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Indiana Department of Transportation
TRANSPORTATION ASSET MANAGEMENT PLAN
April 2018

Images from the top:
- Damage to Rockville Road Bridge over I-465 in Indianapolis
- Paving train working along Indiana 65 in Clark County
- Construction of added travel lanes during I-65 Major Moves 2020 project in Tippecanoe County
- (Cover) Lewis & Clark Bridge over the Ohio River, on Indiana 265 near Utica
The Indiana Department of Transportation (INDOT) has developed a strategic, systematic, and disciplined business process for operating, maintaining, and improving physical assets. This process focuses on engineering and economic analysis based on quality information. It identifies a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement of infrastructure. The goal is to achieve and sustain a desired state of good repair over the life cycle of the assets at a practical cost.

This initial Transportation Asset Management Plan (TAMP) outlines INDOT’s asset management policies and practices.

Approval:
I do fully approve INDOT’s initial Transportation Asset Management Plan

Joe McGuinness, Commissioner
April 30, 2018
Overview of the TAMP

The Indiana Department of Transportation (INDOT) is responsible for managing the state’s transportation assets, including bridges and roads. INDOT has set both short term and long term bridge and pavement condition targets. In order to meet the long term targets, INDOT will need to continue to plan, budget, and adjust projects on the state’s bridges and roads to reach these standards.

The state’s Next Level Indiana legislation, championed by Governor Eric Holcomb and passed in April 2017, provides the funding needed for INDOT to improve the conditions of its bridges and roads over the next 20 years. The 20-year Next Level Indiana plan will support steady and consistent improvement in bridge and pavement quality, improve safety along the transportation system, and increase mobility as INDOT invests in projects to ease congestion, eliminate delays, and foster economic growth. The 20-year plan will fully fund the asset management plan for bridges and roads maintained by INDOT.

This Transportation Asset Management Plan (TAMP) is a management tool that brings together all related business processes, as well as internal and external stakeholders, to achieve a common understanding and commitment to improve the state’s bridges and roads over the next 10 years.
What is a Transportation Asset Management Plan?

The Indiana Department of Transportation (INDOT) is responsible for managing the state’s transportation assets, including bridges and roads. INDOT has developed both short and long term targets to improve bridge and pavement conditions. The state’s Next Level Indiana legislation, championed by Governor Eric Holcomb and passed in April 2017, provides the funding needed for INDOT to improve the long term conditions of its bridges and roads over the next 20 years.

This Transportation Asset Management Plan (TAMP) is a management tool that brings together all related business processes, as well as internal and external stakeholders, to achieve a common understanding and commitment to improve the state’s bridges and roads over the next 10 years. The TAMP describes INDOT’s current asset management practices and identifies planned enhancements. The TAMP also describes existing conditions of the transportation network and provides a 10 year plan for managing the state highway system, including goals, performance targets, funding levels, and investment strategies.

INDOT’s asset management program provides a framework for making decisions that will optimize, sustain, and modernize infrastructure performance. INDOT collects and synthesizes information about its facilities to help it make rational and well-informed investment decisions. In addition, INDOT has recently linked its asset management system with its capital programming process, resulting in a new Asset Management/Capital Program Management process that includes: needs identification, ranking, selection, and project portfolio development.

INDOT has established the following core principles for transportation asset management:

- **Asset management is policy-driven.** INDOT decides how to allocate resources based on a well-defined set of goals and objectives.
- **Asset management is performance based.** INDOT translates its policy objectives into performance measures that support day-to-day and strategic management.
- **Asset management involves analysis of options and trade-offs.** INDOT analyzes the impact that different funding allocations will have on system performance to support decisions regarding how to allocate funds within and across different types of investments.
- **Asset management relies on quality information.** INDOT has processes in place to collect and manage accurate and complete asset data.
- **Asset management provides clear accountability and feedback.** INDOT monitors and reports performance results to identify their impact and the effectiveness of the National Highway System (NHS) in providing safe and efficient movement of people and goods.
Why develop a TAMP?

Transportation asset management is a strategic, systematic, and disciplined business process for operating, maintaining, and improving physical assets. Management decisions incorporate engineering and economic analyses that draw from the best available data. These analyses ultimately produce a structured plan for prioritizing infrastructure maintenance, preservation, repair, rehabilitation, and replacement actions that meet short- and long-term goals at a practical life cycle cost.

The U.S. Congress passed the Moving Ahead for Progress in the 21st Century (MAP-21) transportation bill in July 2012. MAP-21 requires every state department of transportation (DOT) to develop a risk-based TAMP. The Federal Highway Administration (FHWA) issued a final TAMP rule in the Federal Register on October 2016 to establish guidelines for state DOTs to develop TAMPs. INDOT’s TAMP meets the requirements outlined in MAP-21 and the Federal Register.

This TAMP describes management and decision-making processes for INDOT’s bridge and pavement assets. Bridge and pavement preservation activities aim to prevent, delay, or mitigate deterioration. In addition, this document discusses the activities performed by a private concessionaire to maintain the Indiana Toll Road (ITR).

INDOT’s TAMP helps to answer questions such as:
• What is the current state of INDOT’s physical assets?
• What are the required levels of service and performance delivery?
• What are the best investment strategies for operations, maintenance, replacements, and improvement?
• What is the best long-term funding strategy?
• What are our risks, and how do we manage them?
• How are we doing?

Overall, the TAMP discusses INDOT’s progress toward the following:
• Achieving and sustaining a desired state of good repair
• Improving or preserving asset condition and the performance of the NHS relating to physical assets
• Achieving INDOT’s targets for asset condition and performance of the NHS in accordance with 23 United States Code (U.S.C.) 150(d)
• Achieving the national goals identified in 23 U.S.C. 150(b)

In conjunction with developing the TAMP, INDOT must establish 2-year and 4-year targets for the following performance measures:
• Percent of deck area of NHS bridges classified in good condition
• Percent of deck area of NHS bridges classified in poor condition

The minimum threshold for Interstate pavement condition is the level set by USDOT. No more than 5.0 percent of Interstate lane-miles of pavements in Poor condition OR missing, invalid, or unresolved data.

INDOT must also establish 2-year targets for non-Interstate NHS pavements and 4-year targets for all NHS pavements for the following performance measures:
• Percent of Interstate pavements in good condition
• Percent of Interstate pavements in poor condition
• Percent of non-Interstate NHS pavements in good condition
• Percent of non-Interstate NHS pavements in poor condition

For NHS bridges, the minimum threshold for condition is to have no more than 10 percent of total NHS bridge deck area on structurally deficient bridges.

This document serves as an initial TAMP. During the development process for the initial TAMP, INDOT has identified the following activities that will be addressed in the final TAMP:
• Facilitating coordination with metropolitan and rural planning organizations through monthly working group meetings with INDOT
• Linking asset management with planning documents and activities by including asset management leadership in planning discussions
• Assessing detailed and explicit risks related to the asset management program by conducting risk workshops and developing a detailed risk register
• Providing transparency related to asset management policies and strategies in support of economic development, sustainability, and performance initiatives by updating the asset management page of INDOT’s public website with relevant asset management information
• Performing risk-based, trade-off analyses within and among selected asset types by developing the risk register and improving coordination among asset management teams
• Identifying lower cost strategies for managing assets through their life by utilizing life cycle cost analysis tools
• Defining performance targets and comparing them against current conditions through joint meetings between the PMG and asset management leadership
• Developing investment scenarios by performing life cycle analysis of assets

1 These goals include improving safety conditions on all public roads, maintaining infrastructure in a state of good repair, reducing congestion on the NHS, improving efficiency of the transportation system, improving accessibility of trade markets and supporting regional economic development, protecting and enhancing the environment, and reducing delays associated with project completion.
What is in this TAMP?

INDOT’s TAMP represents a way of doing business. When used effectively, the TAMP will assist INDOT in preventing major problems, prolonging the life of Indiana’s most critical assets, planning for future replacements, and minimizing the long-term costs of ownership.

This TAMP addresses all INDOT bridges and pavements, the ITR, border bridges, and the bridges and pavements maintained by local agencies on the NHS.

The TAMP is organized as follows:

- Section 2 describes how INDOT manages its bridges.
- Section 3 explains how INDOT manages its pavements.
- Section 4 discusses how the ITR is managed.
- Section 5 provides a financial plan for funding INDOT’s bridges and pavement over the next 10 to 20 years.3
- Section 6 addresses the risks associated with asset management.
- Section 7 describes how INDOT will identify opportunities to improve its asset management practices.

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2 Border bridges are bridges that enter into a bordering state. INDOT shares a portion of the cost for maintenance and preservation of the border bridges.
3 The TAMP includes funding levels for the next 10 years based on the 20-year funding outlined in Indiana’s Next Level Roads initiative from House Enabled Act 1002.
Who is involved in developing and updating the TAMP?

INDOT has two groups involved in developing and updating the TAMP: (1) the Program Management Group (PMG); and (2) the Asset Management Teams.

The PMG is supported by the Executive Funds Team and the Commissioner of INDOT. The PMG consists of senior managers and technical leaders who oversee the Asset Management Teams. The PMG meets regularly to review proposed changes and quarterly to discuss issues in asset management. The PMG provides overall guidance on development of all program prioritized project lists, and evaluates the performance of assets in relation to available funding. The PMG aims to:

- Promote asset management
- Influence change within INDOT’s culture
- Establish performance standards and metrics
- Approve business rules
- Review the INDOT 5-Year Construction Plan and report on:
  - Key performance indicators (KPIs)
  - Trade-off/cross asset analysis
  - State of asset management
  - Contingency offset plans
  - Change management and re-prioritization
- Research and benchmark best practices
- Oversee the development of the TAMP
- Conduct gap analysis at the agency-level
- Report to front office on special topics
- Answer questions on funding and effects on KPIs
- Balance capital and preservation funding levels
- Recommend changes to the program, as required

In coordination with PMG, Asset Management Teams consider issues related to traffic mobility, roadway/pavement, bridge, and traffic safety. Each team consists of a committee chair, vice-chair, and systems assessment or district representatives from each district. The teams meet every month to:

- Evaluate the merit of proposed projects
- Perform quality assurance on proposed projects
- Ensure that all proposed projects report accurate data
- Develop scoring systems to prioritize projects
- Establish statewide project rankings

Specific activities of each team are as follows:

- **Traffic Mobility Team**: makes recommendations on project priorities; reports on asset financials; serves as a change management reviewer to ensure that projects in development meet their purpose and need; and provides overall program fiscal management.
- **Roadway/Pavement Team**: assesses, scores, and prioritizes the merit of pavement-related candidate projects functioning to preserve or modernize road geometrics and pavement.
- **Bridge Team**: makes judgment on bridge priorities to maintain and enhance/modernize existing bridges and small structures.
- **Traffic Safety Team**: assesses, prioritizes, and makes recommendations for funding of infrastructure and non-infrastructure projects to improve safety performance on INDOT roads.
INDOT uses several planning documents and initiatives to help make decisions about transportation funding and asset management. This TAMP aligns with the Next Level Indiana legislation and governs the decisions that result in development of the INDOT 5-Year Construction Plan, and the State Transportation Improvement Program.

These planning documents and initiatives are linked as follows:

- Indiana General Assembly passed House Enabled Act 1002, also known as Next Level Indiana. The legislation funds preservation and construction projects for Indiana’s transportation system over the next 20 years.
- The legislation provides the basis for the financial plan outlined in the TAMP (see Section 5).
- The 20+ Year Long Range Transportation Plan and Multimodal Freight and Mobility Plan set out INDOT’s long-term objectives. INDOT’s long-term objectives provide guidance for the overall development of the TAMP.
- The TAMP describes the responsibilities of the Asset Management Teams that develop the bridge and pavement business rules.
- The business rules define the decision-making process used to develop the INDOT 5-Year Construction Plan.
- The INDOT 5-Year Construction Plan provides the foundation for projects included in the State Transportation Improvement Program.
How does INDOT incorporate the Metropolitan Planning Organizations in the TAMP process?

Good transportation asset management is a continuously improving process and starts with proper coordination.

INDOT has developed the initial TAMP in cooperation with our 14 Metropolitan Planning Organization (MPO) partners. Each month the representatives from the 14 MPOs, which make up the MPO Council, meet in Indianapolis to discuss transportation and planning issues affecting their areas. INDOT collaborates with the MPOs through a series of monthly working group meetings that take place either after each MPO Council meeting or via web conference. The meetings were set up to discuss INDOT’s system assessment tools and capabilities, refinements to our NHS to reduce non-state owned roadway assets, data, work flow processes, goals, and target setting for bridge and pavement assets.

Federal regulations allow MPOs to establish their own condition targets for pavements and bridges. MPOs are given six months for the establishment of state condition targets to complete the necessary analysis and provide documentation to INDOT. INDOT has discussed this opportunity with our MPO partners.

The key to good transportation asset management is strengthening regional and state coordination; increasing transparency of information sharing; and addressing the need for better data, software tools, and reporting. INDOT will continue to coordinate with our MPO partners through routine semi-annual meetings during the spring and fall seasons. These meetings will be used to cover bridge and pavement system assessment impact analysis, gather feedback into funding tradeoff decisions, discuss performance gaps, successes, agree upon any adjustments to performance targets, discuss and document refinements to business rules/processes, weigh in on major changes to TIPs/STIP; and to allow for MPO feedback for continuous improvement.

INDOT is also implementing new STIP and TIP tracking software to automate data exchanges between INDOT and MPOs; to ensure decisions and program changes are properly coordinated; and to ensure reporting consistency for INDOT and all 14-MPOs.
Introduction

What is the timeframe for TAMP development?

This initial TAMP includes the performance measures for bridge and pavement conditions established under 23 Code of Federal Regulations (CFR) Part 490.

FHWA will review this initial TAMP using the following two-step process:

1. FHWA will decide whether the processes INDOT used for developing this TAMP meet applicable requirements. This is referred to as a process certification decision and is determined based on the TAMP development methodologies described in the initial TAMP.
2. FHWA will review how the initial TAMP aligns with regulatory requirements and will provide feedback to INDOT.

After INDOT receives feedback from FHWA, INDOT will prepare and submit a final TAMP to FHWA by June 30, 2019.

INDOT will update its TAMP development processes continually by preparing a new TAMP every four years.

Construction of added travel lanes during I-65 Major Moves 2020 project in Tippecanoe County
How many bridges does INDOT own and maintain?

INDOT owns and maintains 5,747 bridges in the state of Indiana (see Table 1). There are an additional 268 bridges in Indiana on the NHS, including ITR bridges, bridges led by other state agencies, local bridges, and one privately owned bridge (see Table 2). Every month, the owners of Indiana’s other 268 bridges update inventory and condition data in the Bridge Inspection Application System (BIAS) for the bridges that were inspected during that month. Further details regarding the inspection schedule are outlined in the next section.

BIAS creates and maintains a current and complete inventory of all NHS bridges regardless of ownership, in addition to non-NHS bridges owned by INDOT. During the project selection process, all inventory and condition data contained in BIAS is field verified for accuracy to ensure the best available data are used. Field verification provides INDOT with the opportunity to ensure consistency in data collection and to identify issues with the data collection process. If INDOT identifies issues, staff is retrained as necessary.

4 BIAS is the software system that stores inventory, condition, and inspection schedule information on bridges.
5 Border bridges are bridges that enter into a bordering state. INDOT shares a portion of the cost for maintenance and preservation of the border bridges. A special agreement typically determines the lead owner of each bridge.

Table 1: Bridge Inventory, Owned by INDOT

<table>
<thead>
<tr>
<th>Highway System</th>
<th>Number of Bridges</th>
<th>Deck Area (Square Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate NHS</td>
<td>1,427</td>
<td>18,318,566</td>
</tr>
<tr>
<td>Non-Interstate NHS</td>
<td>1,326</td>
<td>12,654,093</td>
</tr>
<tr>
<td>Non-NHS</td>
<td>2,969</td>
<td>20,969,024</td>
</tr>
<tr>
<td>Border Bridges5</td>
<td>25*</td>
<td>3,294,283</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,747</strong></td>
<td><strong>55,235,966</strong></td>
</tr>
</tbody>
</table>

*INDOT is the lead state for 18 border bridges. Other states are the lead for the seven other border bridges.

Table 2: Bridge Inventory, NHS Bridges Owned by Others

<table>
<thead>
<tr>
<th>Highway System</th>
<th>Number of Bridges</th>
<th>Deck Area (Square Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indiana Toll Road</td>
<td>241</td>
<td>3,208,207</td>
</tr>
<tr>
<td>Other State Agencies</td>
<td>13</td>
<td>157,540</td>
</tr>
<tr>
<td>Local</td>
<td>13</td>
<td>128,331</td>
</tr>
<tr>
<td>Private</td>
<td>1</td>
<td>17,441</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>268</strong></td>
<td><strong>3,511,519</strong></td>
</tr>
</tbody>
</table>
How does INDOT assess the condition of its bridges?

INDOT uses the bridge rating scale from the FHWA Recording and Coding Guide for the structure and Appraisal of the Nation’s Bridges (Coding Guide) to determine the condition of the bridge. The inspection team rates the deck, superstructure, and substructure of the bridge (see Figure 1) from 0 (failed) to 9 (excellent), as shown in Table 3. Bridges are inspected by inspection crews every 24 months (or 48 months if approved by FHWA). If a bridge is determined to be in critical condition, inspections may take place annually or more frequently depending upon the condition. Bridges owned by other entities are inspected on the same schedule. INDOT owns the inspection contract for those bridges.

These ratings are consistent with the national performance management measures from 23 CFR Part 490 Subpart D regarding bridge condition. According to the national performance management measures, a structurally deficient bridge or culvert is one with any component condition rating less than or equal to 4. State DOTs are accountable for ensuring that no more than 10 percent of the deck area of their NHS bridges, including on- and off-ramps connected to the NHS, is classified as structurally deficient in a given year.

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**Table 3: Condition Ratings (Deck, Superstructure, and Substructure)**

- **9** – Excellent
- **8** – Very Good
- **7** – Good
- **6** – Satisfactory
- **5** – Fair
- **4** – Poor
- **3** – Serious
- **2** – Critical
- **1** – Imminent Failure
- **0** – Failed

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**Figure 1: Bridge Components**

[Image of Bridge Components]

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6 INDOT, Proposed Key Performance Indicator, September 2016.
What are the current conditions of INDOT’s bridges?

INDOT assesses the condition of bridges in the following categories: Interstate NHS, non-Interstate NHS, non-NHS, all INDOT roads, and border bridges. Figure 2 shows the condition of INDOT’s bridges. Overall, 97 percent of INDOT’s bridges were in fair or better condition in 2017.

Over the past 10 years, INDOT’s bridges have remained in a consistently well-maintained condition. The largest improvement in condition lies with the border bridges, which have seen significant improvement in condition since 2014, from 71 percent in fair or better condition to a full 100 percent in fair or better condition.

Footnote:

7 All INDOT roads includes interstate on the NHS, non-Interstate NHS, and non-NHS.

* The condition ratings for 2007 to 2017 were developed using INDOT’s system which is based on the condition of bridge elements (deck, superstructure, substructure). Starting in 2018, INDOT is transitioning to the FHWA bridge condition ratings system based on condition by deck area percentage. Using the FHWA system, 97.3 percent of INDOT’s bridges are in fair or better condition in 2018.
How do current bridge conditions compare to INDOT’s targets?

INDOT evaluates the current condition of its assets against the condition targets it sets to determine if any performance gaps exist. INDOT maintains two steps for adopting condition measures and targets:

1. Planning processes that include a formal public comment period; and
2. An internal review and approval by the PMG. When adopting or modifying condition measures and targets, INDOT carefully considers existing commitments, relative priorities, and trade-offs among all resources.

During the planning process, INDOT determined that different condition targets for urban and rural bridges are not appropriate.

After completing the process, INDOT set a condition target of 96.1 percent of its bridges in fair or better condition by 2028. This target is based on the NHS established in 2018 and may change as INDOT updates the NHS routes. INDOT’s bridges are not currently meeting the condition target. However, with the preservation funding outlined in Section 5 of the TAMP, INDOT anticipates that it will meet the condition target for bridges. INDOT’s bridges are considered to be in a state of good repair when the condition target is met.

Lewis & Clark Bridge over the Ohio River, on Indiana 265 near Utica

8 Condition measures are the metric used to establish targets and to assess progress toward achieving the established targets.
How does INDOT consider bridge life-cycle costs?

The Bridge Management Unit within the Engineering and Asset Management Division at INDOT is responsible for developing and implementing a management system for all INDOT-owned bridges and locally owned NHS bridges. INDOT uses the Deighton Total Infrastructure Management System (dTIMS) software to perform life cycle cost analyses of its assets. In accordance with 23 CFR 515.17, the dTIMS software collects, processes, and stores condition and inventory data from BIAS to forecast expected deterioration for each asset. INDOT has excluded Department of Natural Resources bridges, pedestrian bridges, and muck trestle bridges because these are not on the NHS nor on state highway routes.

The deterioration forecast identifies future performance gaps that may arise compared with INDOT’s set condition targets for the assets. Based on these gaps, the dTIMS software determines alternative treatment strategies to improve the future condition of the asset in order to achieve the condition target. Since INDOT considers its bridges to be in a state of good repair when the condition targets are met, the treatments identified by dTIMS reflect deficiencies that hinder progress toward achieving a desired state of good repair.

INDOT inputs information into the dTIMS software that allows the analysis to take place; such information includes approved condition targets for each asset type, and decision trees that determine which treatment strategies apply to different types and levels of deterioration, and the variables that INDOT uses to determine the condition of the asset.

With this information stored in the system, dTIMS evaluates treatment strategies by year over the life cycle of the asset to determine which treatment strategy should be applied to a given asset and in what year the treatment strategy should be applied. The software determines an initial treatment strategy and then resets the affected analysis variables for the asset to determine if a subsequent treatment strategy is recommended in the future. The initial treatment strategy determines the needs for the short-term and the subsequent treatment strategy determines the long-term needs.

Once all assets in the system have been analyzed, the software calculates the costs and benefits of the strategies to evaluate alternative treatment plans. The costs for treatments are based on historical costs of similar treatments from the previous 4 years. Unit costs, as provided in Table 4, are verified and updated annually based on historical expenditures.

The purpose of the life cycle cost analysis process is to minimize life cycle costs while achieving condition targets. In order to do this, the dTIMS software...
recommends the most cost-effective strategies based on a budget scenario defined by INDOT. The result is an optimized list of recommended projects, along with the recommended schedule for performing the treatments, which are constrained to the input budget scenario. Based on an analysis of funding needs performed prior to the TAMP development, INDOT has determined that it is fully funded for preservation activities. This determination is dependent upon actual revenue meeting forecasted levels as discussed in the Risk Management section.

Bridge engineers with local knowledge of the assets approve, reject, and, if needed, add to the projects recommended by the dTIMS analysis. The software is limited to providing recommendations based on the condition data, so the engineers provide additional knowledge of the performance of the assets not addressed by the conditions.

The engineers spend the majority of their time in the field collecting information on the assets, so they are aware of any safety, congestion, reliability, or other issues with the assets that are not reflected in the condition data analyzed by the dTIMS software.

Additionally, based on the engineer’s assessment of the dTIMS output, the engineer can suggest updates to the formulas used to analyze future performance gaps. For instance, if dTIMS suggests a superstructure replacement for a bridge in 3 years, but the engineer believes such a treatment is better-suited for 5 years, the dTIMS formula can be readjusted to better predict asset treatment needs.

The recommended projects are then scored as described in the bridge business rules presented in the next section. Once scored, the projects are analyzed again to determine the effect of the projects on the condition of the roadway.

INDOT is developing life cycle plans that span at least 25 years for all bridges within its inventory. An example of this analysis is presented in Figure 3, which shows a scenario for a single bridge that involves deck preservation activities in 2016 and 2031 at a total cost of $2.2 million. The condition of the bridge would improve as a result of the preservation activities. The alternative scenario is the cost of replacing the entire bridge in 2040 if no preservation activities are performed. This cost is $4 million, considerably more than the preservation scenario.

9 dTIMS software is commercially available software that performs life cycle cost analysis for asset management. The software has multiple modules. INDOT uses the bridge module to serve as the bridge management system (BMS).

10 Minimum standards for developing and operating bridge and pavement management systems.

11 Potential treatment strategies include deck overlay, deck replacement, and superstructure replacement, among others.
How does INDOT develop its overall bridge investment strategy?

INDOT’s Bridge Asset Management Office, which is in the Engineering and Asset Management Division, develops and analyzes bridge data to identify cost-effective projects for improving Indiana’s bridges. Inside this office, the Bridge Asset Management Team (BAMT) has developed bridge business rules that describe the methods to use when assigning scores to potential projects. The scoring system ranks the projects recommended during the life cycle planning analysis process to determine the best allocation of resources according to the scoring factors outlined in Table 5, Table 6, and Table 7. Other projects fall into the category known as exceptions to the rules, which includes projects complying with the guidelines set out in the Bridge and Culvert Preventative Maintenance Agreement (BCPMA). These projects are automatically given a 100-point score. Other exceptions to the rule include border bridges, fracture critical, special and underwater inspections, larger culvert replacements, and grade separation bridge projects, among others.

### Table 5: Bridge Rehabilitation and Major Reconstruction Scoring Factors and Weights

<table>
<thead>
<tr>
<th>Scoring Factor Number</th>
<th>Bridge Scoring Factor Description</th>
<th>Score</th>
<th>Weights (100-Point Scale)</th>
<th>Maximum Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Condition</td>
<td>0–10</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>#2</td>
<td>Cost-Effectiveness</td>
<td>0–10</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>#3</td>
<td>Functional Classification Priority</td>
<td>0–10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>#4</td>
<td>AADT* Impacts</td>
<td>0–10</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

**Subtotal** 100

| Supplementary Factor | Earmarks, Other Contributions | 0–5     | 7                      | 35                     |

**Grand Total** 135

* AADT = annual average daily traffic

### Table 6: Large Culvert Scoring Factors and Weights

<table>
<thead>
<tr>
<th>Scoring Factor Number</th>
<th>Bridge Scoring Factor Description</th>
<th>Score</th>
<th>Weights (100-Point Scale)</th>
<th>Maximum Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Overall Culvert Condition</td>
<td>0–10</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>#2</td>
<td>Cost-Effectiveness</td>
<td>0–10</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>#3</td>
<td>Functional Classification Priority</td>
<td>0–10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>#4</td>
<td>AADT* Impacts</td>
<td>0–10</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

**Subtotal** 100

| Supplementary Factor | Earmarks, Other Contributions | 0–5     | 7                      | 35                     |

**Grand Total** 135

* AADT = annual average daily traffic

### Table 7: Maintenance and Preservation Project Scoring System

<table>
<thead>
<tr>
<th>Scoring Factor Number</th>
<th>Bridge Scoring Factor Description</th>
<th>Score</th>
<th>Weights (100-Point Scale)</th>
<th>Maximum Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Project Meeting (BCPMA*) Condition</td>
<td>0–5</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

**Total** 100

*BCPMA = Bridge and Culvert Preservation Maintenance Agreement

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13 Projects that involve preservation and maintenance activities.
How are projects prioritized?

INDOT’s goal is to implement a strategic, long-term program of identifying, programming, budgeting, and completing bridge and culvert preservation projects to improve the statewide condition of these assets at the lowest possible cost to taxpayers.

Based on the type of work and the required time to develop a proposed project, INDOT has three different programs for bridges and large culverts:14

1. **Long-Term Call Program:** The projects proposed for this program normally involve bridge replacement and major bridge component rehabilitation and reconstruction. The development time for this program is 5 to 7 years.

2. **Short-Term Placeholder Program:** The projects proposed for this program are projects that typically do not require right-of-way or railroad permits, or utility relocation, but may require some environmental permits. They typically involve work types such as deck overlays, deck replacements, bridge painting, and culvert lining. The development time for this program is typically 2 to 3 years.

3. **Bridge and Culvert Preventive Maintenance Agreement (BCPMA) Program:** The projects involved in this program involve primarily preservation and preventive maintenance activities such as deck patching, joint replacement, thin deck overlay, scour protection, railing repair, and culvert repair. The development time for this program is typically 18 to 24 months.

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14 Culverts are tunnel-like structures that allow running water to pass under a roadway or railway.
What are the steps to determining project priorities?

The Long-Term Call and Short-Term Placeholder Programs involve the following steps, culminating in funding for the overall program:

1. The INDOT Central Office BAMT analyzes the entire INDOT network of bridges with its BMS software for a set funding level. The software produces a summary of recommended projects based on benefit-cost ratios.

2. The list of projects is provided to the six INDOT District Bridge Asset Engineers (BAE) for review.

3. The BAEs review the recommended lists with District personnel to develop a final list of proposed structures and treatments based on the recommendations of the software, local knowledge of bridge performance, and engineering judgment.

4. The BAEs use the bridge and culvert scoring systems shown previously in Table 4, Table 5, and Table 6 to rank each of the proposed projects on their list and provide this prioritized list to the Central Office BAMT along with estimated costs and project scopes.

5. The Central Office BAMT compiles the individual District lists and determines whether information is missing, projects are duplicated, or clarification is needed.

6. The Central Office BAMT, including the BAE, gathers to discuss the proposed projects and to confirm or modify the provided scores. 

7. After deliberations, the Central Office BAMT provides the final prioritized list of proposed projects with “Team Adjusted Score” to the PMG and Executive Funds Team (EFT) for their review.

8. The PMG, with input from the Central Office BAMT, determines which projects in order of ranking are able to be completed based on the cost of the project and the available funding. The PMG then submits the list to an oversight committee made up of senior INDOT personnel and economists, known as the Project Prioritization System committee. The committee then analyzes the entire program for final approval using the following variables:
   a. Safety
   b. Congestion
   c. Environment sustainability
   d. System reliability
   e. Regional and state economic vitality
   f. Potential intermodal connectivity
   g. Total cost of ownership

9. By considering these variables during the project prioritization process, the Project Prioritization System committee ensures projects make progress toward achieving the national goals outlined in USC 150(b).

10. After final project approval, the Districts are notified to input their approved and funded projects in the Scheduling Project Management System (SPMS), where they become active projects.

The BCPMA Program follows a different process. These projects have a set yearly sum of funds available that is equally distributed to each District. Because these projects are preservation-focused, to be eligible for funding, all projects are given high priority and a 100-point score. The project must meet only candidate criteria from the 2016 INDOT BCPMA document and eligibility criteria outlined in the INDOT design manual, Chapter 412.
Each District will submit its list to the Central Office BAMT, which verifies the eligibility of the individual projects and then submits the list to the PMG for final approval. Once approved, the Districts are notified to input their approved and funded projects into SPMS.

15 If the BAE determines that the project scoring system does not account for a specific or unique situation that would lead to a higher project score, the BAE can formally discuss the case to request a vote by the BAMT for approval of a higher score.

16 The Project Prioritization System committee was created by House Enabled Act 1002 and will consist of two engineering and two economic professionals.

17 These goals include improving safety conditions on all public roads, maintaining infrastructure in a state of good repair, reducing congestion on the NHS, improving efficiency of the transportation system, improving accessibility of trade markets and supporting regional economic development, protecting and enhancing the environment, and reducing delays associated with project completion.
### How much pavement does INDOT own and maintain?

INDOT owns 11,058 miles, representing 28,600 lane-miles, of pavement in Indiana, as shown in Figure 4. The pavement on roadways owned by INDOT consists of both concrete and asphalt, as shown in Figure 5. There are 192 additional miles, representing 767 lane-miles, of NHS pavement owned by local government entities, as shown in Figure 6.

INDOT hires the Pathway Services team to conduct inspections of all NHS roads, regardless of ownership. On an annual basis, the Pathway Services team provides the condition and inventory data to INDOT. INDOT is then able to update the condition and inventory data that is stored in the Roads and Highways ESRI program. The Roads and Highways program maintains a current and complete inventory of all NHS pavement, regardless of ownership.

A quality assurance process is conducted prior to inputting the data into the Roads and Highways software. The quality assurance process ensures there are no duplicate records, ensures the sum of the segment lengths match the certified mileage for each system, re-establishes State Log and County Log measures, and identifies gaps in segmentation.

By conducting the quality assurance process, INDOT ensures it is using the best available data. INDOT also performs field verification of the data collection process. Field verification provides INDOT with the opportunity to ensure consistency in data collection and to identify issues with the data collection process. If INDOT identifies issues, staff is retrained as necessary.
How does INDOT assess the condition of its pavements?

INDOT assesses the condition of its pavement for three pavement networks: interstate NHS, non-interstate NHS, and non-NHS. INDOT collects roadway condition on all state-maintained highways on an annual basis. Data are collected on the following performance measures to determine the condition of INDOT’s pavement:

- **International Roughness Index (IRI):** the roughness of the pavement.
- **Rutting (RUT):** a depression or groove in the roadway.
- **Faulting:** displacement of pavement at joints or cracks along the roadway.
- **Cracking:** roadway distress that can lead to development of potholes.

For each performance measure, condition data are collected for six zones of evaluation including the right (RWP) and left wheel path (LWP) zones, two non-wheel path zones (NWP), outside pavement edge zone, and the outside shoulder zone of the roadway. These six zones cover the entire roadway to provide INDOT with a complete account of the condition of the roadway.

The performance measures are categorized as good, fair, and poor as outlined in Table 8. For Asphalt and Jointed Concrete Pavement (JCP), IRI, cracking, and RUT/faulting must all be rated as “good” to be considered “good” overall. For Continuously Reinforced Concrete Pavement (CRCP), both IRI and cracking must be rated as “good” to be considered “good” overall. Poor asphalt and JCP has at least 2 metrics rated as “poor,” and CRCP has both metrics rated as “poor.” All other combinations result in a “fair” condition assessment for asphalt, JCP and CRCP.

### Table 8: Pavement Condition Thresholds

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRI (inches/mile)</td>
<td>&lt;95</td>
<td>95–170</td>
<td>&gt;170</td>
</tr>
<tr>
<td>RUT (inches)</td>
<td>&lt;0.20</td>
<td>0.20–0.40</td>
<td>&gt;0.40</td>
</tr>
<tr>
<td>Faulting (inches)</td>
<td>&lt;0.10</td>
<td>0.10–0.15</td>
<td>&gt;0.15</td>
</tr>
<tr>
<td>Cracking (percent)</td>
<td>&lt;5</td>
<td>5–20 (asphalt)</td>
<td>&gt;20 (asphalt)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5–15 (JCP)</td>
<td>&gt;15 (JCP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5–10 (CRCP)</td>
<td>&gt;10 (CRCP)</td>
</tr>
</tbody>
</table>
What are the current conditions of INDOT’s pavements?

The condition of INDOT’s interstate pavement has improved slightly between 2009 and 2016 to 94 percent in fair or better condition, as shown in Figure 7. Meanwhile, the condition of the non-interstate NHS declined between 2009 and 2012, from 92 percent to 89 percent in fair or better condition, and has remained fairly steady since 2012 at 90 percent in fair or better condition. Non-NHS pavement owned by INDOT has remained at 88 percent in fair or better condition from 2009 to 2016, with a slight improvement in 2013 to 91 percent.

INDOT also breaks down the IRI measurement by the average IRI and the IRI of the RWP. IRI measures the roughness of roadway pavement in order to track how poor pavement affects roadway users. Figure 8 shows the percent of miles of all INDOT roads that are in fair or better condition based on the average IRI and the IRI RWP from 2009 to 2016.

In terms of average IRI, the conditions have improved slightly since 2009, while the conditions of IRI RWP have remained fairly constant over time.

* FHWA has a condition rating system which results in 0.8 percent of INDOT’s interstate and 3.1 percent of INDOT’s non-interstate pavement in poor condition. To better manage the pavement conditions, the State of Indiana has developed a more stringent condition rating system for pavement, the Indiana Pavement Quality Index (PQI). The PQI consists of scoring the pavement on IRI, cracking in three sections of the lane, and rutting/faulting. INDOT has determined that the PQI better reflects Indiana’s road conditions. The pavement condition values reported in the TAMP are based on the PQI rating system. Based upon the Indiana PQI scoring system INDOT interstates are currently at 4.9% poor condition, and the non-interstate NHS is at 9.4% poor.
How do current pavement conditions compare to INDOT’s targets?

INDOT has set a condition target for all pavement to determine how well pavement is being maintained. INDOT follows two steps for adopting condition measures and targets: (1) planning processes that include a formal public comment period; and (2) an internal review and approval by a designated asset management group. When adopting or modifying condition measures and targets, INDOT carefully considers existing commitments, relative priorities, and trade-offs among assets. During the planning process, INDOT determined that different condition targets for urban and rural pavement is not appropriate.

Following this process, INDOT has set a pavement condition target of 96.1 percent of its interstate NHS pavement and 93.1 percent of its non-Interstate NHS pavement in fair or better condition by 2028. This target is based on the NHS established in 2018 and may change as INDOT updates the NHS routes. INDOT’s pavement is not currently meeting the condition target. However, based on the funding levels to support asset management practices, described in Section 5 of the TAMP, INDOT anticipates meeting its condition targets. INDOT’s pavement is considered to be in a state of good repair when the condition target is met.
How does INDOT account for pavement life cycle costs?

INDOT’s Pavement and Technical Services Divisions are responsible for developing and implementing a pavement management system for INDOT’s roads. INDOT uses the dTIMS software to perform life cycle cost analyses of its assets. In accordance with 23 CFR 515.17, the dTIMS software collects, processes, and stores condition and inventory data from Roads and Highways to forecast expected deterioration of each asset given its current condition. Pavement does not exclude any subgroups when conducting life cycle cost analysis.

The deterioration forecast identifies future performance gaps that may arise compared with INDOT’s set condition targets for the assets. Based on these gaps, dTIMS determines alternative treatment strategies to improve the future condition of assets in order to achieve the condition target. Since INDOT considers its pavement to be in a state of good repair when the condition targets are met, the treatments identified by dTIMS reflect deficiencies that hinder progress toward achieving a desired state of good repair.

INDOT inputs information into the dTIMS software that allows the analysis to take place; such information includes approved condition targets for roadways, trigger rules that determine which treatment strategies apply to different types and levels of deterioration, and the variables that INDOT uses to determine the condition of the roadway.

With this information stored in the system, dTIMS evaluates treatment strategies in each year of analysis to determine which treatment strategy should be applied to a given roadway and in what year the treatment strategy should be applied. The software determines an initial treatment strategy and then resets the affected analysis variables for the roadway to determine if a subsequent treatment strategy is recommended in the future. The initial treatment strategy determines the needs for the short-term and the subsequent treatment strategy determines the long-term needs.

Once all roadways in the system have been analyzed, the software calculates the costs and benefits of the strategies to evaluate alternative treatment plans. The costs for treatments are based on historical costs of similar treatments from 2013 to 2017. Unit costs, as provided in Table 9, are verified and updated annually based on historical expenditures.

The purpose of the life cycle cost analysis process is to minimize life cycle costs while achieving condition targets. In order to do this, the dTIMS software recommends the most cost-effective strategies based on a budget scenario defined by INDOT. The result is an optimized list of recommended projects, along with the recommended schedule for performing the treatments, which are constrained to the input budget scenario. Based on an analysis of funding needs performed prior to the TAMP development, INDOT has determined

<table>
<thead>
<tr>
<th>Table 9: Unit Costs by Work Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Treatment</td>
</tr>
<tr>
<td>Thin Overlay – Rural</td>
</tr>
<tr>
<td>Thin Overlay – Urban</td>
</tr>
<tr>
<td>PM Mill and Fill (Non-Interstate, Rural)</td>
</tr>
<tr>
<td>PM Mill and Fill (Non-Interstate, Low Traffic)</td>
</tr>
</tbody>
</table>
that is fully funded for preservation activities. This determination is dependent upon actual revenue meeting forecasted levels as discussed in the Risk Management section.

Roadway engineers with local knowledge of the assets then approve or reject the recommended projects output by the dTIMS analysis. The software is limited to provide recommendations based on the condition data, so the engineers provide additional knowledge of the performance of the assets not addressed by the conditions. The engineers spend the majority of their time in the field collecting information on the assets, so they are aware of any safety, congestion, reliability, or other issues with the assets that are not reflected in the condition data analyzed by the dTIMS software.

Additionally, based on the engineer’s assessment of the dTIMS output, the engineer can suggest updates to the formulas used to analyze future performance gaps. For instance, if dTIMS suggests a structural overlay for a section of pavement in 3 years, but the engineer believes such a treatment is better-suited for 5 years, the dTIMS formula can be readjusted to better predict treatment plans. INDOT’s Roadway Asset Management Team is also continuously reviewing the system to implement updates as needed.

The recommended projects are then scored as described in the next section. Once scored, the projects are analyzed again to determine the effect of the projects on the condition of the roadway.

INDOT is developing life cycle plans for its pavement divided by sections. Figure 9 is an example of a life cycle cost analysis. In this analysis, the dTIMS software determined a mill and fill preservation project would be needed in 2018 for $1.5 million cost. Then, to improve the condition level back to the target, a structural overlay would be needed in 2028 for $10.3 million. This cost is much lower than the $120 million cost to replace the entire section of pavement in 2034.

Figure 9: Pavement Life Cycle Plan
How does INDOT develop its overall pavement investment strategies?

INDOT’s strategy for investing in maintenance and capital preservation on its roadways is to achieve an acceptable level of performance for the lowest cost while accounting for the pavement’s functionality. The Roadway Asset Team has developed pavement business rules that describe the methods for scoring the proposed projects recommended by the pavement management system.21 The scoring system ranks the projects recommended during the life cycle planning analysis process to determine the best allocation of resources.

The project scoring system uses project-level data on cost, condition, and other factors, including traffic, trucks, road class, and system. The data are assessed in the context of the following types of treatment:

- **Maintenance**: maintenance work program that consists of localized maintenance work, select preservation activities, select patching work, and chip-seals and crack sealing of the existing pavement
- **Functional**: capital program pavement preservation-placeholder level work related to the smoothness of the pavement
- **Minor Structural**: capital program pavement preservation-large capital level work related to the smoothness of the pavement and lesser-small structural improvement projects
- **Major Structural**: capital program pavement preservation-large capital level work related to significant structural improvement projects
- **Modernization**: capital program pavement preservation-large capital level work related to significant geometric and structural improvement projects

Each type of treatment is assessed up to a maximum number of points for each of the following three criteria:

- **Cost effectiveness**: total cost of the project divided by its benefits to pavement. The total cost comprises several components: project cost, area of pavement in square yards, functional and/or structural design life of the pavement, and the cost per lane mile year of service.
- **Condition**: measured by functional and structural cracking index by pavement type, IRI RWP, and traffic values. INDOT is also developing a single pavement quality index that will be inputted into the pavement management system to simplify the pavement benefit evaluation.
- **Miscellaneous factors**: RUT, network system, falling weight deflectometer, equivalent single axle load,22 coring,23 and friction values.

After the preliminary scoring, a statewide supplementary review is conducted and a candidate list is produced to evaluate and prioritize projects based on other available data concerning fiscal earmarks, other financial contributions by external means, and unique, project-specific factors in order to account for the value of the non-traditional or external revenue contributed to the project’s total cost.

Based on the score of each project, the Roadway Asset Team creates a list of projects to recommend for programming.

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21 INDOT, Roadway Asset Team Scoring Rules, July 2012.
22 Established a relationship to determine the effects of axles carrying different loads on the roadway.
23 Coring is a process to extract a sample of the pavement to assess the quality of the pavement including severity of cracking and bond quality between pavement layers.
How does INDOT determine project priorities?

INDOT uses a data-driven, judgment-informed, and financially constrained approach to project prioritization. This approach involves five steps culminating in funding for the program:

1. The initial step is for the Capital Funds Program Management (CPFM) Team to provide projections of available federal and state revenue for the 5-year capital program.

2. The PMG divides the anticipated budget, based on analysis of needs from the pavement management system, among the Asset Management Teams based on the needs of the network. The Roadway Asset Team is able to build a capital program for the 3-year and 5-year call for project programs (placeholder and large capital).

3. The Roadway Asset Team runs the pavement management system to develop a list of candidate projects. The list of projects from the management system is exported into a scoping application for Roadway Asset Team members to evaluate the projects for purpose and need, and to provide concurrence or feedback.

4. Project proposals are reviewed and submitted to statewide deliberation in which the following occurs:
   a. Asset Management Teams, including both Central Office and district representation, review project proposals. Asset Management Teams produce a recommended prioritized list of statewide projects.
      i. PMG creates a prioritized list of all proposed projects statewide according to the recommendations from the Asset Management Teams. PMG prioritizes projects based on need, project categories, and agency priorities. PMG does not consider past funding.
MANAGING PAVEMENT

ii. The PMG then submits the list to an oversight committee made up of senior INDOT personnel and economists, known as the Project Prioritization System committee. The committee then analyzes the entire program for final approval using the following variables:

1. Safety
2. Congestion
3. Environment sustainability
4. System reliability
5. Regional and state economic vitality
6. Potential intermodal connectivity
7. Total cost of ownership

iii. By considering these variables during the project prioritization process, the Project Prioritization System committee ensures projects make progress toward achieving the national goals outlined in USC 150(b).24

b. A draft Program Update Report, internal to INDOT staff, summarizes new and proposed projects, and shows where the new state projects will appear in INDOT's schedule of programmed projects.

c. PMG submits the Draft Program Update Report to the Deputy Commissioners of Engineering and Asset Management; Capital Program Management; and Operations Business Units for review and approval by members of the executive office as determined by the Deputy Commissioner of Engineering and Asset Management in consultation with the Commissioner. The Deputy Commissioner transmits executive office comments and official notice of approval to the divisions, including any specific direction or amendments required. PMG facilitates revisions of the draft Program Update Report in accordance with the executive office action.

d. PMG provides the revised draft Program Update Report to the asset managers, districts, and MPOs, and requests comments. All concerns must be documented in writing.

5. The final step in the process involves INDOT allocating funding and updating the program, as follows:

a. PMG addresses district and MPO comments and produces a Final Program Update Report. PMG determines if comments are sufficiently substantive to require further approval by the Deputy Commission before the report becomes final. The district office works with the Central Office to arrange and host a primary meeting in each district focusing on consultation with non-metropolitan local officials and RPOs.

b. CPFM authorizes new projects in SPMS and changes the existing program to reflect the Final Program Update Report. PMG provides the Asset Management Managers with updated budget estimates of the projected federal and state funding for the next 5 years by fiscal year. These budget projects are the projections by which fiscal constraint limits are established for all state projects in the next Indiana State Transportation Improvement Program (STIP).

Projects not implemented due to limited funding are put on hold. When the next call for projects is announced, the Roadway Asset Team will consider these projects along with any new recommended projects to submit for prioritization.

24 These goals include improving safety conditions on all public roads, maintaining infrastructure in a state of good repair, reducing congestion on the NHS, improving efficiency of the transportation system, improving accessibility of trade markets and supporting regional economic development, protecting and enhancing the environment, and reducing delays associated with project completion.
What is the Indiana Toll Road?

In keeping with Indiana’s role as the Crossroads of America, the Indiana Toll Road (ITR) serves as a critical transportation link between highways leading to major East Coast cities and northern Indiana, the City of Chicago, and the western United States. As shown in Figure 10, the ITR crosses northern Indiana to connect Ohio and Illinois. The ITR has been in existence since 1956 and consists of 333 bridges and 156.9 miles of roadway.25

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Figure 10: Indiana Toll Road Map
What is the Indiana Toll Road Concession Company and its responsibilities?

The Indiana Toll Road Concession Company (ITRCC) is the concessionaire responsible for the ITR. ITRCC was established in 2006. In the same year, ITRCC entered into an agreement with the Indiana Finance Authority (IFA), the government body that oversees state-related debt issuance. The *Concession and Lease Agreement for the Indiana Toll Road* provided ITRCC with the rights to operate, maintain, and collect tolls on the ITR for the next 75 years at a cost of $3.85 billion.

ITRCC is responsible for maintaining the ITR bridges and pavement in good condition throughout the lifetime of the *Concession and Lease Agreement for the Indiana Toll Road*.

To ensure that ITRCC is maintaining its assets according to the requirements of the agreement, ITRCC provides INDOT with a comprehensive report detailing the planned rehabilitation, replacement, and reconstruction capital improvement work scheduled over a 10-year period. This Capital Improvement Program Report is completed annually. Projects included in the report are planned based on inspection and condition report findings.
How does ITRCC perform asset management?

Under the *Concession and Lease Agreement for the Indiana Toll Road*, ITRCC is required to maintain its facilities in accordance with established standards. All ITR bridge inspection information is stored in BIAS. *Table 10* outlines the activities that ITRCC performs to maintain the bridges and structures, and the frequency of such activities.

<table>
<thead>
<tr>
<th>Activity to be Performed</th>
<th>Minimum Frequency of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge and structure cleaning:</td>
<td></td>
</tr>
<tr>
<td>• Bridges</td>
<td>Once yearly, when no further winter chemicals will be applied, but no later than May 31</td>
</tr>
<tr>
<td>• Overhead and bridge-mounted signs</td>
<td></td>
</tr>
<tr>
<td>• Retaining walls and other structures</td>
<td></td>
</tr>
<tr>
<td>Inspections and reports:</td>
<td></td>
</tr>
<tr>
<td>• All bridge structures</td>
<td>Once every 2 years</td>
</tr>
<tr>
<td>• Filing of INDOT Inventory/Appraisal Forms</td>
<td>Once every 5 years</td>
</tr>
<tr>
<td>• Fracture critical structures and members</td>
<td>Annually</td>
</tr>
<tr>
<td>• Underwater inspection</td>
<td>Once every 5 years</td>
</tr>
</tbody>
</table>

ITRCC is responsible for hiring a structure inspection team comprised of a project manager, structure inspection team leader, fracture critical member inspection team leader, underwater structure inspection team leader, roadway inspection team leader, facility inspection team leader (by discipline), inspection team members, and a structure evaluation rating engineer to conduct inspections annually. The inspection team is approved by the IFA.

The ITRCC roadway inspection team evaluates the condition of the roadway system components, including the pavements, signage, guardrails, pavement markings, fencing, and lighting for the mainline and ramps.

Environmental inspections cover the current state of environmental records, wastewater treatment, water treatment, hazardous material management, response to hazardous substance emergencies, underground storage tanks, air, herbicides and pesticides, storm water management, community right-to-know forms, materials management, regulatory compliance, and various additional initiatives.

ITRCC regularly prepares reports on asset conditions, but each asset follows a different schedule. For example, the Capital Improvement Program Report and a Fracture Critical Member Report are prepared annually. In contrast, a Facilities Condition Report is prepared once every 4 years. More information is contained in the *Concession and Lease Agreement for the Indiana Toll Road*.27

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26 The bridge and structure inspections are governed by the Concession and Lease Agreement for the Indiana Toll Road, Volume II of III, Operations and Procedures Manual, Chapter J: Annual State of the ITR and Capital Improvement Program Reports.

How is performance evaluated on the ITR?

ITRCC implements a variety of approaches to evaluating asset condition and performance. Bridges on the ITR are inspected by an expert engineer. The engineer uses best judgment to assess the condition of the bridge, as detailed in Table 11.

Pavement conditions on the mainline, toll plaza ramps, and travel plaza parking lots are assessed using the pavement quality indicator (PQI) scoring method also described in Table 9.

ITRCC also performs visual assessments for facilities inspections based on the acceptance criteria outlined in the Concession and Lease Agreement for the Indiana Toll Road. Environmental inspections document the state of environmental records, wastewater treatment, water treatment, and hazardous material management, among other initiatives.

Table 12 lists the current condition targets for the ITR.

### Table 11: Condition Assessment Approach, ITR

<table>
<thead>
<tr>
<th>Asset and Structure</th>
<th>Approach</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridges and Structure</td>
<td>Performance Index (PI) and Sufficiency Rating</td>
<td>Inspections are consistent with the National Bridge Inspections Standard (NBIS) as required by FHWA. The PI scoring system rates the condition of the deck, superstructure, and substructure from 0 to 9 (failure to excellent). A composite score of each bridge component is calculated according to a formula provided by FHWA to determine the overall bridge sufficiency rating. ITR then attributes the following condition labels based on the sufficiency rating (percent) of the bridge:  • Excellent: 90–100  • Good: 80–90  • Fair: 70–80  • Marginal: 60–70  • Poor: &lt;60</td>
</tr>
</tbody>
</table>

| Pavement | Pavement Quality Indicator (PQI) | For the mainline pavement, PQI is a composite score of pavement condition rating, the IRI, and the rutting depth. Toll plaza ramp pavement and travel plaza parking lot pavement condition are assessed qualitatively by an engineer who applies an approximate corresponding PQI score. The score is from 0 to 100:  • Excellent: 90–100  • Good: 80–90  • Fair: 70–80  • Poor: <70 |

### Table 12: Condition Targets, ITR

<table>
<thead>
<tr>
<th>Asset</th>
<th>Condition Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridges and Structure</td>
<td>Average sufficiency rating of 80</td>
</tr>
<tr>
<td>Pavement</td>
<td>Mainline: Average PQI of 80; No more than 10 percent in poor condition</td>
</tr>
<tr>
<td></td>
<td>Toll Plaza Ramp: 90 percent of pavement in good condition</td>
</tr>
<tr>
<td></td>
<td>Travel Plaza Parking Lot: 90 percent of pavement in good condition</td>
</tr>
</tbody>
</table>
What are the current conditions of the Indiana Toll Road?

ITRCC reports condition ratings for all 333 bridges, including decks, superstructures, substructures, and an overall sufficiency rating. ITRCC’s 80/90 PUSH Project is making improvements to 53 of the ITR bridges and did not report the ratings for these bridges in 2017. ITRCC reported ratings for the other 280 bridges in the 2017 Capital Improvement Report.

The average sufficiency rating for ITR bridges in 2016 is 87.3 percent. As shown in Figure 11, more bridges under the purview of ITRCC have been improving than declining in condition between 2013 and 2015.

From 2014 to 2016, the PQI of the ITR mainline pavement decreased from 93.3 to 90.4 on average. Although the value has decreased, the 90.4 rating is still above the goal of a PQI above 80. Additionally, the 90.4 average PQI does not include the 292 lane miles of pavement reconstructed in the 80/90 PUSH Project, which is described later.

As shown in Figure 12, ITR toll plaza pavement has remained steady since 2015. Of the 25 toll plazas, the pavement of 10 decreased in condition, 5 maintained the same condition, and 10 improved in condition between 2015 and 2017.

ITRCC has demolished and rebuilt a number of the travel plaza ramps and anticipates reporting improved conditions in the 2018 report.

28 241 of these bridges are on the NHS.
29 ITRCC’s 80/90 PUSH project was a major project to improve customer safety, improve the condition of 53 bridges and 73 miles of pavement, and reduce the level of maintenance work required in the future.
What capital improvement work is scheduled and planned?

ITRCC updates its Capital Improvement Program Report annually. The Capital Improvement Program Report provides a 10-year forecast for recommended projects and the funding needed to complete the projects. The findings from the condition inspections are important considerations in developing the report.

The Capital Improvement Program Report provides budgetary estimates in the year of expenditure for projects ITRCC has planned for the next 10 years. This report also identifies the decisions that ITRCC made to select improvement projects necessary to maintain the ITR in a state of good repair.

Currently, three major projects are included in the Capital Improvement Program:

- **80/90 PUSH Project**: A major rehabilitation and upgrade of a 73 mile section of the ITR delivered during the 2016 and 2017 construction season. The bridge portion of the 80/90 PUSH Project included rehabilitation of 53 bridges. The pavement portion of the 80/90 PUSH Project included rehabilitation of more than 70 miles of pavement. The mainline pavements were cracked and seated with a new asphalt overlay. All shoulders were milled 1.5 inches and filled to meet the new mainline grade. Various pavement rehabilitation activities were employed at all interchanges within the project limits.

- **Intelligent Transportation System (ITS) along the ITR**: Completion of ITS to work in conjunction with a fiber optic system installed for the 80/90 PUSH Project beginning in spring 2017 and scheduled to “go live” in 2018.

- **Travel Plaza Replacements**: Demolition of all existing structures on each site along with the replacement of fuel tanks, sewer lines, and upgraded flow capacity.

The estimated cost for construction and improvements from 2016 through 2027 is $298 million. The estimated cost includes projects related to buildings, travel plazas, roadway, and bridges.
What is the financial plan for the Indiana Toll Road?

ITRCC has entered into a performance-based contract with INDOT and must meet the condition targets outlined in the *Concession and Lease Agreement for the Indiana Toll Road*. ITRCC outlines its financial plan to maintain the ITR according to the agreed upon condition targets listed in the Capital Improvement Program Report. The Capital Improvement Program Report provides information on all capital improvement projects planned for the next 10 years on the ITR. As part of the agreement to lease the ITR, ITRCC’s projects are fully funded by toll revenue and not eligible for state or federal funding. INDOT’s financial plan outlined in the next section does not include ITR-related projects.

ITRCC has planned spending of $57,369,000 from 2016 to 2020 for building/roadway/lighting projects. Of that total, $40,296,000 will be spent on roadway assets.

There is $22,124,618 allotted for capital improvement projects on bridge assets from 2018 to 2027.
What is the value of INDOT’s bridges and pavements?

Based on an analysis of historical data, INDOT estimates that it would cost $220 per square foot to replace an interstate bridge or $200 per square foot to replace a non-interstate or non-NHS bridge. INDOT also estimates it would cost $220 per square foot to replace the border bridges that cross into surrounding states. Due to the large size of the border bridges that cross over the Ohio River, INDOT estimates it would cost $800 million to replace each of these border bridges.

In order for INDOT to rebuild all of its bridges, it would cost approximately $18.4 billion. When including bridges on the NHS that are not owned by INDOT, this figure increases to $19.1 billion.

INDOT performed a similar analysis to calculate the cost of rebuilding a roadway and estimates that the cost to build a lane-mile of highway can be $1 million. Assuming this cost per lane-mile, INDOT would require $28.6 billion to rebuild its highway system of 28,600 lane-miles of pavement. The cost increases by $768 million when including NHS pavement owned by entities other than INDOT.

Table 13 shows the results of both analyses. This large cost is not feasible for the State of Indiana to pay if all bridges and pavement were to deteriorate and need to be replaced. This reinforces the need for asset management practices to preserve the condition and performance of bridges and pavement.

Table 13: Cost to Replace Bridges and Pavement (Billions)

<table>
<thead>
<tr>
<th>Asset</th>
<th>Owned by INDOT</th>
<th>Owned by Others*</th>
<th>Replacement Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interstate</td>
<td>NHS (Non-Interstate)</td>
<td>Non-NHS</td>
</tr>
<tr>
<td>Bridge</td>
<td>$4.1</td>
<td>$2.8</td>
<td>$4.2</td>
</tr>
<tr>
<td>Pavement*</td>
<td>$4.9</td>
<td>$7.5</td>
<td>$16</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For bridges, includes Indiana Toll Road, other state agencies, local, and private. For pavement, includes Indiana Toll Road and others.

* Cost to replace pavement owned by INDOT totals $28.4 billion in table due to rounding.
Where does INDOT’s funding come from, and how can INDOT spend these funds?

INDOT’s existing funding comes from a variety of sources, as described in the STIP.10 These sources are described below.

Federal-Aid Funds

State Federal-Aid FHWA Funds

**National Highway Performance Program (NHPP)**
- **Goal:** Authorized to support the condition and performance of the NHS, for the construction of new facilities on the NHS, and to ensure that investments of federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in an asset management plan of a state for the NHS.
- **Eligibility:** Projects on the NHS are eligible for this type of funding.
- **Allocation:** This funding is apportioned as a lump sum for each state. The total is divided among apportioned programs. Two percent of a state’s STPBG funding is set aside for SPR.

**Highway Safety Improvement Program (HSIP)**
- **Goal:** A core federal-aid program with the purpose of achieving a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on tribal land.
- **Eligibility:** HSIP funds are designated for safety projects that correct or improve a hazardous road location or feature, or address a highway safety problem. Funds can also be used for workforce development, training, and education activities.
- **Allocation:** This funding is apportioned as a lump sum for each state with the total divided among apportioned programs. Two percent of a state’s HSIP funding is set aside for SPR.

Surface Transportation Block Grant Program (STPBG)
- **Goal:** Promotes flexibility in state and local transportation decisions, and provides flexible funding to best address state and local transportation needs.
- **Eligibility:** Projects on and off the NHS are eligible for this type of funding.
- **Allocation:** This funding is apportioned as a lump sum for each state. The total is divided among apportioned programs. Two percent of a state’s STPBG funding is set aside for SPR.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)
- **Goal:** Provides a flexible funding source to state and local governments for projects and programs to help meet the requirements of the Clean Air Act.
- **Eligibility:** Funds may be used for a transportation project or program intended to help an area meet the National Ambient Air Quality Standards, or to maintain adherence to the National Ambient Air Quality Standards.
- **Allocation:** This funding is apportioned as a lump sum for each state with the total divided among apportioned programs. Two percent of the funds must be used for SPR. A state with PM$_{2.5}$ (fine particulate matter) areas must use a portion of its funds to address PM$_{2.5}$ emissions in such areas.31

Federal Lands Highway Program (FLHP)
- **Goal:** A unified program for federal lands transportation facilities, federal lands access transportation facilities, and tribal transportation facilities.
- **Allocation:** The majority of funding is allocated to the National Park Service, U.S. Fish and Wildlife Service, and U.S. Department of Agriculture Forest Service.

Emergency Relief Program (ER)
- **Goal:** A program that assists federal, state, tribal, and local governments with the expense of repairing serious damage to federal-aid,
tribal, and federal lands highways resulting from natural disasters or catastrophic failures.

- **Eligibility:** INDOT must file a notice of intent to request ER funds with the FHWA Division Office within the state to initiate the ER application process. The application must be submitted within 2 calendar years of the date of the disaster.

**State Earmarks, and Local Federal-Aid FHWA Earmarks**

- **Provisions that have directed funds for specific transportation-related projects as identified by Congress.**

**Local Federal-Aid FHWA Funds**

- **Allocation:** Local public agencies must match all funds. In order to proceed with projects, the local public agencies must work with INDOT.
- **Eligibility:** Funds provided by INDOT to the local public agencies for federally eligible projects.

**State Funds**

**State Highway Funds**

- **Allocation:** These funds come from fuel taxes on gasoline, permits, federal reimbursement, the motor vehicle highway fund, and the local road and street fund.
- **Eligibility:** This provides funding for the Highway Maintenance Work Program, Highway Capital Improvement Program, Highway Planning and Research Program, Crossroads 2000 Program, and Joint Major Moves Construction.

**State Highway Road Construction and Improvement Fund**

- **Goal:** A fund established for construction and reconstruction projects on state highways.
- **Allocation:** This funding comes from legislation raising the gas tax by 2 cents, which provides INDOT the funding to meet the debt service on the related bonds issue by the IFA.

**Crossroads Funds**

- **Goal:** Continue to improve the condition of state-owned bridges and pavement.
- **Allocation:** This funding comes from an increase in vehicle license fees from legislation passed by the General Assembly in 2016.

**Toll Road Lease Proceeds**

- **Allocation:** Funding from Governor Daniels’ request of the General Assembly in 2006 to authorize the lease of the ITR for 75 years. The state received $3.85 billion up front for the lease.

**Next Level Indiana Trust Fund**

Of the $3.85 billion received for the lease of the ITR, $500 million was placed in the Next Generation Trust Fund and invested by the Treasurer of State. INDOT receives the net investment income every 5 years. The first distribution was in 2011.

During the 2017 legislative session, the General Assembly modified the terms of the Next Generation Trust Fund. The name was changed to the “Next Level Indiana Trust Fund,” and one-half of the $500 million original investment was placed under management by the Indiana Economic Development Corporation to be invested in Indiana economic development initiatives. INDOT continues to receive distribution of all net investment income every 5 years.

Preventive maintenance activities and treatments, and corrective maintenance treatments for INDOT’s bridges are eligible for federal funding.

**Next Level Indiana**

In April 2017, the Indiana General Assembly passed House Enrolled Act 1002, also known as Next Level Indiana.32

The sources of funding for Next Level Indiana include the following:

- Fuel tax increase on gasoline
- Increase of special fuel tax
- Increase of motor carrier surcharge tax
- Transportation improvement fee for all motor vehicle registrations
- Supplemental registration fee for electric vehicles
- Redirecting a larger portion of the sales tax collected on fuel from the state general fund to dedicated highway funds

30 INDOT, INDOT STIP 2018–2021
31 PM2.5 areas were last reported in 2017. At that time, Indiana had PM2.5 areas near the Chicago-Gary-Lake County, IL-IN, Indianapolis, Evansville, IN, Louisville, KY-IN, and Cincinnati-Hamilton, OH-KY-IN metropolitan areas. The map can be found on the EPA’s historical website: https://www3.epa.gov/pm/designations/1997standards/final/statemaps/Indiana.htm
How does INDOT set funding levels for its major investment categories?

INDOT’s funding process begins when the Asset Management Teams create a prioritized list of projects based on the investment strategies discussed earlier in the TAMP. The prioritized project list includes the cost to complete the projects.

Budget estimates are then developed by the CPFM Team, which projects federal and state revenue for the next 5 years.

The prioritized list and the budget estimates are provided to the PMG, which is responsible for assigning funding to each asset category. With the prioritized list of projects and the funding levels, the PMG accepts projects on the list in order of priority until the cost of the projects reaches the funding limit. These projects are then formally included in scheduling.

Table 14 provides the percentage breakdown of funding for INDOT’s investment strategies over the next ten years.

<table>
<thead>
<tr>
<th>Work Type</th>
<th>Year 2018</th>
<th>Year 2019</th>
<th>Year 2020</th>
<th>Year 2021</th>
<th>Year 2022</th>
<th>Year 2023</th>
<th>Year 2024</th>
<th>Year 2025</th>
<th>Year 2026</th>
<th>Year 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge – Bridge Preservation</td>
<td>30%</td>
<td>14%</td>
<td>54%</td>
<td>40%</td>
<td>13%</td>
<td>46%</td>
<td>26%</td>
<td>29%</td>
<td>25%</td>
<td>28%</td>
</tr>
<tr>
<td>Bridge – Bridge Replacement</td>
<td>8%</td>
<td>6%</td>
<td>6%</td>
<td>5%</td>
<td>34%</td>
<td>4%</td>
<td>11%</td>
<td>8%</td>
<td>13%</td>
<td>10%</td>
</tr>
<tr>
<td>Bridge – Small Structures</td>
<td>6%</td>
<td>13%</td>
<td>4%</td>
<td>6%</td>
<td>7%</td>
<td>9%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Pavement – Preventative Maintenance</td>
<td>54%</td>
<td>63%</td>
<td>35%</td>
<td>45%</td>
<td>43%</td>
<td>15%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Pavement – Corrective Maintenance</td>
<td>2%</td>
<td>4%</td>
<td>1%</td>
<td>4%</td>
<td>3%</td>
<td>26%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>
How much money is expected for pavement and bridge projects over the next 10 years?

With passage of the Next Level Indiana legislation in April 2017, INDOT is expecting available revenue to steadily increase over the next 10 years, which would support investments in bridge and pavement projects.

The expected funding outlined in Table 15 includes only state and federal revenue and does not include income from the Next Level Indiana Trust Fund. To estimate the amount of state revenue available over the next 10 years, INDOT’s financial team uses calculations from the Next Level Indiana legislation.33

The finance department is continuously improving its forecasting methods and will adjust estimates as new information becomes available. All funding values have been inflated using the inflation rate from Global Insight software.34

The process to determine the amount of funding available for bridge and pavement projects begins with INDOT allocating funds to operating expenses and debt service, as shown in Figure 13. Once these activities are funded, the remainder of the budget is allocated to bridge and pavement projects.

The estimated funding remaining for pavement and bridges projects over the next ten years is outlined in Table 16.

33 Table 15 differs from the funding outlined in the STIP because INDOT has performed independent forecasting analysis of TAMP-relevant data. The STIP is modified on a monthly basis, and future modifications will take into consideration the analyses performed for the TAMP.
34 Global Insight is a commercially available product that tracks economic activity. INDOT uses the software to analyze the commodities relevant to INDOT’s assets, such as steel, oil, gas, to provide inflation rate forecasts.

### Table 15: Available Federal and State Funding, FY2018–FY2027 (Billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>FY Funding (Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>$1.8</td>
</tr>
<tr>
<td>2019</td>
<td>$1.9</td>
</tr>
<tr>
<td>2020</td>
<td>$1.9</td>
</tr>
<tr>
<td>2021</td>
<td>$2.1</td>
</tr>
<tr>
<td>2022</td>
<td>$2.2</td>
</tr>
<tr>
<td>2023</td>
<td>$2.2</td>
</tr>
<tr>
<td>2024</td>
<td>$2.4</td>
</tr>
<tr>
<td>2025</td>
<td>$2.5</td>
</tr>
<tr>
<td>2026</td>
<td>$2.6</td>
</tr>
<tr>
<td>2027</td>
<td>$2.6</td>
</tr>
</tbody>
</table>

### Table 16: Estimated Funding for Pavement and Bridges (Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Pavement</th>
<th>Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>$389.9</td>
<td>$323.7</td>
</tr>
<tr>
<td>2019</td>
<td>$435.6</td>
<td>$355.8</td>
</tr>
<tr>
<td>2020</td>
<td>$473.9</td>
<td>$467.1</td>
</tr>
<tr>
<td>2021</td>
<td>$511.9</td>
<td>$490.1</td>
</tr>
<tr>
<td>2022</td>
<td>$444.1</td>
<td>$514.5</td>
</tr>
<tr>
<td>2023</td>
<td>$444.1</td>
<td>$514.5</td>
</tr>
<tr>
<td>2024</td>
<td>$475.0</td>
<td>$487.0</td>
</tr>
<tr>
<td>2025</td>
<td>$487.0</td>
<td>$500.0</td>
</tr>
<tr>
<td>2026</td>
<td>$499.0</td>
<td>$512.0</td>
</tr>
<tr>
<td>2027</td>
<td>$512.0</td>
<td>$525.0</td>
</tr>
</tbody>
</table>
What conditions can INDOT achieve with these funding levels?

As the Crossroads of America, Indiana’s roads are strategically important not just to Hoosiers, but to travelers from all over. INDOT knows how important it is for travelers to enjoy a smooth, comfortable drive over Indiana’s bridges and highways, which is why INDOT has committed to improving the condition of its bridges and roadways.

INDOT set condition targets to have 97 percent of bridges in fair or better condition and 95 percent of pavement in fair or better condition by 2038.

To achieve these targets, INDOT has identified annual spending of $400 million for its bridge preservation plan and $390 million for its pavement preservation plan. INDOT determined these funding levels by modeling expected deterioration of each asset and various treatment plans. These funding levels achieve the treatment plan that provides the state with improving assets at the lowest cost over the longest period of time. The analysis INDOT undertook to determine asset management funding needs resulted in a tax increase (Next Level Indiana) that will ensure that these funding levels are available for the next 20 years.

As shown in Figure 14 and Figure 15, INDOT also modeled three other funding levels:

- **Unlimited**: assumes $1 billion expenditure each year
- **Current Plan-Status Quo**: assumes spending for committed projects

---

**Figure 14: Bridge Funding Analysis**

<table>
<thead>
<tr>
<th>Year</th>
<th>Bridge Preservation $400M/yr</th>
<th>Unlimited</th>
<th>Do Nothing Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>84%</td>
<td>86%</td>
<td>88%</td>
</tr>
<tr>
<td>2017</td>
<td>86%</td>
<td>88%</td>
<td>90%</td>
</tr>
<tr>
<td>2019</td>
<td>88%</td>
<td>90%</td>
<td>92%</td>
</tr>
<tr>
<td>2021</td>
<td>90%</td>
<td>92%</td>
<td>94%</td>
</tr>
<tr>
<td>2023</td>
<td>92%</td>
<td>94%</td>
<td>96%</td>
</tr>
<tr>
<td>2025</td>
<td>94%</td>
<td>96%</td>
<td>98%</td>
</tr>
<tr>
<td>2027</td>
<td>96%</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>2029</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2033</td>
<td></td>
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<td></td>
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<tr>
<td>2035</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2037</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2039</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 15: Pavement Funding Analysis**

<table>
<thead>
<tr>
<th>Year</th>
<th>Pavement Preservation $390M/yr</th>
<th>Unlimited</th>
<th>Do Nothing Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>72%</td>
<td>76%</td>
<td>80%</td>
</tr>
<tr>
<td>2017</td>
<td>74%</td>
<td>78%</td>
<td>82%</td>
</tr>
<tr>
<td>2019</td>
<td>76%</td>
<td>80%</td>
<td>84%</td>
</tr>
<tr>
<td>2021</td>
<td>78%</td>
<td>82%</td>
<td>86%</td>
</tr>
<tr>
<td>2023</td>
<td>80%</td>
<td>84%</td>
<td>88%</td>
</tr>
<tr>
<td>2025</td>
<td>82%</td>
<td>86%</td>
<td>90%</td>
</tr>
<tr>
<td>2027</td>
<td>84%</td>
<td>88%</td>
<td>92%</td>
</tr>
<tr>
<td>2029</td>
<td>86%</td>
<td>90%</td>
<td>94%</td>
</tr>
<tr>
<td>2031</td>
<td>88%</td>
<td>92%</td>
<td>96%</td>
</tr>
<tr>
<td>2033</td>
<td>90%</td>
<td>94%</td>
<td>98%</td>
</tr>
<tr>
<td>2035</td>
<td>92%</td>
<td>96%</td>
<td>100%</td>
</tr>
<tr>
<td>2037</td>
<td>94%</td>
<td>98%</td>
<td></td>
</tr>
<tr>
<td>2039</td>
<td>96%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
from FY2016 to FY2019 and $130 million per year for bridges thereafter and $350 million per year for pavement

- **Do Nothing Baseline:** assumes spending for committed projects from FY2016 to FY2019 and then no funding in future years

INDOT anticipates achieving its condition targets for bridges and pavement with its current funding levels. When performing the analysis to determine the funding levels needed to reach the condition targets, INDOT included only bridges and pavement that it owns and operates.

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35 These funding levels are in 2016 dollars and will be adjusted for inflation each year.

36 INDOT uses dTIMS software to model funding needs to optimize condition levels at a practical cost.
Is the transportation system financially sustainable?

In 2015, INDOT conducted a study to assess its transportation funding needs and potential funding sources.\(^{37}\) INDOT determined that the available funds over the next 20 years would not be sufficient to meet state and local transportation needs. The study indicated that Indiana’s transportation funding would decrease over the 20 years as a result of inflation and increased fuel efficiency.

Since this study, the Indiana General Assembly has passed the legislation known as Next Level Indiana (see earlier description of funding sources). As part of a push to preserve Indiana’s transportation assets, the legislation provides sufficient asset management funding for state-maintained bridges and roads over the next 20 years. This bill also provides the necessary funding for a small set of other priority projects.

\(^{37}\) INDOT, Study of Indiana Transportation Infrastructure Funding Mechanisms, October 15, 2015.
What are risks and how do they relate to asset management?

Risk is defined as “the positive or negative effects of uncertainty or variability upon agency objectives.”\textsuperscript{38} Risk management is “the processes and framework for managing potential risks.”\textsuperscript{39}

A key part of the asset management planning process is identifying and mitigating risks associated with implementing the TAMP. A risk management plan has not been developed for this interim TAMP, but a formal plan will be included in the final TAMP.

INDOT will manage its asset management risks by implementing a process consisting of the following elements:

- **Risk identification**: Identify risks that can affect the condition and performance of INDOT’s pavement and bridges.
- **Risk assessment**: Assess each identified risk in terms of the likelihood of occurrence and impact and consequence if the risk occurs.
- **Risk prioritization**: Evaluate and prioritize the identified risks.
- **Mitigation strategies**: Develop a mitigation plan for addressing the top priority risks.
- **Risk monitoring**: Develop an approach to monitor the top priority risks.

Formalizing a risk management plan will help INDOT achieve its condition targets over the next 10 years by reducing the uncertainty these risks pose on bridge and pavement assets. With a proactive plan to monitor identified risks, INDOT will be able to ensure appropriate resources are available for asset management.

\textsuperscript{38} Federal Register, Asset Management Plan, Final Rule, October 24, 2016.

\textsuperscript{39} Ibid.
How will INDOT identify, assess, and prioritize asset management risks?

As part of the risk management plan, INDOT will solicit feedback from its staff to identify asset management risks. INDOT will distribute an online survey to its staff asking the respondents to identify significant risks that could heighten or inhibit INDOT’s ability to manage its bridges and pavement. The staff will review historical data on the assets in order to identify potential risks.

Types of risks that can affect NHS pavement and bridge condition, as well as performance of the NHS, include environmental risks such as flooding, tornadoes, or earthquakes, or issues related to climate change. Other risk categories can include, but are not limited to, financial risks such as uncertainty regarding available future budget, operational risks such as failure of an asset, and strategic risk such as issues with environmental compliance.

INDOT will make special notes to investigate if there are facilities subject to repeated emergency events that require repair and reconstruction on a regular basis. INDOT Technical Services Directors (TSD) working with their System Asset Managers (SAM) will be responsible for reviewing and monitoring the system. This process will involve looking for repeat events and determining if there are trends or issues that need to be monitored or improved.

INDOT will compile the results of the survey and facilitate a risk workshop. Workshop participants will refine the risk statements and assess the likelihood and consequences of each identified risk.

The process to assess the risk is as follows:

- **Risk likelihood**: Each participant casts a vote reflecting their assessment of risk likelihood on a scale of one (rare) to five (almost certain).
- **Risk consequence**: Each participant also casts a vote reflecting their assessment of risk consequence on a scale of one (negligible) to five (extreme).

Figure 16 shows how INDOT will combine the likelihood and consequence scores and determine the relative priority of each risk.

---

**Figure 16: Risk Matrix**

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rare</td>
<td>1. Negligible</td>
</tr>
<tr>
<td></td>
<td>2. Low</td>
</tr>
<tr>
<td></td>
<td>3. Medium</td>
</tr>
<tr>
<td></td>
<td>4. Very High</td>
</tr>
<tr>
<td></td>
<td>5. Extreme</td>
</tr>
</tbody>
</table>

| 2. Unlikely | 2 |
| 4. Low      | 4 |
| 6. Medium   | 6 |
| 8. Very High| 8 |
| 10. Extreme | 10 |

| 3. Possible | 3 |
| 6. Low      | 6 |
| 9. Medium   | 9 |
| 12. Very High| 12 |
| 15. Extreme | 15 |

| 4. Likely | 4 |
| 8. Low    | 8 |
| 12. Medium| 12 |
| 16. Very High| 16 |
| 20. Extreme | 20 |

| 5. Almost Certain | 5 |
|                  | 10 |
|                  | 15 |
|                  | 20 |
|                  | 25 |

---

40 For example revenue is forecasted based on current economic and geo-political conditions. If external factors outside of INDOT’s control related to the economy or geo-political climate change, actual revenue levels may differ from the forecasted values.
INDOT will develop response strategies for each of the priority risks.

Response strategies for risks with negative impacts will include:
- Avoid
- Transfer
- Mitigate
- Accept

Response strategies for risks with positive impacts will include:
- Exploit
- Share
- Enhance
- Accept

INDOT will also develop detailed risk action plans (i.e., statements of planned actions) for each priority risk. Each plan will provide a list of activities INDOT will undertake to address the identified risks, information about the anticipated activity causing the risk, the time frame of each activity, and required funding to implement the plan.

INDOT will summarize each risk action plan in a risk register. The risk register will include the risk statement, the type of impact (positive or negative), the likelihood of the risk, the consequence level, the type of risk response strategy, and the risk action plan. 

The risk register will provide a starting point for INDOT’s risk management process. INDOT will take the next steps to implement the risk action plan, monitor the identified risks over time, and periodically update the risk register. Each risk will be assigned to a particular owner on the Asset Management Team. The risk owner will be responsible for implementing the risk action plan and reporting progress to the chair of the Asset Management Team. Careful consideration will be taken for major catastrophic events, even if the likelihood of such an event is minimal.
What are INDOT’s highest priority risks?

The risk register will define INDOT’s highest priority risks and will follow the format of Table 17. This risk register will be continually updated to monitor INDOT’s highest priority risks.

### Table 17: Asset Management Risk Register

<table>
<thead>
<tr>
<th>#</th>
<th>Risk</th>
<th>Impact Type</th>
<th>Likelihood</th>
<th>Consequences</th>
<th>Severity Level</th>
<th>Risk Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identified Risk</td>
<td>Positive/Negative</td>
<td>Rare, Unlikely, Possible, Likely, Almost Certain</td>
<td>Negligible, Low, Medium, Very High, Extreme</td>
<td>Color-coded System to be Developed</td>
<td>Risk Response Strategy: Negative: Avoid, Transfer, Mitigate, Accept  Positive: Exploit, Share, Enhance, Accept  Risk Action Taken: Detailed plan to respond to risk</td>
</tr>
</tbody>
</table>
Who is responsible for asset management at INDOT?

INDOT’s PMG and Asset Management Teams are responsible for overseeing the asset management implementation process. Each Asset Management Team is overseen by the PMG as shown in Figure 17. INDOT is implementing its asset management efforts in two phases. Phase One has been led by the PMG and Asset Management Team chairs to provide direction for development of the initial TAMP. Phase Two will include high-level staff oversight to ensure that asset management practices are transparent and followed throughout INDOT.

On an annual basis, the Asset Management teams will use dTIMS to analyze the current and future conditions and compare those conditions to the planned conditions. If there are trends identified that affect an asset class in a positive or negative way, the PMG and Asset Management team leadership will adjust funding levels accordingly to meet and maintain goals.

During the asset management implementation process, INDOT will initiate efforts to increase coordination among the asset management teams. By increasing coordination, INDOT will be able to better analyze trade-offs between asset classes when developing its investment strategies.

The PMG and Asset Management Team roles are listed in Table 18.

In addition to the voting members in Table 18, the PMG includes support members with responsibilities ranging from public involvement, to maintenance and operations, to real estate. Certain stakeholder partners also act as supporting members, such as Conexus Indiana, FHWA, MPOs, RPOs, and legislative affairs.

Table 18: Asset Management Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Organizational Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Vice-Chair</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>District Rep., Executive Leadership</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>District Rep., Technical Services</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>District Rep., Capital Program Management</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Capital Program Management</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Capital Funds Management</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Bridge Assets</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Road &amp; Pavements Assets</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Traffic Engineering</td>
<td>Program Management Group</td>
</tr>
<tr>
<td>Director</td>
<td>Asset Planning &amp; Management Division</td>
</tr>
<tr>
<td>Bridge Asset Team Chair</td>
<td>Bridge Asset Management Team</td>
</tr>
<tr>
<td>Mobility Asset Team Chair</td>
<td>Mobility Asset Management Team</td>
</tr>
<tr>
<td>Roadway Asset Team Chair</td>
<td>Roadway Asset Management Team</td>
</tr>
<tr>
<td>Safety Asset Team Chair</td>
<td>Safety Asset Management Team</td>
</tr>
</tbody>
</table>
How will INDOT improve its asset management practices?

This initial TAMP describes INDOT’s existing asset management practices. In an effort to continually improve processes and practices, INDOT is conducting an asset management assessment to identify initiatives to enhance asset management. The results of the self-assessment will be included in the final TAMP as part of the asset management implementation strategy.
Federal TAMP Development Processes Certification Guidance

The following table illustrates how INDOT has addressed the TAMP development processes required for certification by FHWA.

<table>
<thead>
<tr>
<th>#</th>
<th>Process</th>
<th>Required Elements</th>
<th>How the Requirement is Addressed in this Document</th>
<th>Requirement Addressed on These Pages</th>
</tr>
</thead>
</table>
| 1 | Performance Gap Analysis (23 CFR 515.7(a)) | **Physical Condition of Assets**<br>The TAMP must describe a methodology, with regard to the physical condition of the assets, for:<br>• Identifying gaps affecting the State DOT targets for the condition of NHS pavements and bridges as established pursuant to 23 U.S.C. 150(d).<br>• Identifying deficiencies hindering progress toward achieving and sustaining the desired state of good repair (as defined by the State DOT).<br>• Developing alternative strategies that will close or address the identified gaps.<br>**NHS Effectiveness Performance:**<br>The TAMP must describe a methodology for analyzing gaps in the performance of the NHS that affect NHS bridges and pavements regardless of their physical condition, that will:<br>• Identify gaps in the effectiveness of the NHS in providing safe and efficient movement of people and goods. (23 CFR 515.7(a)(2)).<br>• Identify strategies to close or address the identified gaps affecting the physical assets. (23 CFR 515.7(a)(3)). | Description of methodology to assess the condition of assets, identification of gaps between current and desired conditions and identification of funding needed to maintain assets on desired state of good repair.<br>INDOT has determined that its assets are in a state of good repair when the condition targets are met. The dTIMS software forecasts deterioration and identifies potential performance gaps in relation to the condition targets. The software then develops alternative treatment strategies that would improve the condition of INDOT’s assets to reach its condition targets effectively closing the anticipated performance gaps. Therefore, the treatment strategies are the identified deficiencies hindering progress toward achieving SGR.<br>Roadway and bridge engineers review the recommended projects from the dTIMS analysis to ensure all projects are appropriate based on local knowledge of the performance of the assets. The engineers’ input ensures performance gaps not explained by conditions are addressed. The engineers will identify treatment strategies to address the known deficiencies by adding to the list of recommended projects. Engineers also help to update formulas used for performance gap analysis if it seems the formulas are not appropriate based on the output from dTIMS. | Assess the Condition of Assets:<br>Bridges: 2-2<br>Pavement: 3-2 | Identifying Gaps:<br>Bridges: 2-5, 2-6<br>Pavement: 3-5, 3-6 | Identifying Deficiencies:<br>Bridges: 2-5, 2-6<br>Pavement: 3-5, 3-6 | Alternative Strategies:<br>Bridges: 2-5, 2-6<br>Pavement: 3-5, 3-6 | Gaps Regardless of Physical Condition:<br>Bridges: 2-5, 2-6<br>Pavement: 3-5, 3-6 | (Continued on page A-2)
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<tr>
<th>#</th>
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</thead>
</table>
| 2 | Life Cycle Planning Analysis (23 CFR 515.7(b)) | The TAMP must describe a methodology for:  
- Incorporating the State DOT targets for asset condition for each asset class or asset sub-group into the analysis.  
- Modeling deterioration for NHS bridges and pavements for each asset class or asset sub-group.  
- Analyzing potential work types across the whole life of each asset class or asset sub-group with the general unit costs identified.  
- Identifying management strategies for each asset class or asset sub-group to minimize the life cycle costs while achieving the 23 U.S.C. 150(d) performance targets for asset condition.  
- Identifying any subgroups that have been excluded, with justification for their exclusion. | - INDOT inputs condition targets into dTIMS software for analysis to take place against these targets.  
- dTIMS software models deterioration based on current condition levels stored in BIAS for bridges and Roads and Highways for pavement.  
- Treatment strategies correspond to a work type needed to maintain the asset under analysis by dTIMS.  
- dTIMS performs a benefit-cost analysis of all recommended treatment strategies to identify plans that maximize benefits while minimizing costs.  
- INDOT has excluded Department of Natural Resources bridges, pedestrian bridges, and muck trestle bridges because these are not on the NHS nor on state highway routes. Pavement does not exclude any subgroups during the analysis. | Incorporating Targets Into Analysis:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6  
Modeling Deterioration:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6  
Analyzing Potential Work Types:  
Bridges: 2-5, 2-6, 5-2  
Pavement: 3-5, 3-6, 5-2  
Identifying Management Strategies to Minimize Life Cycle Costs:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6  
Identifying Any Subgroups That Have Been Excluded:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6 |

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</thead>
</table>
| 3 | Risk Management Analysis (23 CFR 515.7(c)) | The TAMP must describe a methodology for:  
- Identifying risks that can affect the condition of NHS pavements and bridges, and the performance of the NHS, including the risks listed in 23 CFR 515.7(c)(1).  
- Assessing the identified risks in terms of the likelihood of their occurrence and their impact and consequence if they do occur.  
- Evaluating and prioritizing the identified risks.  
- Developing a mitigation plan for addressing the top priority risks that involve potentially negative consequences.  
- Developing an approach for monitoring top priority risks.  
- Including in the analysis, and considering, a summary of the results of the 23 CFR Part 667 evaluations of facilities in the State repeatedly damaged by emergency events, including at a minimum the results relating to NHS pavements and bridges. | The risk management plan is not formally included as part of the initial TAMP, but it is envisioned to cover the following aspects: risk identification, risk assessment, risk prioritization, mitigation strategies and risk monitoring. An online survey of staff and an in-person risk workshop will be used to identify significant risks that could heighten or inhibit the ability to manage INDOT’s bridges and pavement and risks will be prioritized using their likelihood of occurrence and their potential impact. Risks of major catastrophic events will be considered and a risk register will be used to monitor top priority risks. | Identifying Risks: 6-2  
Assessing Risks: 6-2  
Evaluating and Prioritizing Risks: 6-2  
Develop Mitigation Plan: 6-3  
Develop Approach to Monitor Top Priority Risks: 6-3, 6-4  
23 CFR Part 667: 6-2 |
| 4 | Financial Plan Development (23 CFR 515.7(d)) | The TAMP must describe a methodology for producing a financial plan that:  
- Covers at least a 10-year period.  
- Includes the estimated cost to implement the investment strategies by State fiscal year and work type.  
- Includes the estimated funding levels that are expected to be reasonably available, by fiscal year, to address the costs of implementing the investment strategies, by work type.  
- Identifies anticipated sources of available funding.  
- Includes a summary asset valuation for the State’s NHS pavement and bridges, including the investment needed on an annual basis to maintain the asset value. | Financial plan covers a 10–20 year period.  
INDOT’s existing funding comes from a variety of sources that are described in the Statewide Transportation Improvement Program (STIP), the Next Level Indiana Trust Fund and the sources outlined within the Next Level Indiana legislation.  
In developing the financial plan, INDOT ran dTIMS for several different funding levels and identified the estimated costs by bridge and pavement work types. This analysis was used to set the final performance levels.  
To estimate the amount of state revenue available in the next 10 years, INDOT’s financial team uses calculations from the recently-passed Next Level Indiana legislation. The process to determine the amount of funding available for pavement and bridge projects begins with INDOT allocating funds to operating expenses and debt service. The remaining funds are available for bridge and pavement projects.  
The assets are valued using historical data on costs to build them.  
INDOT analyzed bridge and pavement needs to determine $390 million and $400 million per year in 2016 dollars and adjusted for inflation each year, respectively, will be needed to fund bridge and pavement projects. | 10-year Financial Plan: 5-5  
Estimated Cost to Implement Investment Strategies: 5-6, 5-7  
Estimated Funding Levels Available: 5-5  
Anticipated Sources of Funding: 5-2, 5-3  
Summary Asset Valuation: 5-1 |
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</table>
| 5  | Investment Strategies (23 CFR 515.7(e) and 515.9(f)) | The TAMP must describe a methodology for:  
- Producing investment strategies that collectively make or support progress toward:  
  - Achieving and sustaining a desired state of good repair over the life cycle of the assets,  
  - Improving or preserving the condition of the assets and the performance of the NHS relating to physical assets,  
  - Achieving the State DOT targets for asset condition and performance of the NHS in accordance with 23 U.S.C. 150(d), and  
  - Achieving the national goals identified in 23 U.S.C. 150(b).  
- Identifying and describing how the investment strategies are influenced by:  
  - Anticipated available funding to implement strategies and estimated cost of future work types associated with investment strategies being considered, based on the TAMP financial plan.  
- Results of the TAMP risk, management, life cycle planning, and performance gap analyses. | The goal of the investment strategies is to allocate resources optimally and achieve a desired state of good repair.  
dTIMS software develops proposed treatment strategies to achieve condition targets set by INDOT. By achieving the condition targets, the treatment strategies allow INDOT to achieve and sustain a desired state of good repair. The intention of the treatment strategies is to improve the condition of the assets if dTIMS identifies a future performance gap, or to preserve the condition of the asset if it is already achieving the condition target. INDOT does not simply rely on the output of the dTIMS software to ensure investment strategies will achieve condition targets and the national goals. INDOT has the dTIMS output reviewed by engineers with knowledge of the assets to ensure the projects are appropriate to achieve the condition targets.  
During the project prioritization process, the Project Prioritization System committee reviews projects based on the national goals.  
Budget estimates are input into dTIMS to constrain the recommended projects to a given budget scenario.  
The dTIMS software conducts performance gap analysis and life-cycle cost analysis to develop a list and schedule of recommended projects. The projects are ranked according to the bridge and pavement business rules, which govern the investment strategies. | Investment Strategies:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6  
Achieving National Goals:  
Bridges: 2-9  
Pavement: 3-9  
Anticipated Sources of Funding: 5-6 |
| 6  | Obtaining Data from Other NHS Owners (23 CFR 515.7(f)) | The TAMP must describe a methodology for obtaining necessary data from other NHS owners in a collaborative and coordinated effort. | Condition inspections take place every 1, 2 or 4 years for bridges. Every month, the owners of Indiana's other 268 bridges update inventory and condition data in the Bridge Inspection Application System (BIAS) for the bridges inspected that month. Similarly, other owners of NHS roads update condition and inventory data in Roads and Highways on a periodic basis. ITRCC is responsible for maintaining the ITR as described in its lease agreement. ITRCC shares its capital expenditure plans with INDOT. | Obtaining Data:  
Bridges: 2-1  
Pavement: 3-1 |

(Continued on page A-5)
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<thead>
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<th>#</th>
<th>Process</th>
<th>Required Elements</th>
<th>How the Requirement is Addressed in this Document</th>
<th>Requirement Addressed on These Pages</th>
</tr>
</thead>
</table>
| 7  | **Use of Best Available Data and Bridge and Pavement Management Systems to Develop TAMP (23 CFR 515.7(g))** | The TAMP must describe a methodology for:  
• Ensuring that the State DOT uses the best available data for development of the TAMP.  
• Ensuring that the TAMP is developed using bridge and pavement management systems that meet the requirements of 23 CFR 515.17. If, at the time of the first certification, the State DOT does not have bridge and pavement management systems that fully comply with 23 CFR 515.17 standards, the State DOT process identifies additional means it will use to provide analyses or other information needed to meet all of the requirements in 23 CFR 515.17.  
• Ensuring the process for using information from the State DOT’s Statewide Transportation Improvement Program (STIP) in the development of the State DOT’s TAMP is consistent with TAMP process and data requirements. This means that the STIP may be used to provide background information, but cannot be used as a substitute for carrying out the required analyses, or be used to override the results of the required independent analyses of relevant data when developing investment strategies. | INDOT collects and synthesizes information about its facilities to help make rational and well-informed investment decisions. INDOT field verifies and quality checks all data in BIAS and Roads and Highways to ensure best available data is used and to ensure consistency in collection methods. Therefore, data used in the BMS and PMS are the best available data.  
INDOT has developed bridge and pavement management systems that meet the requirements of 23 CFR 515.17. The bridge management system collects, processes, stores, and updates inventory and condition data stored in the Bridge Inspection Application System (BIAS). The pavement management system does the same with inventory and condition data stored in the Roads and Highways software. Both management systems forecast deterioration, determine the benefit-cost over the life cycle of the assets, and identifies short-term budget needs when assessing initial treatment needs then identifies long-term budget needs during the second treatment assessment. INDOT is able to input a budget scenario into the pavement management systems so the software determines strategies within financial constraints, and the software provides recommendations on projects to manage asset condition. The recommendations include a schedule for the projects to take place.  
On the funding side, the Statewide Transportation Improvement Program (STIP) is used as a background document to develop financial projections, but the outline of funding in the TAMP differs from the funding outlined in the STIP because INDOT has performed independent forecasting analysis of TAMP-relevant data. Additionally, the finance department is continuously improving its forecasting methods and will adjust estimates as new information becomes available. | Using Best Available Data:  
Bridge: 2-1  
Pavement: 3-1  
BMS and PMS Met 23 CFR 515.17 Requirements:  
Bridges: 2-5, 2-6  
Pavement: 3-5, 3-6  
Using STIP is Consistent with TAMP Requirements: 5-5 |