# *Idaho Transportation System 2010 Pavement Performance Report*


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# 1.0 INTRODUCTION/PURPOSE OF THE REPORT

The Idaho Transportation Department's (ITD's) Idaho Transportation System Performance Report is a summary of the status of ITD-jurisdiction pavements. It is our intention to provide the reader with an accurate and useful review of the historical and current condition of Idaho's pavement.

# 2.0 PURPOSE OF A PAVEMENT MANAGEMENT SYSTEM (PMS)

A Pavement Management System is defined as a system which involves the identification of optimum strategies at various management levels and maintains pavements at an adequate level of serviceability. These include, but are not limited to, systematic procedures for scheduling maintenance and rehabilitation activities based on optimization of benefits and minimization of costs.

Historically, Idaho has managed around 12,000 lane miles, with additions and subtractions annually. Thus far, ITD has made significant progress toward reducing deficient pavements and giving motorists a safer and smoother ride. Pavement deficiencies on the State Highway System have been reduced from 41% in 1993 to **16%** by the end of calendar year 2010. This has been accomplished by:

1. Establishing Department efficiency measures
2. Consolidating programs and applying the cost savings to pavement-rehabilitation projects
3. Utilizing a maintenance / preventative maintenance program which slows the rate of pavement deterioration
4. Improving the way we collect, analyze, and report pavement data
5. Continued coordination efforts between the Districts and Headquarters, to exchange project planning information and project history.

Historically, Idaho's Pavement Management System has covered both the network and project level. Both network-level and project-level pavement management is currently performed by the Division of Highways, Materials Section and the six Idaho districts.

In 2009, the Idaho Transportation Department invested in a new pavement and maintenance management system, which is hosted by software from AgileAssets. This system became active on December 17, 2010, and will be the new pavement management system thus forward. This system will greatly aid in the storage of our data and the analysis we perform. The new program will be further explained in detail in Section 3.0, Description of the Current System.

# 3.0 DESCRIPTION OF THE CURRENT SYSTEM

## 3.1 BRIEF HISTORY OF IDAHO PAVEMENT MANAGEMENT

In 1977, the Idaho Transportation Department began a review of existing pavement management programs with the goal of adopting one to fit Idaho's needs. The following year a Pavement Performance Management Information System (PPMIS) was acquired and made operational on ITD's mainframe computer. Since 1978, the PPMIS has been steadily improved and modified to meet conditions in Idaho. It has been tested and refined by both ITD and consultant contract. Economic analysis and optimization was completed in July 1986. The HERS-ST (Highway Economic Requirements System, STate model), at:

http://www.fhwa.dot.gov/infrastructure/asstmgmt/hersindex.cfm was implemented in 2007 as software for improved pavement management analysis.

## 3.2 THE NEW TAMS SYSTEM

In 2009, ITD purchased and began implementation of a new pavement management and maintenance management system, abbreviated as "TAMS" (Transportation Asset Management System). This new system allows all asset management related data to be stored in a centralized location.

The Pavement Management System (PMS) portion of TAMS has offered ITD a valuable chance to refine the way they calculate and analyze data, by implementing new pavement performance curves, decision trees that mimic District design choices, and performance models that accurately track and display pavement projects meant to help Idaho become an efficient Best-First practitioner of pavement management.

With all users of the PMS having instant access to all available data, the system will empower the District pavement designers and engineers with an extensive toolbox at their disposal. The system can offer pavement project choices based on budget constraints and desired deficiency that will help Idaho steadily improve their highways for the public. The system will also guide Idaho from a worst-first pavement remedy philosophy to a best-first, more preventative mindset.

This system became active on December 17, 2010, and will be used henceforth for pavement management at ITD.

# 4.0 DATA COLLECTED FOR PAVEMENT ANALYSIS

## 4.1 CRACKING INDEX AND THE IDAHO METHOD

The Idaho state-jurisdiction road system has been analyzed historically by using the Arizona Method. The Arizona method is a surface distress evaluation typically performed by visual survey on the most-travelled lane of the road being assessed. A condition index (Cracking Index) between 0.0 and 5.0 is given to the pavement, based on size and location of cracks, percentage of the roadway surveyed that shows distress, and type of road surface. A 5.0 rating is good pavement with no visible distress and 0.0 is the maximum distress classification.

A roadway that receives a structural improvement (improving the ability of a pavement to support traffic loads through reconstruction or rehabilitation) receives a rating of 5.0 the year that the completion of the construction is observed. A roadway that receives a maintenance project (preserving the structural condition of a pavement at an acceptable level - typically a sealcoat) that are preventative in nature will raise the crack index 0.3 points. Thus, a sealcoat can theoretically temporarily raise a pavement out of deficiency.

Historically, ITD's pavement management engineer used the Arizona Method to rate the state-jurisdiction roads every year- usually by windshield method (driving the roads) or by using the digital images collected by the Profiler van. This method guide was revised and enhanced in 2010 and has been renamed the Idaho Method. The methodology remains the same, so the cracking indices will be measured as they have been historically. However, the new guide has much better graphics and some much needed clarification. The new guide has been published and can be viewed here (internal ITD link only):

http://materials/Data/Manuals/ITD%20Pavement%20Rating%20Manual.pdf

## 4.2 FIELD RECORDER

The pavement management engineer along with a District representative uses a Field Recorder software program on a laptop computer and records the condition of the pavement distress using the Idaho Method for each section of state highway. The Field Recorder has information on several other factors of a road section: number of lanes, last maintenance improvement, last rehabilitation or reconstruction, number of railroad crossings, speed limit, shoulder width, and terrain type, to name a few. The pavement management engineer takes note of any changes in the field and updates the records annually.

## 4.3 THE PATHWAY PROFILER VAN

Since 1995, Idaho has used Pathway®Profiler van technology and its predecessors to gather the majority of their roadway data. In 2008 a new road profiler van was purchased by the state to greatly enhance the data quality and quantity that we are able to obtain and process. The profiler van drives every mile of state jurisdiction highway in the State of Idaho and digitally records its condition. Those crystal clear video images of both the front view out of the van as well as the pavement surface are collected by ITD's Planning Division.

With the new 2008 van, the rutting detection lasers have been vastly improved (previous versions used 5 laser points to collect rutting data; the new van employs 1280 points). Additionally, the images are of much higher resolution, the roughness measure (IRI) is more accurate, and several other items are greatly enhanced. In 2009, ITD performed a comparison study between the old van and the new van's IRI data to ensure that our statewide ratings did not suddenly change only due to new equipment. With this comparison, a mathematical equation has been applied to the new data for statistical continuity.

## 4.4 INTERNATIONAL ROUGHNESS INDEX (IRI) AND ROUGHNESS INDEX (RI)

ITD uses a worldwide standard for measuring pavement smoothness called the International Roughness Index, or IRI. IRI was developed by the World Bank in the 1980's and is used in all of the states, as well as several countries. IRI is used to define a characteristic of the longitudinal profile of a traveled wheel track and constitutes a standardized roughness measurement. The commonly recommended units are meters per kilometer (m/km) or millimeters per meter (mm/m). IRI is gathered by the Profiler van.

The index measures pavement roughness in terms of the number of inches per mile that a laser, mounted on the Profiler van, jumps as the van is driven along the roadway. Typically, the lower the IRI number, the smoother the ride, although IRI is not known as a direct measure of rider discomfort.

Idaho takes the measured IRI values for pavement and compresses them onto a 0.0-5.0 scale, similar to the Cracking Index scale, where 0.0 is very rough and 5.0 is very smooth. ITD calls this the pavement Roughness Index, or "RI". These numbers are collected and reported annually.

## 4.5 SKID TESTING

Skid data is collected by the Materials Section of ITD by towing a small trailer that measures the force on a wheel that is locked but not rotating (skidding). Tests conducted on state routes are used in the planning of construction, reconstruction, or rehabilitation of pavements. Most of this data is collected annually or every other year. The skid measurement provides a friction number, by which pavement engineers can calculate if the pavement needs a sealcoat or other remedy to prevent skidding likelihood.

## 4.6 FALLING WEIGHT DEFLECTOMETER (FWD) TESTING

The FWD (Falling Weight Deflectometer) is a non-destructive testing device that is used to complete structural testing for pavement rehabilitation projects, research, and pavement structure failure detection. The FWD is a device capable of applying dynamic loads to the pavement surface, similar in magnitude and duration to that of a single heavy moving wheel load. The response of the pavement system is measured in terms of vertical deformation, or deflection, over a given area using seismometers. The Materials section of ITD collects this data on sections of state highways that are eligible for paving projects, and uses the results to design the new pavement that is needed.

# 5.0 HOW DO WE DETERMINE DEFICIENCY?

## 5.1 THE 3-LEGGED STOOL

Historically, the pavement management system has used the cracking index and roughness index to determine deficiency. These values were compared against a roadway's **Functional Class** using specific thresholds to determine when a roadway should be called "deficient". In the past, Districts would use the deficient threshold notification to realize that a roadway was ready for a project.

In 2010, the improved van technology and the new TAMS system led to the addition of rutting data deficiency thresholds. These were applied in 2010 as a third method to rate pavements as deficient. These thresholds are presented below.

### 5.1.1: DEFICIENT THRESHOLDS, BY FUNCTIONAL CLASS

| **Deficiency: Cracking Index** | | |
|---|---|---|
| Pavement Condition | **Functional Class** | |
| | Interstate and Arterials | Collectors |
| | **Crack Index** | |
| **Good** | CI > 3.0 | CI > 3.0 |
| **Fair** | 2.5 ≤ CI ≤ 3.0 | 2.0 ≤ CI ≤ 3.0 |
| **Poor** | 2.0 ≤ CI <2.5 | 1.5 ≤ CI < 2.0 |
| **Very Poor** | CI < 2.0 | CI < 1.5 |

| **Deficiency: Roughness Index** | | |
|---|---|---|
| Pavement Condition | **Functional Class** | |
| | Interstate and Arterials | Collectors |
| | **Roughness Index** | |
| **Good** | RI > 3.0 | RI > 3.0 |
| **Fair** | 2.5 ≤ RI ≤ 3.0 | 2.0 ≤ RI ≤ 3.0 |
| **Poor** | 2.0 ≤ RI <2.5 | 1.5 ≤ RI < 2.0 |
| **Very Poor** | RI < 2.0 | RI < 1.5 |

| **Deficiency: Rutting** | | |
|---|---|---|
| Pavement Condition | **Functional Class** | |
| | Interstate and Arterials | Collectors |
| | **Rutting depth (inches)** | |
| **Good** | 0.00"- 0.24" | 0.00"- 0.49" |
| **Fair** | 0.25"- 0.49" | 0.50"- 0.99" |
| **Poor** | 0.50"- 0.74" | 1.00"- 1.49" |
| **Very Poor** | ≥0.75" | ≥1.50" |

# 6.0 HOW DOES ITD PREDICT AND RECOMMEND PROJECTS?

## 6.1: HISTORICALLY

Historically, rehabilitation and reconstruction project recommendations were generated by the Highway Economic Requirements System – State Version (HERS-ST). HERS-ST is a federally maintained computer model run with data taken from ITD's mainframe.

ITD used the HERS-ST model to provide information on how quickly Idaho pavements will deteriorate, what types of projects are recommended for the pavement sections, what year the projects might be programmed, and approximately how much they will cost. This information, as well as several other items, has traditionally been presented in the Highway Needs Report.

## 6.2: THE TAMS SYSTEM

In 2009, ITD purchased a new asset management system (TAMS) which will henceforth be used to predict deterioration and recommend projects. TAMS has very powerful performance models and decision trees that were directly designed by ITD pavement design engineers to mimic their choices and historical pavement deterioration.

The Statewide Transportation Improvement Program (STIP) is created by headquarters staff with project recommendations for the next 5 years. The STIP will now be entered into TAMS where TAMS will be used to optimize the recommendations by headquarters staff. TAMS will take the projects and run analysis based on predicted deterioration of roadways and the budget constraints predicted for the next 5 years, and will optimize the best projects on the best highways for the optimal pavement condition. These optimized results will be sent to the Districts for review and changes, and then the Districts will send their final programs back into TAMS. TAMS will run a final analysis with all of the feedback and that information will be sent to the ITIP for programming.

It should be noted that the performance trees and decision trees used in the TAMS system use a slightly modified version of determining deficiency when suggesting programmed projects. This is called the District Method.

### 6.2.1: THE DISTRICT METHOD

The use of functional class to classify deficient pavement has served the Department for a long time. Going forward, functional class will still be used to determine the overall deficiency percentage for the state and districts; that will not change.

However, in the TAMS system, ITD applied a new 4-tier system that divides up the pavement system by speed limit (functional) and CAADT (structural). When District representatives were consulted, it was decided that speed limit and CAADT were the best data sources to divide up how the public would tolerate deficient roadways. For instance, lower speed roadways have manholes and utility patches and other surface deformities that are more easily tolerated at lower speeds (functional). Truck traffic has been proven to cause the majority of cracking, roughness and rutting on a roadway (structural.)

These four tiers are presented below. These are the tiers applied in the TAMS system for analysis.

TABLE 6.2.1: THE DISTRICT METHOD THRESHOLDS

| ROAD TIER | SPEED LIMIT | DAILY TRUCK TRAFFIC (DTT) |
|---|---|---|
| **ALPHA** | ≥65 MPH | ≥ 2000 TRUCKS PER DAY |
| **BETA** | ≥55 MPH | ≥ 500 TRUCKS PER DAY |
| **GAMMA** | ≥35 MPH | ≥ 100 TRUCKS PER DAY |
| **DELTA** | <35 MPH | < 100 TRUCKS PER DAY |

With this four tier system, the deficient thresholds required modification to apply to four tiers instead of the two tiers of functional classes. These thresholds for the new TAMS system analysis are presented below.

TABLE 6.2.2: DISTRICT METHOD CRACK INDEX THRESHOLDS

| Deficiency | Alpha Roads: Tolerated Cracking Indices | Beta Roads: Tolerated Cracking Indices | Gamma Roads: Tolerated Cracking Indices | Delta Roads: Tolerated Cracking Indices |
|---|---|---|---|---|
| **Good** | 5.0 – 4.0 | 5.0- 3.5 | 5.0-3.0 | 5.0- 2.5 |
| **Fair** | 3.9- 3.0 | 3.4- 2.5 | 2.9-2.0 | 2.4- 1.5 |
| **Poor** | 2.9- 2.5 | 2.4- 2.0 | 1.0- 1.5 | 1.4- 1.0 |
| **Very Poor** | ≤ 2.4 | ≤1.9 | ≤1.4 | ≤ 0.9 |

TABLE 6.2.3: DISTRICT METHOD ROUGHNESS INDEX THRESHOLDS

| Deficiency | Alpha Roads: Tolerated Roughness Indices | Beta Roads: Tolerated Roughness Indices | Gamma Roads: Tolerated Roughness Indices | Delta Roads: Tolerated Roughness Indices |
|---|---|---|---|---|
| **Good** | 5.00 – 3.25 | 5.00- 3.00 | 5.00-2.75 | 5.0- 2.50 |
| **Fair** | 3.24- 3.00 | 2.99- 2.75 | 2.75-2.50 | 2.49- 2.25 |
| **Poor** | 2.99- 2.75 | 2.74- 2.50 | 2.49- 2.25 | 2.24- 2.00 |
| **Very Poor** | ≤ 2.74 | ≤2.49 | ≤2.24 | ≤ 1.99 |

TABLE 6.2.4: DISTRICT METHOD RUTTING THRESHOLDS

| Deficiency | Alpha Roads: Tolerated Rutting | Beta Roads: Tolerated Rutting | Gamma Roads: Tolerated Rutting | Delta Roads: Tolerated Rutting |
|---|---|---|---|---|
| **Good** | 0.00”- 0.25” | 0.00”- 0.50” | 0.00”- 0.75” | 0.00”- 1.00” |
| **Fair** | 0.26”- 0.50” | 0.51”- 0.75” | 0.76”- 1.00” | 1.01”- 1.25” |
| **Poor** | 0.51”-0.75” | 0.76”- 1.00” | 1.01”- 1.25” | 1.26”- 1.50” |
| **Very Poor** | >0.75” | >1.00” | >1.25” | >1.50” |

# 7.0 CONDITION OF THE ITD-JURISDICTION PAVEMENT IN IDAHO

The following section details the findings for ITD-Jurisdiction pavement in Idaho for 2010 and previous years. In 2010, **16%** of the state-jurisdiction roads were considered deficient.

## 7.1 PAVED LANE MILEAGE INFORMATION FOR 2010

The official paved lane mileage for the State Highway System as of February 1st, 2011 (according to MACS-ROSE) was **12,028.58**.

The paved lane mileage by district is presented in Table 7.1.

### TABLE 7.1: PAVED LANE MILEAGE PER DISTRICT, IDAHO STATE HIGHWAY

| District | Paved Lane Mileage (as of January 11, 2011) | Unpaved Lane Mileage (as of January 11, 2011) |
|---|---|---|
| **1** | 1,479.180 | 0 |
| **2** | 1,467.182 | 31.648 |
| **3** | 2,586.250 | 0 |
| **4** | 2,340.610 | 0 |
| **5** | 1,853.710 | 0 |
| **6** | 2,301.652 | 18.568 |
| **Total** | 12,028.580 | 50.216 |

*Lane Mileage is from MACS-ROSE and is a snapshot from February 1, 2011.*

## 7.2 DEFICIENT LANE MILES: HISTORICALLY AND NOW

Here, the past three years of deficiency, in both lane mileage and percentage, will be displayed in tabular form. 2010 numbers are as of November 2010.

### TABLE 7.2: DEFICIENT LANE MILES, IDAHO STATE HIGHWAY

| | DEFICIENT LANE MILES | | | % DEFICIENT | | |
|---|---|---|---|---|---|---|
| **District** | **2008** | **2009** | **2010** | **2008** | **2009** | **2010** |
| **1** | 224 | 195 | 206 | 15% | 13% | 14% |
| **2** | 247 | 274 | 234 | 17% | 19% | 16% |
| **3** | 544 | 503 | 401 | 21% | 20% | 16% |
| **4** | 652 | 615 | 477 | 28% | 27% | 22% |
| **5** | 289 | 260 | 265 | 16% | 14% | 15% |
| **6** | 389 | 263 | 340 | 17% | 11% | 14% |
| **TOTAL** | 2343 | 2110 | 1923 | 20% | 18% | 16% |

## 7.3 STATEWIDE PAVEMENT CONDITION, MAINTENANCE HISTORY, AND REHABILITATION HISTORY

The following section shows 2010 pavement condition (Figures 7.3.1 through 7.3.3). Remember that "deficient" includes poor and very poor pavement condition.

### FIGURE 7.3.1: STATEWIDE PAVEMENT CONDITION, 1992 TO 2010

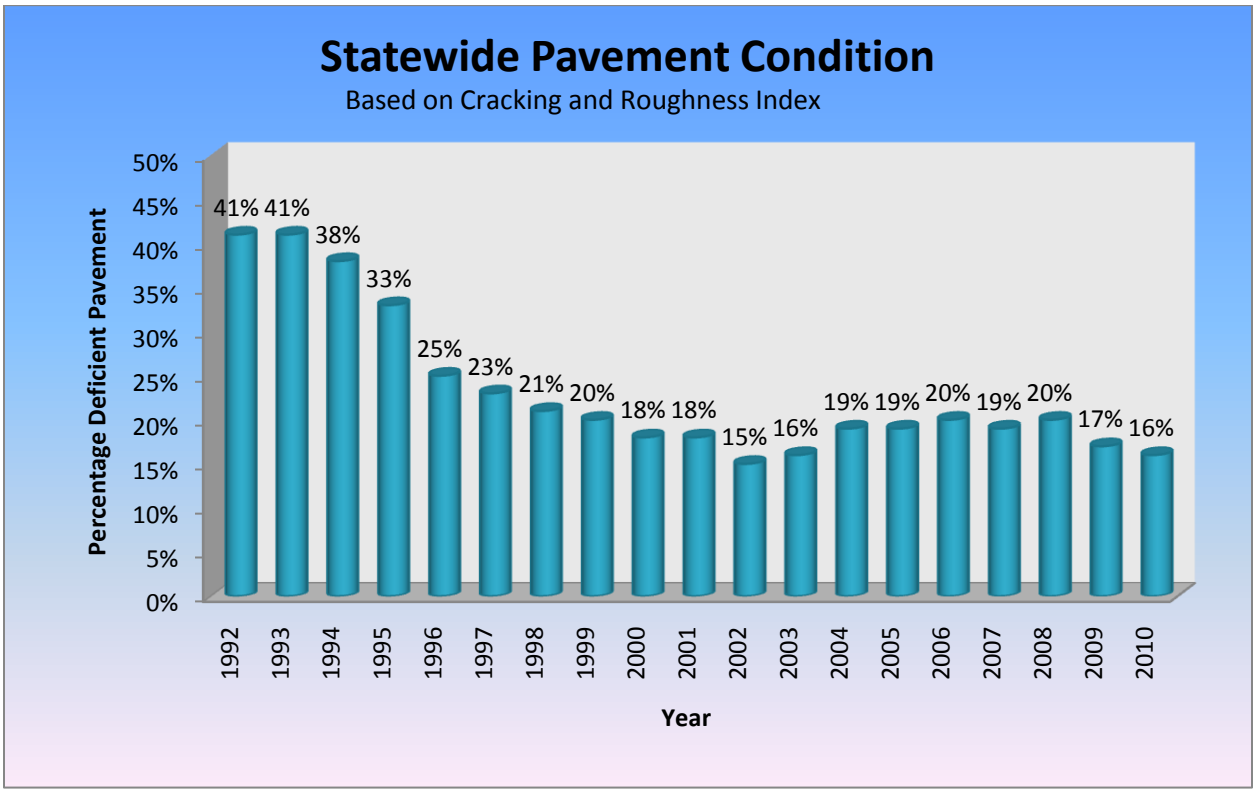


FIGURE 7.3.2: 2010 STATEWIDE PAVEMENT CONDITION, PIE CHART

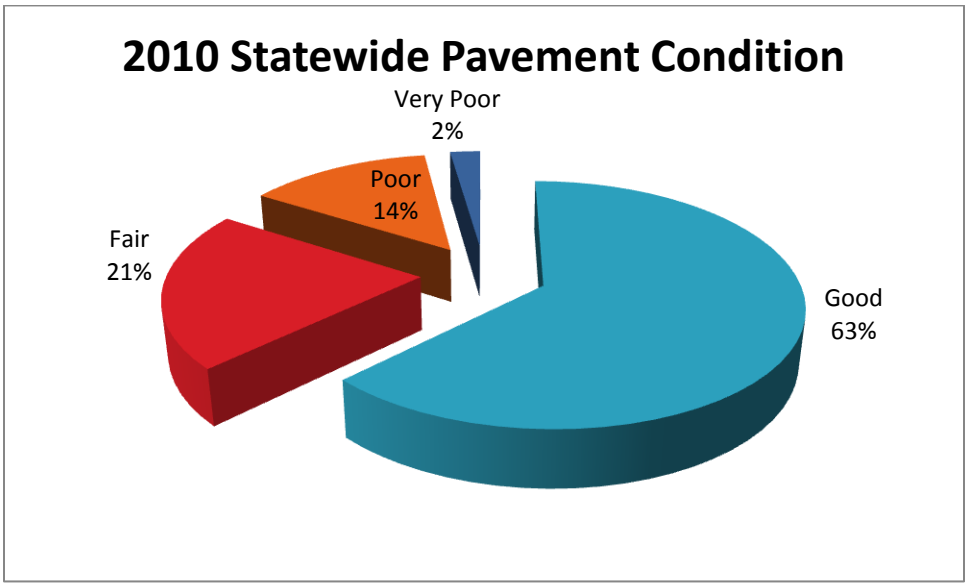
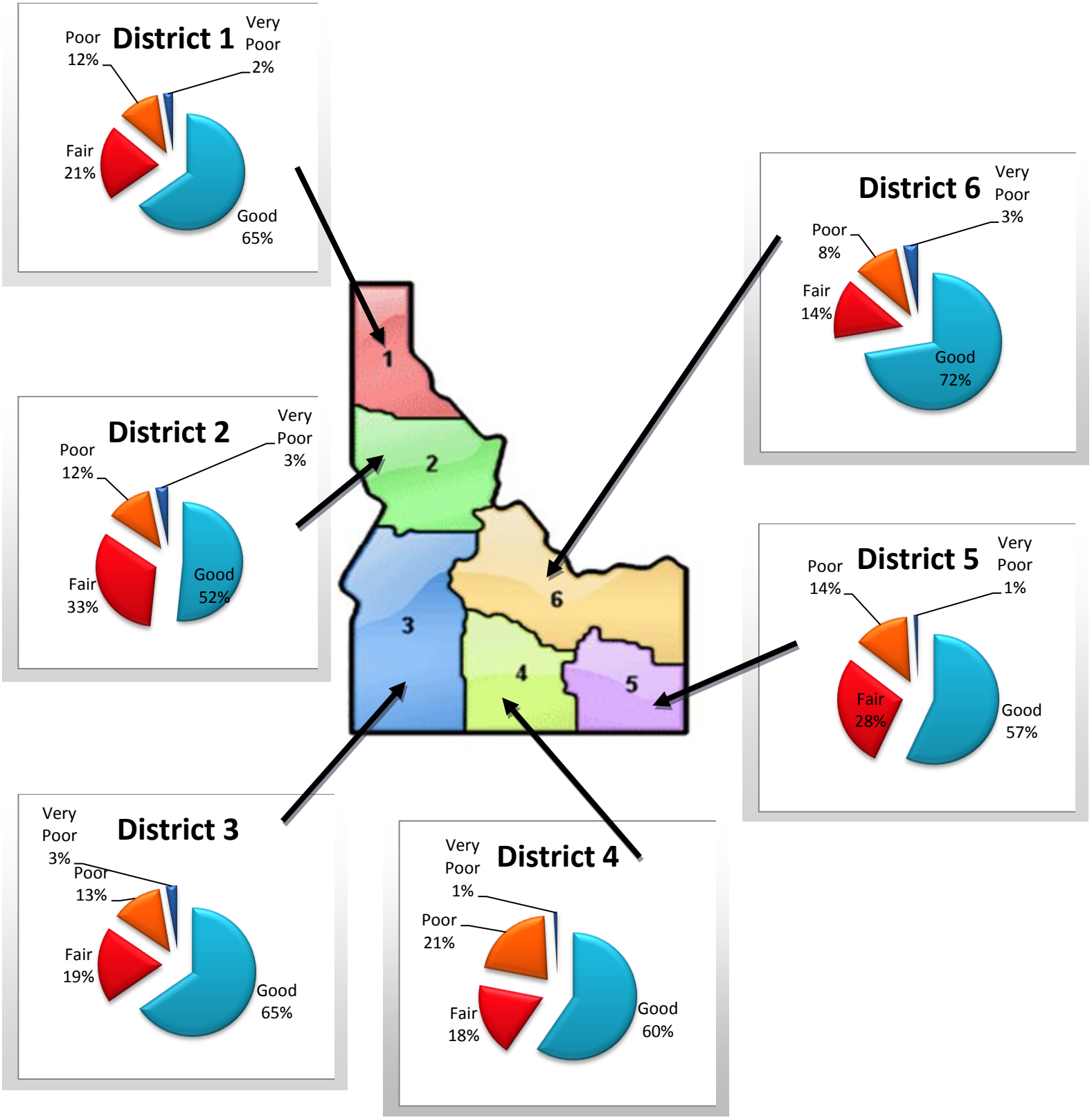


FIGURE 7.3.3: 2010 PAVEMENT CONDITION BY DISTRICT



# 8.0 BUDGETS AND FINANCES

Much of Idaho's transportation funding is tracked by the Statewide Transportation Improvement Program (STIP). The purpose of the STIP is to provide for a fiscally sound, set (1-5 years) capital improvement plan for the state's surface transportation program. The STIP is a fully integrated transportation planning process for transportation planning and transportation project selection. The STIP is updated annually and follows this planning cycle closely to ensure that projects are identified, selected, and prioritized.

ITD project selection operates under a federal fiscal year (October 1 — September 30) and the STIP must be approved by the Federal Highway Administrative (FHWA) and Federal Transit Administration (FTA) and the Environmental Protection Agency (EPA). This multi-year and multi-modal program identifies the transportation projects that have been through an inclusive and ongoing public involvement process. A more detailed explanation of the STIP can be found at:

http://itd.idaho.gov/planning/stip/index.htm