # | o7 |
| | = | Kio° Q US | KG | K ° ° ° | 7 |
| | U | Kio° Q US | KG | K ° ° ° | 7 |
| | = | d° @h u# | h° h | h °° #h) | o7 |
| | U | d° @h u# | h° h | h °° #h) | o7 |
| | U | Ol8 h u# | h° h | h °° #7) | o7 |

°
8
O h k h

|) |) o |) | # | ‡ u | ‡ y |
|----|--------|-----------|-----|------------|--------|
| = | | Ol8 h u# | h h | h ' h##7) | o7 |
| V° | | hyUh98 | KG | K o ' O | 7 |
| U | | α# Q8 | h h | h ' h##h) | o7 |
| = | | α# Q8 | αh | o k ' h## | o7 |
| = | | 7yQ98 | 8kh | 8 ' O | 7 |
| U | | 7yQ98 | 8kh | 8 ' O | 7 |
| U | | α° u' d'' | αh | o k ' h## | o7 |
| = | | α° u' d'' | αh | o k ' h## | o7 |
| = | | K@uch@ | h h | h ' h##h) | o7 |
| U | | K@uch@ | h h | h ' h##h) | o7 |
| U | | #kV kch@ | h h | h ' h##h) | o7 |
| = | | #kV kch@ | h h | h ' h##h) | o7 |
| U | | °dk | αh | o k ' h## | o7 |
| = | | °dk | αh | o k ' h## | o7 |

APPENDIX H

M&R UNIT COSTS

H1: M&R Unit Costs

H2: Component Costs for Repair

H3: Airport Category

Maintenance and Repair (M&R) Unit Costs

The M&R costs developed for the ALDOT PMP include costs for maintenance, preservation, and repair activities and are described below.

Unit Costs Source Data

The source for the M&R costs data is RSMMeans, which has data for 14 locations throughout Alabama, as identified by the yellow highlighted boxes in Figure 1. The cost data is presented in terms of individual line items like asphalt wearing course, aggregate base etc., which were consolidated to develop the activity costs described below.

The cost data show a distinct difference in costs between locations north and south of Birmingham, especially for the higher value items like the asphalt layers. Therefore, the unit costs were developed accordingly for the airports north and south of Birmingham, as identified in Figure 1. Appendix H2 presents the component costs used in developing the M&R costs.

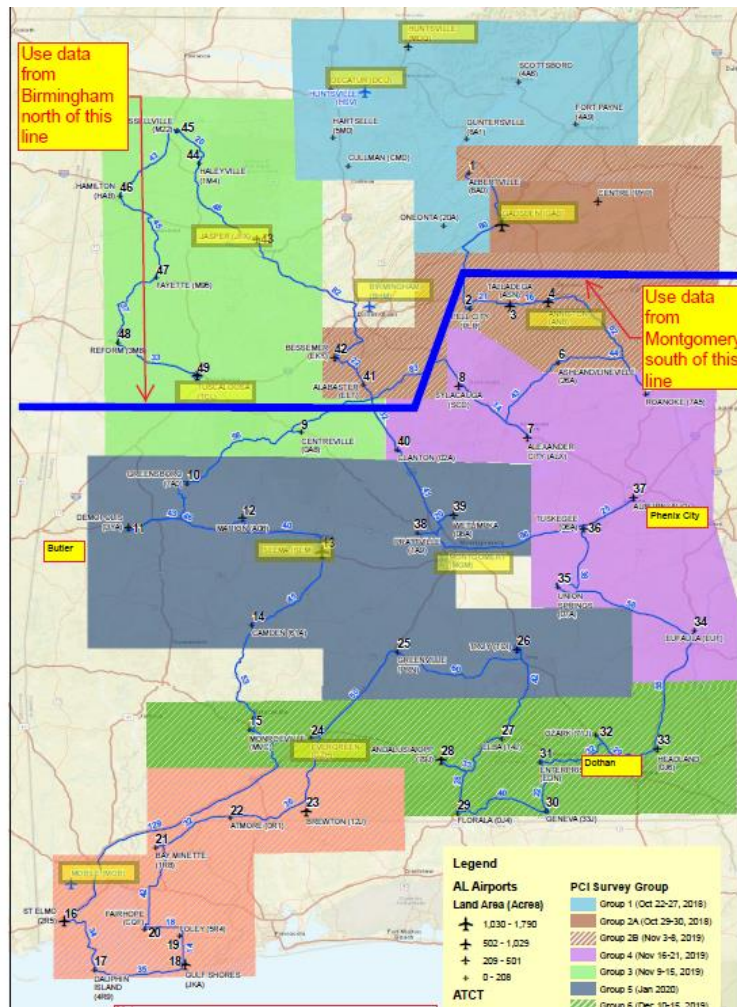


Figure 1: RSMMeans Unit Costs Locations.

Maintenance & Repair (M&R) Activities

Maintenance activities are localized activities which are typically assigned in the first year of the M&R plan based on the observed distresses.

Repair activities are further subdivided into preservation, rehabilitation, and reconstruction. Repair activities are conducted for larger areas, typically at the section level and are assigned based on the Critical Pavement Condition Index, denoted as CP in Table 1. The CP is based on the section’s rank or importance within the overall network and typically ranges from 55 to 70. The CP was set at 70 for the ALDOT runway pavements and 65 for the other pavements.

Table 1: Repair Activities.

| Activity Type | PCI | Activity |
|----------------|---------|-------------------------------------|
| Preservation | > CP | Runway Surface Treatment |
| | | Taxiway and Apron Surface Treatment |
| Rehabilitation | > CP | 2" AC OL ¹ |
| | 55 - CP | Mill 2" & 2" AC OL |
| | 45 - 55 | Mill 2" & 3" AC OL |
| Reconstruction | 0 - 45 | Reconstruct with AC |

¹For Sections with Structural Distress and PCI greater than Critical PCI

The depths for the milling and overlay (AC OL) in Table 1 were established by creating a balance between removal of surficial distress and providing additional pavement structural capacity. All overlay options include full-depth patching to repair localized distresses.

From the FAA 5010 records, the Alabama airport network includes a wide range of allowable aircraft loads. The airports were divided into three categories of allowable aircraft loads based on requirements for minimum pavement thickness and the use of a P-401 surface layer. The categories are based on the aircraft maximum gross takeoff weight (MGTOW) and include: less than 12,500 lbs, 12,500 to 30,000 lbs, and 30,000 to 100,000 lbs. Appendix H3 presents the category for each airport.

For any sections requiring reconstruction, the pavement sections were established primarily in accordance with the requirements in Table 3 of the FAA’s Advisory Circular 150/5320-6F. The pavement sections used for developing the cost estimates are:

- 12,500 lbs 4" P-403 (State HMA Mix) + 6" P-209 Base
- 12,500 – 30,000 lbs 4" P-403 (State HMA Mix) + 8" P-209 Base
- 30,000 – 100,000 lbs 5" P-401 + 10" P-209 Base

It is important to note that while the FAA requires a stabilized base for those pavements that support aircraft operations with MGTOWs that are greater than 100,000 lbs, the number of such operations is minimal for those airports shown in Appendix H3. As a result, the cost of a stabilized base is excluded in the development of the unit costs for ALDOT’s PMP update. However, based on the Engineer’s future design and aircraft fleet mix development, project-level construction work could include the use of a stabilized base at that time.

M&R Unit Costs

Paving projects typically include additional project costs like mobilization, design, construction administration and inspections, and drainage improvements. A summary of non-direct pavement construction line items has been included in the unit costs in Tables 5 and 6 as described below. These non-direct items are expressed as a percentage of the total component costs for each activity.

These non-direct pavement construction items were developed from API’s extensive experience with APMP project cost estimation. These percentages may vary for Alabama airport construction projects; however, since the direct pavement scope of work is estimated in a network-level evaluation, these conservative estimates serve as a good starting point for the development of realistic total project costs and annual APMP budgets for ALDOT. For repair activities such as Mill & Overlay, which typically do not include significant drainage work, the corresponding multiplier was reduced by 50 percent. The non-direct cost factors are presented in Table 2.

Table 2: Cost Factors.

| Factor | Function of | Estimate | | |
|-----------------------|---|--------------|----------------|----------------|
| | | Preservation | Rehabilitation | Reconstruction |
| Mobilization | All costs, less design | 10% | 10% | 10% |
| Drainage Improvements | Paving costs | - | 4% | 8% |
| Contingency | All costs, less mobilization and design | 10% | 20% | 20% |
| Design & CM | All costs, less mobilization and design | 15% | 20% | 20% |

The M&R unit costs for maintenance, preservation, and repair activities were developed from the RSMMeans cost data and are presented in the following section.

Maintenance

The maintenance activities include crack seal, and full and partial-depth patching. The unit costs are presented in Table 3.

Table 3: Unit Costs for Maintenance.

| Activity | Unit Cost | Unit |
|----------------------------|-----------|------|
| Seal Cracks - AC | \$3.95 | lf |
| AC Full-Depth Patching | \$25.05 | sf |
| AC Partial-Dept Patching | \$16.28 | sf |
| Seal Cracks – PCC | \$6.00 | lf |
| PCC Full-Depth Patching | \$35.00 | sf |
| PCC Partial-Depth Patching | \$175.00 | sf |
| Jt. Seal | \$8.00 | lf |
| Slab Replacement | \$20.00 | sf |

Preservation

The unit costs for the surface treatments are presented in Table 4. They include sealing of cracks and application of pavement markings.

Table 4: Unit Costs for Preservation Activities.

| Activity | Unit Cost | Unit |
|-------------------------------------|-----------|------|
| Runway Surface Treatment | \$0.57 | sf |
| Taxiway and Apron Surface Treatment | \$0.88 | sf |

Rehabilitation and Reconstruction

As discussed previously, repair activities are also divided into rehabilitation and reconstruction. The unit costs for airport repair for the Northern Region (Birmingham Area) and Southern Region (Montgomery Area) are shown in Tables 5 and 6, respectively.

Table 5: Unit Costs for Repair Activities, Northern Region.

| Activity Type | Activity | MGTOW, thousand lbs | | |
|----------------|--------------------|---------------------|---------|---------|
| | | 12.5 | 12.5-30 | 30-100 |
| Rehabilitation | 2" AC OL | \$3.78 | | \$4.19 |
| | Mill 2" & 2" AC OL | \$4.15 | | \$4.56 |
| | Mill 2" & 3" AC OL | \$5.18 | | \$5.79 |
| Reconstruction | AC Reconstruction | \$8.40 | \$9.10 | \$10.91 |

Table 6: Unit Costs for Repair Activities, Southern Region.

| Activity Type | Activity | MGTOW, thousand lbs | | |
|----------------|--------------------|---------------------|---------|--------|
| | | 12.5 | 12.5-30 | 30-100 |
| Rehabilitation | 2" AC OL | \$3.54 | | \$3.91 |
| | Mill 2" & 2" AC OL | \$3.90 | | \$4.27 |
| | Mill 2" & 3" AC OL | \$4.82 | | \$5.37 |
| Reconstruction | AC Reconstruction | \$7.63 | \$8.25 | \$9.87 |

Appendix H2
Component Costs for Repair

| Activity Type | Unit | Birmingham (Northern) | Montgomery (Southern) | Comments |
|---|------|--------------------------|--------------------------|--|
| Milling 1" to 3" | SY | \$2.08 | \$2.01 | |
| Pavement Demolition | SY | \$6.34 | \$6.12 | |
| Haulage - For Demolition & AC | CY | \$6.08 | \$5.87 | |
| Haulage for 12" Thick Demolition | SY | \$2.03 | \$1.96 | |
| Haulage for 2" Thick AC Paving | SY | \$0.34 | \$0.33 | |
| Haulage for 3" Thick AC Paving | SY | \$0.51 | \$0.49 | |
| Haulage for 4" Thick AC Paving | SY | \$0.68 | \$0.65 | |
| AC Wearing Course | Ton | \$97.42 | \$86.90 | |
| AC Binder Course | Ton | \$87.80 | \$78.17 | |
| P401 - For airports with >60 kip aircraft | Ton | \$116.90 | \$104.28 | Assumed P401 cost to be 20% greater than AC Wearing Course |
| 6" Aggregate Base (P208) | SY | \$10.17 | \$9.12 | |
| 8" Aggregate Base (P208) | SY | \$13.29 | \$11.89 | |
| 6" P209 Aggregate Base | SY | \$12.20 | \$10.94 | Assumed P209 cost to be 20% greater than P208 |
| 8" P209 Aggregate Base | SY | \$15.95 | \$14.27 | Assumed P209 cost to be 20% greater than P208 |
| 10" P209 Aggregate Base | SY | \$19.94 | \$17.84 | Direct multiplier for 10" from 8" |
| 4" P154 Aggregate Base | SY | \$5.42 | \$4.86 | Assumed P154 cost to be 20% lower than P208 |
| 6" P154 Aggregate Base | SY | \$8.14 | \$7.30 | Assumed P154 cost to be 20% lower than P208 |
| Pavement Markings | sf | \$1.48 | \$1.39 | |

**Appendix H3
Airport Category**

| Region | City | FAA ID | Max Gross Weight (Thousand lbs) | | | Max GW | Category |
|------------|-------------------|--------|---------------------------------|-------|-------|---------------|---------------|
| | | | S | D | 2D | | |
| Birmingham | Reform | 3M8 | 12.5 | - | - | 12.5 | <= 12,500 |
| | Fayette | M95 | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Hamilton | HAB | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Scottsboro | 4A6 | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Alabaster | EET | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Centre-Piedmont | PYP | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Fort Payne | 4A9 | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Haleyville | 1M4 | 20.0 | - | - | 20.0 | 12,500-30,000 |
| | Hartselle | 5M0 | 20.0 | - | - | 20.0 | 12,500-30,000 |
| | Guntersville | 8A1 | 24.0 | - | - | 24.0 | 12,500-30,000 |
| | Cullman | CMD | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Russellville | M22 | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Jasper | JFX | 50.0 | - | - | 50.0 | > 30,000 |
| | Oneonta | 20A | 20.0 | 35.0 | 55.0 | 55.0 | > 30,000 |
| | Bessemer | EKY | 60.0 | 60.0 | - | 60.0 | > 30,000 |
| | Albertville | 8A0 | 60.0 | 90.0 | 130.0 | 130.0 | > 30,000 |
| | Madison | MDQ | 60.0 | 75.0 | 140.0 | 140.0 | > 30,000 |
| | Decatur | DCU | 75.0 | 125.0 | 150.0 | 150.0 | > 30,000 |
| | Tuscaloosa | TCL | 61.0 | 87.0 | 168.0 | 168.0 | > 30,000 |
| | Gadsden | GAD | 90.0 | 115.0 | 195.0 | 195.0 | > 30,000 |
| Montgomery | Floralia | 0J4 | - | - | - | - | <= 12,500 |
| | Elba | 14J | 4.0 | - | - | 4.0 | <= 12,500 |
| | Headland | 0J6 | 12.0 | - | - | 12.0 | <= 12,500 |
| | Roanoke | 7A5 | 12.0 | - | - | 12.0 | <= 12,500 |
| | Greenville | PRN | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Union Springs | 07A | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Wetumpka | 08A | 15.0 | - | - | 15.0 | 12,500-30,000 |
| | Atmore | 0R1 | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Clanton | 02A | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Eufaula | EUF | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Geneva | 33J | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Greensboro | 7A0 | 16.0 | - | - | 16.0 | 12,500-30,000 |
| | Centreville | 0A8 | 18.0 | - | - | 18.0 | 12,500-30,000 |
| | Ashland-Lineville | 26A | 20.0 | - | - | 20.0 | 12,500-30,000 |
| | Sylacauga | SCD | 20.0 | - | - | 20.0 | 12,500-30,000 |
| | St. Elmo | 2R5 | 23.0 | - | - | 23.0 | 12,500-30,000 |
| | Ozark | 71J | - | 25.0 | - | 25.0 | 12,500-30,000 |
| | Camden | 61A | 27.0 | - | - | 27.0 | 12,500-30,000 |
| | Bay Minette | 1R8 | 28.0 | - | - | 28.0 | 12,500-30,000 |
| | Foley | 5R4 | 28.0 | - | - | 28.0 | 12,500-30,000 |
| Tuskegee | 06A | 28.5 | - | - | 28.5 | 12,500-30,000 | |

**Appendix H3
Airport Category**

| Region | City | FAA ID | Max Gross Weight (Thousand lbs) | | | Max GW | Category |
|---------------|----------------|--------|---------------------------------|-------|-------|----------|---------------|
| | | | S | D | 2D | | |
| Montgomery | Alexander City | ALX | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Dauphin Island | 4R9 | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Pell City | PLR | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Prattville | 1A9 | 30.0 | - | - | 30.0 | 12,500-30,000 |
| | Enterprise | EDN | - | - | - | - | > 30,000 |
| | Evergreen | GZH | 30.0 | 50.0 | - | 50.0 | > 30,000 |
| | Marion | A08 | 30.0 | 50.0 | - | 50.0 | > 30,000 |
| | Selma | SEM | 33.0 | 54.0 | - | 54.0 | > 30,000 |
| | Fairhope | CQF | 36.0 | 58.0 | - | 58.0 | > 30,000 |
| | Brewton | 12J | 40.0 | 60.0 | - | 60.0 | > 30,000 |
| | Demopolis | DYA | 30.0 | 38.0 | 60.0 | 60.0 | > 30,000 |
| | Monroeville | MVC | 70.0 | - | - | 70.0 | > 30,000 |
| | Auburn-Opelika | AUO | 45.0 | 75.0 | - | 75.0 | > 30,000 |
| | Talladega | ASN | 30.0 | 65.0 | 95.0 | 95.0 | > 30,000 |
| | Gulf Shores | JKA | 80.0 | 100.0 | - | 100.0 | > 30,000 |
| | Troy | TOI | 24.0 | 80.0 | 140.0 | 140.0 | > 30,000 |
| | Anniston | ANB | 28.0 | 43.5 | 260.0 | 260.0 | > 30,000 |
| Andalusia-OPP | 79J | 98.0 | 160.0 | 275.0 | 275.0 | > 30,000 | |

APPENDIX I

PAVEMENT CAPITAL IMPROVEMENT PROGRAM

I1: PCIP Summary

I2: Year 1 Maintenance Plan



Appendix I1
PCIP Summary
 Brewton Municipal Airport (12J)

| Branch & Section | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|------------------|---|---|---|--|--|--|--|
| A01-01 | StopGap \$2136.34 Before:60.55 After:60.55 | StopGap \$2432.81 Before:58.34 After:58.34 | Required Project Major Below Critical \$500740.3 Before:56.13 After:100 | Preventive \$266.17 Before:97.78 After:97.78 | Preventive \$547.19 Before:95.57 After:95.57 | Preventive + Required Project Global MR \$73914.22 Before:93.36 After:97.79 | Preventive \$579.32 Before:95.58 After:95.58 |
| R0624-01 | StopGap \$3219.82 Before:60.17 After:60.17 | Required Project Major Below Critical \$810308.66 Before:53.81 After:100 | Preventive \$223.97 Before:98.7 After:98.7 | Preventive \$448.47 Before:97.47 After:97.47 | Preventive \$648.02 Before:96.45 After:96.45 | Preventive \$859.14 Before:95.44 After:95.44 | Preventive \$1131.71 Before:94.16 After:94.16 |
| R0624-02 | StopGap \$15363.34 Before:53.74 After:53.74 | Required Project Major Below Critical \$3377567.99 Before:49.48 After:100 | Preventive \$824.75 Before:98.7 After:98.7 | Preventive \$1651.47 Before:97.47 After:97.47 | Preventive \$2386.31 Before:96.45 After:96.45 | Preventive \$3163.76 Before:95.44 After:95.44 | Preventive \$4167.46 Before:94.16 After:94.16 |
| R1230-01 | Required Project Major Below Critical \$4537259.38 Before:45.34 After:100 | Preventive \$831.49 Before:98.7 After:98.7 | Preventive \$1658.97 Before:97.48 After:97.48 | Preventive \$2405.8 Before:96.45 After:96.45 | Preventive \$3189.6 Before:95.44 After:95.44 | Preventive \$4201.5 Before:94.16 After:94.16 | Preventive \$5695.91 Before:92.32 After:92.32 |
| R1230-02 | Required Project Major Below Critical \$608449.88 Before:60.17 After:100 | Preventive \$194.99 Before:98.7 After:98.7 | Preventive \$389.04 Before:97.48 After:97.48 | Preventive \$564.18 Before:96.45 After:96.45 | Preventive \$747.99 Before:95.44 After:95.44 | Preventive \$985.29 Before:94.16 After:94.16 | Preventive \$1335.75 Before:92.32 After:92.32 |

Appendix I1
PCIP Summary
 Brewton Municipal Airport (12J)

| Branch & Section | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|------------------|---|---|--|--|---|--|--|
| TA-01 | StopGap \$5182.28 Before:50.36 After:50.36 | Required Project Major Below Critical \$1003152.69 Before:46.52 After:100 | Preventive \$194.62 Before:98.98 After:98.98 | Preventive \$424.17 Before:97.85 After:97.85 | Preventive + Required Project Global MR \$117103.42 Before:96.33 After:98.98 | Preventive \$450.01 Before:97.85 After:97.85 | Preventive \$790.11 Before:96.33 After:96.33 |
| TA-02 | Preventive + Required Project Global MR \$41205.04 Before:87.94 After:95.3 | Preventive \$335.82 Before:93.09 After:93.09 | Preventive \$471.51 Before:90.58 After:90.58 | Preventive \$622.07 Before:87.94 After:87.94 | Preventive \$779.79 Before:85.32 After:85.32 | Preventive \$937.46 Before:82.86 After:82.86 | Preventive \$1092.11 Before:80.62 After:80.62 |
| TA1-01 | StopGap \$505.34 Before:44.28 After:44.28 | Required Project Major Below Critical \$148878.88 Before:40.73 After:100 | Preventive \$15.68 Before:98.98 After:98.98 | Preventive \$34.18 Before:97.85 After:97.85 | Preventive + Required Project Global MR \$9435.97 Before:96.33 After:98.98 | Preventive \$36.26 Before:97.85 After:97.85 | Preventive \$63.67 Before:96.33 After:96.33 |
| THANG01-01 | StopGap \$619.52 Before:64.49 After:64.49 | StopGap \$819.51 Before:60.08 After:60.08 | Required Project Major Below Critical \$182150.08 Before:55.19 After:100 | Preventive \$44.84 Before:98.97 After:98.97 | Preventive \$96.87 Before:97.85 After:97.85 | Preventive \$170.08 Before:96.33 After:96.33 | Preventive \$269.7 Before:94.35 After:94.35 |

Appendix I1
PCIIP Summary
 Brewton Municipal Airport (12J)

| Branch & Section | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|------------------|---|--|--|--|---|---|--|
| THANG01-02 | Preventive + Required Project Global MR \$32796.92 Before:91.34 After:97.5 | Preventive \$160.65 Before:95.86 After:95.86 | Preventive \$249.11 Before:93.77 After:93.77 | Preventive \$357.35 Before:91.33 After:91.33 | Preventive \$479.57 Before:88.7 After:88.7 | Preventive \$608.8 Before:86.07 After:86.07 | Preventive \$740.04 Before:83.56 After:83.56 |
| TL01-01 | StopGap \$168.92 Before:45.22 After:45.22 | StopGap \$188.28 Before:42.44 After:42.44 | Required Project Major Below Critical \$52655.2 Before:38.89 After:100 | Preventive \$5.6 Before:98.97 After:98.97 | Preventive \$12.09 Before:97.85 After:97.85 | Preventive \$21.23 Before:96.33 After:96.33 | Preventive \$33.67 Before:94.35 After:94.35 |

Appendix I2
Localized Maintenance Plan
Brewton Municipal Airport (12J)

| Branch ID | Section ID | Policy | Distress Code | Description | Severity | Distress Qty | Distress Unit | Percent Distress | Work Description | Work Qty | Work Unit | Unit Cost | Work Cost |
|-----------|------------|------------|---------------|-------------|----------|--------------|---------------|------------------|--------------------|----------|-----------|-----------|-----------|
| A01 | 01 | Safety | 50 | PATCHING | Low | 126 | SqFt | 0.12 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 48 | L & T CR | Low | 2,431 | Ft | 2.26 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 57 | WEATHERING | Medium | 30,701 | SqFt | 28.57 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 43 | BLOCK CR | Low | 20,608 | SqFt | 19.18 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 43 | BLOCK CR | Medium | 2,103 | SqFt | 1.96 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 57 | WEATHERING | Low | 40,795 | SqFt | 37.96 | No Localized M & R | 0 | | \$0.00 | \$0 |
| A01 | 01 | Safety | 48 | L & T CR | Medium | 1,388 | Ft | 1.29 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 52 | RAVELING | Low | 3,526 | SqFt | 2 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 43 | BLOCK CR | Medium | 2,821 | SqFt | 1.6 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 57 | WEATHERING | Medium | 47,249 | SqFt | 26.8 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 43 | BLOCK CR | Low | 35,260 | SqFt | 20 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 48 | L & T CR | Low | 1,340 | Ft | 0.76 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 48 | L & T CR | Medium | 8,039 | Ft | 4.56 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 01 | Safety | 57 | WEATHERING | Low | 93,087 | SqFt | 52.8 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 02 | Preventive | 48 | L & T CR | Low | 610 | Ft | 1.32 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 02 | Preventive | 57 | WEATHERING | Low | 6,355 | SqFt | 13.76 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA | 02 | Preventive | 57 | WEATHERING | Medium | 763 | SqFt | 1.65 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 57 | WEATHERING | Medium | 710 | SqFt | 5 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 48 | L & T CR | Medium | 703 | Ft | 4.95 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 57 | WEATHERING | Low | 8,805 | SqFt | 61.98 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 43 | BLOCK CR | Low | 1,420 | SqFt | 10 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 43 | BLOCK CR | Medium | 4,261 | SqFt | 29.99 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 48 | L & T CR | Low | 82 | Ft | 0.58 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TA1 | 01 | Safety | 52 | RAVELING | Medium | 28 | SqFt | 0.2 | No Localized M & R | 0 | | \$0.00 | \$0 |
| THANG01 | 01 | Preventive | 48 | L & T CR | Medium | 432 | Ft | 1.1 | Crack Sealing - AC | 432 | Ft | \$3.95 | \$1,706 |
| THANG01 | 01 | Preventive | 57 | WEATHERING | Low | 5,414 | SqFt | 13.85 | No Localized M & R | 0 | | \$0.00 | \$0 |
| THANG01 | 01 | Preventive | 43 | BLOCK CR | Medium | 516 | SqFt | 1.32 | Crack Sealing - AC | 157 | Ft | \$3.95 | \$621 |
| THANG01 | 01 | Preventive | 52 | RAVELING | Low | 10,312 | SqFt | 26.38 | No Localized M & R | 0 | | \$0.00 | \$0 |
| THANG01 | 01 | Preventive | 48 | L & T CR | Low | 245 | Ft | 0.63 | No Localized M & R | 0 | | \$0.00 | \$0 |

Appendix I2
Localized Maintenance Plan
 Brewton Municipal Airport (12J)

| Branch ID | Section ID | Policy | Distress Code | Description | Severity | Distress Qty | Distress Unit | Percent Distress | Work Description | Work Qty | Work Unit | Unit Cost | Work Cost |
|-----------|------------|------------|---------------|-------------|----------|--------------|---------------|------------------|--------------------|----------|-----------|-----------|-----------|
| THANG01 | 01 | Preventive | 57 | WEATHERING | Medium | 14,481 | SqFt | 37.05 | No Localized M & R | 0 | | \$0.00 | \$0 |
| THANG01 | 02 | Preventive | 57 | WEATHERING | Low | 3,749 | SqFt | 10.16 | No Localized M & R | 0 | | \$0.00 | \$0 |
| THANG01 | 02 | Preventive | 57 | WEATHERING | Medium | 1,687 | SqFt | 4.57 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TL01 | 01 | Safety | 52 | RAVELING | Low | 1,300 | SqFt | 26.64 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TL01 | 01 | Safety | 43 | BLOCK CR | Medium | 1,025 | SqFt | 21 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TL01 | 01 | Safety | 57 | WEATHERING | Medium | 1,500 | SqFt | 30.74 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TL01 | 01 | Safety | 43 | BLOCK CR | Low | 1,100 | SqFt | 22.54 | No Localized M & R | 0 | | \$0.00 | \$0 |
| TL01 | 01 | Safety | 48 | L & T CR | Medium | 50 | Ft | 1.02 | No Localized M & R | 0 | | \$0.00 | \$0 |