



Indiana
Department of
Transportation

BIL COMPLIANT

TRANSPORTATION ASSET MANAGEMENT PLAN

June 2022



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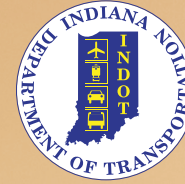
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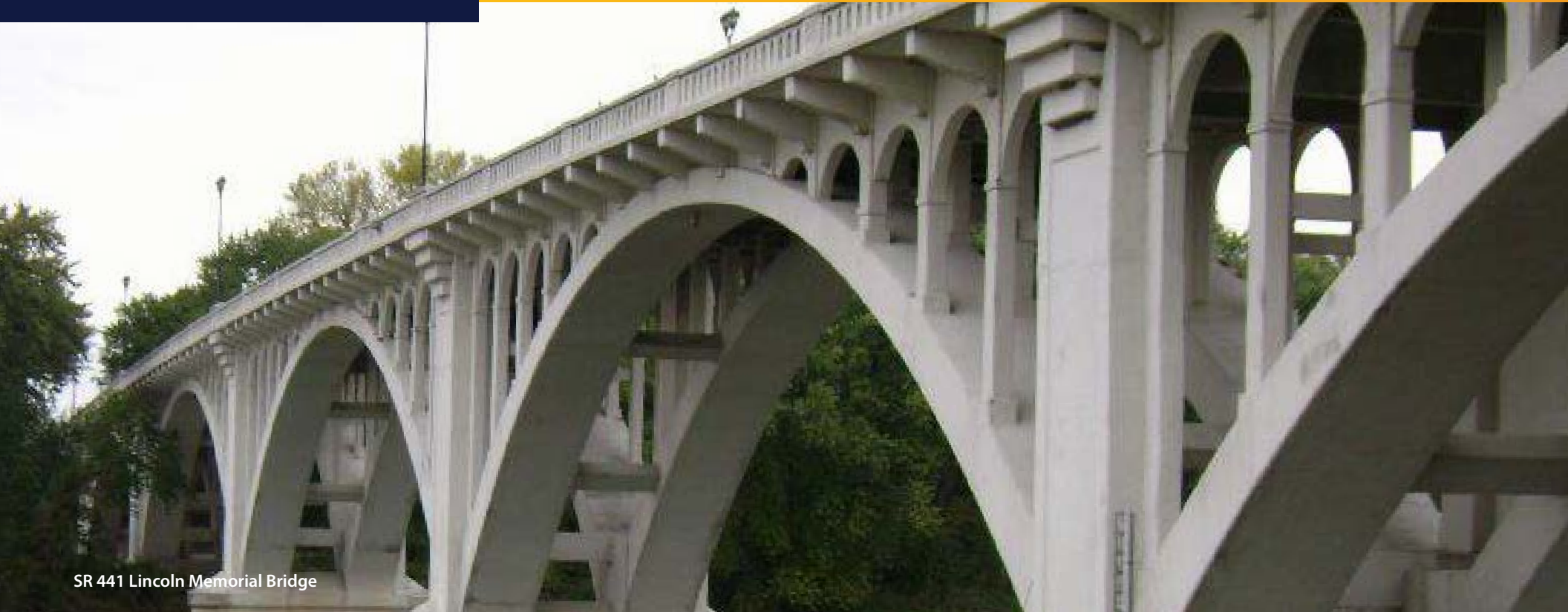
Indiana Department of Transportation

TRANSPORTATION ASSET MANAGEMENT PLAN

June 2022



Cover: Second Avenue Bridge is the main thoroughfare into Columbus, Indiana
This page: Rural highway and wind farm.



SR 441 Lincoln Memorial Bridge

Approval

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

Approval:

I do fully approve INDOT's Transportation Asset Management Plan

Michael Smith, Commissioner

June 28, 2022



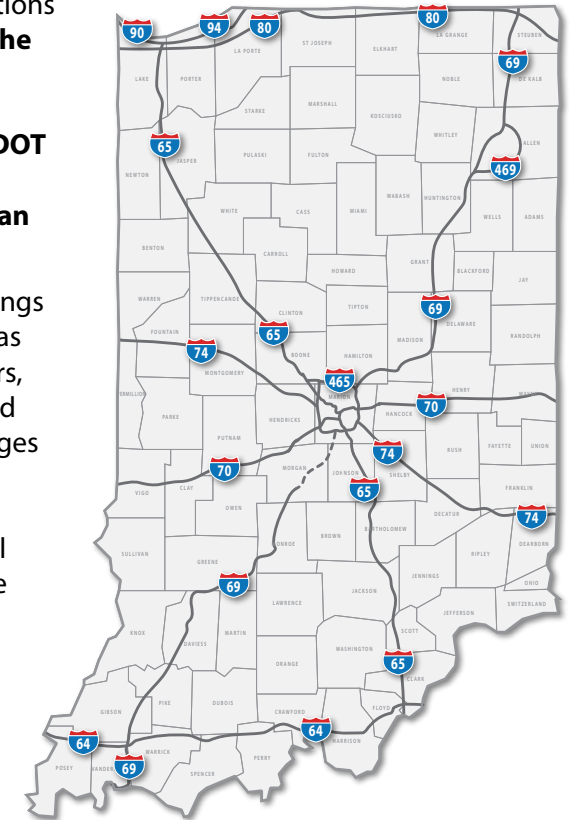


Overview of the TAMP

The Indiana Department of Transportation (INDOT) is responsible for managing the state's transportation assets, including bridges, large culverts, 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 through 2037. **The 20-year plan will fully fund the asset management plan for bridges, large culverts, and roads maintained by INDOT through the 10-year outlook of this Transportation Asset Management Plan (TAMP).**

The 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. This TAMP updates our last plan developed in 2019. The latest TAMP includes several improvements including a combined life cycle planning section and an updated risk register that identifies connections and actions for the asset management program as well as risks associated with extreme weather.



I-265 Lewis and Clark Memorial Bridge



What is a Transportation Asset Management Plan?

The Indiana Department of Transportation (INDOT) is responsible for managing the state's transportation assets, including bridges, large culverts, and roads. INDOT has developed both short- and long-term targets to improve bridge, large culvert, 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 through 2037.

This 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 make rational and well-informed investment decisions. In addition, INDOT has linked its asset management system with its capital programming process, resulting in an 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 is a resilient strategy.** INDOT considers extreme weather and the resiliency of its transportation network while developing its plan to meet asset management goals.
- **Asset management involves analysis of options and trade-offs.** INDOT analyzes the impact that different funding allocations would 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. The Bipartisan Infrastructure Law (BIL) amended TAMP requirements to include State DOTs taking into consideration extreme weather and resilience within their life-cycle cost and risk management analysis (Public Law 117-58 § 11105). INDOT's TAMP meets the requirements outlined in MAP-21, the BIL, 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 private concessionaires to maintain the Indiana Toll Road (ITR), the Ohio River Bridges (ORB), the Cline Avenue Bridges (CAB), and large culverts.

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?

The TAMP documents INDOT's objectives of:

- 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)¹

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

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.

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

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.

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?

This TAMP is an update of the TAMP developed in 2019. It reflects updates to INDOT's asset management process. The TAMP represents INDOT's 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 ORB, the CAB, large culverts, the ITR, border bridges,² and the bridges and pavements maintained by local agencies on the NHS.

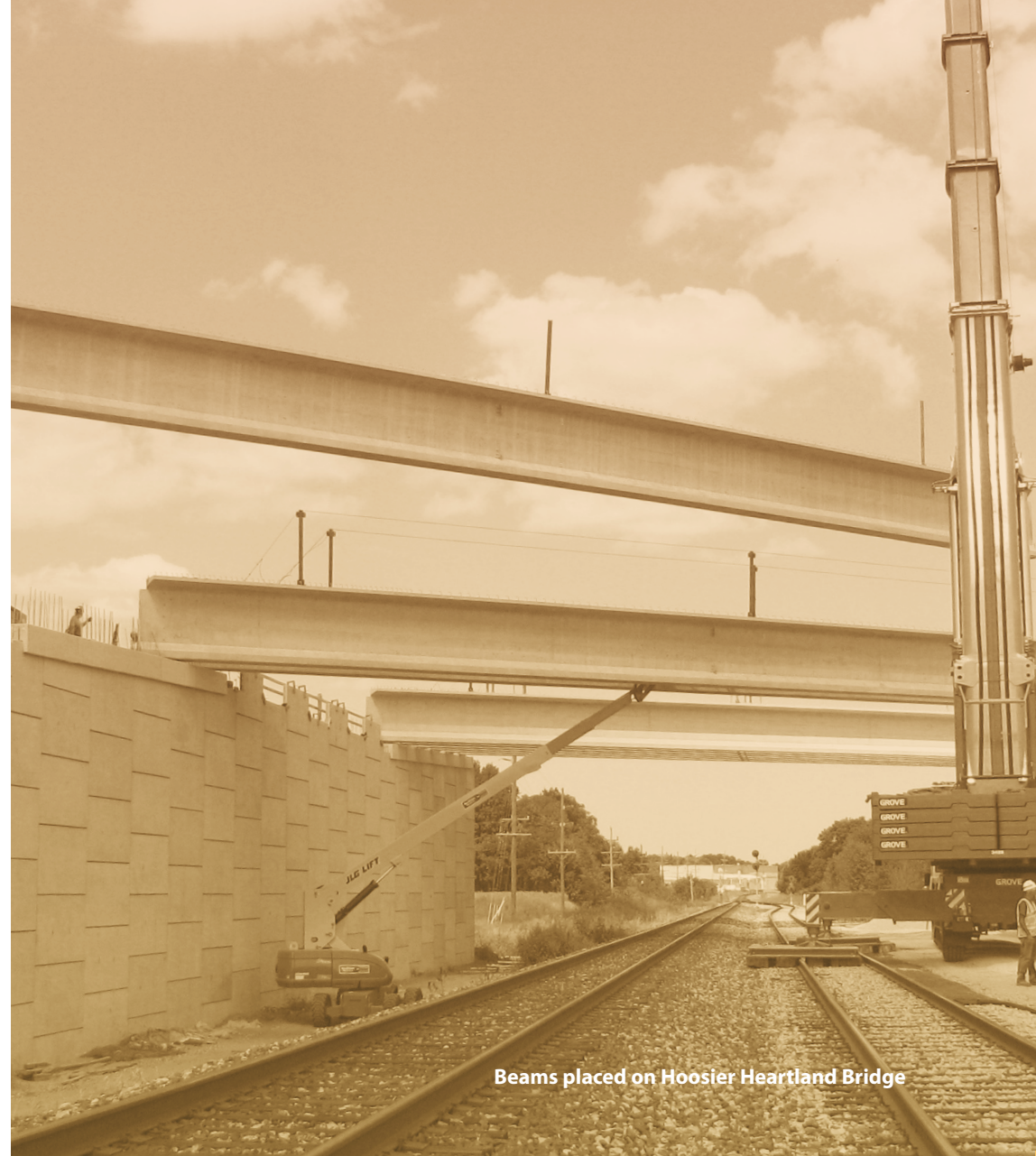
The TAMP is organized as follows:

- **Section 2** describes the inventory and current condition of bridges and pavement.
- **Section 3** explains how INDOT conducts life-cycle planning for bridges and pavement.
- **Section 4** discusses how the ORB are managed.
- **Section 5** describes how the CAB is managed.
- **Section 6** discusses how the ITR is managed.
- **Section 7** provides a financial plan for funding INDOT's bridges and pavement over the next 10 to 20 years.³
- **Section 8** addresses the risks associated with asset management.
- **Section 9** describes how INDOT will identify opportunities to improve its asset management practices.

The management of large culverts is described in an appendix.

²Border bridges are bridges that enter into a bordering state. INDOT shares a portion of the cost for maintenance and preservation of the border bridges.

³The 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 Enrolled Act 1002, 2017.



Beams placed on Hoosier Heartland Bridge



Who is involved in developing and updating the TAMP?

INDOT has three groups involved in developing and updating the TAMP: (1) the Program Management Group (PMG); (2) the Asset Management Teams, and (3) the TAMP Steering Committee. 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 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 the 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 the 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 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 priorities for projects that increase capacity or level of service; 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.
- **Pavement Team:** develops and maintains a long-range asset management plan that determines the appropriate investments needed and prioritizes their merit in order to preserve or modernize pavement assets.
- **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.

The TAMP Steering Committee consists of representatives from INDOT's Asset Management leaders (Central Office and District), Program Delivery, Finance, Metropolitan Planning Organizations (MPOs), and FHWA. The TAMP Steering Committee provides direction to the TAMP effort and assists in communicating the purpose and progress of TAM to other stakeholders.



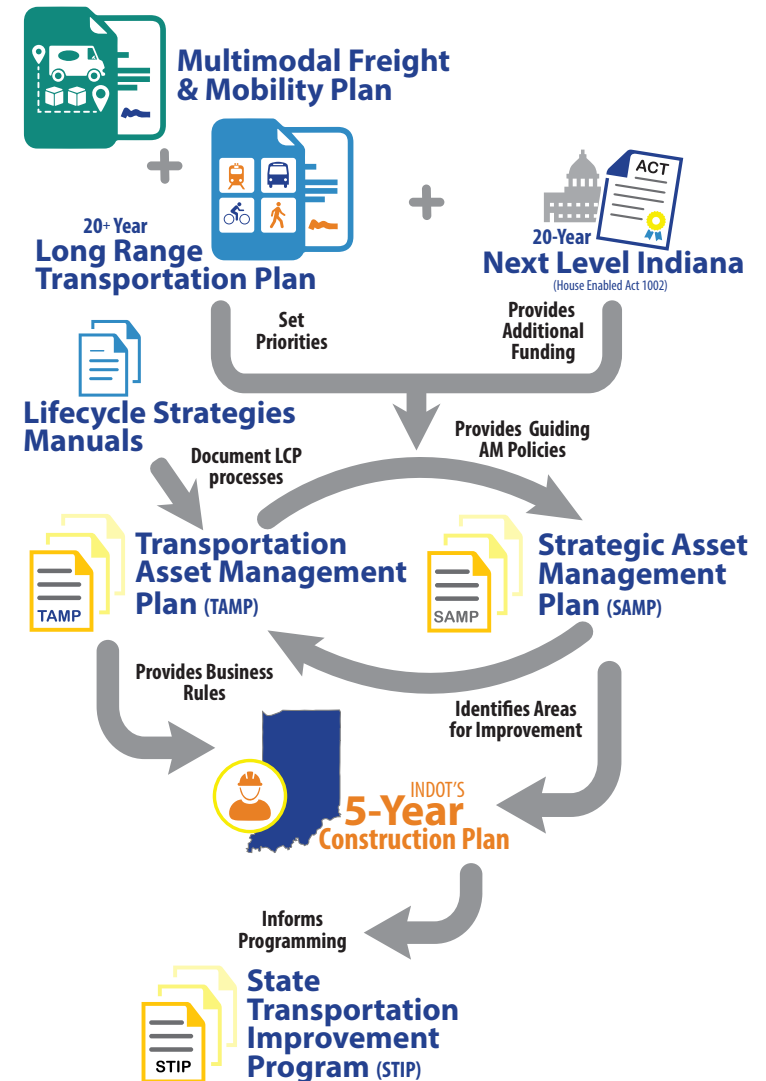
How does the TAMP relate to INDOT's other planning documents and initiatives?

As shown in **Figure 1**, 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 Enrolled 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 7).
- 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.
- These business rules and life-cycle planning processes are codified in the Bridge and Pavement Lifecycle Strategies manuals.
- The TAMP also provides the guiding asset management principles that feed into the Strategic Asset Management Plan (SAMP).
- The SAMP provides a means to identify areas for improvement within the TAMP.
- 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*.

Figure 1: INDOT Planning Documents and Initiatives







How do the TAMP and SAMP relate to each other?

In coordination with the TAMP, INDOT has developed a SAMP. While the SAMP is guided by the policies established in the TAMP, the SAMP governs a larger grouping of assets beyond the scope of the National Highway System. Additionally, the SAMP provides strategic guidance for implementing the policies of the TAMP. The SAMP and TAMP are aligned with a common set of imperatives and principles (shown in **Figure 2**) that guide asset management at INDOT.

Figure 2: Asset Management Principles and Initiatives

OUR FOUR IMPERATIVES

 <p>Safety First</p> <p>We will always ensure safe and sustainable asset utilization, protecting our customers and staff.</p>	 <p>21st Century Workforce</p> <p>We will develop our workforce and align our employees around INDOT's Mission.</p>	 <p>Great Service</p> <p>We will deliver great service, balancing the needs of our customers with available funding.</p>	 <p>Our Investment Strategy</p> <p>We will align our asset-related decision making to ensure effective delivery of our 20 Year Road and Bridge Plan.</p>
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INDOT'S ASSET MANAGEMENT PRINCIPLES

 <p>Forward-Looking and Sustainable</p> <p>We will incorporate social, legislative, environmental and financial considerations into decisions, taking into account present and future service commitments and giving due attention to the long-term stewardship of assets.</p>	 <p>Continually Improving</p> <p>We will make continual improvement a key part of our asset management approach, with a focus on driving innovation through the development of tools, techniques and solutions.</p>
 <p>Making Robust, Repeatable & Transparent Decisions</p> <p>We will utilize a formal, but scalable, consistent, and repeatable approach to manage infrastructure assets - enabling services to be provided in the most efficient and cost effective manner. We will collect, collate, control and circulate the right asset information, at the right time, informing the right asset management decisions.</p>	 <p>Life-Cycle Cost Perspective</p> <p>We will take an integrated "big picture" approach to asset management that considers the combined impact of all aspects of the asset life-cycle within the control of INDOT - acquiring, operating, maintaining, renewing and retiring assets. New assets will not be constructed/acquired without considering future operating and maintenance costs.</p>
 <p>Risk-Based and Optimal</p> <p>We will direct resources & expenditures to achieve agreed service outcomes & benefits, balancing the needs of stakeholders and customers with available funding - at an acceptable level of risk. We will manage our assets in terms of their role and value within their full system context, promoting reliability of the transportation system, as opposed to managing individual assets and business processes in isolation.</p>	 <p>People-Focused (Customers & Staff)</p> <p>We will adopt a customer-focused approach to managing our assets, only accommodating additional demand for services when considering the impacts to our current Levels of Service. We will recruit, train and retain the right staff and work with our university and trade school partners to ensure we develop the best workforce.</p>



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 TAMP in cooperation with our 14 MPO partners. Each month, the representatives from the 14 MPOs, which make up the MPO Council, meet in Indianapolis (or virtually) 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 prior to each MPO Council meeting. 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 Transportation Improvement Programs (TIPs)/STIP; and to allow for MPO feedback for continuous improvement.

INDOT is also implementing 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. Purchased software did not align with INDOT business practices, so it is being replaced by a new STIP system developed by INDOT, which will incorporate MPO input.



What is the timeframe for TAMP development?

In 2018, INDOT prepared an initial TAMP that included the performance measures for bridge and pavement conditions established under 23 Code of Federal Regulations (CFR) Part 490. FHWA reviewed the initial TAMP in a two-step process that included a process certification decision and a review of how the initial TAMP aligned with regulatory requirements. Through the process certification decision, FHWA determined the development methodologies described in the initial TAMP met applicable requirements.

Following the review, FHWA provided feedback that INDOT incorporated in a final TAMP adopted in 2019.

This document is an update to the 2019 TAMP. INDOT will continually update its TAMP development processes and prepare a new TAMP every four years with the next TAMP due in 2026.



I-69 Finish Line extension



How many NHS bridges are in Indiana and how many bridges does INDOT own and maintain?

INDOT owns and maintains 5,728 bridges in the state of Indiana (see **Table 1**). There are an additional 268 bridges in Indiana on the NHS, including ITR bridges, the Ohio River Bridges, the Cline Avenue Bridges, and bridges owned by local entities (see **Table 2**). 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 throughout the year.⁴ Further details regarding the inspection schedule are outlined in the next section.

BIAS maintains a current and complete inventory of all NHS bridges regardless of ownership, in addition to non-NHS bridges owned by INDOT. INDOT bridge inspections are reviewed for accuracy and consistency following the guidance in the INDOT Bridge Inspection Manual. 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. The inventory data in **Tables 1, 2, and 3** on the next page have been updated since the 2019 TAMP due to changes in INDOT's inventory and newer inspection data. All data are up to date as of March 2022.

⁴BIAS is the software system that stores inventory, condition, and inspection schedule information on bridges.



2014 Milton-Madison Steel Truss Bridge project—
carrying U.S. 421 into place over the Ohio River



Table 1: Bridge Inventory, Owned by INDOT

Highway System	Number of Bridges	Deck Area (Square Feet)
Interstate	1,444	18,525,934
Non Interstate NHS ⁵	1,348	12,195,426
Non NHS	2,919	19,051,856
Border Bridges ⁵ - NHS	12	1,937,676
Border Bridges ⁶ - Non-NHS	5	408,208
Total	5,728	52,119,100

Table 2: Bridge Inventory, NHS Bridges Owned by Others

Agency	Number of Bridges	Deck Area (Square Feet)
Indiana Toll Road	242	3,165,675
Ohio River Bridges	12	716,372
Cline Ave Bridge	3	569,943
Locally Owned	11	126,360
Total	268	4,578,350

Table 3: NHS Bridge Inventory and Performance Measures*

Agency	Number Bridges	Deck Area (SFT)	% Good	% Fair	% Poor
INDOT - Interstate	1,444	18,525,934	52.1%	45.1%	2.8%
INDOT - Non Interstate NHS ⁵	1,348	12,195,426	51.6%	46.7%	1.7%
INDOT - Border Bridges ⁶ - NHS	12	1,937,676	19.6%	80.4%	0.0%
Indiana Toll Road - NHS	242	3,189,994	30.8%	64.0%	5.1%
Ohio River Bridges - NHS	12	716,372	98.6%	1.4%	0.0%
Cline Avenue Bridges	3	569,943	96.9%	3.1%	0.0%
Allen County - NHS	2	12,317	14.3%	85.7%	0.0%
Hendricks County - NHS	7	74,485	84.9%	15.1%	0.0%
Lake County - NHS	1	24,962	0.0%	100.0%	0.0%
Marion County - NHS	1	14,596	0.0%	100.0%	0.0%
Total	3,072	37,261,705	50.0%	47.6%	2.4%

*Condition measured using the FHWA condition metrics.

⁵ This includes 4 bridges that cross the Indiana Toll Road. These bridges are owned by ITR but maintained by INDOT.

⁶ INDOT is lead state on 7 border bridges, of which 3 are NHS and 4 are non-NHS.



How does INDOT assess the condition of its bridges?

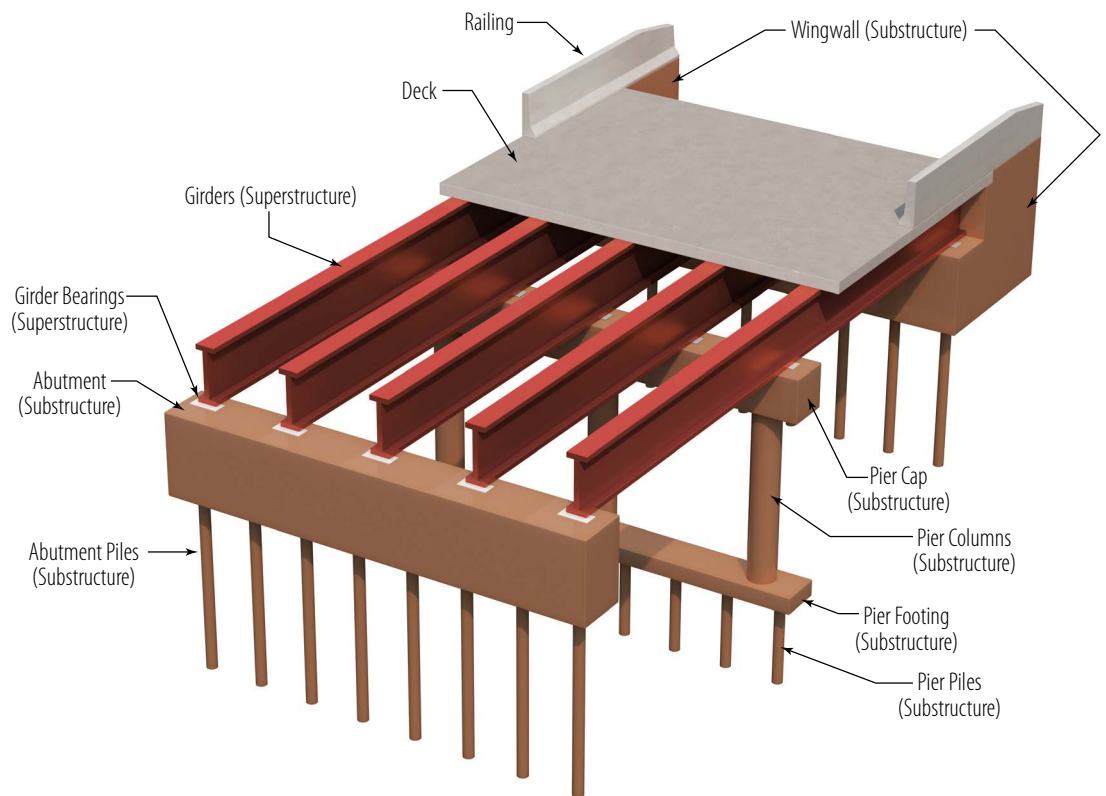
INDOT uses the bridge rating scale from the FHWA Recording and Coding Guide for the structure and Appraisal of the Nation's Bridges (Coding Guide) to determine the condition of the bridge.⁷ The inspection team rates the deck, superstructure, and substructure of the bridge (see **Figure 3**) from 0 (failed) to 9 (excellent), as shown in **Table 4**. 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.

Table 4: 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

Figure 3: Bridge Components



⁷ INDOT, Proposed Key Performance Indicator, September 2016.



Interstate 69 at East 106th Street, Fishers, Indiana



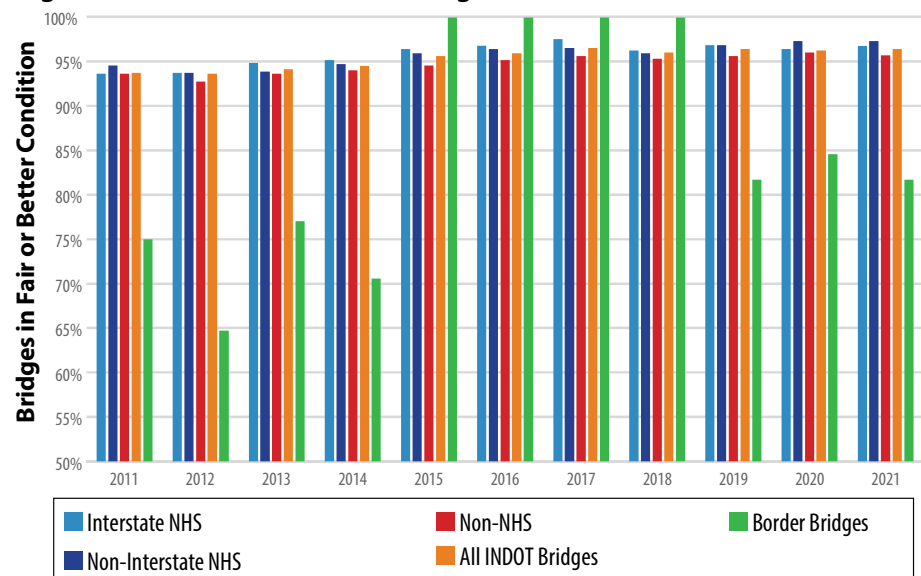
What are the current conditions of INDOT's bridges?

INDOT assesses the condition of bridges in the following categories: Interstate NHS, non-Interstate NHS, non-NHS, all INDOT bridges,⁸ and border bridges. **Figure 4** shows the condition of INDOT's bridges. Overall, 96.4 percent of INDOT's bridges were in fair or better condition in 2021 using the INDOT KPI. Using the FHWA performance measure, 97.6 percent of bridges on the NHS were in fair or better condition. This is an improvement since the last TAMP.

Over the past 10 years, INDOT's bridges and bridges on the NHS 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 88 percent in fair or better condition.

⁸ All INDOT bridges includes those on interstate NHS, non-Interstate NHS, and non-NHS.

Figure 4: Condition of INDOT's Bridges*



*The condition ratings were developed using INDOT's KPI which is based on the condition of four bridge components (wearing surface, deck, superstructure, substructure). Since 2018, INDOT has also used the FHWA bridge performance measure based on three components (deck, superstructure, substructure) by deck area percentage.



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 performance gaps exist. INDOT maintains two steps for adopting condition measures⁹ 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 establishing different condition targets for urban and rural bridges would not be appropriate.

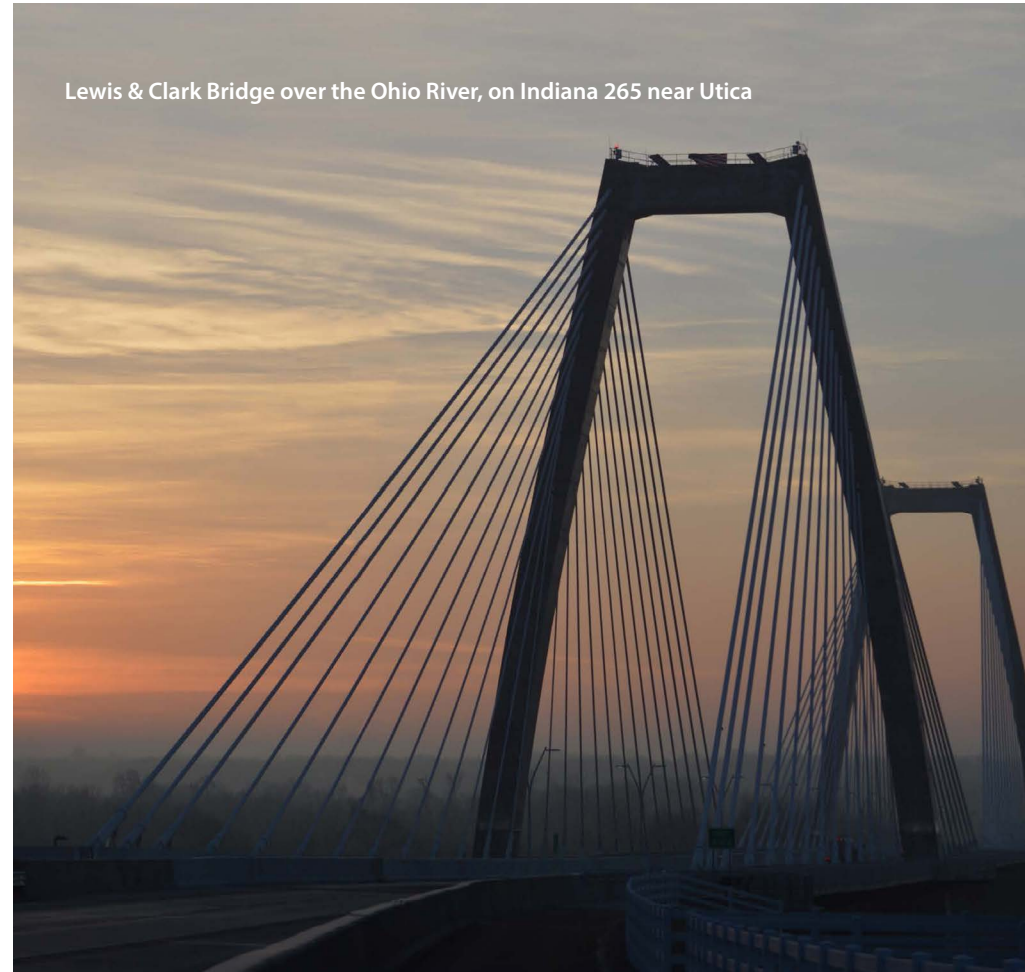
There are several metrics that INDOT uses to track bridge conditions. Internally, INDOT has a KPI that states 96.0 percent of bridges will be in fair or better condition, and our 2017 transportation legislation requires us to be no more than 3.0 percent poor by 2037. INDOT's bridges are currently meeting the KPI, and our modeling indicates we will reach the 3.0 percent goal within the 20-year timeframe. Additionally, with the preservation funding outlined in Section 7 of the TAMP, INDOT anticipates that it will continue to 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.

INDOT is drafting new condition targets based on FHWA's condition rating system in coordination with our MPO partners. The draft targets are:

- 2-Year NHS Bridge Target: 49.0 percent good, 3.0 percent poor
- 4-Year NHS Bridge Target: 47.5 percent good, 3.0 percent poor

⁹ Condition measures are the metric used to establish targets and to assess progress toward achieving the established targets.

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



How much pavement does INDOT own and maintain and how much NHS pavement is in Indiana?

INDOT owns 11,032 miles, representing 28,514 lane-miles, of pavement in Indiana, as shown in **Figure 6**. The pavement on roadways owned by INDOT consists of both concrete and asphalt, as shown in **Figure 5**. There are 191 additional miles, representing 779 lane-miles, of NHS pavement owned by local government entities and the Indiana Toll Road, as shown in **Figure 7**.

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 stored in the ESRI Roads and Highways program. The Roads and Highways program maintains a current and complete inventory of all NHS pavement, regardless of ownership, outlined in **Table 5**.

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.

Figure 5: Pavement Type of Indiana Roads

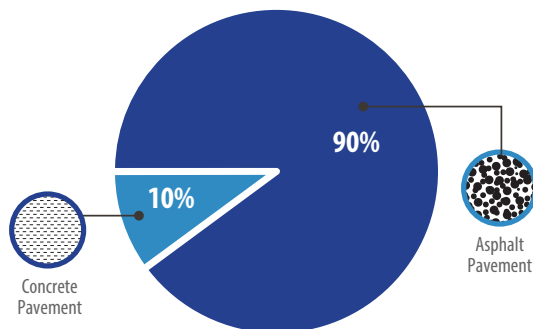


Figure 6: Inventory of Pavement Owned by INDOT

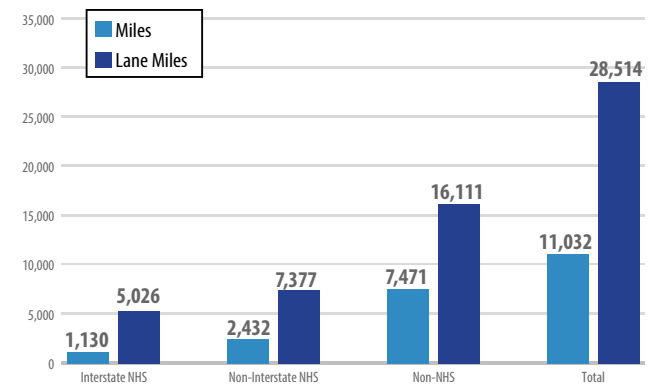
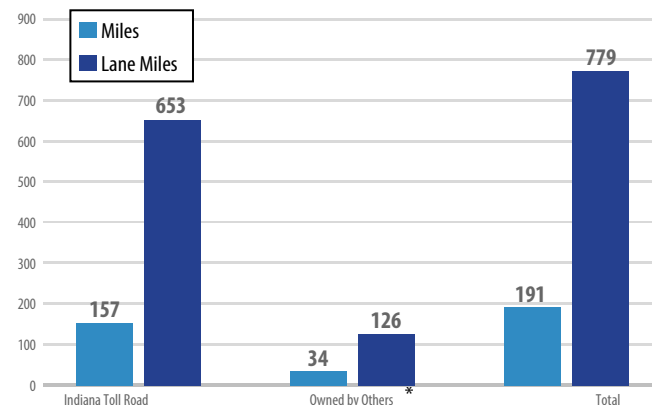


Figure 7: Inventory of NHS Pavement Not Owned by INDOT*



*Other includes Allen County, City of Fort Wayne, Hendricks County, Town of Avon, Town of Brownsburg, Town of Plainfield, Jennings County, City of North Vernon, Johnson County, City of East Chicago, City of Gary, City of Indianapolis, City of Evansville, and City of Terre Haute.



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. Since the last TAMP, INDOT has been able to add condition information for NHS routes owned and maintained by local agencies.

Table 5: NHS Pavement Inventory and Condition Summary*

Jurisdiction	Center Miles	Lane Miles	% Good	% Fair	% Poor
INDOT - Interstate	1130	5,024	74%	25%	1%
INDOT - Non Interstate NHS	2422	7,361	58%	41%	1%
Indiana Toll Road	157	651	66%	28%	1%
Ohio River Bridge - NHS	2.0	8	100%	0%	0%
Allen County - NHS	3.8	15	86%	11%	3%
City of Fort Wayne - NHS	2.2	6	86%	14%	0%
Hendricks County - NHS	3.6	10	25%	64%	11%
Town of Avon - NHS	4.2	16	46%	54%	0%
Town of Brownsburg - NHS	3.4	14	87%	13%	0%
Town of Plainfield - NHS	8.4	33	42%	57%	1%
Johnson County - NHS	0.6	1	73%	27%	0%
City of East Chicago - NHS	1.5	6	0%	23%	77%
City of Gary - NHS	1.4	4	66%	34%	0%
City of Indianapolis - NHS	2.2	10	23%	70%	7%
City of Evansville - NHS	0.9	3	0%	82%	18%
City of Terre Haute - NHS	5.3	19	3%	80%	18%

*Condition measured using the FHWA condition metrics.



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 data 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 (including a portion of the shoulder zone) 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 6**. 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 have 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 6: Pavement Condition Thresholds

Performance Measure	Good	Fair	Poor
IRI (inches/mile)	<95	95–170	>170
RUT (inches)	<0.20	0.20–0.40	>0.40
Faulting (inches)	<0.10	0.10–0.15	>0.15
Cracking (percent)	<5	5–20 (asphalt) 5–15 (JCP) 5–10 (CRCP)	>20 (asphalt) >15 (JCP) >10 (CRCP)



What are the current conditions of INDOT's pavements?

The condition of INDOT's interstate pavement has improved from 2013 to 2021, particularly since Next Level Indiana legislation was passed in 2017. As shown in **Figure 8**, interstate pavement was 97.6 percent in fair or better condition in 2021. Meanwhile, the condition of the non-interstate NHS also improved between 2013 and 2021, from 90 percent to 97.8 percent in fair or better condition. Non-NHS pavement owned by INDOT improved from 91 percent to 95.5 percent in fair or better condition between 2013 and 2021.

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 9** 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 2013 to 2021.

In terms of average IRI and IRI RWP, the conditions have improved since 2013, particularly since 2018.

Figure 8: Pavement Condition History*

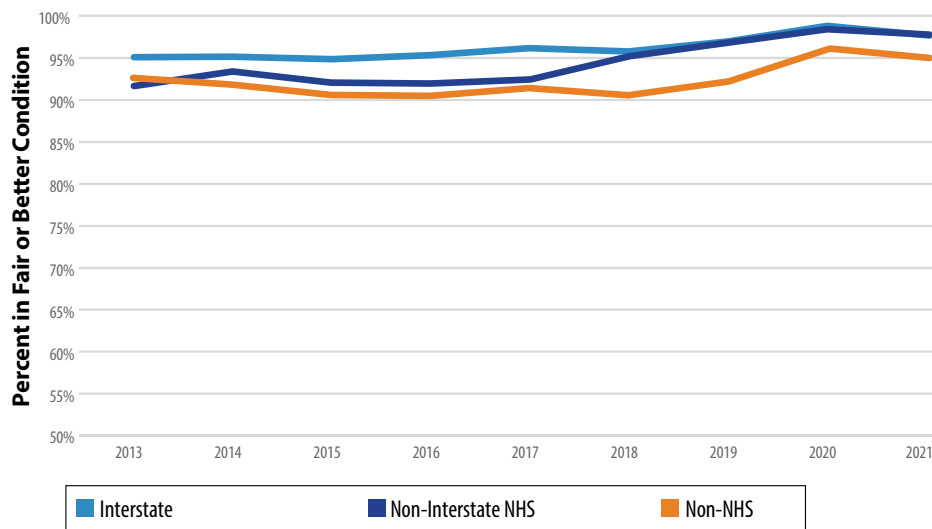
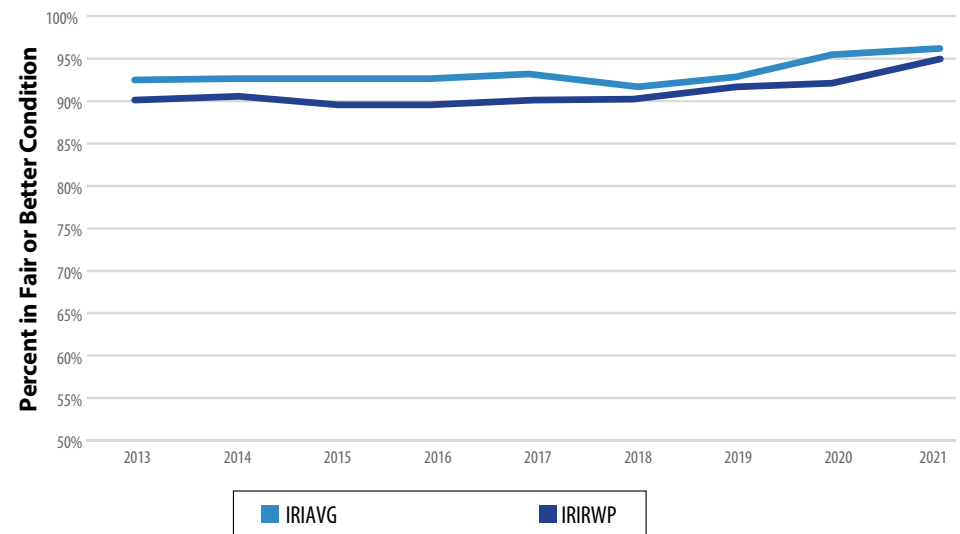


Figure 9: Condition of Pavement, IRIAVG and IRIRWP



*These condition ratings are based on the INDOT rating system, which uses the IRI right wheel path.



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 having different condition targets for urban and rural pavement would not be appropriate.

INDOT's internal goal for pavement conditions as set in our 2017 transportation bill is no more than 5 percent poor by 2027. Based on the funding levels to support asset management practices, described in Section 7 of the TAMP, INDOT anticipates meeting its condition targets within the

established timeframe. INDOT's pavement is considered to be in a state of good repair when the condition target is met.

In addition to the condition targets established for the TAMP based on INDOT's condition rating system, INDOT is drafting new condition targets based on FHWA's condition rating system in coordination with our MPO partners. The draft targets are:

- **2-Year Interstate Target:** 60.0 percent good, 1.0 percent poor
- **4-Year Interstate Target:** 62.0 percent good, 1.0 percent poor
- **2-Year Non-Interstate Target:** 50.0 percent good, 1.5 percent poor
- **4-Year Non-Interstate Target:** 48.0 percent good, 1.5 percent poor



I-69 progress in southern Indiana



How does INDOT Conduct Network-Level Life Cycle Planning?

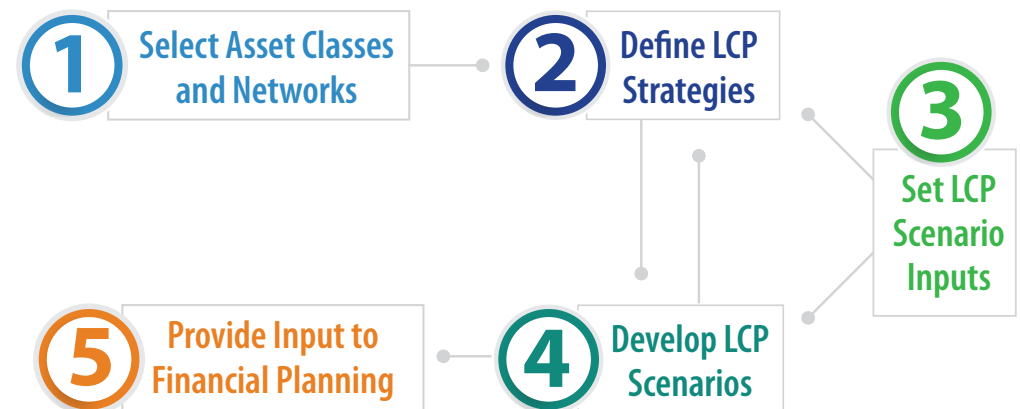
FHWA has outlined a five-step process for conducting network-level life cycle planning for transportation assets. The five-step process is described in FHWA's Using an LCP (Life Cycle Planning) Process to Support Transportation Asset Management: A Handbook on Putting the Federal Guidance into Practice. **Figure 10** outlines the five steps.

Extreme Weather and Resiliency Considerations

As described further in Chapter 8, INDOT considers extreme weather and the resiliency of its transportation network as part of risk identification. Two of the major weather and resilience risks are changes in extreme temperatures and increased risk of flooding – both of which may require changes in treatments and increased investments in preservation and rehabilitation. To address these risks during life-cycle planning, INDOT uses its pavement and bridge modeling systems to consider the impact of more substantial treatments in a resiliency scenario that requires greater funding. This scenario includes the need for upsizing culverts to meet current design standards, cleaning or expanding ditches, and increasing the waterway openings for bridges to accommodate higher levels of flooding to meet current design standards.

In addition, when construction and reconstruction work type projects are scoped, consideration is given to whether the roadway is prone or could become prone to flooding. Alternatives are then considered to accommodate future events, so the road is not damaged or closed during a flood. Also, during our annual review of our pavement and bridge modeling systems, INDOT receives feedback from the field about how well the models reflect actual performance in the field. INDOT actively reviews its decision trees, treatment specifications, and treatment intervals to reflect changing conditions.

Figure 10: Five-Step Process for LCP from FHWA



How does INDOT consider bridge life-cycle costs?

In August 2020, INDOT codified its business rules and life-cycle planning processes for bridges in the Bridge Lifecycle Strategies manual. Life-cycle planning for bridges starts with the bridge management system.

The Bridge Management Section within the Asset Management Division at INDOT is responsible for developing and implementing a management system for all INDOT-owned bridges. INDOT uses the Deighton Total Infrastructure Management System (dTIMS) software to perform life-cycle cost analyses of its bridge network.¹⁰ In accordance with 23 CFR 515.17,¹¹ the dTIMS software collects, processes, and stores condition and inventory data from BIAS as well as future committed projects from the Scheduling Project Management System (SPMS) to forecast expected deterioration for each asset. dTIMS models only INDOT's highway bridges. It excludes bridges such as pedestrian bridges, parks, and railroads.

The dTIMS model incorporates deterioration forecasts and generates future treatment strategies¹² that optimize conditions for any budget scenario. This allows INDOT to identify necessary funding to ensure it meets its bridge condition targets, as well as balances budgetary needs between bridge and pavement assets.

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 has different treatment strategies defined by decision trees that are triggered by different types and levels of deterioration. The Bridge Lifecycle Strategies manual provides details on the trigger rules and treatment strategies. These strategies are determined based on the condition information that INDOT inputs into the dTIMS software to allow the analysis to take place.

With this information stored in the system, dTIMS evaluates treatment strategies by year over a 30-year analysis period to determine which treatment strategy should be applied to a given asset and in what year.

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.

Figure 11 provides an example of the type of analysis dTIMS conducts for individual bridges. This example shows a scenario for a single bridge that involves deck preservation activities in 2022 and 2043 at a total cost of \$0.9 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 2050 if no preservation activities are performed. This cost is \$2 million, considerably more than the preservation scenario.

Figure 11: 30-Year Life Cycle Plan

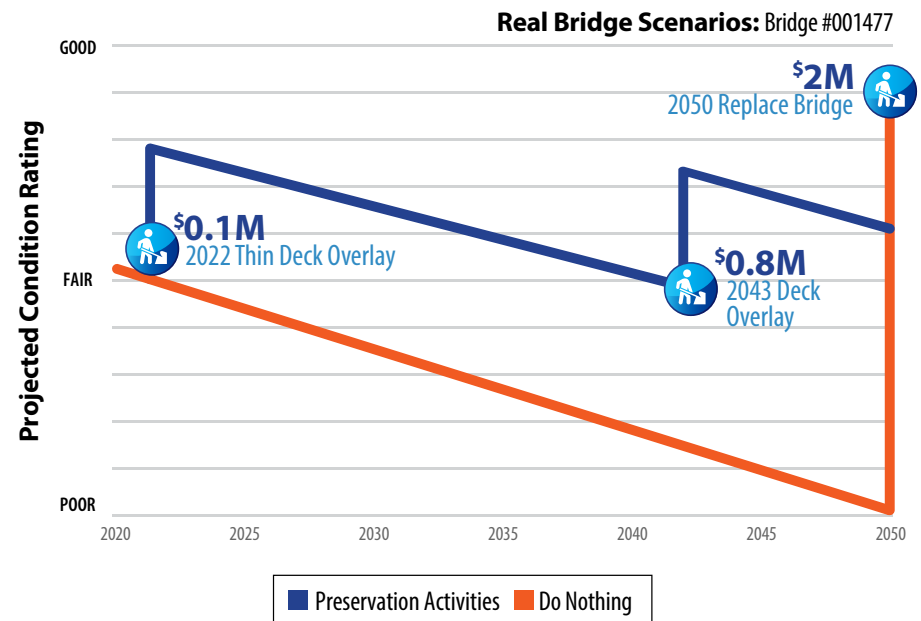


Figure 16 within the Financial Plan section of the TAMP shows the input that the LCP process provides to financial planning. **Figure 16** provides the results of the network-level analysis of five scenarios: Planning Budget, 10-Percent Funding Reduction, 10-Percent Funding Increase, Resiliency Scenario, and Do Nothing.

Once all assets in the system have been analyzed, the software calculates the costs and benefits of the strategies. The costs for treatments are based on historical costs of similar treatments from the previous 4 years. Unit costs, as provided in **Table 7**, are verified and updated annually based on historical expenditures. The benefits of the treatments are determined by the Bridge Quality Index (BQI). The BQI is a composite score between 0 and 100 primarily based on the condition of the four main bridge components: wearing surface, deck, superstructure, and substructure.

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 strategies for the entire network of bridges with the highest benefits constrained within a budget scenario defined by INDOT. The result is an optimized list of recommended projects, along with a recommended schedule for performing the treatments. Based on an analysis of funding needs performed prior to the TAMP development, INDOT has determined that it is appropriately 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.

dTIMS is also restricted to include all projects that are already programmed. Therefore, when running a new analysis with dTIMS, the software will take into consideration the projects that have been committed which increases the reliability of the recommended projects list.

The recommended projects are then scored as described in the bridge business rules presented on the next page. Once scored, the projects are analyzed again to determine the effect of the projects on the overall network bridge conditions.

¹⁰ 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).

¹¹ Minimum standards for developing and operating bridge and pavement management systems.

¹² Potential treatment strategies include deck overlay, deck replacement, and superstructure replacement, among others.



Table 7: Unit Cost by dTIMS Treatment Type

Bridge Treatment	Unit Cost (per square foot)												Targeted (5) bins each containing 1,147 (1/5th) bridges. The area associated with the mean bridge in each bin was used as the representative area (indicates if bin is skewed towards either bound)	
	(EA)	1,143 count		1,147 count		1,148 count		1,148 count		941 count		191 count		
	(SFT)	0	<= 2,650	>2,650	<= 4,590	> 4,590	<= 7,240	> 7,240	<= 11,525	> 11,525	<= 30,000	>30,000		Unlimited (>300,000)
	(WxL)	WxL 42 x 36		WxL 42 x 90		WxL 47 x 130		WxL 60 x 150		WxL 60 x 285		WxL 60 x 500		
(SFT)	1512		3780		6110		9000		17100		30000			
Bridge Painting (Interstate)		\$53.60		\$35.00		\$30.90		\$29.90		\$30.90		\$33.00	For all cases (excluding Paint), included a 20% Contingency, 2% Construction Engineering, 5% Mob and Demob, and a 4% Inflation Averaging to account for 2017 thru 2020 prices.	
Bridge Painting (Non-Interstate)		\$38.10		\$27.80		\$22.70		\$19.60		\$15.50		\$12.40		
Thin Deck Overlay (Interstate)		\$116.40		\$63.90		\$42.20		\$37.10		\$21.60		\$21.60		
Thin Deck Overlay (Non-Interstate)		\$84.50		\$42.20		\$31.90		\$26.80		\$21.60		\$15.50		
Deck Overlay (Rigid) (Interstate)		\$477.90		\$227.60		\$190.60		\$153.50		\$106.10		\$79.30		
Deck Overlay (Rigid) (Non-Interstate)		\$382.10		\$185.40		\$132.90		\$106.10		\$79.30		\$63.90		
Deck Replacement (Interstate)		\$764.30		\$424.40		\$286.30		\$233.80		\$170.00		\$143.20		
Deck Replacement (Non-Interstate)		\$567.50		\$392.40		\$291.50		\$222.50		\$138.00		\$127.70		
Super Replacement (Interstate)		\$1,124.80		\$589.20		\$419.20		\$339.90		\$259.60		\$212.20		
Super Replacement (Non-Interstate)		\$769.40		\$419.20		\$328.60		\$270.90		\$222.50		\$190.60		
Bridge Replacement (Interstate)		\$1,894.20		\$928.00		\$663.30		\$530.50		\$377.00		\$286.30		
Bridge Replacement (Non-Interstate)		\$912.60		\$535.60		\$434.70		\$365.70		\$291.50		\$239.00		



How does INDOT develop its overall bridge investment strategy?

INDOT’s Bridge Asset Management Office, which is in the 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.¹³ 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 8** and **Table 9**.

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).¹⁴ These projects are automatically given a 100-point score. Other exceptions to the rules include border bridges, fracture critical, special and underwater inspections, larger culvert replacements, and grade separation bridge projects.

¹³ INDOT, Project Scoring Guidelines and Business Rules for Bridge and Large Culvert Asset Program, July 2017.

¹⁴ Projects that involve preservation and maintenance activities.

Table 8: Bridge Rehabilitation and Major Reconstruction Scoring Factors and Weights

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
#1	Condition	0–10	5	50
#2	Cost-Effectiveness	0–10	3	30
#3	Functional Classification Priority	0–10	1	10
#4	AADT* Impacts	0–10	1	10
Subtotal				100
Supplementary Factor	Earmarks, Other Contributions	0–5	7	35
Grand Total				135

* AADT = annual average daily traffic

Table 9: Maintenance and Preservation Project Scoring System

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
N/A	Project Meeting (BCPMA*) Condition	0–5	20	100
Total				100

*BCPMA = Bridge and Culvert Preservation Maintenance Agreement



How are bridge projects prioritized?

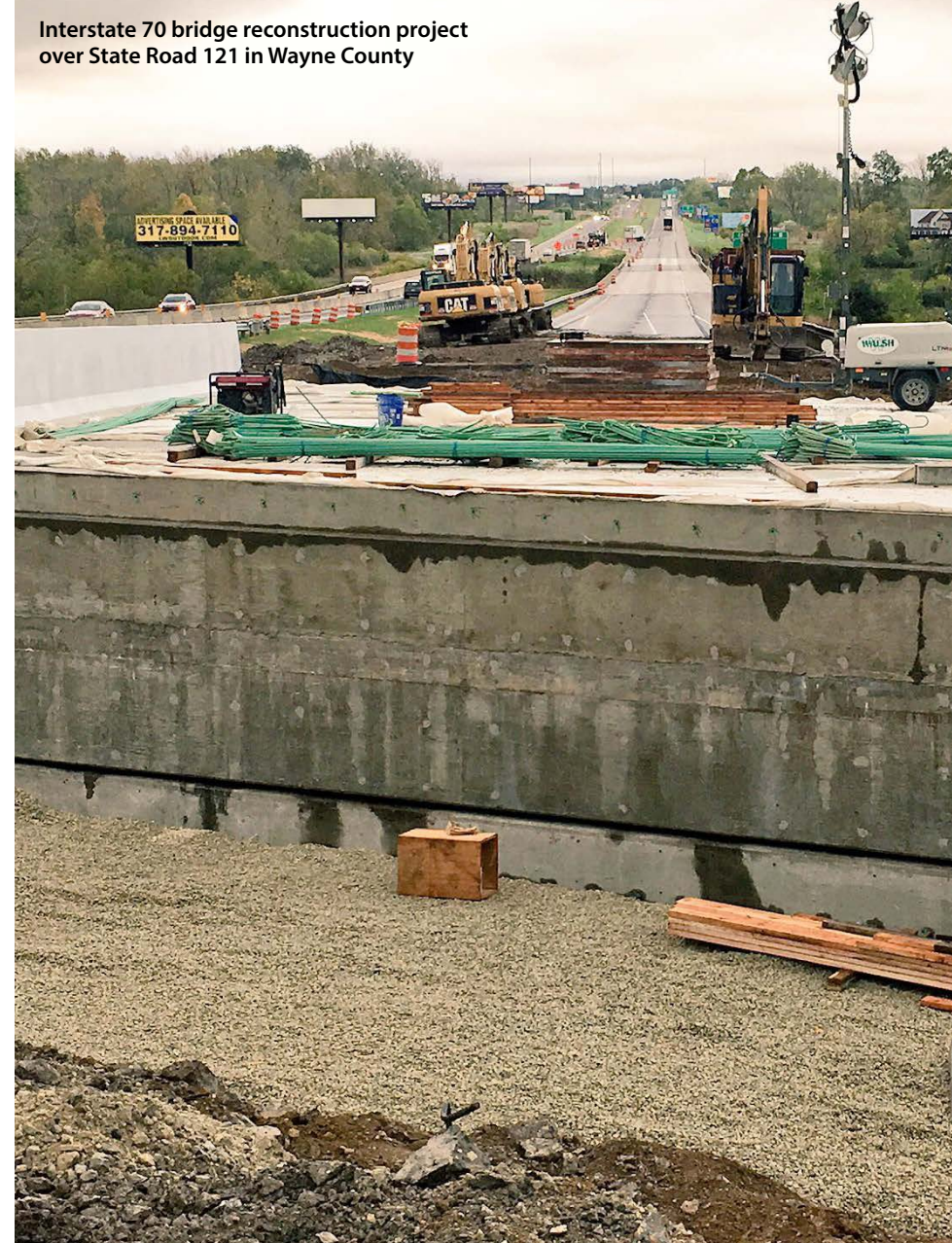
INDOT's goal is to implement a strategic, long-term program of identifying, programming, budgeting, and completing bridge and culvert preservation projects to improve the statewide condition of these assets at the lowest possible cost to taxpayers. Life-cycle planning for culverts is described in more detail in Appendix B.

Based on the type of work and the required time to develop a proposed project, INDOT has two different programs for bridges and large culverts:¹⁵

1. **Five-Year Call Program:** This program covers a range of projects. These include short-term projects (such as deck overlays, deck replacements, bridge painting, and culvert lining) that typically do not require right-of-way or railroad permits, or utility relocation, but may require some environmental permits. They also include longer term projects such as bridge replacement and major bridge component rehabilitation and reconstruction. The development time for this program is 2 to 5 years.
2. **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.

¹⁵ Culverts are tunnel-like structures that allow running water to pass under a roadway or railway.

Interstate 70 bridge reconstruction project over State Road 121 in Wayne County



What are the steps to determining bridge project priorities?

INDOT has a 20-year bridge and large culvert plan for all of its network of bridges and large culverts. Each district has reviewed the recommendations of dTIMS, considered current inspection information, and compared the asset needs while also considering how they might be best bundled with nearby pavement projects to come up with a fiscally constrained 20-year plan. This plan is then analyzed by Central Office staff to assure that the projects and treatments included align with dTIMS recommendations to improve the overall health of our network and contain an appropriate balance of preservation, rehabilitation, and replacement treatments. The projects included in each District's 20-year plan are for the most part then used in creating the long-term call each year, with some minor modifications that may be required due to changes in condition or to align with changes in the Pavement program to improve INDOT's corridor approach to asset management.

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, initially established by the PMG. 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 in **Table 8**, **Table 9**, and **Table B-2** in the appendix 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.¹⁶
7. After deliberations, the Central Office BAMT provides the final prioritized list of proposed projects with "Team Adjusted Scores" to the PMG and Executive Funds Team (EFT) for their review.
8. After final project approval, the selected projects are pushed into 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, all projects are given high priority and a 100-point score to be eligible for funding. 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 submits its list to the Central Office BMT, which verifies the eligibility of the individual projects and then submits the list to the PMG for final approval. Once approved, the selected projects are pushed into SPMS.

¹⁶ 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 BMT for approval of a higher score.



How does INDOT account for pavement life cycle costs?

In December 2020, INDOT codified its business rules and life-cycle planning processes for pavement in the Pavement Lifecycle Strategies manual. Life-cycle planning for pavement starts with the pavement management system.

INDOT's Pavement Management Section within the Asset Management Division is 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 roadway network.¹⁷ In accordance with 23 CFR 515.17,¹⁸ the dTIMS software collects, processes, and stores condition and inventory data from Roads and Highways and committed projects from SPMS to forecast expected deterioration of each asset given its current condition. All of INDOT's mainline highways are included when conducting life-cycle cost analysis.

The dTIMS model incorporates deterioration forecasts and generates future treatment strategies that optimize conditions for any budget scenario. This allows INDOT to allocate sufficient funding to ensure it meets its road condition targets, as well as balance budgetary needs between bridge and pavement assets.

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.

The dTIMS software is imbedded with trigger rules that determine which treatment strategies apply to different types and levels of deterioration. The trigger rules, treatment strategies, and reset conditions are described in the Pavement Lifecycle Strategies manual. In order for the analysis to take place to determine the appropriate treatment strategies, INDOT inputs condition information of the roadway into the dTIMS software.

With this information stored in the system, dTIMS evaluates treatment

strategies¹⁹ 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 for a given budget scenario. 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.

Figure 12 provides an example of the type of analysis dTIMS conducts for an individual pavement section. In this analysis, the dTIMS software determined a preventive maintenance (PM) overlay project would be needed in 2022 for a cost of \$17.2 million. Then, to improve the condition level back to the target, a structural overlay would be needed in 2037 for \$30.5 million. The total cost of these two treatments is much lower than the \$163.9 million cost to replace the entire section of pavement in 2042.

Figure 12: Pavement Life Cycle Planning Example

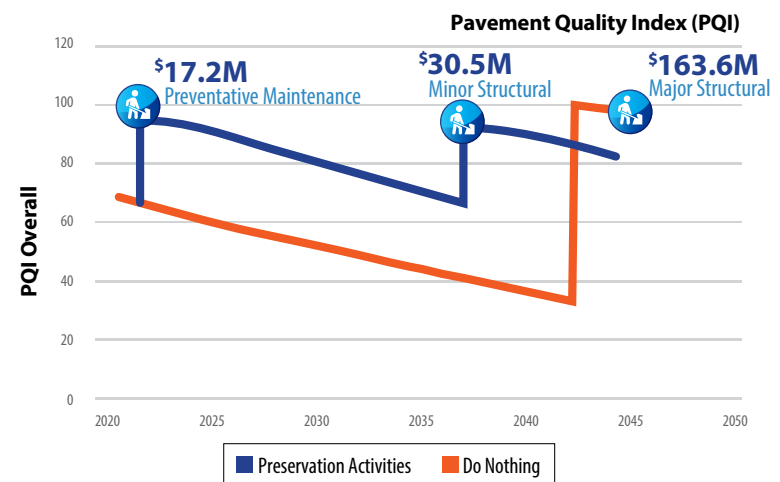


Table 10: Unit Costs by dTIMS Treatment Type

Pavement Treatments	Unit Cost (per square yard)			
	Hot Mix Asphalt (HMA)		Concrete	
	Interstate	Non-Interstate	Interstate	Non-Interstate
Preventive Maintenance	31	25	20	20
Minor Structural	42	42	-	-
Major Structural	225	195	225	195
Rehabilitation	-	-	140	-

Figure 17 within the Financial Plan section of the TAMP shows the input that the LCP process provides to financial planning. **Figure 17** provides the results of the network-level analysis of five scenarios: Planning Budget, 10-Percent Funding Reduction, 10-Percent Funding Increase, Resiliency Scenario, and Do Nothing.

Once all roadways in the system have been analyzed, the software utilizes an optimization approach to calculate the costs and benefits of the strategies. The costs for treatments are based on historical costs of similar treatments over the last two to three years. Unit costs, as provided in **Table 10**, are verified and updated annually based on historical expenditures. The treatment benefits are based on the Pavement Quality Index (PQI), which is a function of the four condition factors of International Roughness Index (IRI), rutting (RUT), cracking, and faulting (FAU). The PQI score is between 0 and 100.

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 treatment strategies of the entire roadway network that provide the highest benefit 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.

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.

dTIMS is also restricted to include all projects that are already programmed. Therefore, when running a new analysis with dTIMS, the software will take into consideration the projects that have been committed, which increases the reliability of the recommended projects list. INDOT’s Pavement Asset Management Team (PAMT) is also continuously reviewing the system to implement updates as needed.

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

¹⁷ dTIMS software includes multiple modules. INDOT uses the pavement module as its pavement management system (PMS) to calculate pavement life cycle costs

¹⁸ Minimum standards for developing and operating bridge and pavement management systems.

¹⁹ Potential treatment strategies include mill and fill, grinding up and installing new asphalt, or a structural overlay.



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 PAMT has developed pavement business rules that describe the methods for prioritizing proposed projects recommended by the management system.²⁰ This method ranks the projects recommended during the life-cycle planning analysis process to determine the best allocation of resources.

The project prioritization system uses project-level data to determine the benefit and timing of each investment. The data are assessed based on the pavement material, treatment category, road category, and typical timing for planned investment.

The two pavement materials considered are hot mix asphalt (HMA) and portland cement concrete pavement (PCCP). For HMA, the work treatment options include preventative maintenance, minor structural, and structural. PCCP work treatment options include preventative maintenance and structural.

After the preliminary ranking, 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 Pavement Asset Team creates a list of projects to recommend for programming.

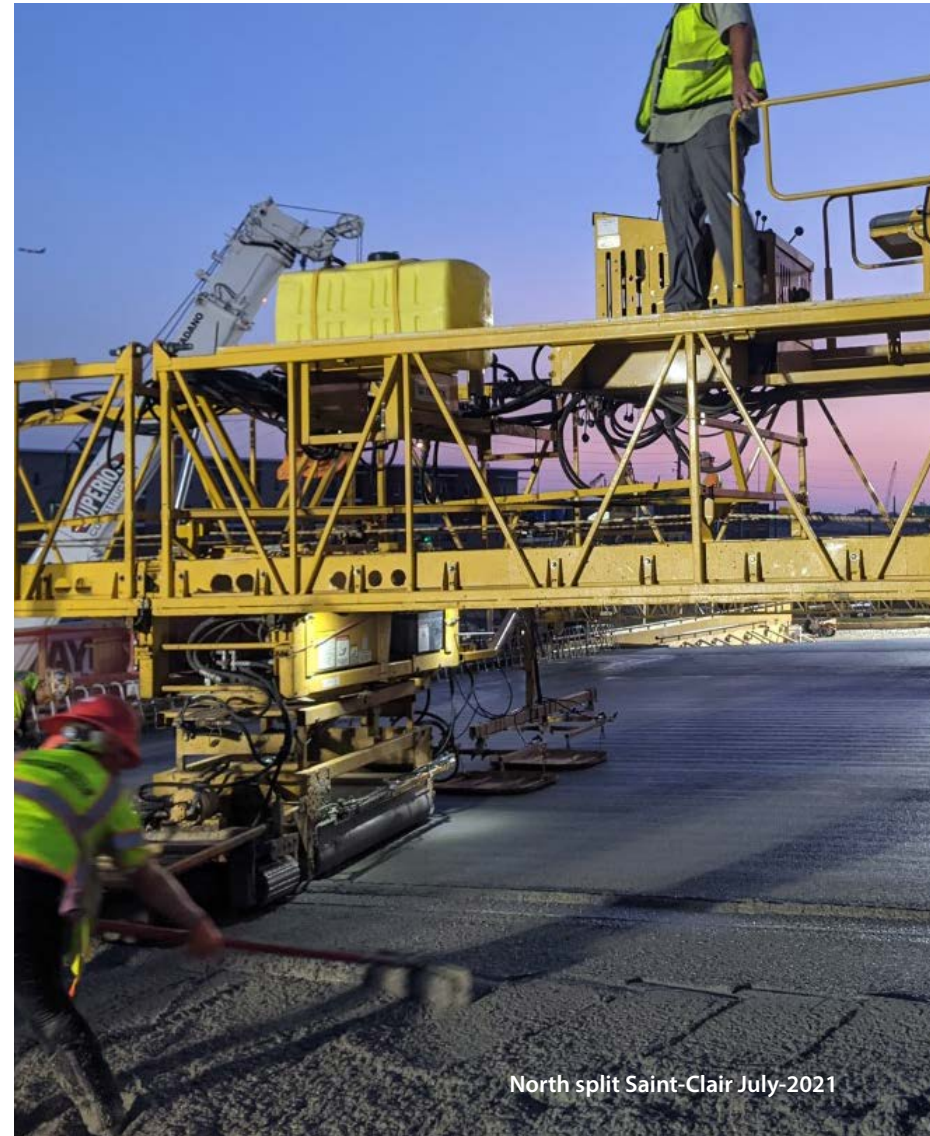
²⁰ INDOT, Roadway Asset Team Operation Policy, October 2017



How does INDOT determine pavement project priorities?

The annual call for projects to maintain a 5-year capital program involves the following steps, culminating in funding for the overall program:

1. The INDOT Central Office PAMT analyzes the entire INDOT network of pavement with its PMS model for a set funding level, initially established by the PMG. The model produces a summary of recommended treatment strategies over a 15-year period based on benefit-cost ratios.
2. The 5-year capital program in conjunction with the 15-year planning period is compiled into INDOT's 20-year pavement asset management plan.
3. The PAMT validates Years 6-10 of the 20-year plan annually based on the recommendations of the model, pavement testing data (cores, geotech, FWD), local knowledge of pavement performance, and engineering judgment.
4. The candidate list considered for INDOT's annual call for projects is taken from Year 6 of the 20-year plan. The PAMT uses the prioritization system to rank projects in the candidate list
5. The PAMT gathers to discuss the proposed projects and to confirm or modify the priority based on data provided in the project scopes.
6. After deliberations, the final prioritized list of proposed projects is provided to the PMG and Executive Funds Team (EFT) for their review.
7. After final project approval, projects are pushed into SPMS, where they become active projects.



What are the Ohio River Bridges?

The Louisville-Southern Indiana Ohio River Bridges Project (Project) consisted of two separate design and construction contracts under one National Environmental Policy Act (NEPA) document. The Downtown Crossing (DTC) contract was procured and executed by Kentucky Transportation Cabinet (KYTC), including all Project work in Indiana along I-65. The East End Crossing (EEC) contract was a P3 contract procured and executed by the Indiana Finance Authority (IFA) with the support of INDOT. This contract included all Project work in Kentucky along KY 841.

The Project constructed two new Ohio River bridges: the Abraham Lincoln for I-65 NB at the DTC and the Lewis and Clark Bridge for KY 841 at the EEC. The DTC contract also rehabilitated the John F Kennedy Bridge, which now carries I-65 SB across the Ohio River. The purpose of the Project was to increase cross-river mobility by improving safety, alleviating traffic congestion, and connecting highways between Kentucky and Indiana. The Lewis and Clark Bridge is located along IN 265 and KY 841 over the Ohio River.

In addition to the Lewis and Clark Bridge, the EEC included 16 additional new bridge structures, 13 of which fall under the Operations and Maintenance Phase of the P3 contract for a term of 35 years after Substantial Completion on December 18, 2016. The full list of all EEC bridges is found in **Table 11**.

KYTC took the lead to finance, design, and construct the Downtown Crossing, while INDOT oversaw finance, design, and construction of the East End Crossing. Because the Abraham Lincoln Bridge is the responsibility of the State of Kentucky, the information in this section of the TAMP is in reference to the Lewis and Clark Bridge at the East End Crossing and the 13 additional bridges constructed as part of the EEC. The East End Crossing is maintained and operated by East End Crossing Partners (EECP), formerly WVB East End Partners (WVB).

Table 11: Ohio River Bridges

NBI	Name	Location
080663	Lewis and Clark	SR-265 over Ohio River
079900		Port Rd over SR 265 NB & SB (LSIORB Section 6)
079902		Port Rd over ramp from SR62 to SB SR265 (Ramp IR-9) (LSIORB Section 6)
080659		SR 265 SB over Lentzier Creek & Brookhollow Way (LSIORB Section 6)
080660		SR 265 NB over Lentzier Creek & Brookhollow Way
070610		SR 265 WB ramp (Ramp IR-1) from SR 62 over C&O RR (LSIORB Section 6)
070590		SR 265 SB over C&O RR (LSIORB Section 6)
070600		SR 265 NB over C&O RR (LSIORB Section 6)
070650		SR 265 NB over SR 62 (LSIORB Section 6)
070640		SR 265 SB over SR 62 (LSIORB Section 6)
080655		SR 265 SB over Utica-Charlestown Rd & UNT to Lentzier Creek (LSIORB Section 6)
080656		SR 265 NB over Utica-Charlestown Rd & UNT to Lentzier Creek (LSIORB Section 6)
080657		SR 265 NB over UNT to Lentzier Creek (LSIORB Section 6)
080658		SR 265 SB over UNT to Lentzier Creek (LSIORB Section 6)



What is East End Crossing Partners and its responsibilities?



EECP consists of two entities: VINCI Concessions and BBGI Global Infrastructure. EECP is under a 35-year operations and maintenance contract with the Indiana Finance Authority. The contract between EECP and the Indiana

Finance Authority (IFA) is a Public-Private Agreement (PPA) that defines EECP's responsibilities for the East End Crossing.

Specifically, the details the roadway and bridges asset handback criteria. For instance, pavement, curbs, and gutters must have 10 years of useful life remaining at handback. All handback criteria are outlined in Table 23-1 within the Technical Provisions of the PPA.

Handback provisions for various elements are found in Section 23 of the [Technical Provisions](#) document. The performance measures for the ITR are found in Table 22-1 of the [Technical Provision Attachments](#). For example, if a 300-foot section of roadway exceeds an IRI of 160, the roadway will be remedied within 8 months. A pothole that is greater than 0.5 feet deep will be mitigated within 24 hours, temporarily repaired within 28 days, and permanently repaired within 8 months.



How does East End Crossing Partners perform asset management?

EECP is fully responsible for all operating and maintenance (O&M) work for the East End Crossing according to the PPA. Under the PPA, EECP carries out all O&M work in accordance with Good Industry Practice, the requirements, terms, and conditions set forth in the PPA, all laws, the requirements, terms, and conditions set forth in all governmental approvals, the approved Project Management Plan, the approved Operations and Maintenance Plan, the approved Maintenance Plan, Best Management Practices, Safety Compliances, the Safety Plan and Safety Standards, and all other applicable safety, environmental and other requirements.

EECP must follow specific Technical Provisions for conducting general inspections, specialist inspections, and performance inspections of the East End Crossing. The results of the inspections guide development and updates to the Rehabilitation Work Schedule, maintaining asset condition and service levels, and to develop maintenance and rehabilitation work programs.

For all operations and maintenance work, EECP either performs the work itself or enters into an O&M contract with a subcontractor to perform the work. Specific requirements for the contractor in terms of expertise, qualifications, experience, competence, skills, and know-how are outlined in the PPA.



How is performance evaluated on the ORB East End Crossing?

Table 22-1 of Attachment 1 to the Technical Provisions of the PPA, outlines the performance and measurements for the ORB East End Crossing. For instance, flexible pavement must have a smooth surface course with adequate skid resistance and be free from defects. The inspection and measurement method to identify cracks on flexible pavement is through an automated condition distress survey; whereas, potholes are identified by visual inspection.



What are the current conditions of the ORB?

Bridge and pavement condition for the ORB are reported based on INDOT's condition rating system as well as FHWA's condition rating system (see **Table 12** and **Table 13**). Based on INDOT's condition rating system, 90 percent of the bridges are in good or fair condition and 90.5 percent of the pavement is

in good or fair condition. When calculating the condition rating based on the FHWA system, 100 percent of the bridges and pavement are in good or fair condition.

Table 12: ORB Bridge Condition Data

INDOT Condition Rating ORB I-265		
Condition	# Bridges	Percent
Good	11	91.7%
Fair	1	8.3%
Poor	0	0.0%
Grand Total	12	100.0%

FHWA Condition Rating ORB I-265		
Condition	Deck Area	Percent
Good	706,288	98.6%
Fair	10,084	1.4%
Poor	0	0.0%
Grand Total	716,372	100.0%

Table 13: ORB Pavement Condition Data

INDOT Condition Rating ORB I-265		
Condition	Miles	Percent
Good	2	100.0%
Fair	0	0.0%
Poor	0	0.0%
Grand Total	2	100.0%

FHWA Condition Rating ORB I-265		
Condition	Miles	Percent
Good	2	100.0%
Fair	0	0.0%
Poor	0	0.0%
Grand Total	2	100.0%



What is the Cline Avenue Bridge Facility?

The Cline Avenue Bridge facility, located in East Chicago, IN, comprises a precast concrete segmental bridge over the Indiana Harbor Canal, the east steel bridge, and the Ramp A Riley Road access structure. These are maintained by Cline Avenue Bridge LLC. As shown in **Figure 13**, the bridge facility is part of State Road 912 and connects to a stretch of Interstate 80/94. In addition to the bridge structures described above, Cline Avenue Bridge, LLC has maintained responsibility of three segments of roadway pavement:

Section 1 – Cline Ave Mainline

This section stretches from the median crash barrier east of Indianapolis Boulevard to the toll plaza gantry west of the EH&E Railroad and is approximately 930 feet in length.

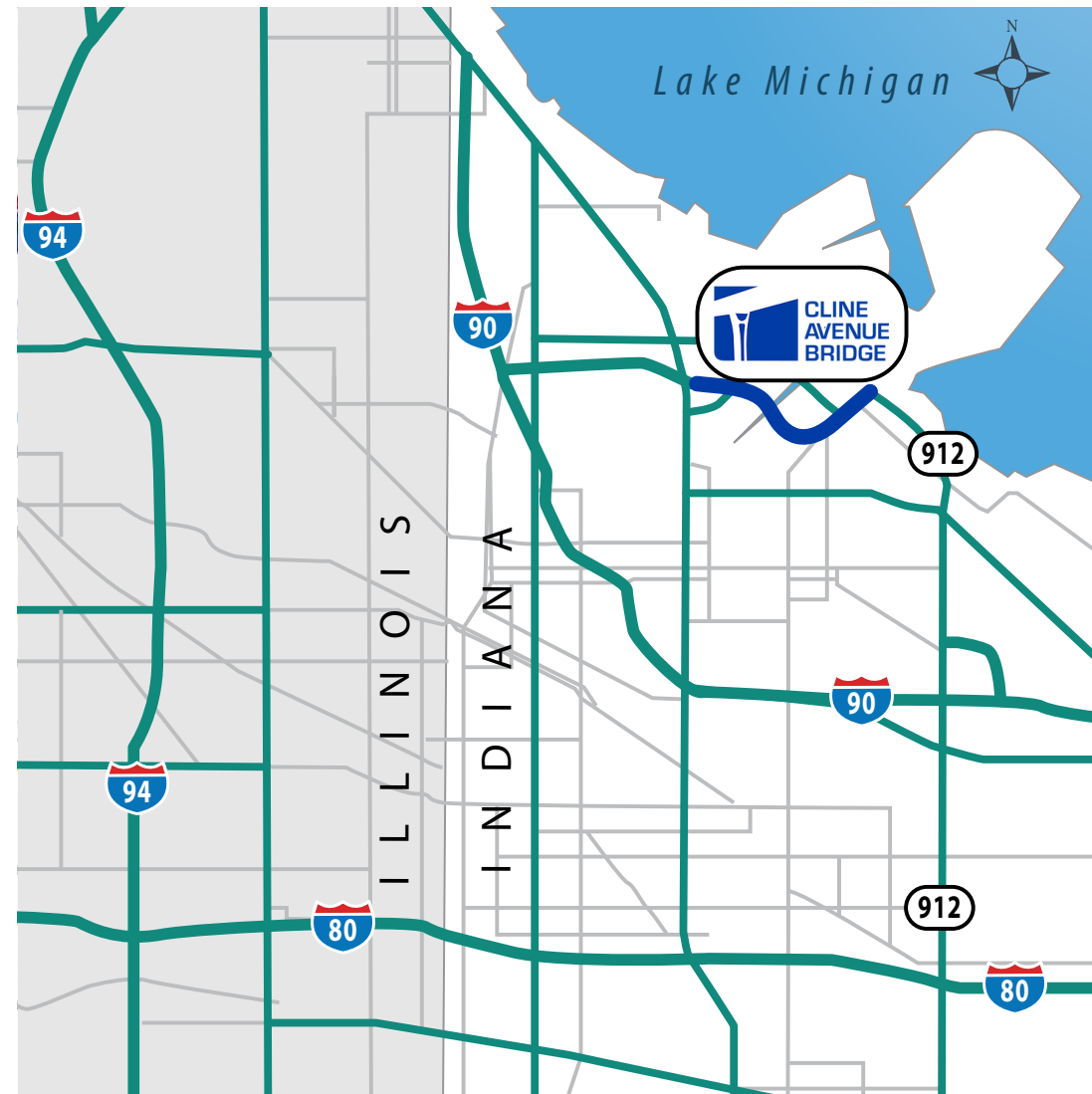
Section 2 – Cline Ave Toll Plaza

The toll plaza is located at the west limit of the Cline Avenue Bridge. It is 62 feet in length with one 12-foot lane in each direction.

Section 3 – Westbound Riley Road Entrance Ramp (Ramp B)

This section stretches from the east side of the segmental bridge portion of the ramp to the northern edge of pavement along Riley Road.

Figure 13: Cline Avenue Bridge Map



What are Cline Ave Bridge LLC and its responsibilities?



Cline Avenue Bridge LLC is a subsidiary of United Bridge Partners (UBP), which is a private bridge infrastructure company that finances, builds, owns, designs, and operates private toll bridges in the United States.

Per section 7.02 of the Exchange Agreement, Cline Avenue Bridge LLC has agreed to construct, operate, and maintain the Cline Avenue Bridge in accordance with the terms of the Development Agreement, and is solely liable for operating the property, including routine maintenance, emergency repairs, and regular inspections. Cline Avenue Bridge LLC's inspections adhere to the National Bridge Inspection Standards (NBIS), or any alternative program reviewed and approved by INDOT.

As per the American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications, the Cline Avenue Bridge project team projects a 75-year Design Life. AASHTO provides minimum Service Life Requirements of permanent and replaceable elements, provided in **Table 14**. The full project maintenance schedule for the Cline Avenue Bridge is included in Attachment 1 of the Cline Avenue Bridge TAMP.

Table 14: Bridge Element Service Life

Bridge Element	Minimum Required Service Life (years)
Permanent Elements Include:	
Foundations, including piles, pile caps and footings	75
Substructures, including piers, pier caps, and abutments	75
Superstructures including primary and secondary structural members, decks, and bracing	75
Retaining Walls	75
Sign Structures and Gantry Structures	50
Replaceable Elements Include:	
Bridge bearings	45
Deck expansion joints, strip seal	25
Deck expansion joints, modular	45
Concrete barriers	45
Deck wearing surface - polymer or cementitious	25
Drainage system	60
Coating system for structural steel - paint	45



How does Cline Ave Bridge, LLC perform asset management?

Cline Ave Bridge, LLC is fully responsible for all operating and maintenance (O&M) work for the Cline Avenue Bridge facility according to the Exchange Agreement. Under the Exchange Agreement, Cline Ave Bridge, LLC carries out all O&M work in accordance with good industry practice and annual inspections in accordance with the National Bridge Inspection Standards, the requirements, terms, and conditions of which are set forth in the Exchange Agreement.

Asset management planning for the Cline Avenue Bridge adheres to the following inspection requirements. Inspections follow the I test inspection guidelines (as they apply at the relevant date on which the testing is undertaken) recognized by the NBIS, with inspections conducted annually. A close examination is made of all parts of each structure. Non-destructive tests are undertaken as appropriate for the type of structure. Tests may include the measurement of structural deflection under calibrated load, the identification and measurement of delamination in bridge decks, the measurement of chloride and carbonation profiles from surface to reinforcement or tendon level, and the in-situ strength testing of concrete elements. Testing of steel structures includes the depth of corrosion or the measurement of remaining structural thickness for hidden and exposed parts and structural coating system analysis. All lengths of weld are tested for cracking at key areas, including all fracture critical details of structural steelwork.

With normal maintenance performed, the Cline Ave Bridge elements are expected to meet the service life outlined in **Table 14**, without replacement or major rehabilitation. Periodic inspections, meeting NBIS requirements, by qualified personnel monitor the condition through the operation and maintenance period, and identify and recommend changes to the maintenance program, as well as locations where the maintenance activities should occur.

Inspections carried out by Cline Avenue Bridge, LLC must meet NBIS requirements. NBIS inspections are conducted annually, with underwater inspections conducted every 60 months. Inspection results are entered into the Bridge Inspection Application System (BIAS), as per INDOT requirements.

In addition to annual inspections, maintenance personnel make more frequent cursory (visual) inspections to detect bridge deck element deficiencies such as joint seal issues, and traffic barrier and railing deficiencies, which will be addressed as they are discovered to meet performance requirements, and also to keep these deficiencies from growing and becoming more costly to repair.



How is performance evaluated on the Cline Avenue Bridge Facility?

Section 1.2 of the Cline Avenue Bridge TAMP and inspection reports outline the performance and measurement evaluation process for the Cline Avenue Bridge. The deck and associated elements are sounded with hammers to help identify areas of unsound concrete. The interior and exterior surfaces of the segmental box girder are inspected for signs of distress. Substructure units are also sounded with hammers to detect outward deficiencies.

As of the latest inspection report (December 2020), all approach, deck, and substructure elements have been deemed in very good condition. The Ramp B superstructure was assessed to be in satisfactory condition. All other superstructure elements are in very good condition. All submerged structure units of the Cline Avenue Bridge were also assessed to be in good or satisfactory condition.



What are the current conditions of the Cline Avenue Bridges?

Bridge and pavement condition for the Cline Ave Bridge facility is reported based on INDOT’s condition rating system as well as FHWA’s condition rating system (see **Table 15**). Based on INDOT’s condition rating system, 100 percent of the bridges are in good or fair condition and 100 percent of the

pavement is in good or fair condition. When calculating the condition rating based on the FHWA system, 100 percent of the bridges and pavement are in good or fair condition.

Table 15: Cline Ave Bridge Condition Data

INDOT Condition Rating		
Condition	# Bridges	Percent
Good	2	67
Fair	1	33
Poor		
Grand Total	3	100

FHWA Condition Rating		
Condition	Deck Area (Ft ²)	Percent
Good	552,502	97
Fair	17,441	3
Poor		
Grand Total	569,943	100



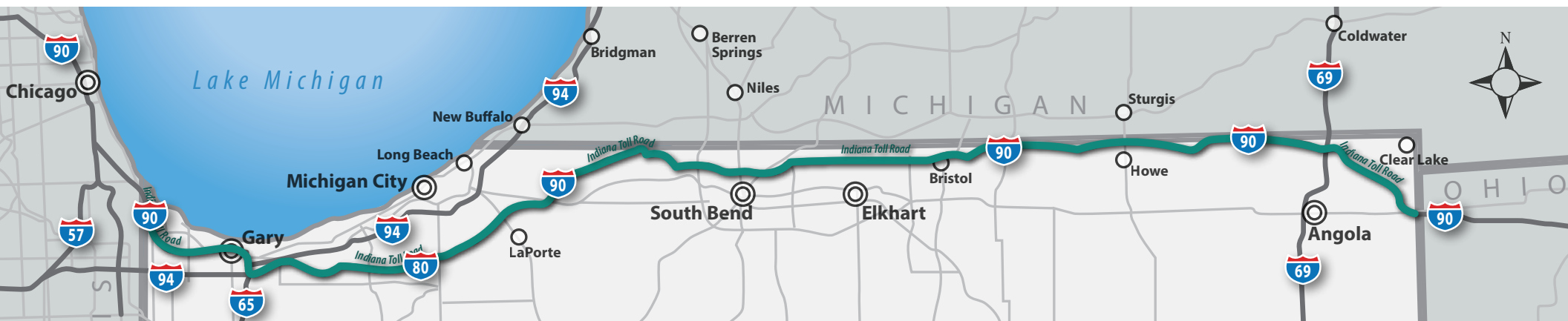
What is the Indiana Toll Road?

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 14**, the ITR crosses northern Indiana to connect Ohio and Illinois. The ITR has been in existence since 1956 and consists of 157 miles of roadway and 333 bridges.^{21, 22}

²¹ Indiana Toll Road Concession Company, 2016–2027 Capital Improvement Program Report, January 2018.

²² 242 of these bridges are on the NHS.

Figure 14: Indiana Toll Road Map



What is the Indiana Toll Road Concession Company and its responsibilities?



The ITR Concession Company, LLC (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 until June 30, 2081 at a cost of \$3.85 billion. In 2015, ownership of ITRCC transferred from Cintra/Macquarie to IFM Investors (IFM) for the remaining 66 years of the 75-year agreement for \$5.725 billion.

ITRCC is responsible for maintaining the ITR facilities and pavement in good condition throughout the lifetime of the **Concession and Lease Agreement for the Indiana Toll Road**. INDOT and IFA have a Memorandum

of Understanding. INDOT oversees that ITRCC is in compliance of the lease. To ensure that ITRCC is maintaining its assets according to the requirements of the agreement, ITRCC provides IFA and 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.



I-80/I-90 westbound Indiana Toll Road, near Exit 77 at Roseland

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.²³ All ITR bridge inspection information is stored in BIAS. **Table 16** outlines the activities that ITRCC performs to maintain the bridges and structures, and the frequency of such activities.

Table 16: Maintenance Activity and Frequency

Activity to be Performed	Minimum Frequency
Bridge and structure cleaning: <ul style="list-style-type: none"> Bridges Overhead and bridge-mounted signs Retaining walls and other structures 	Once yearly, when no further winter chemicals will be applied, but no later than May 31
Inspections and reports: <ul style="list-style-type: none"> All bridge structures Filing of INDOT Inventory/Appraisal Forms Fracture critical structures and members Underwater inspection 	Once every 2 years Once every 5 years Annually Once every 5 years

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. ITRCC's consultant for inspections is Lochner, an IFA-approved inspection company.

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.

The facilities inspection evaluates the condition of the ITR's building and operating system components, including power supply, heating and cooling systems, ventilation, washroom facilities, pumps, and architectural and structural components. All ITR facilities are divided into four groups for purposes of inspections (Group A, B, C, and D). Each year, the inspection team selects a group to evaluate so that each group is inspected every 4 years.

Environmental inspections cover the current state of environmental records, 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 has connected its travel plazas to local water and sewers and have eliminated the prior treatment plants.

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**.²⁴

²³ 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.

²⁴ Indiana Finance Authority, Concession and Lease Agreement for the Indiana Toll Road, Volume II of III, Operations and Procedures Manual.



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 17**.

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 17**.

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 and hazardous material management, among other initiatives.

Table 18 lists the current condition targets for the ITR. Currently, 97 percent of the ITR bridges are currently in fair or better condition. The ITR pavement is currently 88.4 percent good, 8.1 percent fair, and 3.5 percent poor. Performance targets for maintenance items remain as stated in the **Concession and Lease Agreement for the Indiana Toll Road** for operational performance indicators. ITRCC's goal is to maintain overall pavement condition in and "excellent" or "good" rating, and to continually improve in all of the bridge ratings as detailed in the state of the ITR report. In the last two years, ITRCC met or exceeded in all seven (7) categories.

Table 17: Condition Assessment Approach, ITR

Asset	Approach	Description
Bridges and Structure	Performance Index (PI) and Sufficiency Rating	<p>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.</p> <p>ITR then attributes the following condition labels based on the sufficiency rating (percent) of the bridge:</p> <ul style="list-style-type: none"> • Excellent: 90–100 • Good: 80–90 • Fair: 70–80 • Marginal: 60–70 • Poor: <60
Pavement	Pavement Quality Indicator (PQI)	<p>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.</p> <p>The score is from 0 to 100:</p> <ul style="list-style-type: none"> • Excellent: 90–100 • Good: 80–90 • Fair: 70–80 • Poor: <70

Table 18: Condition Targets, ITR

Asset	Condition Target
Bridges and Structure	Average sufficiency rating of 80
Pavement	<p><u>Mainline</u>: Average PQI of 80; No more than 10 percent in poor condition</p> <p><u>Toll Plaza Ramp</u>: 90 percent of pavement in good condition</p> <p><u>Travel Plaza Parking Lot</u>: 90 percent of pavement in good condition</p>



What are the current conditions of the Indiana Toll Road?

ITRCC reports condition ratings for all 333 bridges,²⁵ including decks, superstructures, substructures, and an overall sufficiency rating. Routine NBIS inspections were performed on 317 bridges with National Bridge Inventory (NBI) Reports for each bridge prepared utilizing INDOT's web-based BIAS. The 16 remaining structures under the PUSH 2.0 project received Routine NBIS inspections performed by the design build team and were completed after construction of the PUSH 2.0 project.²⁶ All of the 333 bridge structures' current condition ratings are reflected within the 2020 Annual State of the ITR report.

The average sufficiency rating for ITR bridges in 2020 is 87.2 percent. This is basically unchanged from an average sufficiency rating of 87.4 in 2017. Based on the sufficiency ratings, there has been a decrease in the percent deficiencies compared to the previous years, due to the implementation of the PUSH 1.0 and 2.0 projects, as well as other structure specific contracts the ITR has procured since 2015.

From 2015 to 2020, the PQI of the ITR mainline pavement decreased from 93.3 to 90.6 on average. Although the value has decreased, the 90.6 rating is still above the goal of a PQI above 80 and rated as Excellent.

For ITR bridge condition information on the NHS, please refer back to **Table 3** in Section 2. For ITR pavement condition information on the NHS, please refer back to **Table 5** in Section 2.

²⁵ 242 of these bridges are on the NHS Other bridges, such as overpasses and structures along frontage roads, are not part of the NHS.

²⁶ ITRCC's PUSH projects are a major project to improve customer safety, improve the condition of bridges and pavement on the ITR, and reduce the level of maintenance work required in the future. The first two phases, PUSH 1.0 and PUSH 2.0, have been completed.



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, one major project (the PUSH Project) is included in the Capital Improvement Program related to pavement and bridge improvements. The PUSH project is a major rehabilitation and upgrade of a 73-mile section of the ITR. The PUSH Project was separated in five phases for contracting. As of this TAMP submission, PUSH 1.0, PUSH 2.0, and PUSH 3.0 phases are complete, PUSH 4.0 is currently planned for 2025 from MM123- the Ohio state line, and PUSH 5.0 from MM10-20 is currently planned for 2030.

The PUSH Project has addressed over 25 percent of the bridge structures within the ITR corridor. The pavement portion of the PUSH Project included rehabilitation of more than 70 miles of pavement. The PUSH 2.0 phase rehabilitated a 10-mile corridor section of the ITR. The mainline pavements were cracked and sealed 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.

In 2021, 89/90 PUSH 3.0 phase will rehabilitate 30 miles of pavement from MM93-123, four interchanges and 16 bridge decks. ITR ramps that have a Fair or Poor rating are being addressed in PUSH 3.0 or the annual mill and fill program in 2021. This will bring all ramp pavement conditions to an Excellent or Good rating. In 2021, ITRCC will complete its Smart Truck Parking which will deploy 12 electronic signs across the ITR providing available truck parking spaces at all parking areas. In 2021, ITRCC will kick off a full replacement of its toll system to improve customer service and payment options.



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.

From 2020 to 2030, ITRCC has a total of \$373,183,131 planned spending for capital improvement projects on the ITR. Of this total, \$250 million is allocated for the PUSH 3.0, 4.0, and 5.0 projects, \$52,472,091 for building/roadway/lighting projects (specifically about \$40,296,000 of this will be spent on roadway assets), and \$31,711,040 for bridge assets.

First toll booth west of the Indiana-Ohio border, along I-90 westbound



Google Earth



What is the value of INDOT's bridges and pavements?

Based on an analysis of historical data, INDOT estimates that it would cost approximately \$190 to \$1,900 per square foot to replace a bridge, depending on deck area and location. **Table 7** in the Life Cycle Planning section documents these costs. However, there are seven bridges that cross over the Ohio River that have higher replacement costs is due to the large size of these bridges. These seven bridges include the I-64, I-265, I-275 bridges, two bridges along US 41, and two bridges along I-65.

In order for INDOT to rebuild all NHS bridges, it would cost approximately \$14.8 billion. When including non-NHS bridges owned by INDOT, this figure increases to \$22.4 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 is

approximately \$1.8 million. INDOT would require \$52.2 billion to rebuild its highway system of 28,514 lane-miles of pavement. The cost increases by another \$1.0 billion when including NHS pavement owned by entities other than INDOT.

Table 19 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 19: Cost to Replace Bridges and Pavement (Billions)

Asset	Owned by Others*	Owned by INDOT				Replacement Costs
	NHS	Interstate	NHS (Non-Interstate)	Border Bridge	Non-NHS	
Bridge	\$1.7	\$8.1	\$4.3	\$0.7	\$7.6	\$22.4
Pavement**	\$1.0	\$10.6	\$15.0	N/A	\$26.5	\$53.2
Total						\$75.6

* 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 the table due to rounding.



SR 9 Grant Company pouring a thin concrete overlay



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 Draft 2022-2026 [STIP](#).²⁷ 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 states. Two percent of a state's NHPP funding is set aside for State Planning and Research (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 further sub-allocated among set aside programs under the STPBG program. 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 further sub-allocated among set aside programs under the HSIP program. Two percent of a state's HSIP 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. The total is further sub-allocated among set aside programs under the CMAQ program. 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.²⁸

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 as soon as possible after the disaster. The damage survey summary report must be prepared within 6 weeks following the notification, and the project must advance to the construction obligation stage by the end of the second fiscal year following 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 apart from off-system bridges and section 130 rail. Allocations for local federal aid funds are granted through local federal aid calls or direct allocations to Metropolitan Planning Organizations.
- **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, 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, and Highway Planning and Research Program.

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.²⁹

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

²⁷ INDOT, *INDOT Draft STIP 2022-2026*

²⁸ PM_{2.5} areas were last reported in 2017. At that time, Indiana had PM_{2.5} 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>

²⁹ House Enrolled Act 1002, <https://iga.in.gov/legislative/2017/bills/house/1002#digest-heading>



What Types of Bridge and Pavement Treatment Activities Does INDOT Perform?

INDOT has developed a crosswalk of activities from the Scheduling Project Management System (SPMS) that correspond to the five work types defined by FHWA in **Table 20**. An exhaustive list can be found in Appendix C.

Table 20: FHWA Work Type to INDOT Treatment Crosswalk

FHWA Work Type	INDOT Pavement Treatment	INDOT Bridge Treatment
<p>Maintenance</p>	<p>Minor, corrective actions, including:</p> <ul style="list-style-type: none"> • Patching (partial and full depth); and • Spot Paving. 	<p>Minor, corrective actions, including:</p> <ul style="list-style-type: none"> • Bridge Deck Patching; • Replacing Joints; • Straightening Beams; and • Channel Realigning and Reshaping.
<p>Preservation</p>	<p>Minor treatments intended to preserve the life and condition of a road, including:</p> <ul style="list-style-type: none"> • Crack Sealing; • Chip sealing; and • Resurfacing (single lift). 	<p>Minor treatments intended to preserve the life and condition of a bridge, including:</p> <ul style="list-style-type: none"> • Deck Overlay (thin and rigid); • Deck Sealing and Resealing Activities; • Deck Cleaning; and • Scour Protection.
<p>Rehabilitation</p>	<p>Intermediate level treatments intended to restore functionality and structure, including:</p> <ul style="list-style-type: none"> • Structural and Minor Structural Overlay; and • Slide Correction. 	<p>Intermediate level treatments intended to restore functionality and structure, including:</p> <ul style="list-style-type: none"> • Bridge Rehabilitation or Repair; • Bridge Deck Reconstruction or Replacement; and • Bridge Widening.
<p>Reconstruction</p>	<p>Replacement or substantial reconstruction of an existing road, including:</p> <ul style="list-style-type: none"> • Pavement Replacement; • Rubblizing; • Full Depth Reclamation; • Storm Sewer Repair or Replacement; and • Sewer/Curb/Gutter Construction or Reconstruction. 	<p>Replacement or substantial reconstruction of an existing bridge, including:</p> <ul style="list-style-type: none"> • Bridge Replacement; • Small Structures & Drains Construction; and • Small Structure Replacement.
<p>Construction</p>	<p>Any Mobility Project, including:</p> <ul style="list-style-type: none"> • New Road; • Added Travel Lanes; • Truck/Auxillary Lane Construction; • Sewer/Curb/Gutter Construction; and • Pumping/Lift Stations. 	<p>Any Mobility Project, including:</p> <ul style="list-style-type: none"> • New Bridge; and • New Small Structure.



How does INDOT establish 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.

Tables 21, 22, 23, and 24 provide a breakdown of funding for INDOT’s investment strategies over the next ten years, according to the five work types identified by FHWA.

Table 21: Capital Investment by FHWA Work Type NHS and non-NHS (Millions)

Work Type	Year									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Construction	\$971.9	\$705.1	\$604.0	\$416.4	\$708.4	\$541.5	\$556.7	\$568.9	\$581.6	\$594.7
Maintenance	\$34.8	\$35.7	\$37.5	\$40.4	\$44.6	\$50.4	\$58.5	\$69.5	\$84.7	\$105.8
Preservation	\$328.8	\$407.5	\$309.8	\$391.2	\$468.3	\$290.8	\$292.3	\$289.0	\$281.8	\$269.0
Reconstruction	\$263.7	\$290.9	\$507.6	\$340.0	\$112.7	\$253.8	\$260.9	\$266.6	\$272.6	\$278.7
Rehabilitation	\$356.6	\$344.9	\$304.1	\$227.0	\$364.5	\$266.1	\$273.6	\$279.5	\$285.8	\$292.2

Table 22: In-House Maintenance and Preservation Investment by FHWA Work Type NHS Only (Millions)

Work Type	Year									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Maintenance	\$5.9	\$6.1	\$6.2	\$6.4	\$6.5	\$6.7	\$6.9	\$7.0	\$7.2	\$7.4
Preservation	\$3.6	\$3.7	\$3.8	\$3.9	\$4.0	\$4	\$4.2	\$4.3	\$4.4	\$4.5

Table 23: Total Investment by FHWA Work Type Percent NHS and non-NHS

Work Type	Year									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Construction	50%	40%	34%	29%	42%	39%	39%	39%	39%	39%
Maintenance	2%	2%	2%	3%	3%	4%	4%	5%	6%	7%
Preservation	17%	23%	18%	28%	28%	21%	20%	20%	19%	17%
Reconstruction	13%	16%	29%	24%	7%	18%	18%	18%	18%	18%
Rehabilitation	18%	19%	17%	16%	21%	19%	19%	19%	19%	19%

Table 24: Estimated Funding for NHS only (Millions)

Work Type	Year									
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Construction	\$842.2	\$601.6	\$556.4	\$332.7	\$426.7	\$454.4	\$467.2	\$477.4	\$488.1	\$499.1
Maintenance	\$25.3	\$25.9	\$27.2	\$29.3	\$32.4	\$36.6	\$42.5	\$50.5	\$61.5	\$76.8
Preservation	\$202.9	\$220.9	\$140.1	\$275.1	\$379.6	\$187.1	\$187.6	\$184.6	\$178.8	\$168.9
Reconstruction	\$119.5	\$141.6	\$418.1	\$187.8	\$63.1	\$153.2	\$157.5	\$160.9	\$164.5	\$168.2
Rehabilitation	\$258.9	\$197.7	\$183.9	\$131.4	\$296.5	\$176.0	\$180.9	\$184.8	\$189.0	\$193.2



How much money is expected for pavement and bridge projects over the next 10 years?

As a result of Next Level Indiana legislation, 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 25** includes only state and federal revenue. 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.³⁰

The INDOT Finance Department is continuously improving its forecasting methods and adjusts estimates as new information becomes available. All funding values have been inflated using a projected rate from Global Insight software.³¹

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 15**. Once these activities are funded, the remainder of the budget is allocated to bridge and pavement projects. Other owners of NHS assets in Indiana may affect these targets or performance gaps. However, INDOT does not anticipate other assets impacting the overall conditions of pavement and bridges. INDOT carefully oversees all of its asset owners’ operations.

The estimated funding remaining for pavement and bridges projects over the next ten years is outlined in **Table 26**. **Table 27** provides the estimated funding for bridges and pavement on the NHS. These values have been calculated based on the percent of lane miles for pavement and percent of deck area for bridges that are on the NHS. Note that INDOT manages the entire Federal Aid highway

system in Indiana in a consistent manner, regardless of whether individual segments are part of the NHS or not. INDOT is monitoring projects on the NHS with local agencies. Some improvements such as resurfacing are planned, but activities programmed are less than \$5 million.

³⁰ Table 26 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.

³¹ 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 25: Available Federal and State Funding FY2022–FY2031 NHS and non-NHS (Billions)

Year	FY Funding
2022	\$2.0
2023	\$1.9
2024	\$2.0
2025	\$1.6
2026	\$1.8
2027	\$1.6
2028	\$1.6
2029	\$1.6
2030	\$1.7
2031	\$1.7



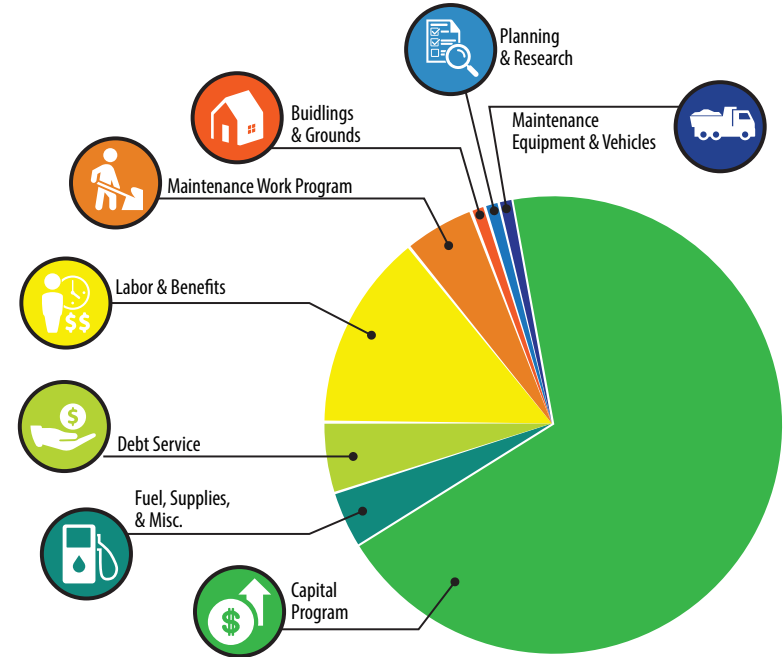
Table 26: Estimated Funding for Pavement and Bridges NHS and non-NHS (Millions)

Year	Pavement	Bridges
2022	\$492.9	\$505.5
2023	\$487.7	\$500.2
2024	\$492.7	\$505.3
2025	\$500.9	\$513.7
2026	\$511.1	\$524.2
2027	\$555.8	\$443.4
2028	\$567.7	\$454.2
2029	\$580.1	\$464.1
2030	\$593.2	\$474.5
2031	\$606.5	\$485.2

Table 27: Estimated Funding for Pavement and Bridges on the NHS (Millions)

Year	Pavement	Bridges
2022	\$291.0	\$306.9
2023	\$335.3	\$303.2
2024	\$306.0	\$285.5
2025	\$284.2	\$329.8
2026	\$302.9	\$309.5
2027	\$337.6	\$264.1
2028	\$344.9	\$270.5
2029	\$352.4	\$276.4
2030	\$360.3	\$282.6
2031	\$368.5	\$288.9

Figure 15: Transportation Budget Allocation



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 the United States. 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 a financial plan shown in **Table 26**. INDOT determined these funding levels by modeling expected deterioration of each asset and various treatment plans.³² These funding

levels achieve the treatment plan that provides the state with improving assets at the lowest cost over the longest period of time. These funding levels are consistent with Next Level Indiana, which ensures that these funding levels are available for the next 20 years.

As shown in **Figure 16** and **Figure 17**, INDOT modeled five funding levels:

- **Planning Budget:** assumes spending for committed projects from FY2022 to FY2026 and investments consistent with Next Level Indiana thereafter (see funding plan shown in **Table 26**)
- **10-Percent Funding Reduction:** assumes spending for committed projects from FY2022 to FY2026 and 10 percent less anticipated

Figure 16: Bridge Funding Analysis

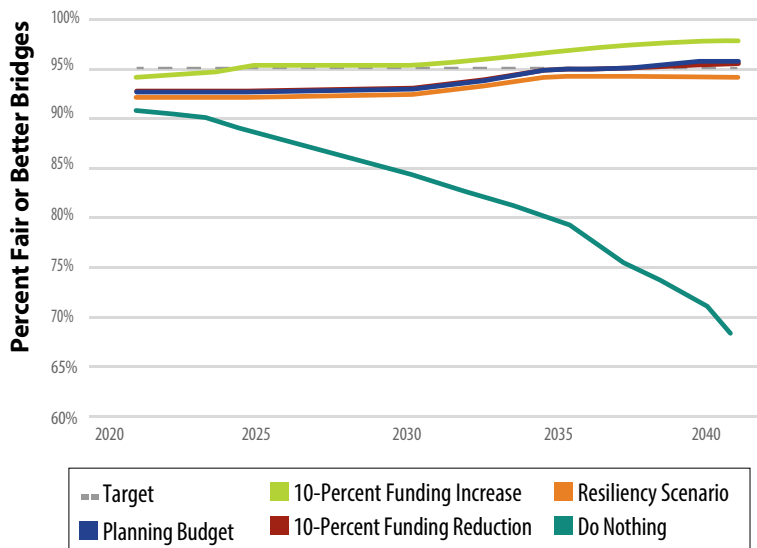
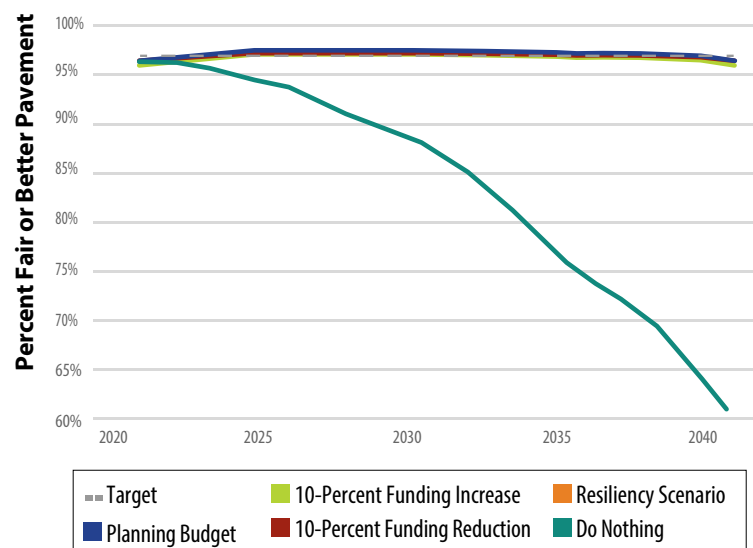


Figure 17: Pavement Funding Analysis



funding in future years due to reductions in federal or state funding (also models effect of poor treatment performance or higher than anticipated costs)

- **10-Percent Funding Increase:** assumes spending for committed projects from FY2022 to FY2026 and 10 percent more anticipated funding in future years due to increases in federal or state funding (also models effect of lower than anticipated costs)
- **Resiliency Scenario:** assumes increased flood events that result in 20 percent higher bridge replacement costs to raise bridges and increase spans over waterways as well as 20 percent higher major and minor structural pavement costs to account for ditch work and enlargement of small culverts
- **Do Nothing:** assumes spending for committed projects from FY2022 to FY2026 and no funding in future years

Gap Analysis

When analyzing the funding levels needed to reach condition targets, INDOT included the bridges and pavement that it owns and operates on and off the NHS. **Table 28** shows how each of the five scenarios perform against the condition targets set for meeting the goals of the Next Level Indiana legislation in terms of the percent good and fair assets by 2037. As can be seen in the table, bridges have no performance gap except under the Do Nothing scenario. Pavements have no gap under most scenarios.

Table 28: Performance of Planning Scenarios in 2037 (in terms of percent good and fair assets)

Asset	Next Level Indiana Target	2037 Forecasted Performance				
		Planning Budget	10% Reduction	10% Increase	Resiliency Scenario	Do Nothing
Bridges	97.0%	97.6% No Gap	97.4% No Gap	97.8% No Gap	97.0% No Gap	73.6% Gap
Pavement	95.0%	95.8% No Gap	95.4% No Gap	97.0% No Gap	94.9% Slight Gap	76.6% Gap

Pavements experience a slight performance gap (only 0.1%) in 2037 under the Resiliency Scenario and there is a gap under the Do Nothing scenario.

INDOT anticipates achieving its condition targets for bridges and pavement with its current funding levels (Planning Budget scenario). INDOT will continue to monitor the impacts of extreme weather and the performance forecasted under the Resiliency Scenario.

³² INDOT uses dTIMS software to model funding needs to optimize condition levels at a practical cost.



How do INDOT’s investment strategies meet the national goals?

In order to maintain the performance and conditions of its assets, INDOT has developed this long-term financial plan, which supports its long-term asset management strategies. The bridge and pavement asset management processes described in the Life Cycle Planning section resulted in multiple strategies that will most efficiently sustain or improve the condition of the

asset given a specified budget. The investment strategies in this chapter support progress in achieving the national goals in 23 USC 150(b) National Goals and Performance Management Measures. **Table 29** shows these strategies and how each goal will be addressed.

Table 29: National Performance Goals and TAMP Strategies

National Performance Goal	Strategies to Achieve Goal
<p>1. Safety. To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.</p>	<p>The Transportation Asset Management Plan (TAMP) strategies support the goals and objectives of the Highway Safety Improvement Program (HSIP). INDOT’s Safety Asset Team monitors crash data and plans projects to improve safety. Implementing these plans will reduce traffic fatalities and serious injuries.</p>
<p>2. Infrastructure condition. To maintain the highway infrastructure asset system in a state of good repair.</p>	<p>The strategies in the TAMP are integrated with the STIP and constrained by available funding to maintain highway assets as funding permits. A state of good repair will be promoted by implementing the TAMP through the STIP.</p>
<p>3. Congestion reduction. To achieve a significant reduction in congestion on the National Highway System.</p>	<p>INDOT’s Mobility Asset Team monitors travel time using National Performance Management Research Data Set (NPMRDS) data, and plans projects to improve mobility and add capacity. Implementing these plans will reduce congestion on the NHS.</p>
<p>4. System reliability. To improve the efficiency of the surface transportation system.</p>	<p>Weather events, congestion and traffic incidents are the main contributors to system unreliability on our transportation system. INDOT’s Mobility Asset team monitors travel time using NPMRDS data and has developed a Major Expansion Priority List. Implementation of these plans will improve system reliability.</p>
<p>5. Freight movement and economic vitality. To improve the National Highway Freight Network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.</p>	<p>The TAMP strategies support the State Freight Plan. INDOT’s Mobility Asset Team monitors truck travel time using NPMRDS data, and plans projects to improve mobility. Implementing these plans will improve freight movement and economic vitality.</p>
<p>6. Environmental sustainability. To enhance the performance of the transportation system while protecting and enhancing the natural environment.</p>	<p>TAMP strategies are designed to support existing environmental, project development, and STIP processes that protect the natural environment. Implementing the TAMP and these other processes will help sustain the environment.</p>
<p>7. Reduced project delivery delays. To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and ‘improving agencies’ work practices.</p>	<p>INDOT’s capital program is geared to a 5-year program (project identification to project letting). This helps ensure projects are able to be delivered, accounting for permitting, utilities, right of way, and development time. INDOT also has a very defined “change management” process, where high risk projects are tracked and any potential changes (scope, budget, etc) are identified and approved early in the 5-year development window. These processes will reduce project delivery delays and allow transparency of our project development process.</p>



Is the transportation system financially sustainable?

In 2015, INDOT conducted a study to assess its transportation funding needs and potential funding sources.³³ 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.

In 2017, the Indiana General Assembly 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 through 2037. This bill also provides the necessary funding for a small set of other priority projects. Over the next ten years, INDOT expects to add an estimated 180 lane miles of pavement and 243,000 square feet of deck area to its roadway network. INDOT's existing asset management financial plan takes into consideration these additional assets.

³³ INDOT, *Study of Indiana Transportation Infrastructure Funding Mechanisms*, October 15, 2015.



Hydraulic rollers



What are risks and how do they relate to asset management?

Managing transportation assets entails managing risk. In the context of asset management, FHWA defines risk as “the positive or negative effects of uncertainty or variability upon agency objectives.”³⁴ Risk management is defined as “the processes and framework for managing potential risks.”³⁵

Considering risk is important in developing a TAMP for the simple reason that transportation agencies often must spend significant resources responding to or mitigating risks. Reacting to the uncertainty presented by risks can be more expensive than proactive management. Risk management strengthens asset management by explicitly recognizing that any objective faces uncertainty and identifies strategies to either reduce uncertainty or its affects. Being proactive in managing risk and avoiding “management by crisis,” helps the INDOT to best use available resources to minimize and respond to risk, as well as to further build public trust.

Risk Management Planning Process Requirements

FHWA requires that states establish a risk management planning process for TAMPs. Specific requirements for the process are listed below.

- Identification of risks that can affect condition of NHS pavements and bridges and NHS performance, including risks associated with current and future environmental conditions
- Assessment of the identified risks in terms of the likelihood of their occurrence and their impact and consequence if they do occur
- Evaluation and prioritization of the identified risks
- Mitigation plan for addressing the top priority risks
- Approach for monitoring the top priority risks
- Summary, for NHS pavements and bridges, of the evaluations of facilities repeatedly damaged by emergency events

INDOT has incorporated risk assessment into the TAMP to plan for any disruptions, anticipate opportunities, and mitigate any consequences more effectively. These risks and uncertainties stem from the seven major risk

categories shown in **Figure 18**. As part of the risk register update for this TAMP, **INDOT identified a number of risks related to resiliency in terms of extreme weather, technological innovation, and the COVID Pandemic.**

Figure 18: Transportation Budget Allocation



While existing transportation infrastructure was designed to handle a broad range of conditions based on historic climate, the frequency and intensity of some extreme weather events is increasing. INDOT is likely to face difficult choices about how and where to invest resources to bolster or replace existing infrastructure. Strategies that INDOT will use in adapting to climate change include:

- Integrate climate change considerations into asset management
- Strengthen or abandon infrastructure that is vulnerable to flooding.
- Raise standards for the resilience of new infrastructure.

³⁴ Federal Register, Asset Management Plan, Final Rule, October 24, 2016.

³⁵ Ibid.



How will INDOT identify, assess, and prioritize asset management risks?

As shown in **Figure 19**, INDOT is managing 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.

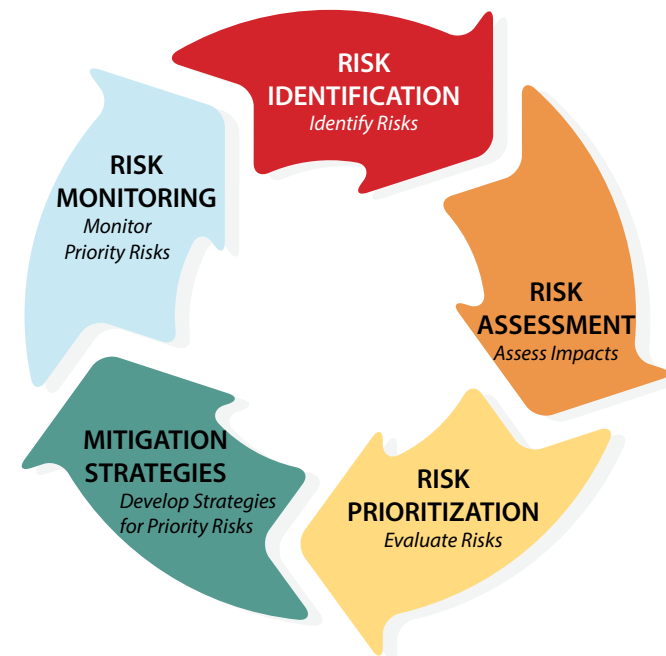
Risk Identification

As part of the TAMP update process, INDOT initiated an effort, performed in cooperation with other NHS owners and stakeholders, to identify additional risks not otherwise addressed through existing processes or programs. These risks were organized into the seven categories described earlier.

Risk Identification consisted of reviewing and validating the preliminarily identified risks and further brainstorming and validating of other uncertainties and risks facing the TAMP. This included filling in the information on the risk register that characterizes each risk, including:

- Defining the risk as a threat or opportunity
- Giving the risk a concise name
- Developing a risk description that encompasses the Specific, Measurable, Attributable, Relevant, and Time-bound (SMART) characteristics of the risk

Figure 19: Risk Management Process



Risk Assessment and Prioritization

In performing the risk assessment, workshop participants used the risk matrix shown in **Figure 20** to classify risks in terms of their likelihood and consequence, as well as to score the priority for each risk. The matrix includes five categories for likelihood (listed in the left column of the figure) and five categories for consequence (listed in the bottom row). Risks were assessed based on qualitative data and severity profiles were calculated that consider the combination of qualitative probability and impact ratings. Separate heat maps were developed to reflect the positive and negative affects of uncertainty or variability.

Figure 20: Threat and Opportunity Risk Matrices

Threats						
Probability	VH	0.2	0.4	0.6	0.8	1
	H	0.16	0.32	0.48	0.64	0.8
	M	0.12	0.24	0.36	0.48	0.6
	L	0.08	0.16	0.24	0.32	0.4
	VL	0.04	0.08	0.12	0.16	0.2
	VL	L	M	H	VH	
Impact						
Opportunities						
Probability	VH	0.2	0.4	0.6	0.8	1
	H	0.16	0.32	0.48	0.64	0.8
	M	0.12	0.24	0.36	0.48	0.6
	L	0.08	0.16	0.24	0.32	0.4
	VL	0.04	0.08	0.12	0.16	0.2
	VL	L	M	H	VH	
Impact						



How is INDOT addressing and monitoring asset management risks?

Mitigation Strategies

INDOT has developed response strategies for each of the risks identified during the previous phases.

Response strategies for risks with negative impacts include:

- Avoid
- Transfer
- Mitigate
- Accept

Response strategies for risks with positive impacts include:

- Exploit
- Share
- Enhance
- Accept

INDOT developed risk action plans (i.e., statements of planned actions) for each risk. Each plan suggests a list of activities INDOT will undertake to address the identified risks. In response to FHWA's Baseline Assessment of TAMP Enhancement Opportunities, INDOT has revised the risk actions plans with additional information on the roles, responsibilities, and frequency of the risk response activities as well as included information on how the TAMP will be modified during future updates per each risk.

Risk Monitoring

INDOT is taking the next steps to implement the risk action plans, monitor the identified risks over time, and periodically update the risk register.

The risk monitoring activities include an annual review of all risks with the PMG as well as representatives from other INDOT departments. In addition to the annual risk review, INDOT will conduct a new risk workshop every four years.

During each workshop, INDOT will review and evaluate the efficacy of the risk action plans from the previous risk register. This includes updating the risk status as active, dormant, or retired, as well as updating the progression of each risk throughout the life cycle of the TAMP. The risk register will be updated and provided along with the updated TAMP. Careful consideration will also be taken for major catastrophic events, even if the likelihood of such an event is minimal.

INDOT is also monitoring the changes in the risk register from the last TAMP to the current version. The latest risk workshop identified several new additions to the risks being considered by INDOT, including:

- Increased deterioration caused by oversized/overweight vehicles
- Impacts of extreme weather
- Staff resource needs
- Changes in commodity prices
- Generalized modeling in the asset management system
- Continued pandemic impacts

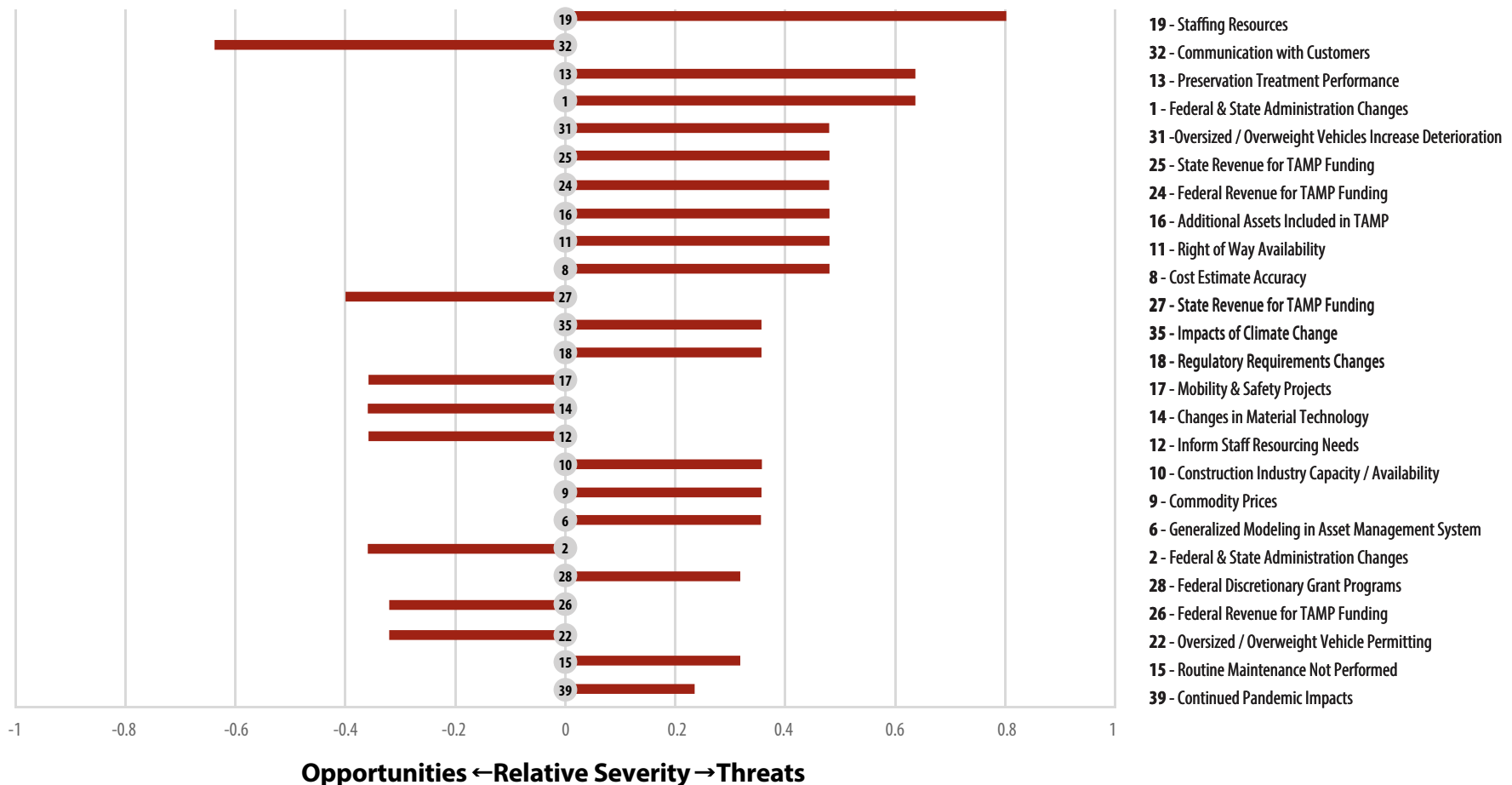
Full details on these risks and how INDOT plans to mitigate or exploit them can be found in the risk register.



What are INDOT's highest priority risks?

From the risk workshop, INDOT identified the top 25 risks. Seventeen (17) of these risks represent threats, while eight represent opportunities as shown in **Figure 21**. The lines on the diagram indicate the priority rating of the risk on a qualitative scale of -1 to 1.

Figure 21: Top 25 Risks by Priority



What are INDOT’s action plans for addressing TAMP risks?

The risk registers below present the highest priority risks identified during the revision of the preliminary risk register. Workshop attendees reviewed the likelihood, consequence and score of each risk in the register, and selected risks for further evaluation based on consideration of these and other factors, including the feasibility of mitigating the risk. The threat risks are presented in **Table 30** and the opportunity risks are presented in **Table 31** in descending priority order. The full risk register with probabilities, impacts, and risk priorities is shown in Appendix D.

Table 30: High-Priority Threat Risks and Mitigation Actions

Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
1	Staffing Resources	Implementation of the TAMP assumes certain levels and capabilities of staffing resources, all heavily reliant on the personnel implementing the program. Salaries of personnel impact attraction and retention of staff. Labor availability remains an issue across the State. Nationwide infrastructure funding will exacerbate the issue. If these resources are not readily available or the skills needed are not provided, the execution of the plan may be impacted through reduced quality, less efficiency, and potential errors and missed opportunities.	Communicate and document the staffing requirements needed to effectively execute the plan. Develop employee attraction and retention programs. Partner with INDOT Talent Management. Ensure training of staff relative to program history and objectives. Acquire and utilize technology to assist staffing resources. Automate and use of technology to improve AM processes and reduce personnel resource needs.	Labor availability and salaries may cost the program more, thus reducing the amount of money being spent on maintaining and upgrading the assets. Evaluate overall program costs for executing the plan vs. asset management efficacy. Evaluate consistency planning and targets relative to how the plan is being impacted by staffing resources.	Program Management Group	Quarterly
2	Preservation Treatment Performance	TAMP has assumed certain life cycle for given treatments. Risk is that the assets do not have the life assumed due to the ineffectiveness of the treatment technology or that the treatment did not have the life that was assumed. This is reliant on quality and appropriateness of the design and quality control of construction activities. Risk is that the treatments do not have the life assumed.	Staff training and authority to correct quality issues in the field, construction training and resources, enhanced technology for inspections to verify construction. Support for quality control decisions. Communicate with construction inspectors, and bridge/pavement engineers on realized life of assets. Develop communication plans with field personnel on technology effectiveness.	Include analysis in the TAMP to address poor treatment performance and technologies that improve performance and extend life of the assets.	Bridge and Roadway Asset Management Teams	Annual. Review of performance of treatment applied, data gathering on results achieved.



Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
3	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. Potential that regulations may change that increase requirements on projects (i.e., environmental, right of way acquisition, etc.). House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.	Evaluate impacts of projects not being completed per timing assumptions or projects legislated to be delivered. Evaluate scenarios of reduced funding. Evaluate how TAMP manages district-level vs. network-wide funding approaches.	INDOT Finance	Monthly
4	Over-sized / Over-weight Vehicles Increase Deterioration	Potential that an increase in freight traffic and over-sized vehicles will cause an increase in deterioration of assets. This would cause an increase in costs for the TAMP and less life expectancy. These vehicles may be focused on select subset of the asset inventory and not the whole network.	Evaluate revenue potential from permit fee modifications as source of TAMP revenue. Increase enforcement resources.	Evaluate the cost assumptions for an increase in deterioration on select routes.	INDOT Multi-Modal / Program Management Group	Annual
5	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is less than estimated amounts over the life of the TAMP. Minimum match with Federal funds must be met first. Potential reduces funding to state-funded maintenance operations due to having to meet Federal match requirements. Potential of revenue impacted due to electric vehicles and reduce vehicle usage. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling. State Highway Fund availability may be limited by legislative changes to the revenue that is used to feed the fund.	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios relative to reduced revenue availability and reduced vehicle usage. Evaluate impacts from electric vehicle usage (long term).	INDOT Finance, Program Management Group	Quarterly. Evaluate Federal match revenue.



Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
6	Federal Revenue for TAMP Funding	TAMP relies on having additional Federal revenue to meet growing asset management needs. Federal gas tax will likely not provide adequate source of funding. Potential that the revenue provided by Federal Government to INDOT is less than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from fuel taxes.	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios relative to reduced Federal revenue availability.	INDOT Finance, Program Management Group	Quarterly. Evaluate Federal match revenue.
7	Additional Assets Included In TAMP	TAMP originally included only pavement and bridges. There is potential that certain additional elements such as culverts and slope stability walls are assumed significant enough to be included in the TAMP and would be covered by the program funds. Large culverts have been included in the TAMP estimates, but smaller culverts have a backlog and may not have been accounted for. There is an issue with evaluating inventory and condition of these elements on the local NHS roadways.	Inventory all major assets, determine condition and need for being included in TAMP. Improve communication from Districts to PMG relative to needs. Identify funding mechanism to address identified deficiencies.	Evaluate scenario where additional needs are identified beyond base assumptions of roadways, bridges, and large culverts.	Bridge and Roadway Asset Management Teams (District)	Annual
8	Right of Way Availability	TAMP assumes that ROW is available. There are potential disconnects in the ROW needed to accomplish projects and what is actually owned by the Department. Acquisition of additional ROW can impact both costs and schedule of projects. Risk includes potential that temporary ROW and easements be purchased to accommodate construction.	Improve documentation of available ROW and asset management project needs. Tie ROW into the asset management system database.	Evaluate cost assumptions in the TAMP relative to ROW costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT ROW	Annual



Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
9	Cost Estimate Accuracy	Initial estimates for projects are developed based upon high-level of information and scope assumptions (dTIMS). Estimates are based upon historical costs. Further project development and future economic conditions can change the assumptions and result in estimate modifications. For example, early estimates for maintenance of traffic (MOT) may not accurately reflect the costs that will eventually be required once MOT plans are developed. Cost assumptions for standardized treatments in the TAMP may not accurately reflect average costs in the field. Area cost factors vary across the state.	Review actual in-place construction costs and what was built compared to planning estimates to verify accuracy and adjust accordingly. For more complicated projects, review Stage 2 submittals to verify cost and scope accuracy.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Finance	Annual
10	Impacts of Climate Change	Potential that climate-based changes lead to an increase in deterioration and an increase in emergency situations such as roadway flooding and washouts. This could lead to an increase in costs for the TAMP. This may be an issue beyond the 10-year timeframe of the TAMP.	Evaluate climate models and impacts to plan assumptions.	Evaluate scenarios and model of increase deterioration, more flooding-induced damages.	Program Management Group	TAMP Update Every 4 years
11	Regulatory Requirements Changes	Potential that projects will be subject to different regulatory requirements than what is currently assumed. This could result in increased costs to the program to meet the new requirements. Examples include new environmental and ADA requirements.	Monitor plan against potential regulatory requirement changes.	Modify the TAMP during future updates per most recent guidelines	Program Management Group	Annual
12	Construction Industry Capacity / Availability	The availability of contractors and skilled labor and their capacity/interest to take on preservation work may impact the number of bidders and bid prices. Lack of competition amongst the construction industry may result in overall higher program costs.	Contractor outreach and provide information of program opportunities. Program incentives to attract contractors. Work with contractors to recruit quality staffing. Survey industry and economic experts relative to future trends in contractor availability.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Economics	Annual



Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
13	Commodity Prices	Fluctuations in commodity prices for key elements and material availability could impact total program costs. INDOT purchases data from Global Insight to model the trends in primary commodities. These are used to inform the active project estimates and adjust accordingly. Potential that fuel prices and other costs increase the costs of projects.	Monitor price fluctuations using Global Insight during estimate updates. Survey industry and economic experts relative to future trends in prices.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Economics	Annual
14	Generalized Modeling in Asset Management System	TAMP has made certain assumptions based on the asset management system modeled at a high-level. Condition data and decisions are based upon historical averages. Project-specific scope may differ from treatments modeled in the asset management system. Limitations of the model. TAMP includes both initial modeling, asset management team selection of projects. Impact may be more of an issue for roadway projects than bridge projects.	Continue to engage asset management teams to verify asset management system assumptions and adjust the model accordingly. Review model projections vs. actual projects and execution of the TAMP. Update TAMP business processes per updated INDOT 20-year fiscal plan and verify plan effectiveness.	Evaluate accuracy of the business rules, decision tree, deterioration rates, and model inputs are accurate in the TAMP. Remodeling based upon actual project selections.	Roadway and Bridge Asset Management Teams	Annual
15	Federal Discretionary Grant Programs	Federal Discretionary Grant Programs may reduce available funding from the Federal Government for TAMP projects. Grant Programs may have specific restrictions and guidelines that would also result in less funding control by the State to select which projects are funded.	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability.	Evaluate scenarios where additional funding is not available.	INDOT Finance, Economics	Annual
16	Routine Maintenance Not Performed	TAMP assumes certain routine maintenance activities will be performed in order to meet projections for deterioration and life expectancies. Risk is that these activities (crack sealing, minor patching, deck cleaning and flushing, etc.) are not performed at the levels of regularity needed. Risk also considers items that are more difficult to maintain. Risk is also that the funding for maintenance needs is not provided.	Document routine maintenance activities expected, Monitor routine maintenance program. Prepare business case for the need for maintenance funding in order to meet asset management condition goals. Improve feedback and communication with maintenance personnel relative to needs.	Evaluate plan relative to an increase in maintenance needs or reduction in useful life of the assets.	INDOT Technical Services, District Maintenance	Annual
17	Continued Pandemic Impacts	Potential that the TAMP will be impacted due to the current pandemic continues. This would exacerbate the other risks such as revenue for the program, staffing resources, construction costs, and reduced deterioration of the assets.	Evaluate transportation models based upon extended pandemic-related impacts	Evaluate transportation models based upon extended pandemic-related impacts	INDOT Finance, Economics	Bi-Annual



Table 31: High-Priority Opportunity Risks and Mitigation Actions

Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
1	Communication with Customers	The TAMP provides an opportunity and a means for establishing communication with customers, stakeholders, decision makers, advocacy groups, and the general public on the benefits of asset management projects and the needs for funding the program.	Develop outreach protocols, presentations, and stakeholder input opportunities to inform TAMP. MPO participation is included within AM. Employ virtual technologies to engage and survey stakeholders.	Adjust plan based upon feedback received during outreach activities.	INDOT Communications Group / Program Management Group	Ongoing
2	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling.	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios where additional funding is made available.	INDOT Finance, Economics	Quarterly. Evaluate Federal match revenue.
3	Mobility & Safety Projects	TAMP does not include the improvements made to the assets performed as part of separate Mobility and Safety Projects. These projects often result in pavement improvements that would then not be subject to rehab as part of TAMP funding.	Coordinate with Mobility and Safety Projects and incorporate into Asset Management System Database.	Evaluate asset management needs based on a corridor approach which would include all possible projects within a given timeframe.	Bridge and Roadway Asset Management Teams (District)	Annual
4	Changes in Material Technology	Material technology continues to improve leading to better resiliency of the assets.	Openness to new technologies, develop specifications to allow new technologies, develop testing protocols to prove effectiveness.	Evaluate plan relative to a decrease in maintenance needs or increase in useful life of the assets.	Bridge and Roadway Asset Management Teams	Ongoing



Rank	Risk Name	S.M.A.R.T. Risk Description	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/Frequency
5	Inform Staff Resourcing Needs	The TAMP could be used to inform the resourcing needs of the Department based upon the project informational and project delivery needs.	Use TAMP as informational resource to employee staffing needs.	Increase information on staffing requirements necessary to execute the TAMP.	Program Management Group	Annual
6	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.	Evaluate impacts of projects not being completed per timing assumptions or projects legislated to be delivered. Evaluate scenarios of reduced funding. Evaluate how TAMP manages district-level vs. network-wide funding approaches.	INDOT Finance	Monthly
7	Federal Revenue for TAMP Funding	Potential that the revenue provided by Federal Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from gas taxes.	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios where additional funding is made available. Develop plan at a deficit and identify projects to be added to plan if additional funding is made available.	INDOT Finance, Economics	Annual
8	Over-sized / Over-weight Vehicle Permitting	INDOT is currently evaluating the damage inflicted due to over-sized or over-weight vehicles and adjusting the fees paid accordingly. This could provide an additional funding source for the TAMP.	Evaluate revenue potential from permit fee modifications as source of TAMP revenue. Increase enforcement resources.	Evaluate scenarios of increased funding. Evaluate how TAMP manages district-level vs. network-wide funding approaches.	INDOT Multi-Modal	Annual



How has INDOT addressed the Part 667 Requirement?

INDOT must account for emergency situations that include roadway flooding and washouts, oversized vehicles hitting overhead bridges, and road settlement due to underlying soil instability. While emergency events are difficult to plan for, INDOT has performed a comprehensive evaluation of its pavement and bridges to identify such facilities that have been damaged by emergency events, as per 23 CFR Part 667. CFR 2022 23-Chapter 1 Part 667 requires states to conduct periodic evaluations of facilities that have repeatedly required repair and reconstruction activities due to emergency events and determine if there are reasonable alternatives for the facilities.

The regulation defines “repeatedly” as two or more occasions that required repair and reconstruction activities to the same facility. Repair and reconstruction activities refers to work on a road, highway, or bridge that has one or more repair or reconstruction elements, including permanent repairs such as restoring pavement surfaces, reconstructing damaged bridges and culverts, and replacing highway appurtenances.

To comply with this requirement, INDOT has conducted an evaluation and compiled a listing of the identified locations in Indiana where emergency events have resulted in repairs to its transportation infrastructure. (An emergency event is a natural disaster or catastrophic failure resulting in an emergency declared by the Governor of the State or the President, as per 23 CFR Part 667.) Specifically, INDOT closely monitors facilities that have been repeatedly damaged. **Figure 22** summarizes the process that INDOT uses to evaluate repeat repairs.

As part of its Part 667 evaluation, INDOT conducted an analysis of the following emergency events:

- Federal Emergency Declarations
- Major Disaster Declarations
- State of Emergency Declarations



Figure 22: INDOT Part 667 Evaluation Process

- 1 Natural Disaster or Catastrophic Failure Occurs
- 2 A. Assessment of Damages
B. Official Emergency Declaration
- 3 Emergency Relief Repair Made
- 4 Update Database
- 5 GIS layer/map updated
- 6 During Project Scoping for next Call, ER layer overlaid on proposed projects
- 7 If proposed project limits encompass ER repair, alternatives considered that would preclude need for a future repair in a similar event

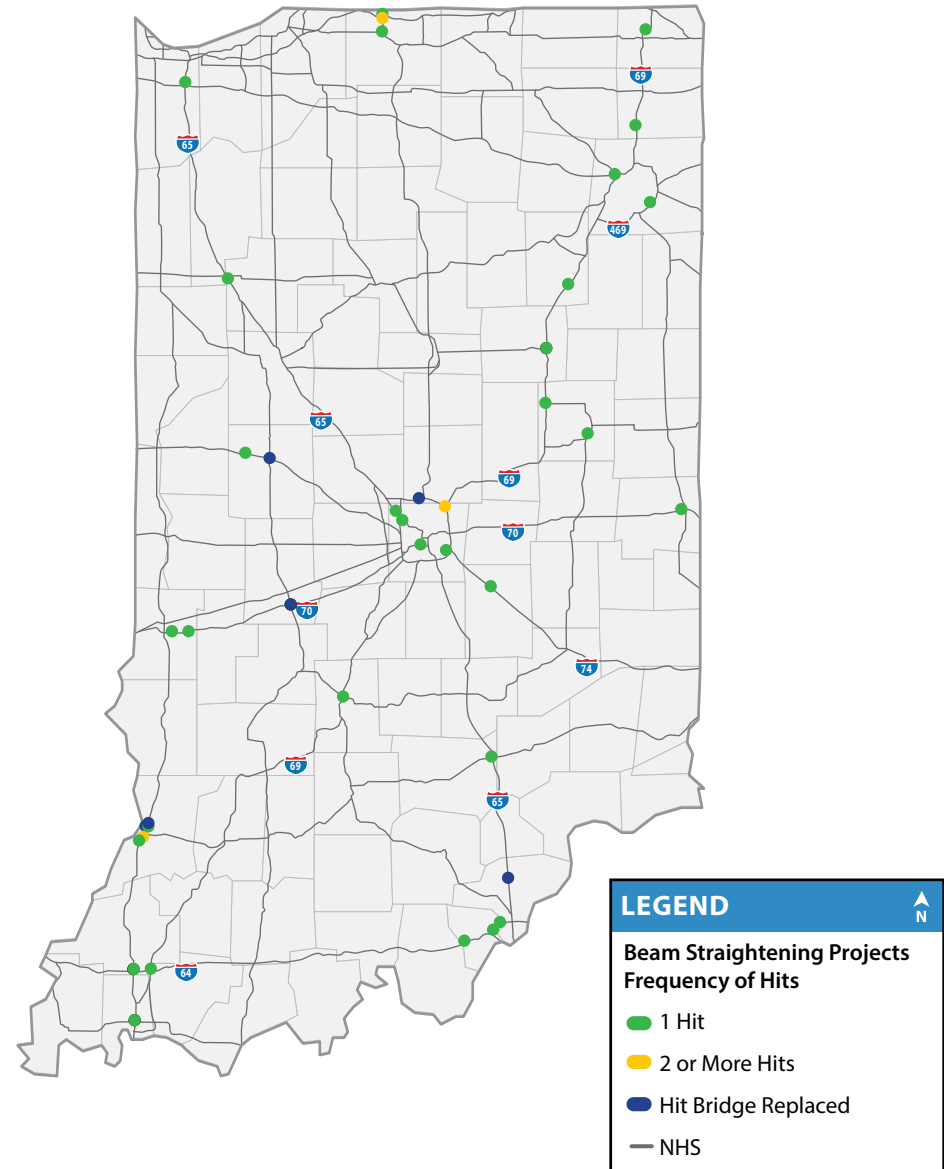


INDOT maps its emergency repair locations in its GIS system. Whenever INDOT is proposing a major road or bridge project in locations where facilities have repeatedly required repair or reconstruction due to emergency events, INDOT will consider enhancement work to prevent the need for another such emergency repair. For example, if a bridge keeps washing out during a flood, INDOT considers raising the bridge or installing an overflow structure.

INDOT has compiled all permanent ER repairs back to the early 1990s and mapped these locations into a GIS layer. As shown in **Figure 23**, INDOT has identified bridges on the NHS that have required emergency repair due to being hit by over-height vehicles since 1998. When a bridge is hit, INDOT considers a beam straightening repair project. The green dots indicate bridges that have been hit once and repaired by a beam straightening project.

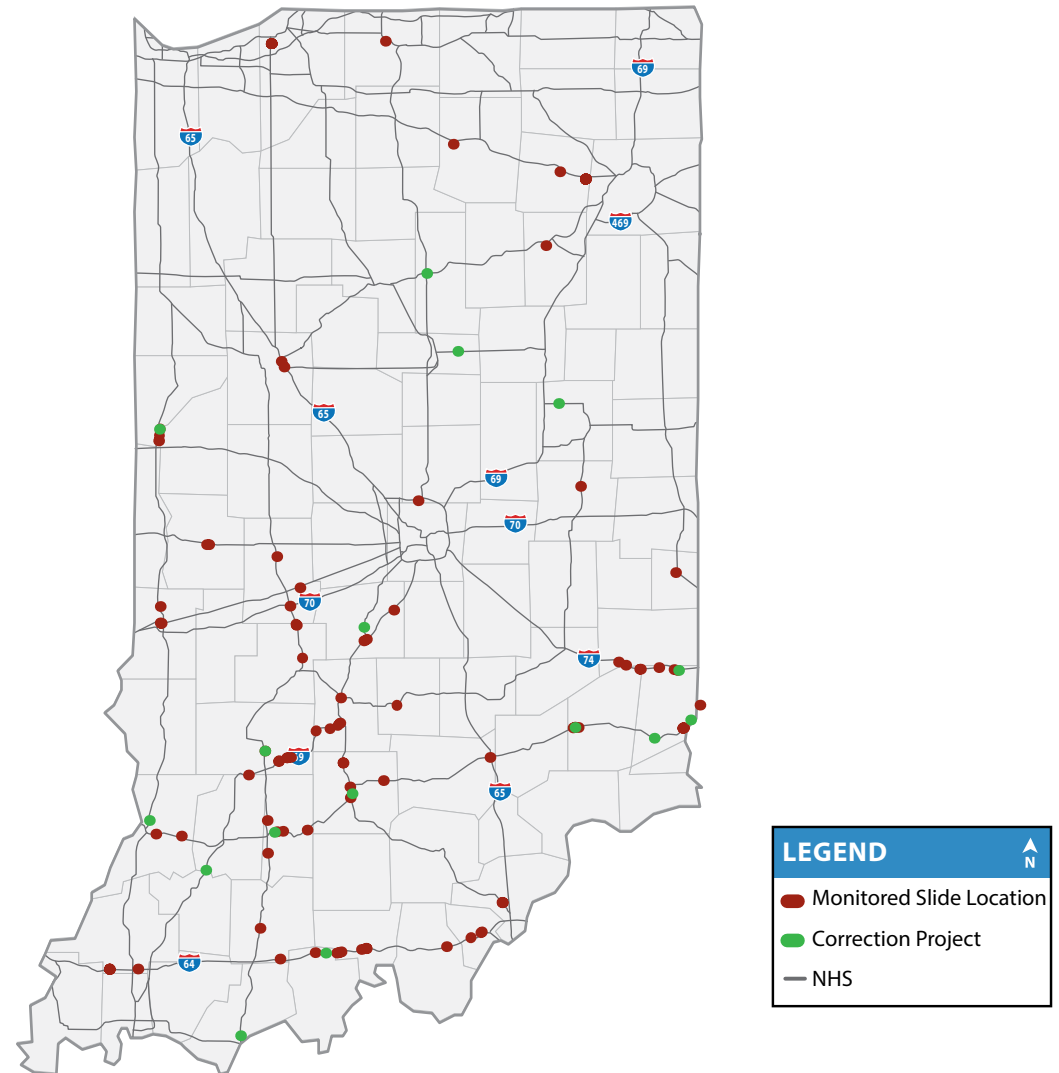
The bridges represented by yellow dots have experienced more than one bridge hit. INDOT has deemed a beam straightening repair project sufficient to repair these bridges. However, when a bridge is subject to repeated hits, INDOT considers raising the bridge. INDOT determined that the bridges indicated by the blue dots required a substantial rehabilitation, including raising the bridge, due to repeat hits. Emergency Relief funding is not used for projects to repair bridges after a hit. INDOT has identified only one location where two permanent repairs were caused by different events on the same facility. INDOT continues to monitor locations where emergency repairs are needed, and will review and update its evaluation once every four years.

Figure 23: NHS Bridge Hits



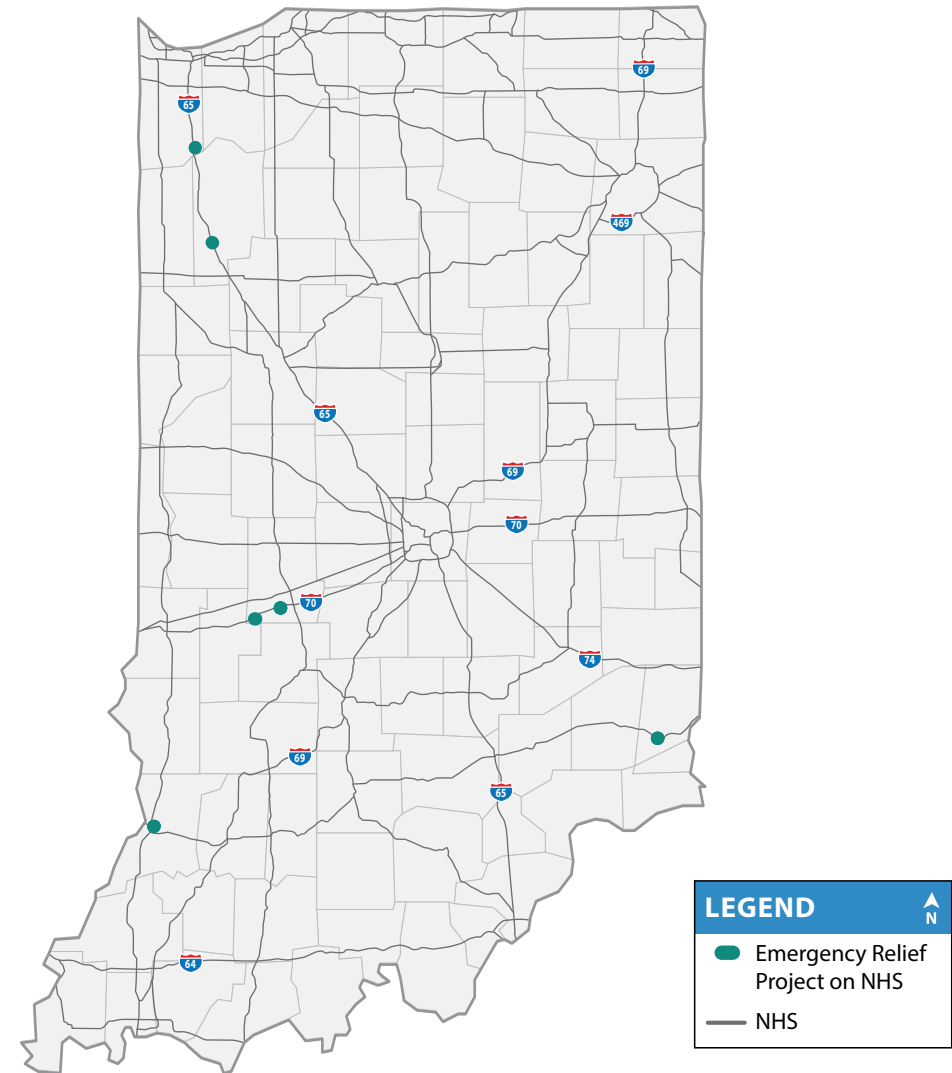
INDOT also analyzes repairs or reconstruction required for slide events. The Geotechnical Services Office of INDOT maintains an inventory of roadway slides and monitors the locations regularly. **Figure 24** shows INDOT's history of slide events on the NHS since 1998. The red dots indicate slides that INDOT is monitoring but have not required a correction yet. The green dots represent slides that have required a correction project.

Figure 24: NHS Slide Correction Projects



Other emergency repairs are those for which INDOT has received FHWA Emergency Relief (ER) funding. **Figure 25** shows the analysis INDOT completed to identify locations requiring emergency repairs since 1996. The green dots on the map indicate locations that have required ER funding on one occasion. These locations have been verified and updated since the last TAMP. All but one of these emergency repairs occurred since 2008 when Indiana experienced major flooding prompting the need for ER funding. Indiana does not have any locations along the NHS that have required ER funding for repeated emergency repairs.

Figure 25: NHS Emergency Relief Projects



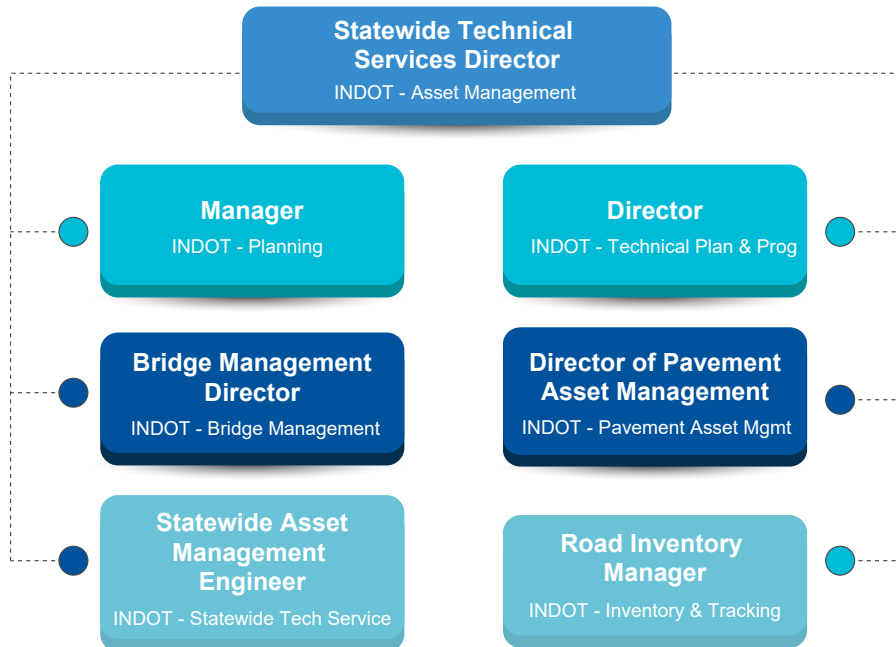
Who is responsible for asset management at INDOT?

Figure 26 provides an organization chart for the INDOT asset management team. The Program Management Group (PMG) is responsible for overseeing the asset management implementation process. The PMG is a select, diverse leadership group of management from INDOT who are involved with providing overall guidance and direction on the development and implementation of the Asset Management Program. The PMG is responsible for the following:

- Ensures that adequate funding and resources are available for Asset Management Program implementation and overall Asset Management Program development.

- Coordinates among the Bridge, Pavement, Mobility, and Safety Asset Teams to analyze trade-offs while developing investment strategies.
- Plays an active role in the key decision making, stakeholder management, risk management and issue resolution, removing obstacles and providing direction pertaining to the Asset Management strategy where necessary.
- Takes any action necessary to ensure the smooth integration of tactics and strategies within and between projects.
- Provides support and direction for Asset Management practices at the District-level.
- Monitors progress and performance of the plans for Asset Management Program development and implementation.
- Ensures consistency of asset management approaches across the Districts.

Figure 26: Asset Management Team Organizational Chart



The PMG initially sets the budget for each asset team. On an annual basis, the Asset Management teams will use the pavement and bridge models 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 PPMG and Managing Director of Asset Management and the asset team leadership will adjust funding levels accordingly to meet and maintain goals.



Over the next 10 years, INDOT expects to add up to 27 new bridges, 180 lane miles of pavement, and 243,000 square feet of new bridge deck. Some of these additional assets will be offset by relinquishing some existing inventory. INDOT’s projected funding and asset management practices will accommodate the addition of these new assets, as our financial plan accounts for these additional assets, while maintaining its existing roads and bridges in a state of good repair.

The PMG, with input from the Asset Teams, determines which projects in order of 20-year plan and ranking are able to be completed based on the cost of the project and the available funding. The PMG 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

By considering these variables during the project prioritization process, the PMG ensures projects make progress toward achieving the national goals outlined in USC 150(b) and State goals in HEA 1002. 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.

Asset Management Team roles are listed in **Table 32**.

In addition to the voting members in **Table 32**, 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, Rural Planning Organizations (RPOs), and legislative affairs.

Table 32: Asset Management Roles

Role	Organizational Unit
Managing Director of Capital Programs	Program Management Group
Managing Director of Asset Management	Operations
Project Finance Director	Finance Group
Managing Director of Transportation System Management and Operations	Operations



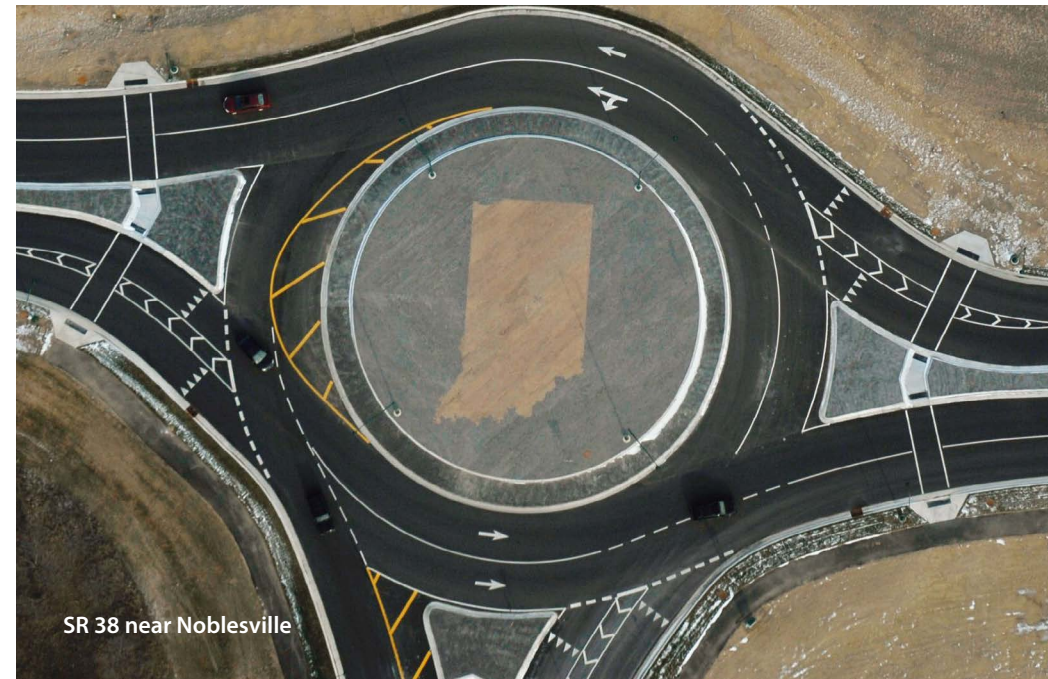
How will INDOT continue to improve its asset management practices?

In an effort to continually improve processes and practices, INDOT has conducted an asset management capability-maturity assessment, which led INDOT to develop its Strategic Asset Management Plan (SAMP) among other identified near-term improvement initiatives. Initiatives to improve asset management practices include:

- **Expand an asset management training program.** The program will be focused on training INDOT staff on asset management good practice across transportation and other industries. The training program will go beyond the tactical elements of asset management to provide a broader view of the end-to-end asset management process.
- **Maintain a high priority business processes.** Each business process will be developed with specific working group teams who will provide guidance.
- **Implement a communication and change management plan.** INDOT will focus on developing content for the internal INDOT asset management webpage and the external asset management webpage.
- **Develop a 20-year plan for each asset.** The 20-year asset management plans fall under the purview of the SAMP and will contribute to furthering asset management practices throughout the state.
- **Maintain the bridge, culvert and pavement asset life-cycle strategies and expand to other assets.** Better asset life-cycle strategies will further optimize how the dTIMS software incorporates data and determines appropriate treatments for assets.
- **Maintain an asset information strategy and data collection plan.** The goal of this plan is to create a more standardized approach for data collection.

- **Continue development of the asset-level risk management processes.** Continual improvements to asset-level risk management practices are critical to the success of the asset management program.

While INDOT has identified these seven initiatives to improve its asset management program, INDOT will continue to assess its asset management practices for additional ways to improve.



Federal TAMP Development Processes Certification Guidance

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

Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
TAMP Approved by Head of State DOT (23 CFR 515.9(k))	Does the TAMP bear the signature of the head of the State DOT?	Approval page with Commissioner’s signature.	Approval: ii
State DOT has Developed its TAMP Using Certified Processes (23 CFR 515.13(b))	Do the process descriptions align with the FHWA-certified processes for the State DOT? [If the process descriptions do not align with the FHWA-certified processes, the State DOT must request recertification of the new processes as amendments unless the changes are minor technical corrections or revisions with no foreseeable material impact on the accuracy and validity of the processes, analyses, or investment strategies. State DOTs must request recertification of TAMP development processes at least 30 days prior to the deadline for the next FHWA TAMP consistency determination as provided in 23 CFR 515.13(c).]	Processes are described throughout the entire TAMP.	Entire TAMP
	Do the TAMP analyses appear to have been prepared using the certified processes?	Processes are described throughout the entire TAMP.	Entire TAMP

(Continued on page A-2)



Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
<p>TAMP includes the required content as described in 23 CFR 515.9(a)-(g) (23 CFR 515.13(b))</p>	Does the TAMP include a summary listing of NHS pavement and bridge assets, regardless of ownership?	Inventory of all bridges and pavement owned by INDOT and bridges and pavement on the NHS owned by other entities.	<p>Bridges: 2-1 to 2-2 Pavement: 2-6 to 2-7</p>
	Does the TAMP include a discussion of State DOT asset management objectives that meets requirements?	INDOT established six core principles for transportation asset management.	<p>Introduction: 1-1</p>
	Does the TAMP include a discussion of State DOT measures and targets for asset condition, including those established pursuant to 23 U.S.C. 150, for NHS pavements and bridges, that meets requirements?	INDOT has 10 year asset management condition targets and new, draft 2 and 4-year condition targets based on FHWA condition rating system for bridges and pavement.	<p>Bridges: 2-5 Pavement: 2-10</p>
	Does the TAMP include a summary description of the condition of NHS pavements and bridges, regardless of ownership, that meets requirements?	Condition of bridges and pavement provided both graphically and explained in text.	<p>Bridges: 2-4 Pavement: 2-9</p>
	Does the TAMP identify and discuss performance gaps?	Performance gaps are identified as bridges or pavement not meeting the condition targets. These pages discuss how INDOT’s bridge and pavement conditions compare to the condition targets currently and under future planning scenarios..	<p>Bridges: 2-5 and 7-8 to 7-9 Pavement: 2-10 and 7-8 to 7-9</p>
	Does the TAMP include a discussion of the life- cycle planning that meets requirements, including results?	Lifecycle planning (LCP) process is described for bridges and pavement. Five steps of the LCP process from FHWA guidance are indicated throughout the LCP discussion.	<p>Bridges & Pavement: 3-1 to 3-11</p>
	Does the TAMP include a discussion of the risk management analysis that meets requirements?	This section details the risk workshop that INDOT set up, how risks relate to asset management, how INDOT is identifying, assessing, and prioritizing asset management risks, as well as how INDOT is addressing and monitoring asset management risks. INDOT has identified its highest priority risks and included a summary of the risk register from the workshop.	<p>Bridges & Pavement: 8-1 to 8-12</p>
	Does the TAMP include the results of the evaluations of NHS pavements and bridges pursuant to 23 CFR part 667?	INDOT has identified bridge hits along the NHS, slide correction projects along the NHS, and projects requiring Emergency Relief (ER) funding.	<p>Bridges & Pavement: 8-13 to 8-16</p>
	Does the TAMP include a discussion of a 10- year Financial Plan to fund improvements to NHS pavements and bridges?	INDOT has portioned bridge and pavement treatments according to FHWA’s 5 work types. The capital investment by FHWA work type and in-house maintenance and preservation investment by FHWA work type are provided. INDOT also includes the percent breakdown by work type of the total investment amount.	<p>Bridges & Pavement: 7-1 to 7-7</p>
Does the TAMP identify and discuss investment strategies the State intends to use for their NHS pavements and bridges?	Investment strategies based on the bridge business rules and pavement business rules are outlined in the TAMP.	<p>Bridges: 3-4 Pavement: 3-10</p>	

(Continued on page A-3)



Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
<p>TAMP Includes the Required Content as Described in 23 CFR 515.9(a)-(g) (23 CFR 515.13(b))</p>	<p>Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving and sustaining a desired state of good repair over the life cycle of the assets?</p>	<p>The investment strategies support the project prioritization process where INDOT ensures projects make progress toward achieving the national goals in accordance with 23 USC 150(d). One of the goals that INDOT places an emphasis on is maintaining its infrastructure in a state of good repair.</p>	<p>Bridges: 3-4 to 3-6 Pavement: 3-10 to 3-11</p>
	<p>Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving the State's targets for asset condition and performance of the NHS in accordance with 23 USC 150(d)?</p>	<p>The investment strategies support the project prioritization process where INDOT ensures projects make progress toward achieving the national goals in accordance with 23 USC 150(d).</p>	<p>Bridges: 3-3 to 3-6 Pavement: 3-9 to 3-11</p>
	<p>Does the TAMP include a discussion as to how the investment strategies make or support progress toward achieving the national goals identified in 23 USC 150(b)?</p>	<p>Project prioritization processes include a discussion of how INDOT ensures projects make progress toward achieving the national goals.</p>	<p>Bridges: 3-5 Pavement: 3-11</p>
	<p>Does the TAMP include a discussion as to how the TAMP's life-cycle planning, performance gap analysis, and risk analysis support the State DOT's TAMP investment strategies?</p>	<p>The TAMP discusses the lifecycle planning process, how performance gaps are identified, and how INDOT has analyzed risks related to asset management. All of these activities feed into the project prioritization process to ensure that the investment strategies take these activities into account.</p>	<p>Bridges: 3-1 to 3-2 Bridges: 3-6 Pavement: 3-8 to 3-9 Pavement: 3-11 Bridges & Pavement: 7-9 Bridges & Pavement: 8-4</p>

(Continued on page A-4)



Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
<p>Consider extreme weather and resilience as part of the lifecycle cost and risk management analysis</p> <p>(23 CFR 515.7 (b), 23 USC 119(e)(4))</p>	<p>Clearly explain the processes used to develop the extreme weather and resilience portions of the risk management and life-cycle planning sections of the TAMP</p>	<p>INDOT has adopted resiliency as a core principle for its asset management. Chapter 3 documents how INDOT incorporates weather and resiliency in its lifecycle planning. In updating its risk register, INDOT explicitly considered resiliency risks in terms of extreme weather, technological change, and the COVID pandemic.</p>	<p>Asset Management Principles: 1-1 LCP: 3-1 Risk: 8-1 to 8-4</p>
	<p>Include discussions of extreme weather and resilience in the risk management and life-cycle planning sections of the TAMP</p>	<p>INDOT receives feedback from the field about how its asset management systems model field conditions. INDOT actively reviews decision trees, treatment specifications, and treatment intervals. The biggest extreme weather impacts are expected related to flooding and increased rehabilitation and replacement costs.</p> <p>INDOT identified extreme weather and resiliency risks during its risk workshop. The risk register includes a column to indicate how the TAMP addresses each risk.</p>	<p>LCP: 3-1, 3-3, 3-10 Risk: 8-5 to 8-12, Appendix D</p>
	<p>Discuss how their investment strategies are influenced by the results of their risk management and life-cycle planning analyses, as provided in 23 CFR 515.7(e)</p>	<p>INDOT developed a specific planning scenario to address resiliency risks identified during lifecycle planning and risk analysis. This scenario is included in the performance gap analysis.</p>	<p>Finance: 7-8 to 7-9</p>

(Continued on page A-5)



Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
<p>Inclusion of Other Assets in the TAMP in 23 CFR 515.9 (l) (continued)</p>	<p>If applicable, does the TAMP include a summary listing of other assets,⁴⁰ including a description of asset condition?</p>	<p>Appendix B provides an inventory and condition summary for large culverts.</p>	<p>Large Culverts: B-1 and B-3</p>
	<p>If applicable, does the TAMP identify measures and State DOT targets for the condition of other assets?</p>	<p>Condition targets have not been established for large culverts.</p>	<p>N/A</p>
	<p>If applicable, does the TAMP include a performance gap analysis for other assets?</p>	<p>N/A</p>	<p>N/A</p>
	<p>If applicable, does the TAMP include a discussion of life cycle planning for other assets?</p>	<p>Condition assessment and project prioritization for large culverts are described in Appendix B. Other steps in life cycle planning are described in Section 3 along with the life cycle planning for bridges.</p>	<p>Large Culverts: B-2 and B-4 Large Culverts: 3-1 to 3-8</p>
	<p>If applicable, does the TAMP include a discussion of a risk analysis for other assets that meets requirements in 23 CFR 515.9(l)(5)?</p>	<p>The risk analysis in Section 8 includes large culverts.</p>	<p>Large Culverts: 8-1 to 8-12</p>
	<p>If applicable, does the TAMP include a financial plan to fund improvements of other assets?</p>	<p>N/A</p>	<p>N/A</p>
	<p>If applicable, does the TAMP include investment strategies for other assets?</p>	<p>Investment strategies for large culverts are described in Appendix B.</p>	<p>Large Culverts: B-4</p>
<p>Integration of TAMP into Transportation Planning Processes that Lead to the Statewide Transportation Improvement Program (STIP) (23 CFR 515.9(h))</p>	<p>Do State DOT planning documents or records of planning activities show that the TAMP was integrated into its transportation planning processes that lead to the STIP?</p>	<p>Not within TAMP, Consistency Determination Documentation submitted separately.</p>	<p>N/A</p>
<p>TAMP Available to the Public (23 CFR 515.9(i))</p>	<p>Has the State DOT made its TAMP available to the public by posting on its website, or distributing in public meetings, or by some other means?</p>	<p>This TAMP will replace prior TAMP online.</p>	<p>N/A</p>

(Continued on page A-6)



Required Elements	Indicators the TAMP Meets Element Requirements in 23 U.S.C. 119(e) and 23 CFR part 515	Review Finding	Requirement Addressed on These Pages
<p>State DOT Demonstrates Through Current and Verifiable Documentation that it has Implemented a TAMP Meeting Requirements of 23 U.S.C. 119 And 23 CFR Part 515 and that the State DOT is Following the Investment Strategies in the TAMP (23 CFR 515.13(b)(2))</p>	<p>Has the State DOT documented evidence that the State DOT is using the TAMP investment strategies? (23 CFR 515.13(b)(2)). The best evidence is that, for the 12 months preceding the consistency determination, there was alignment between the actual and planned levels of investment (in the TAMP) for various work types as defined in 23 CFR 515.5 (i.e., initial construction, maintenance, preservation, rehabilitation and reconstruction) (23 CFR 515.13(b)(2)(i))?</p>	<p>Not within TAMP, Consistency Determination Documentation submitted separately.</p>	<p>N/A</p>
	<p>If the State DOT deviated from the TAMP investment strategies, did they document reasons the deviation(s) were necessary due to extenuating circumstances beyond the State DOT's reasonable control³⁷ (23 CFR 515.13(b)(2)(ii)).</p>	<p>Not within TAMP, Consistency Determination Documentation submitted separately.</p>	<p>N/A</p>

³⁷ If the State DOT wants to address other assets without subjecting those assets to section 515.7 or 515.9(l) analyses, the State DOT can group such assets and identify them as assets outside the TAMP (e.g., "other assets", "non-TAMP assets", "other safety related assets", etc.). State DOTs may identify these other types of assets with their respective funding needs in a separate table or general discussion, but should clearly note that the TAMP framework was not used to arrive at the estimated funding needs/allocations for those non-TAMP assets.



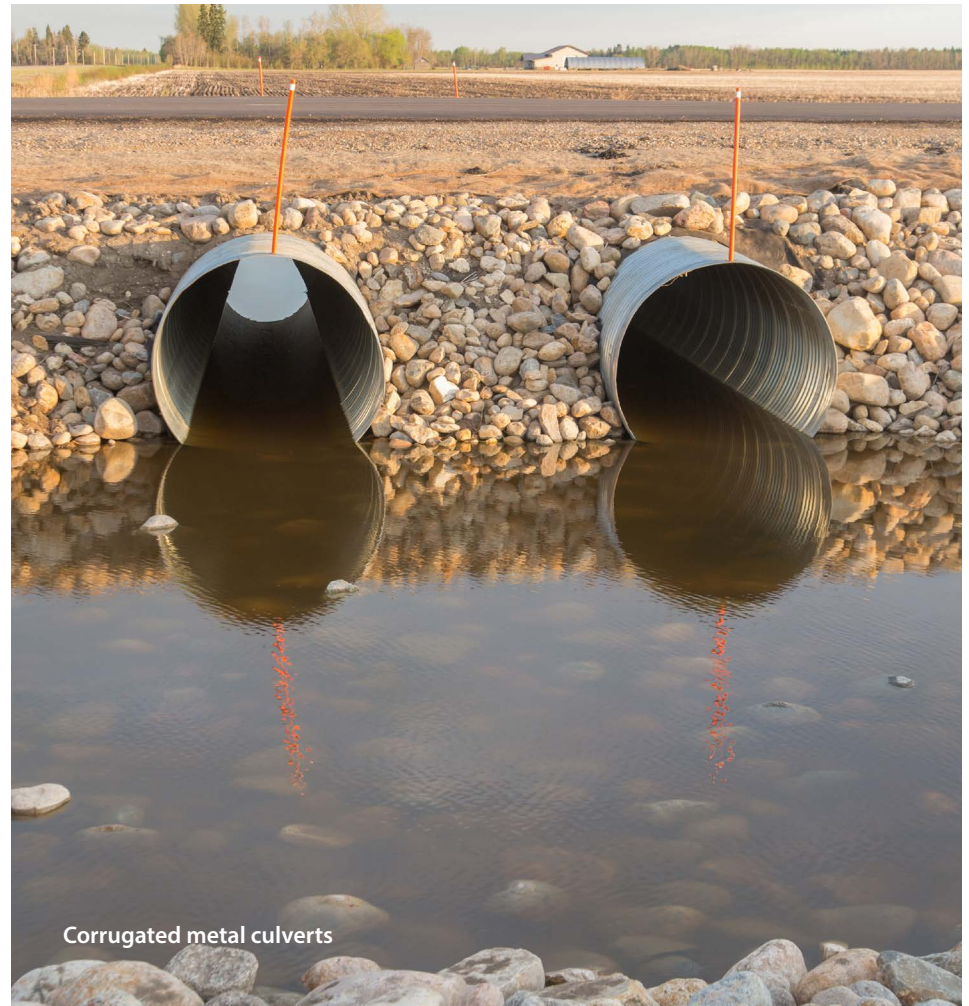
What are large culverts and how many does INDOT own and maintain?

Large culverts are a new addition to INDOT's TAMP. Large culverts and other hydraulic infrastructure play an important role in effectively managing water flows throughout the state. Culverts convey surface water runoff from one side of the road to the other side. A large culvert is defined as any culvert with a span of 48 inches or more. This TAMP includes large culverts in all of its analysis (life cycle cost planning, risk management, and financial planning).

As shown in **Table B-1**, INDOT owns and maintains 8,696 large culverts, of which 3,347 are on the NHS.

Table B-1: Culverts, NHS versus Non-NHS

District	NHS	Non-NHS
01	617	915
02	428	708
03	607	825
04	424	447
05	602	1,225
06	669	1,229
Statewide Total	3,347	5,349



How does INDOT assess the condition of large culverts?

Inspection and assessment of certain large culverts may not be possible in the following conditions:

- High water
- Debris blocking inlet/outlet
- Inability to locate the structure
- One-sided accessibility to the structure

INDOT's assessment and analysis of culverts will become more detailed in future TAMP updates as statewide data collection on culverts continues. The conditional rating system of INDOT's large culverts is defined by **Figure B-1**. For culverts, a single rating of 0 to 9 is assigned for the entire structure. A culvert in 'Good' condition receives a score of 7 or more. A score of 5 or 6 indicates 'Fair' condition, and 4 or below indicates Poor condition.

Figure B-1: Conditions of Large Culverts

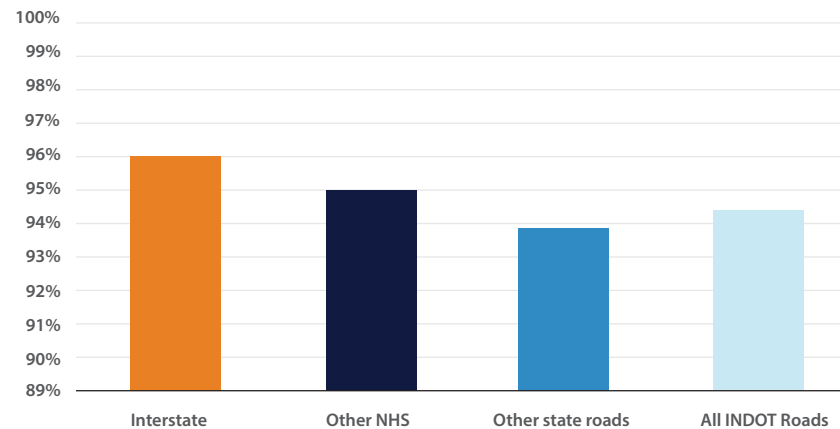
09	Excellent	Perfect condition, recently installed or repaired
08	Very Good	Near perfect condition. Minor blemishes
07	Good	No repairs needed. Small wear and tear
06	Satisfactory	Minor wear on structure. Overall in good condition
05	Fair	Acceptable condition, increase inspection frequency
04	Poor	Needs to be put on radar for extra inspection - potential failure
03	Serious	In danger of failing. Needs repair
02	Critical	Failing. Needs Immediate repair
01	Imminent Failure	Failed/is close to fully failing. Needs immediate repair
00	Unable to Inspect	Culvert under water, full of sediment/debris, unable to locate



What is the condition of INDOT's large culverts?

Figure B-2 shows the condition of INDOT-owned large culverts. Of the 8,696 large culverts that INDOT owns and maintains, 94 percent have been assessed to be in fair or better condition. For large culverts on the NHS, over 96 percent are in fair or better condition on the Interstate, while other NHS routes have over 95 percent of large culverts in fair or better condition.

Figure B-2: 2022 INDOT-Owned Large Culvert Condition Ratings (Percent Fair or Better)



How does INDOT develop its large culvert strategy and deliver projects?

The Bridge Asset Management Team (BAMT) has developed business rules that describe the methods to use when assigning scores to potential large culvert projects. These business rules are consistent with the rules for bridges. The scoring system ranks the large culvert projects recommended during the life-cycle planning analysis process to determine the best allocation of resources according to the scoring factors shown in **Table B-2**. Other projects are exceptions to the rules. These projects include culvert replacements and projects complying with the guidelines in the Bridge and Culvert Preventative Maintenance Agreement (BCPMA). Exceptions-to-the-rules projects are automatically given a 100-point score.

Large culvert projects are prioritized through the steps shown for bridges on Pages 3-7 and 3-8. These projects are delivered using the same programs as bridges. The Five-Year Call Program covers short-term projects, such as and culvert lining, as well as longer term projects. The Bridge and Culvert Preventive Maintenance Agreement (BCPMA) Program includes preservation and preventive maintenance activities such as culvert repair.

Table B-2: Large Culvert Scoring Factors and Weights

Scoring Factor Number	Bridge Scoring Factor Description	Score	Weights (100-Point Scale)	Maximum Weighted Score
#1	Overall Culvert Condition	0–10	5	50
#2	Cost-Effectiveness	0–10	3	30
#3	Functional Classification Priority	0–10	1	10
#4	AADT* Impacts	0–10	1	10
Subtotal				100
Supplementary Factor	Earmarks, Other Contributions	0–5	7	35
Grand Total				135

* AADT = annual average daily traffic



FHWA Work Types

FHWA has defined five work types as overarching categories of treatments: maintenance, preservation, rehabilitation, reconstruction, and construction. **Table C-1** provides a complete listing of all treatment types found in INDOT’s Scheduling Project Management System (SPMS) for pavement and bridge projects that correspond with the five FHWA work type categories. This list has been refined since the previous TAMP.

Table C-1: INDOT Treatment Type to FHWA Work Type Mapping

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Maintenance	Bridge Deck Patching	C112
Maintenance	Bridge Maintenance And Repair	C700
Maintenance	Repair Or Replace Joints	C711
Maintenance	Straighten Beam	C712
Maintenance	Railing Replace Or Repair	C713
Maintenance	Repairs To Approach Slab	C714
Maintenance	Repair/Replace Cathodic Protection	C720
Maintenance	Debris Removal From Channel	C811
Maintenance	Channel Clearing And Protection	C812
Maintenance	Channel Realign And Reshape	C813
Maintenance	Scour Protection (Erosion)	C814
Maintenance	District Wide Bridge Maintenance	C900
Maintenance	Pavement Patching	J115
Maintenance	Pavement Patching	J115
Maintenance	Underdrain inspection and cleaning	J116
Maintenance	Spot Paving	J119
Maintenance	Small Structure Maint and Repair	W130

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Preservation	Bridge Deck Overlay	C111
Preservation	Bridge Deck Sealing	C114
Preservation	Bridge Thin Deck Overlay	C116
Preservation	Bridge Painting	C500
Preservation	Bridge Cleaning	C716
Preservation	Crack Sealing	J113
Preservation	Concrete Surface Restoration	J117
Preservation	Concrete Pavement Preservation (CPP)	J127
Preservation	HMA Overlay Preventive Maintenance	J211
Preservation	Surface Treatment Thin HMA Overlay	J216
Preservation	Surface Treatment Chip Seal	J217
Preservation	Surface Treatment Microsurface	J218
Preservation	Surface Treatment Ultrathin Bonded Wearing Course	J219
Preservation	Concrete Pavement Restoration (CPR)	J225
Rehabilitation	Bridge Rehabilitation Or Repair	C000
Rehabilitation	Bridge Deck Replacement	C113
Rehabilitation	Bridge Widening	C200

(Continued on page C-2)



FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Rehabilitation	Replace Superstructure	C300
Rehabilitation	Superstructure Repair And Rehabilitation	C301
Rehabilitation	Raise Bridge/Lower Pavement	C400
Rehabilitation	Substructure Repair And Rehabilitation	C600
Rehabilitation	Remove & Replace Beam	C715
Rehabilitation	Truss Reconstruction Or Repair	C717
Rehabilitation	Arch Reconstruction Or Repair	C718
Rehabilitation	Covered Bridge Rehabilitation	C719
Rehabilitation	Bridge Rehab-Pipe Lining	C815
Rehabilitation	HMA Overlay Structural	J212
Rehabilitation	HMA Overlay Minor Structural	J213
Rehabilitation	Cold-In-Place Recycling	J214
Rehabilitation	PCC Thin Overlay	J227
Rehabilitation	Crack & Seat PCCP & HMA Overlay	J312
Rehabilitation	Unbonded Concrete Overlay	J318
Rehabilitation	Shoulder Rehabilitation And Repair	J600
Rehabilitation	Shoulder Rehabilitation	J600
Rehabilitation	Slide Correction	N200
Rehabilitation	Small Structure Pipe Lining	W115
Rehabilitation	Small Structure Paved Invert	W116
Rehabilitation	Drainage Ditch Correction	W200
Rehabilitation	Ditch Relocation	W211
Reconstruction	Bridge Replacement	E000

FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Reconstruction	Br Repl with a Small Structure	E315
Reconstruction	Full Depth Reclamation (FDR)	J228
Reconstruction	Rubblize PCCP & HMA Overlay	J314
Reconstruction	Pavement Replacement	L110
Reconstruction	Small Structures & Drains Construction	W000
Reconstruction	Small Structure Replacement	W110
Reconstruction	Small Structure Replacement with Bridge	W120
Reconstruction	Sewer / Curb / Gutter Const/Reconstr	W310
Reconstruction	Slotted Drain Or Inlet Replacement	W311
Reconstruction	Storm Sewer Repair Or Replacement	W312
Construction	New Bridge Construction	A000
Construction	New Road Grading Only	G100
Construction	New Road Construction	G300
Construction	Added Travel Lanes	G400
Construction	Added Travel Lanes Construct Turn Lanes	G414
Construction	Dual Lane Existing Route	G500
Construction	Auxiliary Lane Construction	G600
Construction	Auxiliary Lanes	G610
Construction	Auxiliary Lanes Passing	G611
Construction	Auxiliary Lanes Accel & Decel or Turn Lanes	G612
Construction	Auxiliary Lanes Two-way Left Turn Lanes	G613
Construction	Auxiliary Lanes Truck Climbing Lanes	G614
Construction	Sight Distance Improvement	J500

(Continued on page C-3)



FHWA Work Type	INDOT Treatment Type	SPMS Code Value
Construction	Horizontal Sight Correction	J511
Construction	Vertical Sight Correction	J512
Construction	Curve Correction	J513
Construction	Intersection Improvement	P110
Construction	Radii Improvement	P111
Construction	Intersect. Improv. W/ Added Turn Lanes	P112
Construction	Intersect. Improv. W/ New Signals	P113
Construction	Other Intersection Improvement	P114
Construction	Intersection Improvement Roundabout	P115
Construction	Intersection Improvement Median U-Turn	P120
Construction	New Interchange Construction	R100
Construction	New Interchange, Multi-Level	R112
Construction	Interchange Modification	R200
Construction	Interchange Modification Multi-Level	R212
Construction	Small Structure - New	W111
Construction	Sewer / Curb / Gutter Construction	W300
Construction	Other Sewer/Curb/Gutter Construction	W313
Construction	Pumping / Lift Stations	W314

In addition to the treatments found in the SPMS, INDOT conducts in-house maintenance and preservation activities. In **Table C-2** below, INDOT has assigned these activities to either the maintenance or preservation FHWA work type.

Table C-2: INDOT Treatment Type to FHWA Work Type, In-House Maintenance and Preservation Activities

TAMP Work Type	INDOT Treatment Type
Maintenance	2010 - PERMANENT SHALLOW PATCHING (STN - SHORT TON)
Maintenance	2011 - TEMPORARY SHALLOW PATCHING (STN - SHORT TON)
Maintenance	2020 - DEEP PATCHING (STN - SHORT TON)
Maintenance	2030 - SPOT PAVING (STN - SHORT TON)
Maintenance	2450 - TEMPORARY BRIDGE DECKS PATCHING (SQF - SQUARE FT)
Maintenance	2451 - PERMANENT BRIDGE DECKS PATCHING (SQF - SQUARE FT)
Maintenance	2490 - OTHER BRIDGE MAINTENANCE (MHR - WORK HR)
Preservation	2040 - FULL WIDTH SHOULDER SEAL COAT (FTM - FEET MILE)
Preservation	2041 - SHOULDER FOG SEAL (FTM - FEET MILE)
Preservation	2050 - MAINLINE SEAL COAT (LNM - LANE MILE)
Preservation	2051 - MAINLINE FOG SEAL (LNM - LANE MILE)
Preservation	2070 - MAINLINE CRACK FILLING (LNM - LANE MILE)
Preservation	2071 - SHOULDER CRACK FILLING (FTM - FEET MILE)
Preservation	2095 - RESEAL CONCRETE PVMT JOINTS (LNM - LANE MILE)
Preservation	2410 - BRIDGE CLEANING (DCK - DECKS)
Preservation	2440 - BRIDGE FLUSHING (BRG - BRIDGES)
Preservation	2470 - BRIDGE DECK CRACK FILLING (SQF - SQUARE FT)
Preservation	2471 - BRIDGE DECK BROADCAST SEALING (SQF - SQUARE FT)



INDOT TAMP Risk Register

Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)			Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact							Date/ Frequency
1	Threat	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. Potential that regulations may change that increase requirements on projects (i.e. environmental, right of way acquisition, etc). House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	High	High	0.640	Mitigate	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.	Evaluate impacts of projects not being completed per timing assumptions or projects legislated to be delivered. Evaluate scenarios of reduced funding. Evaluate how TAMP manages district-level vs. network-wide funding approaches.	INDOT Finance	Monthly
2	Opportunity	Federal and State Administration Changes	New administration may change assumed priorities relative to plan goals for condition achievements, funding allocations, staffing, project-selections (mobility vs. preservation), and other infrastructure improvements. House Act 1002 sets certain funding measures that may not be as subject to administration impacts.	Medium	Medium	-0.360	Exploit	Communicate priorities, assumptions, and condition results of TAMP to new administration. Cross-training of internal DOT staff.	Evaluate impacts of projects not being completed per timing assumptions or projects legislated to be delivered. Evaluate scenarios of reduced funding. Evaluate how TAMP manages district-level vs. network-wide funding approaches.	INDOT Finance	Monthly

(Continued on page D-2)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)	Probability	Impact	Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
											Date/ Frequency
3	Threat	Federal Legislation Changes	TAMP guidelines are based upon existing federal legislation. New bills may modify the requirements for the TAMP. Assumption is that new legislation is likely, but the amount of change to the current TAMP assumptions is low.	Low	Low	0.160	Accept	Monitor federal legislation changes	Modify the TAMP during future updates per most recent guidelines	Program Management Group	Four Year TAMP Update Timeframe
4	Threat	Staff Changeover and Institutional Knowledge Loss	TAMP relies on good data collection and interpretation to make informed decisions. Loss of staff that have a specialized role to provide this information could disrupt the timeliness and accuracy of the decision making. Aging staffing will be subject to retirement and younger staff may not stay as long as previous staffing. Impacts ability to forecast future conditions and efficacy of TAMP as a planning document. INDOT has developed a dedicated group for asset management.	Medium	Low	0.240	Mitigate	Improve documentation and formal guidance for asset management. Perform cross-training of staff on data collection and interpretation as it relates to AM objectives and decisions. Develop junior staff into supervisory and senior roles.	Increase information in TAMP relative to documenting processes, procedures, and guidance	Program Management Group	Annual
5	Threat	INDOT Leadership Acceptance of TAMP	The TAMP includes assumptions and formulizing responsibilities for the asset management policies based on Federal guidelines. INDOT leadership may not understand and buy-in to the policies being assumed. This can impact the ability of plan implementation and resourcing. Includes potential that District management aligns with Central Office.	Low	Low	0.160	Mitigate	Ensure proper documentation and information outreach regarding plan objectives, policies, and procedures.		Program Management Group	Annual

(Continued on page D-3)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
6	Threat	Generalized modeling in Asset Management System	TAMP has made certain assumptions based on the asset management system modeled at a high-level. Condition data and decisions are based upon historical averages. Project-specific scope may differ from treatments modeled in the asset management system. Limitations of the model. TAMP includes both initial modeling, asset management team selection of projects. Impact may be more of an issue for roadway projects than bridge projects.	Medium	Medium	0.360	Accept	Continue to engage asset management teams to verify asset management system assumptions and adjust the model accordingly. Review model projections vs. actual projects and execution of the TAMP. Update TAMP business processes per updated INDOT 20-year fiscal plan and verify plan effectiveness.	Evaluate accuracy of the business rules, decision tree, deterioration rates, and model inputs are accurate in the TAMP. Remodeling based upon actual project selections.	Roadway and Bridge Asset Management Teams	Annual	
7	Threat	Data Information Accuracy	Asset management projections and assumptions are currently based upon automated and visual inspection and BIAS data. More in-depth inspections may modify plan assumptions. Network numbers of constructed assets (i.e. lane miles of pavement type) may not match actuals in the field. Bridge information is based upon condition assessments conducted every two years. The quality of the information ties directly into the design of the treatments selected.	Low	Low	0.160	Mitigate	Adjust the inventory information using actual survey information. Track award costs and feed back into DTIMS. Perform additional testing to supplement condition assessment inspections currently used for TAMP. Improve data governance including QC checks to increase confidence in data.	Evaluate scenarios and plan selection based upon better data integrity and reliability. Update TAMP per data governance initiatives.	Roadway and Bridge Asset Management Teams		

(Continued on page D-4)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
8	Threat	Cost Estimate Accuracy	Initial estimates for projects are developed based upon high-level of information and scope assumptions (DTIMS). Estimates are based upon historical costs. Further project development and future economic conditions can change the assumptions and result in estimate modifications. For example, early estimates for maintenance of traffic (MOT) may not accurately reflect the costs that will eventually be required once MOT plans are developed. Cost assumptions for standardized treatments in the TAMP may not accurately reflect average costs in the field. Area cost factors vary across the state.	High	Medium	0.480	Mitigate	Review actual in-place construction costs and what was built compared to planning estimates to verify accuracy and adjust accordingly. For more complicated projects, review Stage 2 submittals to verify cost and scope accuracy.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Finance	Annual	
9	Threat	Commodity Prices	Fluctuations in commodity prices for key elements and material availability could impact total program costs. INDOT purchases data on Global Insights to model the trends in primary commodities. These are used to inform the active project estimates and adjust accordingly. Potential that fuel prices and other costs increase the costs of projects.	Medium	Medium	0.360	Accept	Monitor price fluctuations using Global Insight during estimate updates. Survey industry and economic experts relative to future trends in prices.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Economics	Annual	

(Continued on page D-5)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)	Probability	Impact	Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/ Frequency
10	Threat	Construction Industry Capacity / Availability	The availability of contractors and skilled labor and their capacity/interest to take on preservation work may impact the number of bidders and bid prices. Lack of competition amongst the construction industry may result in overall higher program costs.	Medium	Medium	0.360	Mitigate	Contractor outreach and provide information of program opportunities. Program incentives to attract contractors. Work with contractors to recruit quality staffing. Survey industry and economic experts relative to future trends in contractor availability.	Evaluate cost assumptions in the TAMP relative to potential increase in construction costs. Update the base modeling to reflect updated cost information as it becomes available.	INDOT Economics	Annual
11	Threat	Right of Way Availability	TAMP assumes that ROW is available. There are potential disconnects in the ROW needed to accomplish projects and what is actually owned by the Department. Acquisition of additional ROW can impact both costs and schedule of projects. Risk includes potential that temporary ROW and easements be purchased to accommodate construction.	High	Medium	0.480	Mitigate	Improve documentation of available ROW and asset management project needs. Tie ROW into the asset management system database.		INDOT ROW	Annual
12	Opportunity	Inform Staff Resourcing Needs	The TAMP could be used to inform the resourcing needs of the Department based upon the project informational and project delivery needs.	Medium	Medium	-0.360	Exploit	Use TAMP as informational resource to employee staffing needs.	Increase information on staffing requirements necessary to execute the TAMP	Program Management Group	Annual

(Continued on page D-6)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
13	Threat	Preservation Treatment Performance	TAMP has assumed certain life cycle for given treatments. Risk is that the assets do not have the life assumed due to the ineffectiveness of the treatment technology or that the treatment did not have the life that was assumed. This is reliant on quality and appropriateness of the design and quality control of construction activities. Risk is that the treatments do not have the life assumed.	High	High	0.640	Mitigate	Staff training and authority to correct quality issues in the field, construction training and resources, enhanced technology for inspections to verify construction. Support for quality control decisions. Communicate with construction inspectors, and bridge/pavement engineers on realized life of assets. Develop communication plans with field personnel on technology effectiveness.	Include analysis in the TAMP to address poor treatment performance and technologies that improve performance and extend life of the assets.	Bridge and Roadway Asset Management Teams	Annual. Review of performance of treatment applied, data gathering on results achieved.	
14	Opportunity	Changes in Material Technology	Material technology continues to improve leading to better resiliency of the assets.	Medium	Medium	-0.360	Exploit	Openness to new technologies, develop specifications to allow new technologies, develop testing protocols to prove effectiveness.	Evaluate plan relative to a decrease in maintenance needs or increase in useful life of the assets.	Bridge and Roadway Asset Management Teams	Ongoing	

(Continued on page D-7)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
15	Threat	Routine Maintenance Not Performed	TAMP assumes certain routine maintenance activities will be performed in order to meet projections for deterioration and life expectancies. Risk is that these activities (crack sealing, minor patching, deck cleaning and flushing, etc.) are not performed at the levels of regularity needed. Risk also considers items that are more difficult to maintain. Risk is also that the funding for maintenance needs is not provided.	Low	High	0.320	Mitigate	Document routine maintenance activities expected, Monitor routine maintenance program. Prepare business case for the need for maintenance funding in order to meet asset management condition goals. Improve feedback and communication with maintenance personnel relative to needs.	Evaluate plan relative to an increase in maintenance needs or reduction in useful life of the assets.	INDOT Technical Services, District Maintenance	Annual	
16	Threat	Additional Assets Included In TAMP	TAMP originally included only pavement and bridges. There is potential that certain additional elements such as culverts and slope stability walls are assumed significant enough to be included in the TAMP and would be covered by the program funds. Large culverts have been included in the TAMP estimates, but smaller culverts have a backlog and may not have been accounted for. There is an issue with evaluating inventory and condition of these elements on the local NHS roadways.	High	Medium	0.480	Accept	Inventory all major assets, determine condition and need for being included in TAMP. Improve communication from Districts to PMG relative to needs. Identify funding mechanism to address identified deficiencies.	Evaluate scenario where additional needs are identified beyond base assumptions of roadways, bridges, and large culverts.	Bridge and Roadway Asset Management Teams (District)	Annual	

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review Date/ Frequency		
			Probability	Impact										
17	Opportunity	Mobility & Safety Projects	TAMP does not include the improvements made to the assets performed as part of separate Mobility and Safety Projects. These projects often result in pavement improvements that would then not be subject to rehab as part of TAMP funding.				Medium	Medium	-0.360	Share	Coordinate with Mobility and Safety Projects and incorporate into Asset Management System Database.	Evaluate asset management needs based on a corridor approach which would include all possible projects within a given timeframe.	Bridge and Roadway Asset Management Teams (District)	Annual
18	Threat	Regulatory Requirements Changes	Potential that projects will be subject to different regulatory requirements than what is currently assumed. This could result in increased costs to the program to meet the new requirements. Examples include new environmental and ADA requirements.				Medium	Medium	0.360	Accept	Monitor plan against potential regulatory requirement changes.	Modify the TAMP during future updates per most recent guidelines	Program Management Group	Annual

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
19	Threat	Staffing Resources	Implementation of the TAMP assumes certain levels and capabilities of staffing resources, all heavily reliant on the personnel implementing the program. Salaries of personnel impact attraction and retention of staff. Labor availability remains an issue across the State. Nationwide infrastructure funding will exacerbate the issue. If these resources are not readily available or the skills needed are not provided, the execution of the plan may be impacted through reduced quality, less efficiency, and potential errors and missed opportunities.	High	Very High	0.800	Mitigate	Communicate and document the staffing requirements needed to effectively execute the plan. Develop employee attraction and retention programs. Partner with INDOT Talent Management. Ensure training of staff relative to program history and objectives. Acquire and utilize technology to assist staffing resources. Automate and use of technology to improve AM processes and reduce personnel resource needs.	Labor availability and salaries may cost the program more, thus reducing the amount of money being spent on maintaining and upgrading the assets. Evaluate overall program costs for executing the plan vs. asset management efficacy. Evaluate consistency planning and targets relative to how the plan is being impacted by staffing resources.	Program Management Group	Quarterly	
20	Threat	Transportation Technology Changes	As technology changes, there may be changes relative to the use of autonomous vehicles, truck platooning, or other transportation technologies that change the design criteria, staffing needs, and ITS/ technology infrastructure. Information on what these changes will be is not currently available. This risk is assumed to be low priority within the 10 year timeframe of the TAMP, but greater potential over the longer term.	Low	Low	0.160	Accept	Monitor technology developments. Adjust design criteria and requirements accordingly.	Evaluate plan relative to an increase in maintenance needs or reduction in useful life of the assets based upon new technologies.	Bridge and Roadway Asset Management Teams	Semi-Annual	

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
21	Opportunity	Transportation Technology Changes	As technology changes, there may be changes relative to the use of autonomous vehicles, truck platooning, or other transportation technologies that change the design criteria, staffing needs, and ITS/ technology infrastructure. Information on what these changes will be is not currently available. This risk is assumed to be low priority within the 10 year timeframe of the TAMP, but greater potential over the longer term.	Low	Low	-0.160	Accept	Monitor technology developments. Adjust design criteria and requirements accordingly.	Evaluate plan relative to a decrease in maintenance needs or improvement in useful life of the assets based upon new technologies.	Bridge and Roadway Asset Management Teams	Semi-Annual	
22	Opportunity	Over-sized / Over-weight Vehicle Permitting	INDOT is currently evaluating the damage inflicted due to over-sized or over-weight vehicles and adjusting the fees paid accordingly. This could provide an additional funding source for the TAMP.	Low	High	-0.320	Accept	Evaluate revenue potential from permit fee modifications as source of TAMP revenue. Increase enforcement resources.		INDOT Multi-Modal	Annual	
23	Opportunity	Fuel Price Fluctuations	Rising fuel price can result in fewer traffic volumes, resulting in less deterioration of the assets. This is somewhat offset by the potential reduction in gas tax revenue.	Low	Medium	-0.240	Accept	Monitor fuel prices on plan objectives and modify plan accordingly.	Evaluate plan based upon reduced deterioration of assets due to reduced usage.	INDOT Economics	Annual	
24	Threat	Federal Revenue for TAMP Funding	TAMP relies on having additional Federal revenue to meet growing asset management needs. Federal gas tax will likely not provide adequate source of funding. Potential that the revenue provided by Federal Government to INDOT is less than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from fuel taxes.	Medium	High	0.480	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios relative to reduced Federal revenue availability.	INDOT Finance, Program Management Group	Quarterly. Evaluate Federal match revenue.	

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)			Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact							Date/ Frequency
25	Threat	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is less than estimated amounts over the life of the TAMP. Minimum match with Federal funds must be met first. Potential reduces funding to state-funded maintenance operations due to having to meet Federal match requirements. Potential of revenue impacted due to electric vehicles and reduce vehicle usage. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling. State Highway Fund availability may be limited by legislative changes to the revenue that is used to feed the fund.	Medium	High	0.480	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios relative to reduced revenue availability and reduced vehicle usage. Evaluate impacts from electric vehicle usage (long term).	INDOT Finance, Program Management Group	Quarterly. Evaluate Federal match revenue.
26	Opportunity	Federal Revenue for TAMP Funding	Potential that the revenue provided by Federal Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to Continuing Resolutions, Highway Trust Fund solvency, and less revenue from gas taxes.	Low	High	-0.320	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios where additional funding is made available. Develop plan at a deficit and identify projects to be added to plan if additional funding is made available.	INDOT Finance, Economics	Annual
27	Opportunity	State Revenue for TAMP Funding	Potential that revenue provided by State Government to INDOT is more than estimated amounts over the life of the TAMP. Fluctuations in revenue can be attributed to the economy and sales taxes, gas tax revenue, and tolling.	Low	Very High	-0.400	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability. Monitor market fluctuations using Global Insight.	Evaluate scenarios where additional funding is made available.	INDOT Finance, Economics	Quarterly. Evaluate Federal match revenue.

(Continued on page D-12)



Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
28	Threat	Federal Discretionary Grant Programs	Federal Discretionary Grant Programs may reduce available funding from the Federal Government for TAMP projects. Grant Programs may have specific restrictions and guidelines that would also result in less funding control by the State to select which projects are funded.	Low	High	0.320	Mitigate	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability.	Evaluate scenarios where additional funding is not available.	INDOT Finance, Economics	Annual	
29	Opportunity	Federal Discretionary Grant Programs	Federal Discretionary Grant Programs may provide additional funding from the Federal Government for TAMP projects.	Very Low	High	-0.160	Enhance	Maintain project cost balance sheets. Develop strategy to provide options for projects funded based upon revenue availability.	Evaluate scenarios where additional funding is made available.	INDOT Finance	Annual	
30	Threat	State Highway Funding Non-TAMP Projects	Potential that other projects are funded from the State Highway Fund that reduce the availability of funding for TAMP projects. Correlates with Federal and State Administration Changes risk.	Low	Medium	0.240	Mitigate	Use TAMP as informational resource to inform benefits and needs for pavement and bridge preservation projects.	Evaluate scenarios where additional funding is not available.	INDOT Finance	Annual	
31	Threat	Over-sized / Over-weight Vehicles Increase Deterioration	Potential that an increase in freight traffic and over-sized vehicles will cause an increase in deterioration of assets. This would cause an increase in costs for the TAMP and less life expectancy. These vehicles may be focused on select subset of the asset inventory and not the whole network.	High	Medium	0.480	Mitigate	Evaluate revenue potential from permit fee modifications as source of TAMP revenue. Increase enforcement resources.	Evaluate the cost assumptions for an increase in deterioration on select routes.	INDOT Multi-Modal / Program Management Group	Annual	

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
32	Opportunity	Communication with Customers	The TAMP provides an opportunity and a means for establishing communication with customers, stakeholders, decision makers, advocacy groups, and the general public on the benefits of asset management projects and the needs for funding the program.	High	High	-0.640	Exploit	Develop outreach protocols, presentations, and stakeholder input opportunities to inform TAMP. MPO participation is included within AM. Employ virtual technologies to engage and survey stakeholders.	Adjust plan based upon feedback received during outreach activities.	INDOT Communications Group / Program Management Group	Ongoing	
33	Opportunity	Stakeholder and MPO Involvement	Opportunity for stakeholders and MPOs to provide input into the development of the TAMP to better inform the decisions and priorities for the TAMP. MPOs have a relatively low amount of total ownership of INDOT assets, thus this is assumed to be a low risk for the TAMP.	Low	Very Low	-0.080	Exploit	Develop outreach protocols, presentations, and stakeholder input opportunities to inform TAMP.	Update TAMP per MPO and other stakeholder inputs where applicable	Program Management Group	Ongoing	
34	Threat	Traffic Demand Model	TAMP currently does not include traffic demand models in the projections of possible condition impacts related to traffic volumes. Potential that the condition assumptions will be worse than assumed based upon higher truck traffic volumes than are currently assumed.	Low	Low	0.160	Exploit	Opportunity is to use available traffic demand models to better inform the TAMP projections on asset conditions.	Evaluate the cost assumptions for an increase in deterioration based upon potential increase traffic and truck volumes.	INDOT Traffic Modeling	Semi-Annual	
35	Threat	Impacts of Climate Change	Potential that climate-based changes lead to an increase in deterioration and an increase in emergency situations such as roadway flooding and washouts. This could lead to an increase in costs for the TAMP. This may be an issue beyond the 10-year timeframe of the TAMP.	Medium	Medium	0.360	Accept	Evaluate climate models and impacts to plan assumptions.	Evaluate scenarios and model of increase deterioration, more flooding-induced damages.	Program Management Group	TAMP Update Every 4 years	

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Risk #	Threat/ Opportunity	Risk Event Name	S.M.A.R.T Description (Specific, Measurable, Attributeable, Relevant, and Time Bound)				Risk Priority	Mitigation Strategy	Mitigation Strategy Action Plan	TAMP Response	Risk Owner	Risk Review
			Probability	Impact								Date/ Frequency
36	Threat	Workforce Distribution Changes	Potential that the network transportation needs will be different based upon changing workforce dynamics and trends. Examples include more dispersed workforce and work-from-home options leading to less dense city centers. Risk includes potential increase in freight traffic to serve this dispersed workforce.	Medium	Low	0.240	Accept	Evaluate transportation models relative to usage and locations	Evaluate scenarios, model, and plan based upon changes in transportation models.	INDOT Planning, Traffic	3 - 5 years	
37	Threat	Continued Pandemic Impacts	Potential that the TAMP will be impacted due to the current pandemic continues. This would exacerbate the other risks such as revenue for the program, staffing resources, construction costs, and reduced deterioration of the assets.	Medium	Low	0.240	Accept	Evaluate transportation models based upon extended pandemic-related impacts	Evaluate transportation models based upon extended pandemic-related impacts	INDOT Finance, Economics	Bi-Annual	
38	Threat	Workforce Distribution Changes	Potential that the network transportation needs will be different based upon changing workforce dynamics and trends. Examples include more dispersed workforce and work-from-home options leading to less dense city centers. Risk includes potential increase in freight traffic to serve this dispersed workforce.	Medium	Low	0.240	Accept	Evaluate transportation models relative to usage and locations	Evaluate scenarios, model, and plan based upon changes in transportation models.	INDOT Planning, Traffic	3 - 5 years	
39	Threat	Continued Pandemic Impacts	Potential that the TAMP will be impacted due to the current pandemic continues. This would exacerbate the other risks such as revenue for the program, staffing resources, construction costs, and reduced deterioration of the assets.	Medium	Low	0.240	Accept	Evaluate transportation models based upon extended pandemic-related impacts	Evaluate transportation models based upon extended pandemic-related impacts	INDOT Finance, Economics	Bi-Annual	

