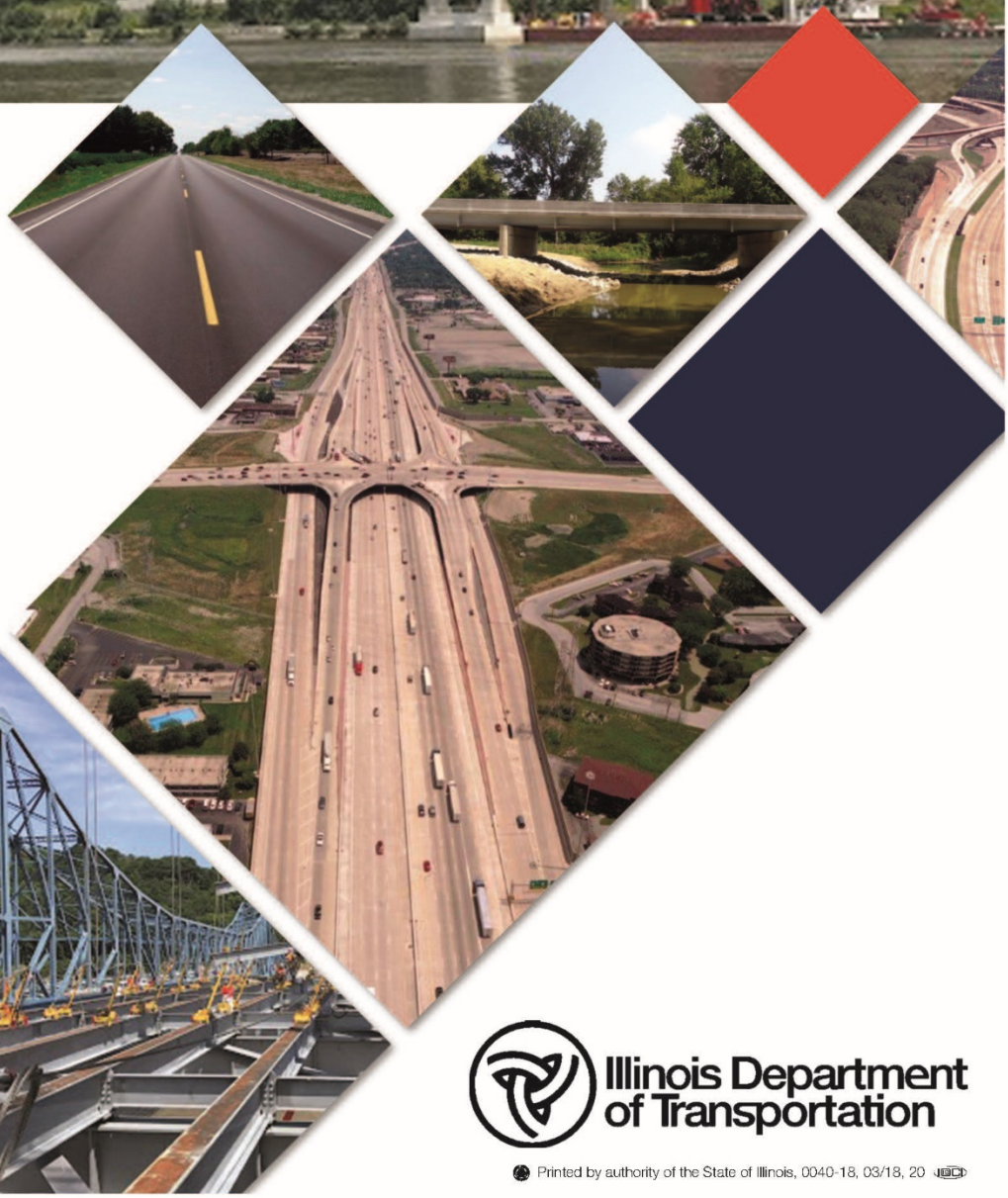
State of Illinois
Illinois Department of Transportation

TRANSPORTATION ASSET MANAGEMENT PLAN

APRIL 2018



RAISING the BAR

Illinois Department of Transportation

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Chapter 1: Introduction

Illinois' Transportation System

The State of Illinois boasts one of the largest, most effective multi-modal transportation systems in the nation. As the home to Chicago and O'Hare International Airport, Illinois also features the second largest public transportation system, the second largest rail system, the third largest Interstate system, and the fourth largest highway system in the country. The State's residents, businesses, and visitors rely on this transportation system to provide travel options, to build the State's economy, and to support local communities. The Illinois Department of Transportation (IDOT) has statutory responsibility for the planning, construction, operation, and maintenance of this transportation network, with the exception of the Chicago Skyway and facilities constructed, maintained, and operated by the Illinois State Toll Highway Authority (Illinois Tollway). IDOT's facilities include highways and bridges, public transit, airports, and rail freight/passenger systems. IDOT meets its responsibilities in ways that enhance the quality of life, promote economic prosperity, and demonstrate respect for the environment; always keeping in mind its multi-modal transportation vision.

Illinois is **third in the nation** in the number of miles of Interstates. The 2,184 miles of the State's Interstate system comprise 1.48 percent of all roads in the State, but carry 31 percent of all traffic.

Illinois is also **third in the nation** in terms of the number of bridges.

Illinois Travel Statistics, 2016

In addition to Interstates, the State has

- **165** miles of other freeways
- **5,243** miles of principal arterials
- **8,925** miles of other arterials
- **22,731** miles of collectors
- **107,708** miles of local roads

Illinois Travel Statistics, 2016

This transportation system represents a significant investment of public funds. For that reason, IDOT places a high priority on the preservation and maintenance of the system infrastructure through ongoing investments to improve the safety and efficiency of the system while adapting the system to meet the evolving needs of both today's travelers and future generations of travelers. IDOT is committed to being accountable to the public for its work and being transparent in the way it operates. IDOT also serves as an advocate and trusted advisor to State, local, and federal governments, and other community agencies and partners in providing transportation access and services for all of Illinois.

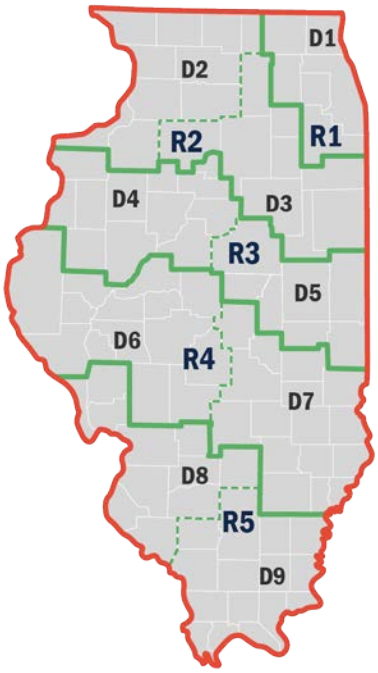


Figure 1-1. IDOT's transportation regions and districts.

To manage the highway network, the State is divided into five transportation regions consisting of nine district offices, as shown in figure 1-1, with its central headquarters located in Springfield,

Illinois. The central bureaus within the Office of Planning and Programming and the Office of Highways Project Implementation work together to develop, maintain, and operate IDOT's highway system. These bureaus develop policies, procedures, standards, and guidelines to accomplish the improvement objectives for the network. In addition, the Office of Planning and Programming is responsible for coordinating the collection, analysis, and management of the asset inventory and condition data. The guidelines provided by this Office are used by the district offices to identify, select, and prioritize asset improvements to meet the program objectives established for each district. In addition, the central bureaus monitor the programs administered by the nine districts to ensure statewide uniformity of policy interpretation and compliance, and to ensure program coordination with other stakeholders at the federal, State, and local levels.

IDOT's Focus on Asset Management

IDOT is at a crossroads. IDOT does not currently have enough resources to maintain the existing State-maintained system[1] of roads and bridges at the desired State of Acceptable Condition. Without additional revenue, asset conditions will continue to deteriorate and desired performance objectives will not be met. The *FY 2018-2023 Proposed Highway Improvement Program*[2] *(MYP*) reports that by 2023, 40 percent of the State-maintained highways, and one in seven bridges, will be in unacceptable condition. This situation demands that future investments in IDOT's highway system are strategic, addressing agency priorities that balance system preservation with external emphasis on quality of life and economic growth. The proposed MYP places a priority on improving the condition of the more than 7,000 miles of roads and 4,143 bridges on the National Highway System (NHS) that are maintained by IDOT. The focus of the proposed plan is in large part due to new federal performance rules that establish minimum conditions for Interstate pavements and NHS bridges, and promote the use of federal funds to achieve State and federal performance objectives.

To ensure that available funds are used as effectively as possible, IDOT has introduced several initiatives to enhance its ability to make performance-based, data-driven investment decisions. For example, congestion mitigation and expansion projects are now being considered through a value-driven project selection process that evaluates the expected benefits of each potential project. In addition, IDOT is in the process of acquiring new analytical tools that will help prioritize future improvements to existing pavements and bridges. These asset management software programs, which are mandated under the new federal asset management rules, use asset

With On-Going Enhancements to Support Performance-Based Decisions:

- ☑ New project selection process to evaluate the benefits of expansion and congestion mitigation projects
- ☑ Acquisition of pavement and bridge analysis tools to evaluate investment options
- ☑ Increased investments in pavement and bridge preservation to extend service life

[1] Throughout this document, references to the State-maintained system exclude the Chicago Skyway and the Illinois Tollway.
[2] http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/OP&P/HIP/2018-2023/Summary.pdf

condition data to predict the impact of different improvement strategies on future network conditions. Changes to the way IDOT manages its pavements and bridges are also underway, shifting the agency towards planned, proactive investments in preservation activities that will slow the rate of pavement and bridge deterioration so these assets last as long as possible. As a result of these improved tools and project selection strategies, IDOT will be better able to make on-going investments in the highway system that support performance objectives and help ensure that limited resources are used wisely.

IDOT's plan to better use performance data to drive investment decisions aligns with national initiatives to promote a transportation asset management (TAM) framework at the State DOT level that:

- Supports the use of strategic performance objectives.
- Introduces a systematic process that links investments to performance objectives.
- Emphasizes the use of preservation treatments that extend the life of the highway system at a minimum practicable cost.
- Considers agency risks or exposure in setting investment priorities.
- Uses asset inventory information, asset condition data, and analysis tools to evaluate options for allocating resources and strategically selecting projects.

TAMP Requirements

Current federal legislation requires all State DOTs to develop a risk-based Transportation Asset Management Plan (TAMP) that describes how the State's roads and bridges on the NHS "will be managed to achieve system performance effectiveness and State DOT targets for asset condition, while managing the risks in a financially responsible manner, at a minimum practicable cost over the life cycle of its assets." (23 CFR 515.7) The requirement to develop a TAMP was first established in federal legislation passed in 2012, commonly known as the Moving Ahead for Progress in the 21st Century (MAP-21) Act. The TAMP requirement was retained in the current federal legislation, commonly known as the Fixing America's Surface Transportation (FAST) Act, which also includes requirements for performance-based management. The Federal Highway Administration (FHWA) established the rules that govern the processes that must be used to develop the TAMP, the minimum requirements that apply, the penalties for failure to develop and implement a TAMP, and the minimum standards for tools to support the TAMP development. It is recognized that portions of the NHS are owned and operated by agencies other than the State DOT. 23 CFR 517(f) recognizes that the State DOT may collect information from other NHS owners "in a collaborative and coordinated effort. IDOT has coordinated with the Illinois

Tollway to determine the most effective means to share information related to Illinois Tollway assets and how they are managed. Since the Illinois Tollway prepares extensive asset management documentation under its Trust Indenture, reporting on those portions of the NHS will not be duplicated in this narrative, but can be referenced in the Illinois State Toll Highway Authority's Official Statement. IDOT will establish a similar collaborative and coordinated effort with the Chicago Skyway for it next TAMP. This initial TAMP includes 7.5 miles maintained by the Skyway Concession Company, LLC (Skyway) in its inventory figures.

In accordance with these rules, the federally-required TAMP is required to include the information shown in figure 1-2.

In addition to the minimum requirements for the TAMP, there are several other key requirements outlined in the federal legislation and/or the final rules that impact the way pavements and bridges are managed now and in the future. Several of these requirements are summarized below.

- Minimum standards are established for developing and operating bridge and pavement management systems (23 CFR 515.7).
- Each State DOT is required to conduct periodic self-assessments of the agency's capabilities to conduct asset management, as well as its current efforts in implementing the TAMP (23 CFR 515.19).
- Each State, through its DOT, is required to conduct statewide evaluations to determine if there are reasonable repair or reconstruction alternatives to roads, highways, and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events declared by either the President of the United States or the Governor of the State (23 CFR 667.1).
- No more than 5 percent of the Interstate system lane miles may be in Poor condition, using performance measures established by FHWA (23 CFR 490.315).
- No more than 10 percent of the bridge deck area on the NHS may be considered Structurally Deficient using performance measures established by the FHWA (23 CFR 490.411).
- Each State DOT shall develop and utilize a Data Quality Management Program, approved by FHWA, that addresses the quality of all data collected to report pavement condition metrics to the FHWA (23 CFR 490.319).

IDOT is in the process of satisfying these and other requirements outlined in the federal legislation, but there are several initiatives that will take years to fulfill. For example, IDOT is in the process of acquiring pavement and bridge

MINIMUM TAMP CONTENT TO SATISFY FEDERAL REQUIREMENTS INCLUDE

- Asset management objectives
- Asset management measures and State DOT targets for asset condition
- A summary description of asset conditions
- Performance gap identification
- Life-cycle planning
- Risk management analysis
- Financial plan
- Investment strategies

Figure 1-2. Minimum TAMP requirements.

management software programs as part of an Enterprise Asset Management System (EAMS), but the full implementation of these programs is expected to take several years as the agency develops guidance and programming processes to support its new preservation-based investment strategies.

The completion of this document represents IDOT's best faith effort to meet the requirements for developing a risk-based TAMP. A second, more detailed plan will be submitted to FHWA by June 30, 2019 and subsequent updates to the TAMP will be submitted in accordance with the minimum 4-year cycle required under legislation.

TAMP Content

IDOT's TAMP exceeds the FHWA's minimum requirements for developing a TAMP since the agency elected to expand the content beyond just the NHS pavements and bridges to include all State-maintained pavements and bridges. The processes used to develop a risk-based 10-year investment strategy for pavements and bridges are captured in the following eight chapters.

- **Chapter 1: Introduction** – This chapter introduces the IDOT highway system, explains IDOT's commitment to TAM, describes the minimum requirements for a TAMP, and introduces the content of this document.
- **Chapter 2: Asset Management Objectives** – This section of the TAMP summarizes IDOT's current and planned initiatives to support asset management.
- **Chapter 3: Asset Inventory and Conditions** – This chapter summarizes the number and type of pavement and bridge assets that are included in the system, describes the processes used to monitor conditions, presents historical trends in performance, and reports the value of the existing pavements and bridges maintained by IDOT.
- **Chapter 4: Life Cycle Planning** – This section of the TAMP introduces the concept of life cycle planning and explains its effectiveness at reducing the long-term costs of system preservation. Typical life cycle strategies used by IDOT to manage its pavements and bridges are also discussed in this section.
- **Chapter 5: Risk Management** – The risk chapter introduces the concept of risk management, explains how risks are used in setting investment priorities, and summarizes the most significant risks impacting the implementation of this TAMP. This chapter also introduces a new process that IDOT has developed for managing assets that are routinely impacted by emergency events.
- **Chapter 6: Financial Plan and 10-Year Investment Strategies** – This chapter summarizes the expected funding levels over the next 10 years

and the level of investment that will be made in pavement and bridge work activities to achieve performance objectives.

- **Chapter 7: Performance Gap Analysis** – This chapter summarizes IDOT's State of Desired Acceptable Condition and the impact the planned 10-year investment strategies will have on achieving these conditions.
- **Chapter 8: Planned Enhancements** – The final chapter identifies the steps that IDOT is taking to meet the federal requirements and to further strengthen its use of performance-based, data-driven investment decisions.

Chapter 2: Asset Management Objectives

Overview

In the past, IDOT has primarily focused its highway investments on addressing the most pressing needs, such as congestion in the Chicago area, economic development demands in a particular region, or deteriorated pavement and bridge needs across the State. Historically, IDOT's pavement and bridge condition assessment procedures, which are discussed further in the next chapter, have been used to report necessary pavement and bridge improvements in terms of both Backlog and Accruing. This focus on Backlog, which represents deteriorated pavements and bridges in need of significant repair, tended to drive investments towards projects that were in unacceptable condition. This focus on deteriorated pavements and bridges represented a "worst first" strategy that required substantial funding levels each year. Since the required annual funding level was not available to address all Backlog needs, network conditions declined and desired conditions were known as "aspirational goals" since they were unachievable. According to the 2017 Long Range Transportation Plan (LRTP) Funding Report[3], IDOT's funding levels have been stagnant for over a decade, making it difficult to address the growing transportation needs across the State.

With this TAMP, IDOT has established constrained performance goals that better estimate the pavement and bridge conditions that can actually be achieved with the funding available. The current focus is on achieving a state of *Desired Acceptable Conditions* with the funding levels available. In the next several years, IDOT will be using these results to establish 2- and 4-year performance targets for portions of its highway network and demonstrating their commitment to achieving these objectives to FHWA and other stakeholders.

Other initiatives will allow IDOT to better evaluate investment options so the agency can more effectively communicate funding needs with the State legislature and other stakeholders while also taking steps to increase the amount of preservation treatments performed to slow the rate of asset deterioration and defer the need for costly repairs. These changes, which are supported by federal legislation, provide IDOT with an opportunity to take advantage of new technology, new ways of doing business, and improved

RAISING the BAR

IDOT's Asset Management Activities Are **Raising the Bar** by Taking Advantage Of:

- ☑ New technology
- ☑ New ways of doing business
- ☑ Improved transparency and accountability

[3] http://www.idot.illinois.gov/transportation-system/transportation-management/planning/index

transparency and accountability that will help ensure the continued vitality of the highway system today and into the future.

Asset Management Goals and Objectives

The State-maintained highway system is critical to the growth and development of both State and national economies, providing a crucial link between the east and west coasts, as well as serving as the center of the nation's freight network. To meet the continuing demand on the system, IDOT is committed to making the best use of available funding to support system needs and priorities. However, federal and State revenues have not kept up with the needs of the system. As a result, the 2017 LRTP, which establishes the strategic direction for the Illinois transportation system, presents new ways for IDOT to be effective stewards of public funds through the use of asset management planning and the implementation of performance-based project selection tools to best leverage existing funds to provide a transportation system that meets both the State's and the nation's needs.

The development of the LRTP is the result of a collaborative process that included the input of a variety of stakeholders from throughout the State. The results of the process led to five broad goals for the agency's investments, as shown in the call-out box to the left.

The LRTP outlines implementation strategies and performance measures that are designed to enable IDOT to achieve its goals and monitor progress. To accomplish the stewardship goal, IDOT's strategies emphasize investments in improvements to existing assets, as well as transparency in the project selection and prioritization process, to help ensure these decisions are guided by sound data and performance-based processes. The new investment strategies that IDOT is implementing promote the use of preservation treatments to slow the rate of deterioration and a more strategic approach to project selection that optimizes the use of available funding.

Previously, IDOT had separate performance goals for asset conditions that were based in large part on highway functional classification and traffic volumes. Moving forward, IDOT has set asset goals that *raised the bar* for asset conditions on the entire highway network. Desired State of Acceptable Conditions were set for the Interstate system and for all other state highways. The selected condition levels represent the condition at which preservaton treatments are considered viable.[4] In the absence of funding constraints,

IDOT's Investment Goals

- **Economy** – Improve Illinois' economy by providing transportation infrastructure that supports the efficient movement of people and goods
- **Livability** – Enhance the quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options, and preserve the environment
- **Mobility** – Support all modes of transportation to improve accessibility and safety by improving connections between all modes of transportation
- **Resiliency** – Proactively assess, plan, and invest in the state's transportation system to ensure that our infrastructure is prepared to sustain and recover from extreme events and other disruptions
- **Stewardship** – Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois' transportation system

[4] As discussed in chapter 3, acceptable pavement conditions are set at a CRS value of 5.5 or higher for Interstate pavements and 5.0 or higher for all other State highways. For bridge elements, the NBI rating is set at 5 or higher.

IDOT would maintain system conditions so that at least 90 percent of its pavements and 93 percent of its bridges remain in acceptable condition. However, funding levels are not adequate to achieve IDOT's desired condition across the network.

Therefore, IDOT has established new targets representing acceptable levels for desired conditions for all of the pavements and bridges based on system hierarchy in the following order: Interstate and Non-Interstate Routes on the National Highway System (NHS), Non-NHS Marked Routes, and Non-NHS Unmarked Routes. Moving forward, IDOT's emphasis will continue to focus on preserving the NHS, which tend to be of regional significance and carry higher traffic volumes. IDOT set performance targets at 90 percent of the Interstate miles and non-Interstate NHS routes, 75 percent of the marked routes, and 50 percent of unmarked routes equal to or above acceptable conditons. The performance targets for bridges are set at 93 percent of the NHS bridge deck area and 90 percent of the non-NHS bridge deck area at or above acceptable conditions. These performance targets for pavements are shown in figure 2-1 and for bridges in figure 2-2.

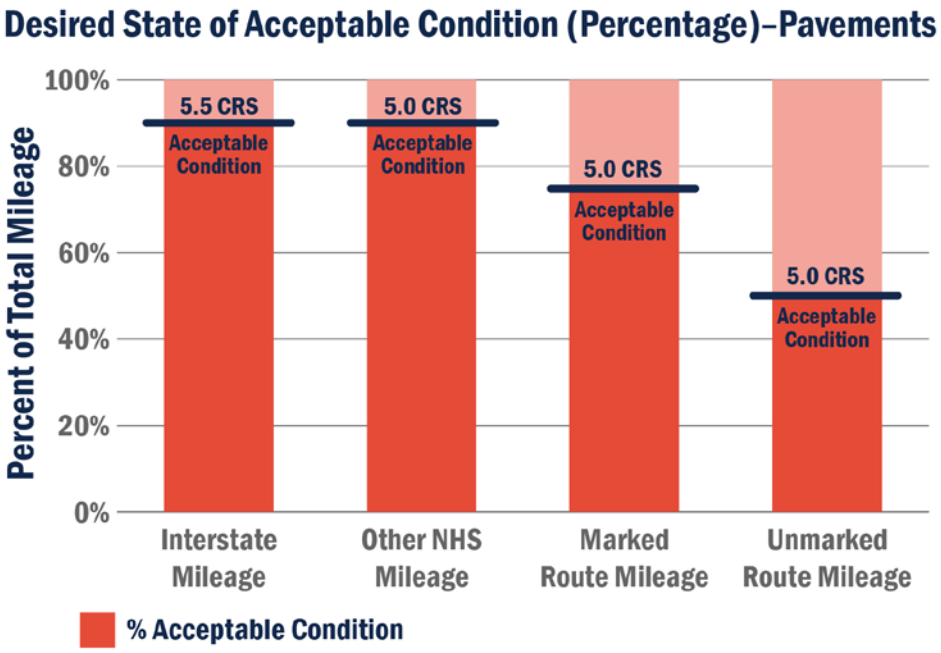


Figure 2-1. Desired State of Acceptable Condition targets for pavements[5].

[5] The CRS rating procedures are described in chapter 3.

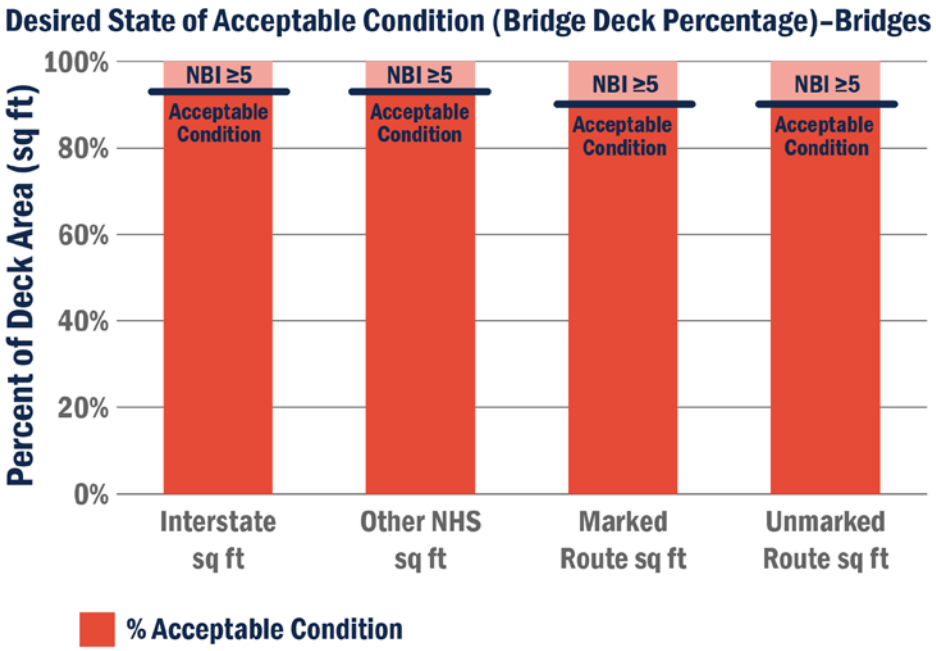


Figure 2-2. Desired State of Acceptable Condition Targets for bridges[6].

In addition to establishing realistic asset condition targets, IDOT has made a commitment to increased expenditures in pavement and bridge preservation to slow the rate of deterioration and postpone the need for more expensive treatments. This asset management philosophy is reflected in the FHWA's definition for asset management:

Asset management is a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost.[7]

The TAMP outlines IDOT's strategies to shift towards a more data-driven decision process that supports the use of analysis tools and life cycle strategies to reduce the rate of system deterioration as cost-effectively as possible.

[6] The NBI inspection procedures are described in chapter 3.
[7] 23 CFR 515.5

Current Business Processes Supporting Asset Management

In addition to setting the strategic direction for system investments, the LRTP serves as the overarching framework for IDOT programs and specific modal plans, providing policies to guide system development rather than specific improvements. Planned improvements are programmed separately from the LRTP and released annually as the Multi-Year Highway Improvement Program and the Multi-Year Multi-Modal Improvement Programs.

Long-Range Transportation Plan

The LRTP is also designed to act as the parent policy umbrella for other relevant policy and mode-specific plans developed by IDOT as a suite of plans. As shown in figure 2-3, the suite includes interrelated plans such as the State Highway Safety Plan, the Transit Plan, the Rail Plan, the Freight Plan, the Bike Plan, the ITS Architecture Plan, and this TAMP.

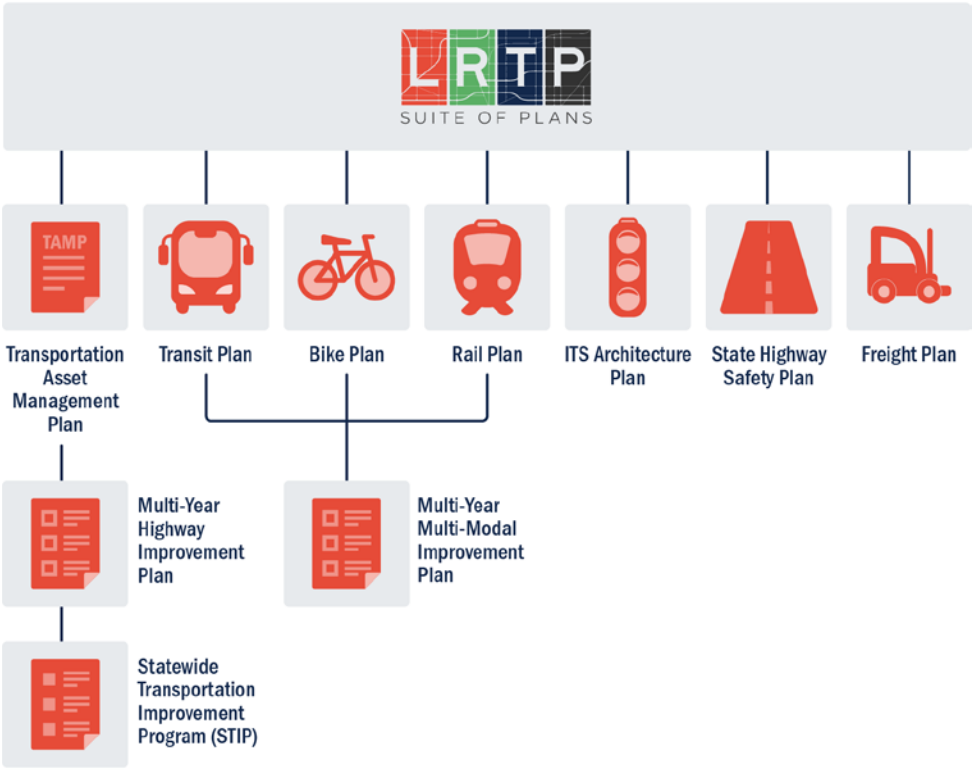


Figure 2.3. Long-range transportation suite of plans.

To address the funding limitations that have existed over the past decade, IDOT has identified several potential strategies for increasing revenues and managing costs. To manage costs, IDOT has adopted an asset management

strategy that is helping the agency achieve the four goals listed below for its asset management program[8].

- Create a culture through training and communication where Transportation Asset Management (TAM) is viewed as a way of doing business.
- Move towards a more performance-based approach to TAM decision making.
- Find a balance between proactive, preservation-first and reactive, worst-first strategies.
- Provide IDOT staff with improved access to accurate, timely, consistent, and complete asset data and information.

To achieve these goals, IDOT's Implementation Plan outlines the seven initiatives listed below to advance the use of asset management principles.

- Initiative 1: Develop a TAM strategic plan.
- Initiative 2: Develop an initial TAMP.
- Initiative 3: Enhance the ability to analyze pavements and bridges.
- Initiative 4: Establish performance targets and incorporate them into the budgeting process.
- Initiative 5: Improve asset management communication and documentation.
- Initiative 6: Improve data access, sharing, and mapping.
- Initiative 7: Integrate risk management into the asset management process.

Since the completion of the gap analysis, IDOT has been enacting the work plan and focusing on the development of this TAMP (Initiative 2). The TAMP development process has enabled IDOT to better incorporate performance data into the budgeting process (Initiative 4) and led to the development of processes that consider both risks and life cycle needs (Initiative 7).

To accomplish Initiative 3, IDOT is in the process of acquiring new analysis tools, such as pavement and bridge management systems, that can be used to inform decision-making and help IDOT better identify the optimal balance between addressing deficient assets and slowing the rate at which assets

[8] Illinois DOT Transportation Asset Management Gap Analysis and Implementation Plan, August 2015.

by **extending** the useful lives of existing assets while **reducing** long-term preservation costs.

become deficient through system preservation. These tools are also expected to help accomplish Initiative 6, providing improved data integration and access.

IDOT's plans to increase the use of pavement preservation treatments, as outlined in this TAMP, illustrate one of the enhanced management practices the agency is adopting to help control costs and extend the useful lives of existing transportation assets. The investment strategies outlined in this TAMP represent a concerted effort to identify the preservation needs of its more than 16,000-mile State highway system and bridge network to extend the useful lives of these existing assets while reducing the long-term preservation costs.

In addition, as part of the stewardship initiatives outlined in the LRTP, IDOT is establishing a performance-based project selection process for expansion projects included in the Multi-Year Program. The process, and the supporting analysis tool, identify projects that provide the State with the highest return on investment after consideration of economic development, livability, mobility, and other benefits to each project (a data-driven process).

Multi-Year Highway Improvement Program (MYP)

Each year, IDOT develops a multi-year highway improvement program (MYP) that weighs the need to preserve the existing system in a state of good repair with the need to enhance or expand the highway network to address congestion and economic development demands. Before being included in the Highway Program, improvements are evaluated by the Office of Planning and Programming based on goals, needs, and available resources. IDOT's TAMP provides the link between the LRTP and its shorter-term (6-year) bridge and pavement programs in the MYP.

For the MYP, IDOT uses a mix of federal transportation funds, State motor fuel tax and vehicle registration fees, bonds, and miscellaneous revenue sources to build, operate, and maintain the roads and bridges under its jurisdiction.

Once investment levels are established, the Office of Planning and Programming works with the districts to select projects that will enable IDOT to meet its performance objectives. In the absence of pavement and bridge management tools, IDOT has developed a spreadsheet tool that allows the Office of Planning and Programming to evaluate the impacts of different investment options for both pavements and bridges. The tool facilitates the analysis of programming funds for preservation, rehabilitation, and reconstruction at both the State and district levels using assumed rates of deterioration and treatment costs. Once the Office of Planning and Programming and the districts have agreed to the amount

of preservation, rehabilitation, and reconstruction work that will be done during the multi-year period, the districts use pavement and bridge condition information and established guidelines to select the projects that best match the intended investments. The final list of projects is incorporated into the Statewide Transportation Improvement Program (STIP). The published MYP is presented to the General Assembly and made public each spring.

For the portions of the Illinois NHS owned and operated by the Illinois Tollway, a comprehensive Capital Program Plan has been published in addition to the Illinois Tollway's Official Statement.

Future Initiatives to Support Asset Management

IDOT's planned improvements to better use performance data to drive investment decisions aligns with national initiatives to promote a TAM framework at the State DOT level that:

- Supports the use of strategic performance objectives that are linked to investments.
- Introduces a systematic process for determining pavement and bridge needs over the life of an asset.
- Emphasizes the use of preservation treatments that economically extend the life of the highway system.
- Considers agency risks or exposure in setting investment priorities.
- Uses asset inventory information, asset condition data, and analysis tools to evaluate options for allocating resources and selecting projects.

For managing pavements and bridges, this means:

- Pavement management software acquisition and implementation.
- Bridge management software acquisition and implementation.
- Revisions to pavement data collection deliverables to meet FHWA performance measures.
- Improved coordination between District and Central Office planning and programming activities.

Chapter 3: Asset Inventory and Performance

Overview

IDOT maintains a large highway system that represents the nation's third largest Interstate system and the fourth largest highway system. According to IDOT's *2017 Freight Plan*, 1.23 billion tons of freight at a value of $3 billion were moved to, from, or within Illinois, with approximately 54 percent of that tonnage using the State's highways[9]. Managing a network of this size and importance requires a good understanding of system conditions and needs. As the basis for this understanding, IDOT collects and maintains inventory and condition information on its pavements, bridges and some ancillary assets to estimate needs. This chapter summarizes IDOT's pavement and bridge inventory and its current conditions.

Highway System and Owners

Owner Roles and Responsibilities

There are nearly 150,000 centerline miles of roads in the State of Illinois and IDOT is responsible for nearly 16,000 of those miles. The roads under IDOT's jurisdiction are comprised of Interstates, U.S. Highways, and State Routes. The remaining miles are managed by the Illinois State Toll Highway Authority (Illinois Tollway), the Skyway, or local agencies within the State. In addition to responsibility for maintaining the road surface, transportation agencies are responsible for managing the bridges, tunnels, culverts, guardrail, signs, signals, and other appurtenances required for safety and mobility.

IDOT'S RESPONSIBILITIES

IDOT is responsible for maintaining 1,892 of the 2,184 centerline miles of Interstate highway pavement in the State as well as 1,910 Interstate highway bridges. In addition to the Interstate highways, which are part of the National Highway System (NHS), IDOT is responsible for maintaining most of the other NHS routes, as well as most Marked and Unmarked routes in the State. This includes 15,889 centerline miles of pavement, 5,976 bridges, and 3 tunnels.

Interstate Highways make up a network of controlled-access highways that cross the country, connecting large cities. They are designated by the U.S. Department of Transportation.

US Highways are part of an older national highway system without restricted access that is maintained by state and local governments. These highways are numbered by the U.S. Department of Transportation.

State Routes are highways that are not part of the Interstate or U.S. Numbered Highway System. These highways are numbered by, and maintained by, IDOT.

The **State System** also includes other supplemental roads, such as Unmarked Routes.

The **National Highway System** (NHS) is a network of strategic highways identified by the U.S. Department of Transportation and approved by the United States Congress. All Interstate Highways are part of the NHS, as are some U.S. and State Highways. NHS routes must comply with applicable Federal regulations.

[9] http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/OP&P/ILFreightPlan_FINAL.pdf

ILLINOIS TOLLWAY'S RESPONSIBILITIES

The Illinois Tollway was created by legislation in 1967 "to promote the public welfare and to facilitate vehicular traffic by providing convenient, safe, modern, and limited access highways." Under the direction of the Illinois Tollway Board of Directors, the Illinois Tollway builds, operates, and maintains the roads under its jurisdiction. The Illinois Tollway is authorized to issue bonds to expand and make capital improvements to its system and to collect tolls to fund its operations and to repay bonds. The Illinois Tollway is required by the Amended Trust Indenture to maintain the system in good repair. As an Agency, the Illinois Tollway receives consistently high ratings with Fitch, Moody's, and Standards & Poors due to the strong Debt to Service coverage, which extensively relates to the ability to manage and invest in the Illinois Tollway assets in a responsible manner for the long term.

The Illinois Tollway and Skyway operate and maintain a total of 292 centerline miles of pavement and 440 bridges on the State's Interstate highways, the majority of which are located in the Chicago metropolitan area.

LOCAL AGENCY RESPONSIBILITIES

Collectively, the counties, townships, and municipalities in Illinois are responsible for the operation and maintenance of over 130,000 miles of roads[10] and the associated structures and appurtenances. Locally-maintained networks include some of the U.S. highways in urban areas and all of the local roads within their jurisdiction. These local agencies use a mix of federal transportation funds, State motor fuel tax funds, and locally-generated funds to address the needs of the roads and bridges under their jurisdiction. IDOT partners with local agencies in a number of ways, including the establishment of highway design standards; policies; and procedures for the distribution and expenditure of funds; as well as assistance in planning, financing, design, construction, and maintenance of local agency programs and projects.

Systems

For reporting and managing system conditions and needs, IDOT classifies its pavements and bridges using the definitions listed below.

- National Highway System (NHS) – On a national level, certain highways are designated as part of the NHS, making them eligible for federal funding under the National Highway Performance Program (NHPP). All

[10] Illinois Travel Statistics 2016, Table C-1, February 2017.

Interstate and some Non-Interstate U.S. and State highways, regardless of ownership, are included on the NHS based on their importance to the nation's economy, defense, and mobility. IDOT is required to provide certain types of information to the FHWA related to the NHS on a regular basis.

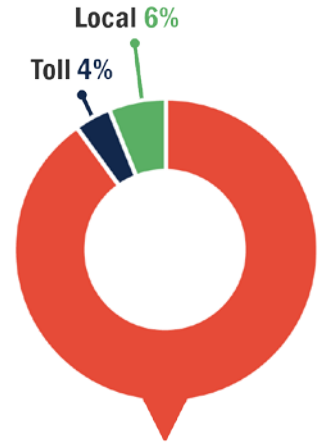
- **Interstate Highways** – These are highways designated by the U.S. Secretary of Transportation and designed to national standards as limited-access freeway. All Interstate highways are included in the NHS. Interstate highways are further divided by ownership, as described below.
  - State-maintained – Highways operated and managed by IDOT.
  - Toll Roads – Highways operated and managed by the Illinois Tollway and the Skyway.
- **Other NHS Highways** – This classification includes non-Interstate highways that are included on the NHS. Most pavements and bridges in this classification are managed by IDOT, but a portion of the system is maintained by local agencies.
- **Non-NHS Routes** – The remainder of the State-maintained system is classified as non-NHS routes, which includes both U.S. and State highways. This category is further broken down into the following two subcategories:
  - Marked Routes –This category includes non-NHS highways that are signed as U.S. or State marked routes.
  - Unmarked Routes – This category includes any supplemental highways that are included in the jurisdictional responsibility of the State.

Asset Inventory

Pavements

INVENTORY

Using the highway classifications defined earlier, table 3-1 summarizes the centerline miles of pavement in each category. It is important to note that IDOT reports pavement inventory in terms of centerline miles. The actual number of lane miles maintained is much higher. For example, a one-mile stretch of highway with two lanes in each direction would count as one centerline mile, but four lane miles.



90% of the NHS in Illinois is maintained by IDOT

Table 3-1. Pavement centerline miles by system.[11]

	System	Jurisdiction	Total Centerline Miles	Total State Maintained NHS Miles
NHS	Interstates	State	1,892	7,140
		Toll*	292	
	Non-Interstate NHS	State	5,248	
		Local	490	
Non-NHS	Marked Routes	State	6,402	8,749
	Unmarked Routes	State	2,347	
*Illinois Tollway and Skyway				

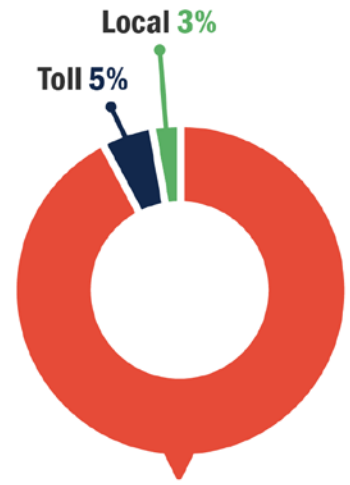
AGE

Due to limited funding for addressing pavement needs over the past several years, the average time before a pavement receives an improvement is increasing. This means that, on average, more vehicles on the State-maintained system are traveling on deteriorated roads each year. On a system-wide basis, the statistics indicate that 90 percent of the State-maintained network is more than 40 years old, which exceeds the typical pavement's design life of 30 years. The statewide pavement age statistics are summarized in table 3-2.

Table 3-2. Age of the State-maintained road system.[12]

Age Category	Percent of NHS Interstate Miles	Percent of Non-Interstate NHS Miles	Percent of Non-NHS Marked Routes	Percent of Non-NHS Unmarked Routes	Total Percentage
New	0.0%	0.0%	0.0%	0.0%	0.0%
1-10 Years	1.2%	0.9%	0.5%	0.6%	0.7%
11-20 Years	2.3%	2.5%	0.6%	0.6%	1.4%
21-40 Years	20.0%	8.7%	2.6%	6.5%	7.3%
>40 Years	76.5%	87.6%	95.9%	90.6%	90.1%
Unknown	0.0%	0.3%	0.4%	1.7%	0.5%
Total	100%	100%	100%	100%	100%

[11] FHWA approved NHS miles as of 1-31-18.
[12] Information provided by Data Management Unit in the Office of Planning and Programming, February 2018.



92% of the bridges included in the TAMP are maintained by IDOT

Bridges

INVENTORY

A summary of the number and size of bridges maintained by IDOT, the Illinois Tollway, the Skyway, and local agencies is presented in table 3-3. In addition to bridges, the inventory includes large culverts (those greater than 20 feet in length).

IDOT also has a number of other structures it is responsible for, including pedestrian/bicycle crossings, tunnels, small bridges and culverts, and pipeline structures. These structures are not included in the TAMP.

Table 3-3. Number and sizes of bridges by system.[13]

	System	Jurisdiction	Total Number of Bridges	Total sq ft Deck Area (thousands)	Totals (sq ft in thousands)	State Maintained Totals
NHS	Interstate	State	1,910	33,129	4,807 bridges 73,235 sq ft	4,143 bridges (86.19%) 60,240 sq ft (82.25%)
		Toll*	440	7,470		
	Non-Interstate NHS	State	2,233	27,111		
		Local	224	5,524		
Non-NHS	Marked	State	2,154	11,663	3,743 bridges	3,743 bridges
	Unmarked	State	1,589	14,890	26,553 sq ft	26,553 sq ft
	NHS and Non NHS Structures				8,550 bridges 99,788 sq ft	7,886 bridges (92.23%) 86,793 sq ft (86.98%)
	*Illinois Tollway and Skyway					

Border Bridges

Included in the bridge inventory are several border bridges that begin in Illinois but cross over major rivers and end in other States. The management of these bridges is shared with the adjacent States of Iowa, Missouri, Kentucky, and Indiana, depending on the location of the bridge. This shared responsibility requires a close partnership with the neighboring State and coordination in terms of the timing and cost sharing of improvements, increasing the overall complexity required to manage them effectively.

[13] Data provided by the Bridge Office on February 27, 2018.

There are 39 bridges that fall into this category, crossing the three major rivers that make up 71 percent of the State's boundaries – the Mississippi, the Ohio, and the Wabash.

Major Bridges

The bridge inventory also includes 184 bridges with a total length greater than or equal to 1,000 feet that are classified as Major Bridges (some of which are also Border Bridges). In addition, 53 additional structures were added to the classification due to their complexity and high cost for maintenance, repair, and replacement. The combined total of 237 bridges considered to be Major Bridges represent 23,715,717 square feet of bridge deck area, representing a substantial portion of the State-maintained bridge deck area. Because of the size and complexity of these bridges, their rehabilitation and replacement consume a significant portion of the available budget. For that reason, IDOT has a separate Illinois Major Bridge Program that specifically targets deficient highway bridge projects that exceed replacement or rehabilitation costs of $7.5 million for State bridges and $1.0 million for local bridges. The Illinois Major Bridge Program provides federal National Highway Performance Program funds and/or Surface Transportation Program funds for up to 90 percent of eligible project costs.

AGE

As with pavements, the funding needed to address all of the identified bridge needs has been inadequate over the last decade. The aging of the State-maintained bridge inventory is reflected in figure 3-1. It shows that approximately 45 percent of IDOT's bridges still in service are more than 50 years old, representing a significant level of deferred investment.

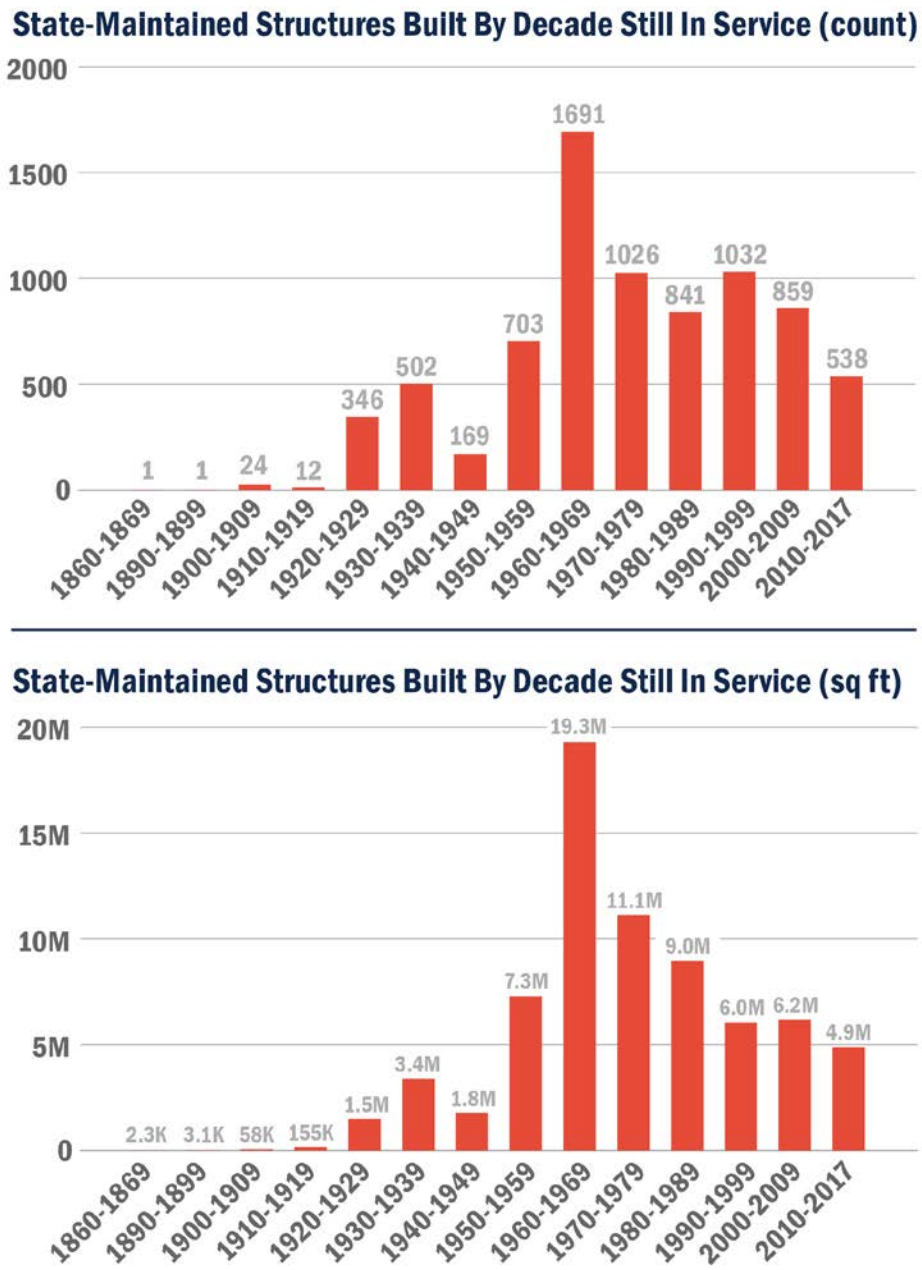


Figure 3-1. Number of State-maintained bridges built, by decade.

Factors Impacting Asset Performance

The age of the pavement and bridge networks is a key factor influencing performance. As pavements and bridges age, they typically require more frequent, and expensive, maintenance and rehabilitation in order to continue to provide acceptable levels of performance. In addition, pavement and bridge conditions are influenced by many other factors.

Factors Impacting Both Pavements and Bridges

There are a number of factors that influence the performance of both pavements and bridges, including:

- Available funding.
- Increased traffic volumes and weights.
- Increased truck percentages.
- The age of the current system.
- Weather, including the frequency and duration of freeze-thaw cycles.
- The availability of maintenance personnel to perform preservation work when it is most effective.
- The addition of new traffic lanes or bridges to the system without a corresponding increase in maintenance funding.
- Changes in design specifications that exceed the standards that were in place when many of the pavements and bridges were originally designed.
- Approximately 10 percent of the NHS pavements and bridges are outside of IDOT's control, with limited opportunities to influence the treatments used.

Additional Factors Impacting Pavement Performance

In addition to the factors that impact both pavements and bridges, pavement conditions are also influenced by the following:

- Environmental conditions.
- The condition of underlying layers.
- Material properties.
- Poor construction quality.
- Premature failures due to inadequate drainage.
- Moisture infiltration into the underlying pavement layers.
- Funding limitations that have led to resurfacing as the predominant repair – over time, each resurfacing gets less life than the one before it. This is an unsustainable solution.

Additional Factors Impacting Bridge Performance

There are also several factors that have a significant impact on bridge conditions, as listed below.

- IDOT cannot fully control the timing of repairs for bridges shared with other States.
- Preservation activities have been deferred for years.
- IDOT's heavy use of de-icing chemicals has led to premature deterioration.

Monitoring and Reporting Asset Conditions

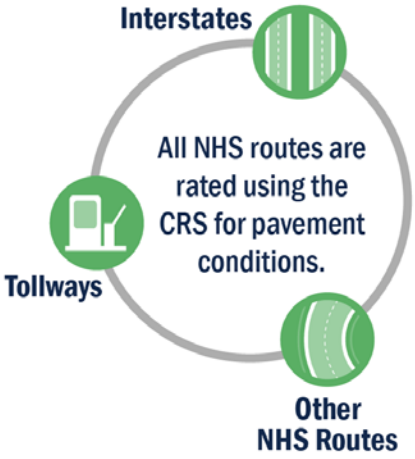
Pavements

PAVEMENT CONDITION ASSESSMENT

IDOT collects condition data on Interstate pavements annually, and collects data on Non-Interstate pavements on a two-year cycle. The data is collected and processed by a vendor using an automated data collection vehicle (DCV), such as the vehicle shown in figure 3-2.

Figure 3-2. Automated data collection vehicle.

CRS surveys are performed in each travel direction on divided highways and in one direction on all other routes. Downward-facing cameras are used to record pavement condition information and panoramic cameras provide visual references that are useful when viewing the images. In addition, lasers are used to collect sensor data to determine rutting, roughness, and faulting measures. Personnel from the Office of Planning and Programming and each of the Districts view the digital images of the pavement surface at workstations to identify predominant distress, based on distress type, amount, and severity. The sensor data and distress data are combined to determine a Condition Rating Survey (CRS) value ranging from 1.0 to 9.0, with a 9.0 representing a newly constructed



or resurfaced pavement and a 1.0 representing a failed pavement. In addition to collecting CRS ratings on the State-maintained system, IDOT also inspects any locally-maintained roadways on the NHS on a two-year cycle.

The Illinois Tollway also uses the CRS rating procedure to rate the condition of its pavement network. The Illinois Tollway contracts with a vendor to conduct CRS inspections annually. The Illinois Tollway utilizes this information as supporting documentation for a comprehensive Pavement Management Plan that is used to program pavement maintenance, rehabilitation, repair, and replacement programs. The Pavement Management Plan is updated bianually to incorporate inspection results and construction projects.

IDOT is required to report pavement condition information to the FHWA on the NHS each year as part of the FHWA's Highway Performance Monitoring System (HPMS). The pavement condition information required by the FHWA differs from the CRS procedure in terms of the types of distress rated and the way the information is used to report pavement conditions. Fortunately, IDOT's automated data collection process provides sufficient information to allow the Deparment to extract the HPMS data in addition to the CRS ratings. IDOT is currently working with the vendor to improve methods for processing the data in accordance with the HPMS data for the required submittals.

PAVEMENT PERFORMANCE METRICS

IDOT's Pavement Performance Metrics

IDOT is in the process of changing the way CRS ratings are used to monitor pavement performance and identify investment needs. In the past, the CRS was evaluated in conjunction with other data, such as average daily traffic and the roadway functional classification, to determine the greatest repair needs. Based on this information, each roadway segment was determined to be in "Acceptable" condition or in need of repair. Roadway segments in Acceptable condition were further divided into either "Accruing" or "Adequate" condition. Accruing segments were those anticipated to deteriorate to the point that they would need improvement within six years of the evaluation, while adequate segments were those expected to need little or no improvement within those same six years.

If the roadway segment was determined to have "Needs," it was classified in terms of "Critical Backlog" or "Other Backlog." Critical Backlog included roadway segments that had deteriorated to a very poor or unacceptable condition in which extensive patching and base repair were required before resurfacing. Road segments classified as Other Backlog had deteriorated to the point that an improvement was needed immediately and the cost of

repairs was expected to increase significantly if the improvement was delayed. Together, roadway segments in these categories were commonly referred to as the "Backlog" of needs.

The classification of roadway segments in Backlog condition varied based on the functional classification and traffic levels. In general, roadway segments on high-volume facilities, such as Interstates, were maintained at a higher level than low volume, rural routes where traffic generally travels at lower speeds. In recognition of the differences in maintenance, Backlog needs were set at a higher condition level on high-volume facilities than on low-volume facilites.

IDOT recently initiated changes to its pavement performance metrics that shifted the focus from Backlog needs to a more proactive approach that recognizes the importance of preservation activities before pavements deteriorate to a Backlog condition. The new approach uses CRS values to determine the percentage of the highway system that is in a "Desired Acceptable Condition," representing a CRS value of 5.5 or higher for Interstates and 5.0 for Other NHS and Non-NHS routes. These CRS values were selected because they represent the condition at which preservation treatments are considered viable.

Using current and predicted CRS values in conjunction with anticipated funding levels, the initial targets shown in table 3-4 were established as the Desired Acceptable Conditions used in the Performance Gap Analysis described in chapter 7.

by establishing new Desired Acceptable Conditions for Pavements

- Interstates: 90 percent of the network with a CRS ≥ 5.5
- Other NHS routes: 90 percent of the network with a CRS ≥ 5.0
- Non-NHS Marked routes: 75 percent of the network with a CRS ≥ 5.0
- Non-NHS Unmarked routes: 50 percent of the network with a CRS > 5.0

Table 3-4. IDOT's Desired Acceptable Conditions for pavements.

System	Acceptable Condition (CRS)	Desired System Percentage in Acceptable Condition
Interstate	5.5 or greater	90%
Other NHS	5.0 or greater	90%
Non-NHS Marked Routes	5.0 or greater	75%
Non-NHS Unmarked Routes	5.0 or greater	50%

Illinois Tollway's Pavement Performance Metrics

The Illinois Tollway classifies its roadway conditions using slightly different performance measures, as shown in table 3-5.

Table 3-5. Summary of pavement condition criteria for the Illinois Tollway.

Condition Rating Survey (CRS)	Pavement Condition Category
7.5–9.0	Excellent
6.6–7.4	Good
6.0–6.5	Transitional
4.5–5.9	Fair
1.0–4.4	Poor

These performance metrics are used to report pavement conditions and in turn influence the type and timing of maintenance, preservation, and rehabilitation activities. A summary of findings is published annually in the Illinois Tollway's Consultant Engineer's report.

Bridges

BRIDGE CONDITION ASSESSMENT

To enable IDOT to manage the more than 8,000 bridges on the State highway system, the agency conducts bridge inspections on a regular cycle in accordance with the National Bridge Inspection Standards (NBIS) established by the FHWA and the IDOT Bridge Element Inspection Manual. NBIS inspections are conducted to ensure the safety of the public and to catalog accurate data reflecting each bridge's physical attributes and current conditions. The Standards outline the requirements for inspection procedures, frequency, and rater qualifications for all bridges (and structures) with a total span length greater than 20 feet. The inspections are performed by a combination of State, local, and contractor personnel, all of whom have been trained in accordance with the NBIS procedures. In general, District bridge inspectors inspect state-maintained bridges, with the exception of major river bridges, which are inspected by Bureau of Bridges and Structures inspection crews. Local engineers or consultants inspect locally-maintained bridges. Information on the bridges located on the NHS are reported to the FHWA for the same HPMS program used to report pavement data.

During the inspections, each of the major bridge components is evaluated, including decks (consisting of the deck wearing surface, joints, and parapets), superstructure (consisting of beams, diaphragms, and stiffeners), substructures (consisting of piers, abutments, foundation, slope, crash walls, and piling), and culverts using the National Bridge Inventory (NBI) rating scale

that ranges from 0 for a failed structure to 9 for a structure in excellent condition. A description of each NBI rating is provided in table 3-6.

Element level inspections, conducted according to the IDOT Bridge Element Inspection Manual, assign percentages of four condition states to each bridge element using a more detailed and complex breakdown of elements within a bridge. This element level inspection information will be used heavily in asset management functions.

Bridges throughout the system receive a routine visual inspection at least every two years, except for some in good condition are inspected on a four-year cycle. Underwater inspections are performed every five years. Other inspections may be conducted following incidents that threaten bridge stability (e.g., collisions or floods), to monitor special situations, or following new construction.

Table 3-6. NBI bridge condition rating descriptions.

Code	Description
N	Not applicable.
9	Excellent condition.
8	Very good condition — no problems noted.
7	Good condition — some minor problems.
6	Satisfactory condition — structural elements show some minor deterioration.
5	Fair condition — all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	Poor condition — advanced section loss, deterioration, spalling, or scour.
3	Serious condition — loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical condition — advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support.
1	"Imminent" failure condition — major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement is affecting structure stability.
0	Failed condition — out of service — beyond corrective action.

The Illinois Tollway conducts routine bridge inspections each year and the resulting "Structure Inspection Field Reports" are reviewed by the Illinois Tollway's Consulting Engineer. Culverts that meet the FHWA classification of bridges (greater than 20 ft) are also inspected at a minimum every two years as part of the bridge inspections and are assigned a condition rating similar to that of the bridges. As part of the inspection of bridges and culverts, an NBI rating of 0 to 9 is assigned to the structure using the same process that IDOT follows. These ratings are used to document the condition of the deck, superstructure, and substructure. The inspection data is submitted to IDOT for submittal to the FHWA. As described in the next section, the Illinois Tollway also uses the inspection results to determine an overall Health Index.

BRIDGE PERFORMANCE METRICS

IDOT's Metrics

The processes being used to report bridge conditions and to identify, select, and prioritize bridge needs are undergoing similar changes to those described earlier for pavements. In the past, bridge investment priorities were identified using a program called BAMS (Bridge Analysis and Monitoring System), which is a program planning tool that categorizes bridges into a hierarchy of deficiency levels. BAMS used 16 categories for bridge condition, with nine representing Backlog condition issues and the remaining seven categories used to identify bridges that would accrue to a Backlog condition in the future. As with pavements, bridges in Backlog condition had deteriorated to the point where an improvement was needed immediately. Those bridges classified to be in Accruing condition were expected to need improvements during or subsequent to the current multi-year program timeframe.

Today, IDOT is increasing its focus on programming a range of treatments over a bridge's life cycle and so rather than focus exclusively on Backlog bridges, the focus is on meeting targets for desired acceptable levels of condition. These acceptable levels of condition were established based on current and projected conditions, as well as anticipated levels of funding for bridges. The resulting Desired Acceptable Condition Levels for bridges are presented in table 3-7.

IDOT is ... RAISING the BAR

by establishing new Desired Acceptable Conditions for Bridges

- Interstate and all other NHS bridges: 93 percent at or above an NBI rating of 5
- All other bridges: 90 percent at or above an NBI rating of 5

Table 3-7. IDOT's Desired acceptable conditions for bridges.

System	Acceptable Condition (NBI Value)	Desired System Percentage in Acceptable Condition
Interstate	5 or greater	93%
Other NHS	5 or greater	93%
Bridges on Non-NHS Marked Routes	5 or greater	90%
Bridges on Non-NHS Unmarked Routes	5 or greater	90%

Illinois Tollway Metrics

In addition to the NBI rating the Illinois Tollway calculates a Health Index for each bridge based on a weighting of the deck, superstructure, and substructure ratings from the inspection. The Health Index is intended to provide an overall indication of the structural integrity of a bridge, with a higher weight placed on the deck since it tends to deteriorate faster than the other bridge components. The Health Index is a number on a 0 to 100 scale, with 100 being the best rating, as shown in table 3-8.

Table 3-8. Illinois Tollway's bridge Health Index number descriptions.

Bridge Health Index	Description
≥ 90	No problems or some minor problems noted. No action required.
80–89	Some areas of minor deterioration. Minor repair by Maintenance or Contract would prevent additional deterioration.
70–79	Structural elements are sound but exhibit minor section loss or deterioration. Repair Contract likely needed within 5 years.
60–69	Advanced section loss. Repair Contract should be initiated within 2 years.
< 60	Advanced loss of section and deterioration. Local failures possible. Immediate attention needed.

According to the *2017 Series A Official Statement*, the Illinois Tollway is aggressive in addressing its bridge needs, with no bridges receiving a Health Index of < 60.

Ensuring Data Collection Quality

IDOT has instituted several processes to ensure the quality of the asset condition data used to support its programming activities. For pavements, the data collection vendor is required to have a Data Quality Control Plan in place that identifies the steps the contractor will take to ensure quality data prior to the start of data collection, as the data is being collected, and during the processing of the data. Pavement distress data is assessed by IDOT raters who have participated in both classroom and field instruction prior to production. Manuals and guidelines are provided to the districts to aid them during the rating activities. Experienced raters from the central office review a random sampling of rating sections to ensure rating uniformity throughout the State.

IDOT and its partners use only certified inspectors to conduct bridge inspections, all of whom have completed the training required to complete the certification process.

For both pavements and bridges, the condition information is compared to prior years' data as a reasonableness check. Any pavement sections or bridges with unusual rates of deterioration are flagged for further review.

Performance Trends (Current and Projected)

Pavements

CURRENT AND HISTORICAL CONDITIONS

Historically, IDOT's pavement performance has been reported in terms of the number of miles of Backlog pavement, representing pavements needing rehabilitation. As shown in figure 3-3, there was a significant increase in the number of Backlog miles after 2010. In response to this increase, which reflected inadequate funding levels to reach targets, IDOT lowered its Backlog criteria to reflect the deteriorating conditions. Going forward, IDOT has adopted transformational business processes that no longer accept lowered conditions. IDOT's new processes are committed to *Raising the Bar* through its emphasis on preservation strategies and its new targets for Desired Acceptable Conditions.

RAISING the BAR

IDOT's transformative processes will help achieve improved conditions over the long term.

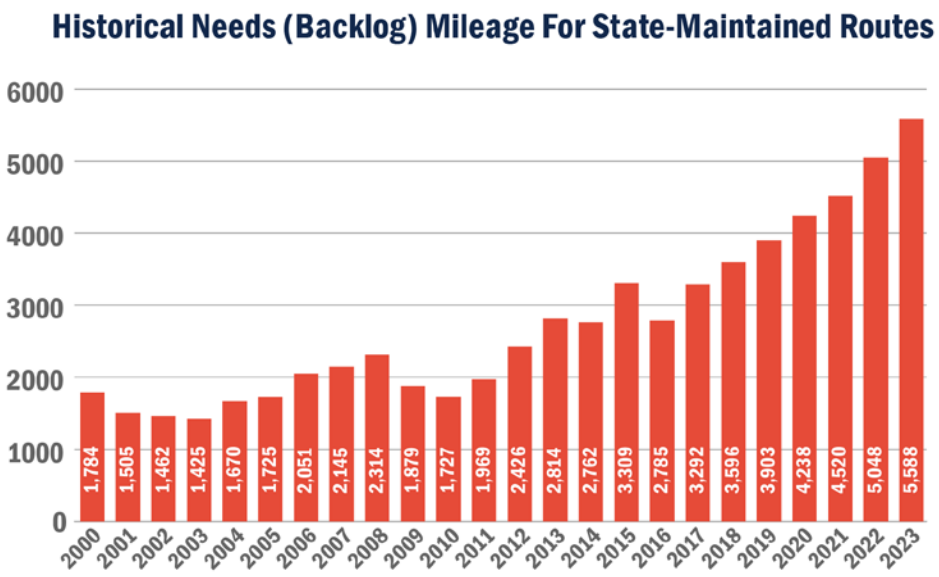


Figure 3-3. Historical summary of backlog conditions on routes maintained by IDOT.[14]

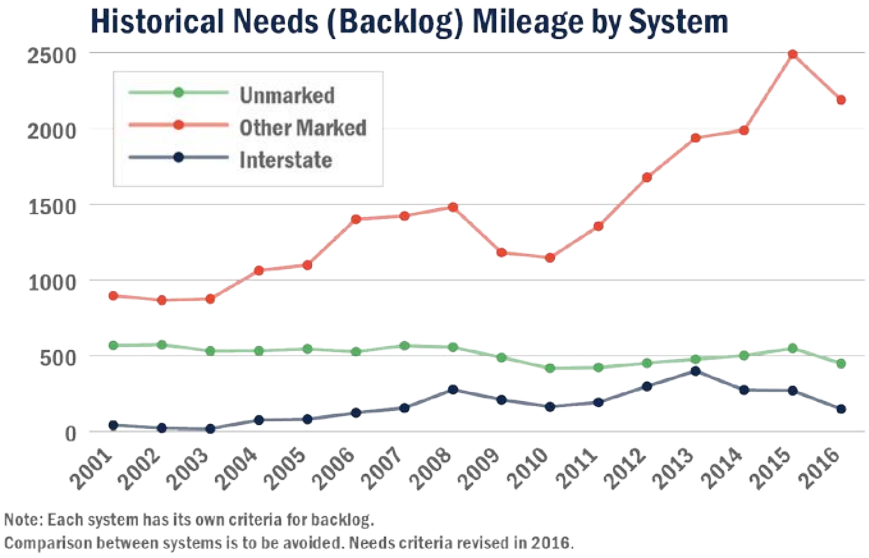


Figure 3-4. Historical backlog mileage by system.

As shown in figure 3-4, the largest number of miles in Backlog condition was on the marked routes, which include both Non-Interstate NHS and Non-NHS marked routes. In 2016, 17.5 percent of the total system was reported to be in Backlog condition and 27.8 percent was expected to accrue to a Backlog condition within six years if no rehabilitation was scheduled. These conditions are represented in

[14] As noted in the TAMP, the criteria for determining needs are being revised.

figures 3-5 and 3-6, both of which represent the pavement metrics IDOT used historically rather than the new metrics introduced in the TAMP.

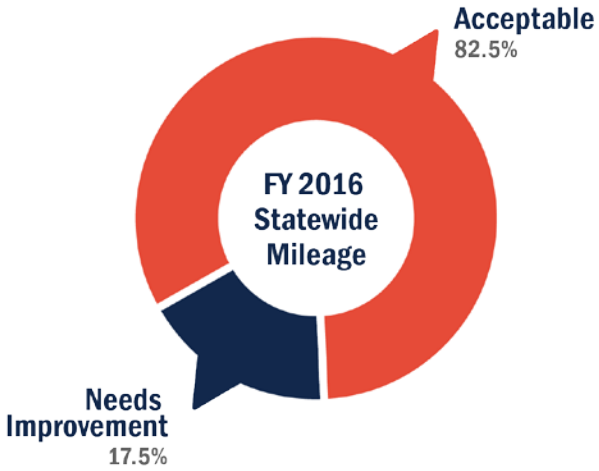


Figure 3-5. 2016 statewide pavement conditions using IDOT's historical metrics.

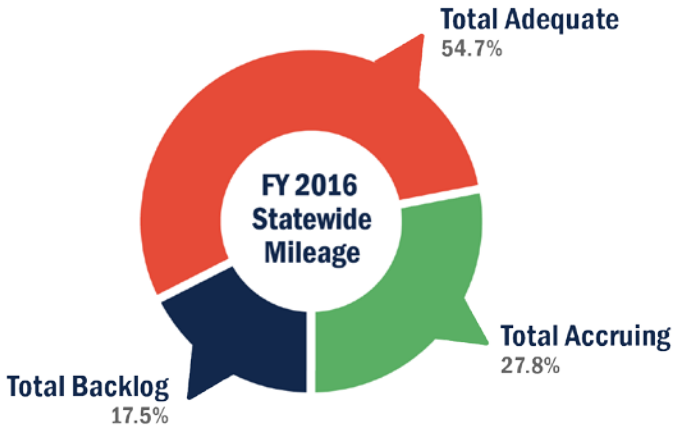


Figure 3-6. 2016 statewide pavement condition by category (using IDOT's historical performance metrics).

IDOT is ... RAISING the BAR

by moving from Backlog to Desired Acceptable Conditions.

For the FY 2019-2024 MYP, IDOT implemented new processes that end its use of Backlog as a pavement performance metric and replace it with Desired Acceptable Conditions, which represent a CRS value greater than 5.5 for Interstate pavements and 5.0 for Non-Interstate NHS and Non-NHS pavements. Pavements in this condition category are considered to be in *Fair* condition, which means that they can be preserved using low-cost preservation treatments. Using the new metric, approximately 71 percent of the system is currently in Desired Acceptable Condition, as is 78 percent of the total NHS. IDOT has placed a priority on maintaining Interstate conditions,

which is reflected in the fact that 86 percent of the Interstate system is considered to be in Desired Acceptable Condition. Only slightly more than 291 centerline miles of Interstate pavement fall below the Desired Acceptable Conditions. These statistics are reflected in figures 3-7, 3-8, and 3-9, which show system conditions, NHS conditions, and Interstate conditions, respectively with the new performance metrics.

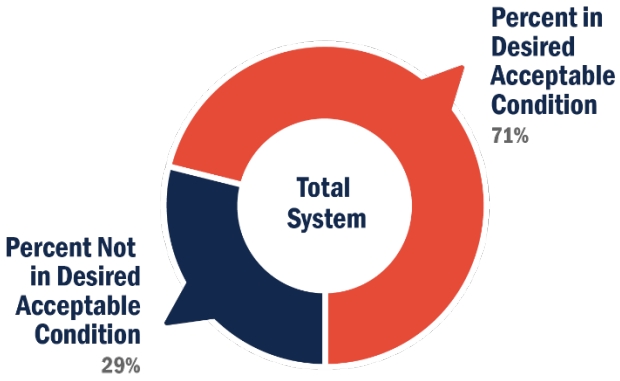


Figure 3-7. Percent of the total pavement centerline mileage in Desired Acceptable Condition using IDOT's new pavement performance metrics.

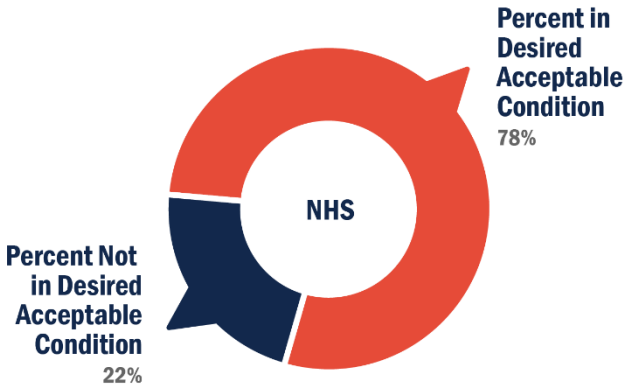


Figure 3-8. Percent of the total NHS centerline mileage in Desired Acceptable Condition using IDOT's new pavement performance metrics.

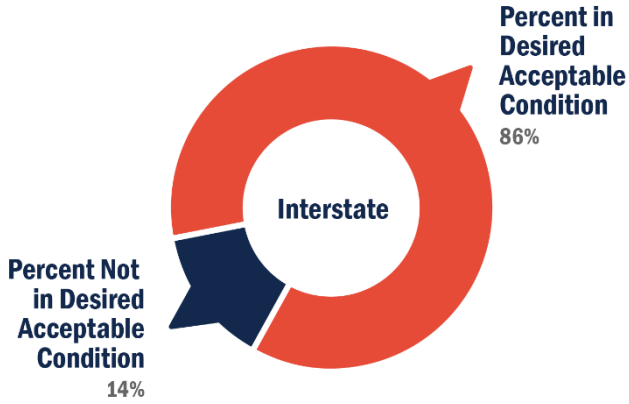


Figure 3-9. Percent of the Interstate centerline mileage in Desired Acceptable Condition using IDOT's new pavement performance metrics.

PREDICTING FUTURE PAVEMENT CONDITIONS

As the State highway system continues to age, and with funding levels unable to address expected needs, it has become increasingly important to develop a proactive and predictive approach to plan highway investments. IDOT uses pavement performance models to support the analyses needed to implement this approach. IDOT's models are based on the historical performance of individual pavement sections over time. The average rate of change in condition over the life of a pavement section is calculated and combined with data from other pavement sections that have similar construction (which are referred to as a "family"). The average rate of change for the entire family is used to predict the future condition of all pavement sections that meet the family criteria. IDOT has refined its models over the years, with the most recent update having taken place in 2007. The existing pavement performance models are expected to be incorporated into IDOT's new pavement management software once it is implemented.

The Illinois Tollway has developed its own performance models to predict pavement conditions as part of a 2013 study. The Illinois Tollway models also predict CRS over time, but incorporate additional data, such as traffic volumes, pavement thickness, and construction history.

Bridges

CURRENT CONDITIONS

For the FY 2019-2024 MYP, the performance metric for bridges was also changed and the definition for Desired Acceptable Conditions was set at an NBI rating of 5 or better, representing a bridge that could be preserved using proactive maintenance or preservation treatments. Using this metric, system conditions are presented in figures 3-10, 3-11, and 3-12 using the 2017 NBI submittal data. Figure 3-10 shows the percentage of bridge deck area in Desired Acceptable Condition, figure 3-11 shows the same for the NHS, and figure 3-12 presents the information for Interstate bridges only. As the figures

show, most of the bridge deck area is currently in a Desired Acceptable Condition, regardless of the system.

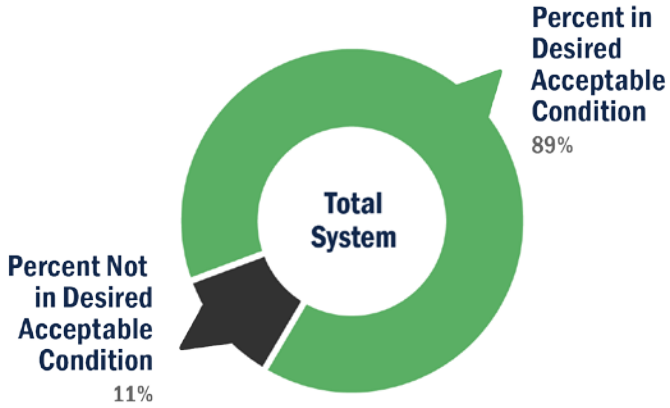


Figure 3-10. Percent of total bridge deck area in Desired Acceptable Condition using the new bridge performance metrics.

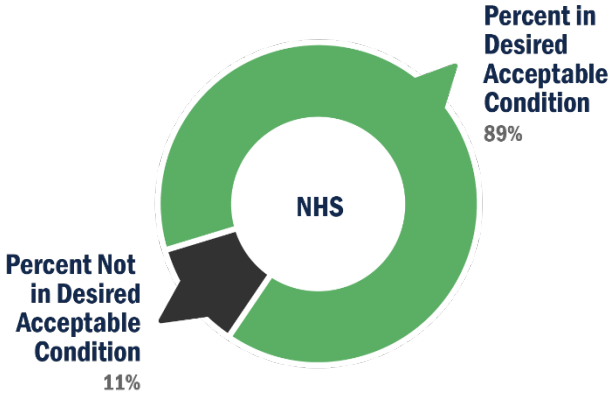


Figure 3-11. Percent of NHS bridge deck area in Desired Acceptable Condition using the new bridge performance metrics.

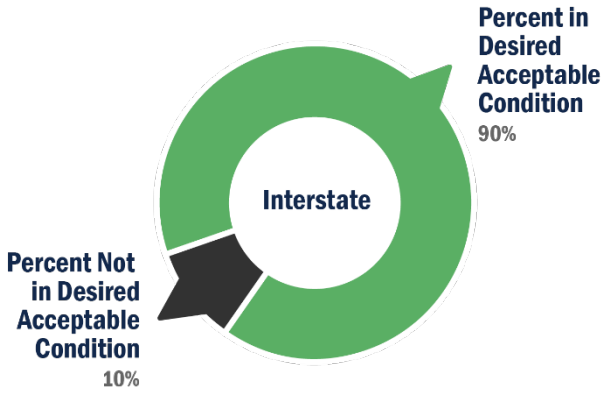


Figure 3-12. Percent of Interstate bridge deck area in Desired Acceptable Condition using the new bridge performance metrics.

PREDICTING FUTURE CONDITIONS

In the past, IDOT had developed average rates of change in bridge conditions to identify expected changes in terms of the Accruing and Backlog bridge conditions for its use in developing the MYP. With the 2017 changes in performance metrics for both pavements and bridges, modifications are expected to the bridge deterioration rates to support IDOT's needs. In addition, IDOT is expected to acquire and implement new bridge management software that will have enhanced bridge condition prediction capabilities that will be used in the future.

The Illinois Tollway has also established models to predict bridge deterioration rates. The Illinois Tollway models look up tables of life cycle based on bridge type for the general bridge component (such as joint, deck, and substructure). Guidelines established by IDOT for the deterioration curves are used with modifications based on Illinois Tollway history, experience, and type of bridge.

Asset Valuation

Since its inception, IDOT has made significant, on-going investments in its pavements and bridges. If the existing pavements and bridges on the NHS were replaced today, they would require an investment of over $55 billion, as shown in table 3-9.

The replacement value shown in table 3-9 is different than the reported value of the State-maintained system reported on IDOT's financial statements for two very important reasons. First, table 3-9 represents only the pavements and bridges on the NHS, so a significant number of pavement and bridge assets, as well as highway ancillary assets (such as lighting, signs, and drainage culverts) are not represented in the table. Second, IDOT's financial statements use a depreciation approach to represent asset value, which decreases the value each year based on the expected life of the asset. As a result, a pavement or bridge that has exceeded its design life would be totally depreciated, resulting in a book value of $0. Since all of IDOT's pavements and bridges, especially those on the NHS, have a significant value to the traveling public, the replacement value of estimating asset value was determined to be more representative than the book value for purposes of developing this TAMP. No changes are being made to the way asset value is being reported on IDOT's financial statements.

*Table 3-9. NHS pavement and bridge value calculations.**

System	Centerline Miles	Unit Replacement Cost ($ Per Centerline Mile)	Estimated Replacement Value
Interstate Pavement (Non-Toll)	1,892	$5,000,000	$9,465,000,000
Toll	292	$5,000,000	$1,460,000,000
Other NHS	5,738	$3,124,150	$17,926,372,700
Total – Pavements	**7,923**		**$28,851,372,700**
System	**Deck Area in Square Feet**	**Unit Replacement Cost ($ Per sq ft)**	**Estimated Replacement Value**
Interstate Bridges (Non-Toll)	33,129,275	$376	$12,456,607,400
Toll Bridges	7,470,254	$376	$2,808,815,504
Other NHS Bridges	32,635,907	$345	$11,259,387,915
Total – Bridges	**73,235,436**		**$26,524,810,819**
Total Value — Pavements and Bridges			**$55,376,183,519**

* Note: The Toll replacement costs for pavements and bridges were estimated based on IDOT replacement costs. They have not been confirmed by the Illinois Tollway or Skyway.

To preserve the $55 billion investment in its pavements and bridges, IDOT continues to invest in maintenance and rehabilitation activities that preserve system conditions and keep the system operating safely. Without additional funding beyond that outlined in the TAMP, IDOT anticipates that the value of its system is likely to decrease as the average age of the bridges and the number of years between pavement treatments increase. For that reason, this TAMP outlines specific investments in the NHS pavements and bridges, allowing IDOT to preserve the value of the portion of the system used by the greatest number of users.

Chapter 4: Life Cycle Planning

Overview

Many factors impact the condition of infrastructure assets, including traffic loads, weather conditions, and material properties. IDOT uses a variety of maintenance and rehabilitation treatments to preserve system performance and to keep the system operating as efficiently as possible. These activities help to offset the factors that lead to system deterioration. Through a planned, strategic approach to managing its assets effectively over their life cycle, IDOT can delay the need for costly repairs and keep the system in a Desired Acceptable Condition for as long as possible.

Managing the Asset Life Cycle

Managing transportation assets is similar to taking care of a home or car. By conducting routine maintenance activities, such as changing the oil or rotating tires, for example, car owners can keep their cars in good condition and avoid the costly repairs associated with engine failure or leaks (see figure 4-1). Pavements and bridges require similar preventive strategies to keep them operating in the best possible condition for as long as possible. Through regular, ongoing investments in low-cost treatments such as crack sealing a pavement or washing a bridge, these assets can achieve their expected design life and help reduce the likelihood that unexpected, more costly repairs will be needed due to accelerated deterioration.

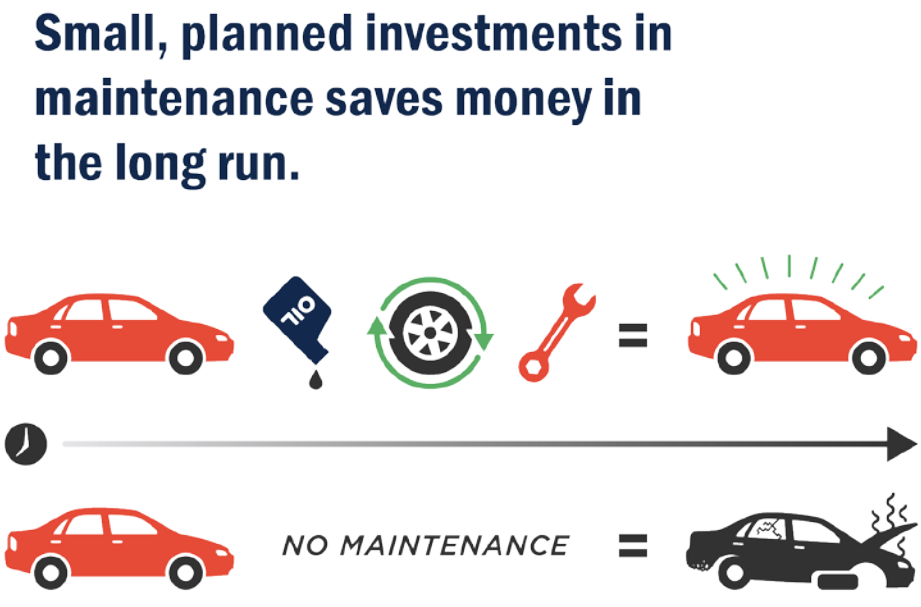


Figure 4-1. Importance of maintenance to keep assets operational.

IDOT is ... RAISING the BAR by developing improved guidance for using preservation treatments.

It is not easy to apply these concepts to the transportation system because a) funding levels are not constant and are not known well in advance, b) needs are greater than available funding, so short-term fixes are often used to keep assets operational, and c) there are many competing demands for the same funding, forcing IDOT to choose between investments that preserve system conditions and those that reduce congestion or improve safety. Even so, IDOT recognizes the benefits to applying treatments that preserve system conditions and has included investment strategies in this TAMP that increase the spending on these types of treatments. In addition, IDOT is in the process of developing new business processes that will help to ensure that the Districts adopt the system preservation activities outlined in the TAMP.

As discussed earlier in this TAMP, the new business processes represent a significant departure from the way IDOT has invested in its pavements and bridges in the past. Under the previous approach, the implementation of the program varied among the Districts, funding was minimal, and there was little verification that preservation funds were being used as intended. The revised strategies outlined in this TAMP address those concerns by placing a greater emphasis on the use of improved guidance ensuring that preservation techniques are applied to pavements and bridges before significant deterioration occurs. This is expected to reduce the overall cost of preserving IDOT's pavements and bridges and slow the overall rate of network deterioration.

Picking the Right Treatment at the Right Time

The key to managing assets over their life is knowing the condition and the rate at which the assets are deteriorating so the right treatments can be identified on a timely basis. Different treatments address different types of deterioration, so knowing the cause and severity of distress is important. As shown in figure 4-2, there are different categories of work that are applied throughout an asset's life cycle. By applying treatments that extend the useful life of an asset for as long as possible, IDOT is able to preserve system conditions very cost-effectively. Agencies that defer needed maintenance often find that their pavements and bridges aren't lasting as long as expected, which results in higher funding needs than originally planned.

The previous chapter described the pavement survey and bridge inspection results that IDOT uses as the basis for determining the extent of deterioration present and appropriate types of repairs. IDOT has also established deterioration models for managing its pavements and bridges that enable the agency to predict the rate of change in asset conditions so that appropriate treatments can be anticipated and planned for. IDOT is in the process of updating its deterioration models for bridges to further improve its ability to manage these important assets.

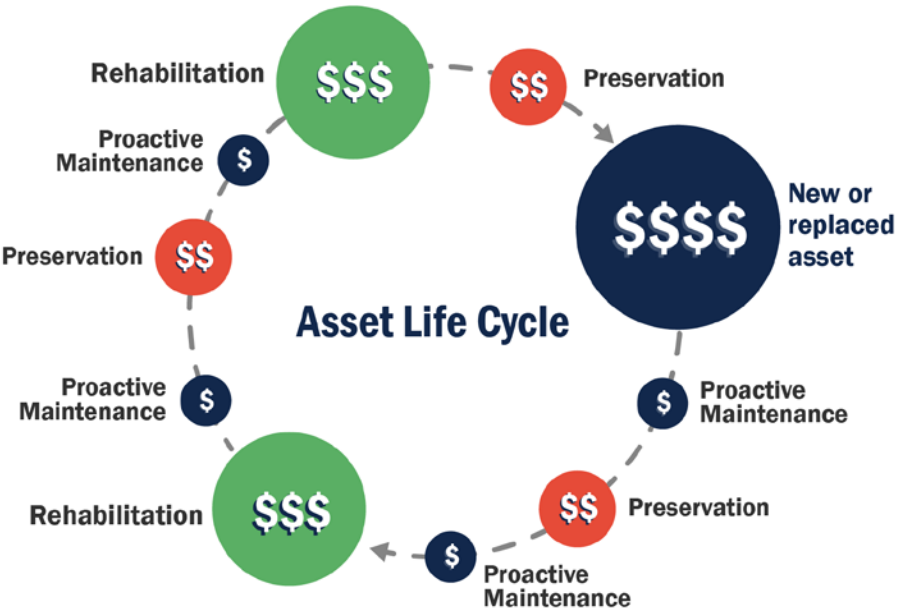


Figure 4-2. Typical asset life cycle treatment needs and relative costs.

Treatment costs vary based on the amount of deterioration present

TYPES OF PAVEMENT IMPROVEMENTS

Depending on the condition of the pavement, the type of deterioration present, the type of road, and the typical traffic levels, one of the following types of improvements may be programmed. Improvement costs increase based on the amount of deterioration that is present, as shown in the graphic. All costs listed below are statewide averages that include both pre-construction and construction items.

- Reconstruction – This category involves total replacement of the pavement, including the base layers. This category also includes unbonded concrete overlays and asphalt overlays of rubblized concrete. Treatments in this category cost between $2.6 million and $5 million per centerline mile.
- Major and Minor Rehabilitation – Structural overlays, bonded concrete overlays, and structural cold-in-place recycling are in this category. Treatments in this category typically cost between $0.6 million to $2.2 million per centerline mile.
- Preservation – These are lower-cost treatments than the first two categories that are designed to be applied to pavements in Good or Fair condition to slow the rate of deterioration. This category includes a variety of treatments, including Surface Maintenance at the Right Time (SMART) overlays of 1.5 to 1.75 inches, hot-in-place recycling, load transfer restoration, full-depth repairs, and various types of surface treatments.

Treatments in this category typically cost between $0.3 million to $1.6 million per centerline mile.

- **Proactive Maintenance** – Proactive maintenance includes treatments such as crack and joint filling/sealing, fog seal, cold/micro-milling, and diamond grinding/grooving. These treatments generally cost between $25,000 to $50,000 per centerline mile.

An example of how these different categories of treatments are spaced out over the life cycle of a pavement is presented in figure 4-3, which shows the timing of treatments for Interstate pavement. In this example, Proactive Maintenance is applied when pavements are in *Very Good* condition, Preservation treatments are applied to pavements in *Good* condition, Minor and Major Rehabilitation is recommended for pavements in *Fair* condition, and Reconstruction is recommended for pavements in *Poor* condition. Similar types of treatment age ranges were developed for the Other NHS and Non-NHS pavements, as well.

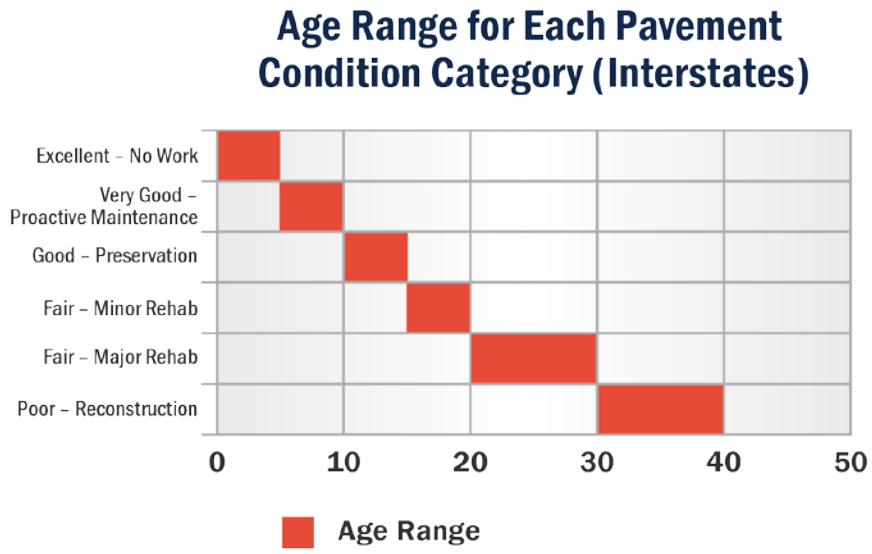


Figure 4-3. Typical age ranges for various categories of repair on Interstate pavements.

TYPES OF BRIDGE IMPROVEMENTS

Depending on the condition of the bridge, the type of deterioration present, the type of bridge, and the typical traffic levels, one of the following types of improvements may be programmed. Improvement costs increase based on the amount of deterioration that is present, as shown in the graphic on the following page. All costs listed below are statewide averages that include both pre-construction and construction items.

Treatment costs vary based on the amount of deterioration present

- **Reconstruction** – This category involves complete replacement of a bridge. Reconstruction typically ranges in price from $300 to $375 per square foot.
- **Major Rehabilitation** – This category includes rehabilitation to, or replacement of, one or more of the major bridge elements, such as deck replacement, superstructure replacement, or substructure rehabilitation. Treatments in this category typically range in price from $185 to $233 per square foot.
- **Preservation** – This category includes low-cost treatments applied to bridges in relatively good condition to slow their rate of deterioration, including washing, deck sealing, concrete substructure sealing, and painting. Preservation treatments generally cost between $35 and $50 per square foot.
- **Proactive Maintenance** – Proactive maintenance includes planned activities to a specific bridge component, such as expansion joint replacement, bearing replacement, steel repair, concrete repair, deck patching, and overlay. The average cost of these maintenance treatments is $30 per square foot.

The typical timing for bridge improvements is shown in figure 4-4.

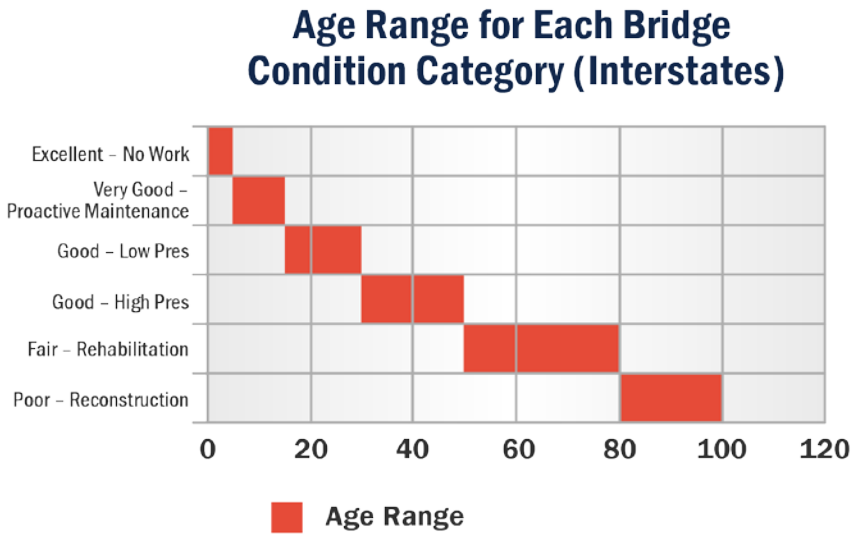


Figure 4-4. Typical age ranges for various categories of repair on bridges.

Planned Activities to Improve Life Cycle Planning

IDOT has initiated a process to acquire and implement new pavement and bridge management software. The software will allow the agency to use deterioration models, including element-level deterioration models that will

be developed for bridges, and treatment rules to analyze different investment scenarios to improve future life cycle planning. The new software will enable IDOT to better anticipate its needs, evaluate different investment options, and convey the long-term consequences of different investment strategies.

Life Cycle Management

In the current absence of pavement management and bridge management systems capable of analyzing various life cycle scenarios, IDOT has developed a spreadsheet tool to simulate changes in network conditions associated with different levels of investment. The spreadsheet enables IDOT to:

- Link CRS or NBI ratings to an associated type of treatment based on desired practices. For instance, pavements with a CRS of 4.0 to 4.5 are eligible for Major Rehabilitation, while bridges with an NBI rating of 4 or less are eligible for Reconstruction.
- Establish different costs for different levels of repair.
- Define the inventory in terms of the current condition based on the results of the most recent CRS surveys and NBI inspections. For example, the pavement and bridge inventories were defined in terms of Interstate, Other NHS, Marked Routes, and Unmarked Routes. For each system, CRS condition ratings and NBI ratings were defined for each type of repair. The number of miles (for pavements) and square feet (for bridges) at each condition rating were then linked to a level of repair, as discussed earlier.
- Establish rates of deterioration for each system and condition category based on the number of years a pavement or bridge was expected to stay in that category without additional treatment. The resulting graphs, examples of which were presented earlier as figures 4-3 and 4-4, were then used to predict changes in condition over the 10-year analysis period.
- Set acceptable condition levels in terms of the percent of the network reaching targeted condition levels. For instance, the Desired Acceptable Condition for Interstate pavements is 90 percent with a CRS value of 5.5 or higher and for bridges, the desired acceptable level of repair is 93 percent of the bridge deck area with an NBI rating of 5 or more.
- Enter expected funding levels over a 10-year analysis period.
- Set funding distributions for pavements and bridges based on the expected funding levels.
- Distribute the available funding by work type. For instance, one scenario could be run with 50 percent of all available funding going to Rehabilitation and 50 percent to Reconstruction while an alternate scenario could distribute 20 percent of the funding to Proactive

Maintenance, 20 percent to Preservation, 30 percent to Rehabilitation, and 30 percent to Reconstruction.

- Generate outputs showing the resulting impact on system conditions after 10 years of spending in accordance with each scenario. The resulting outputs summarized the amount of work conducted in each category, the total amount spent, and the actual percent of the system that satisfies the acceptable condition targets.

This analysis tool was used both for life cycle planning and developing the investment strategies for the 10-year financial plan in chapter 6, *Financial Plan and 10-Year Investment Strategies*. To support the implementation of these investment strategies, IDOT provided the Districts with enhanced asset data and TAMP treatment selection criteria for identifying projects to include in the FY 2019-2024 MYP. In the future, IDOT plans to use the tool at the District level to assist the District Programming Engineers with the development of their MYP to help ensure consistency with the TAMP. This tool is expected to be replaced with pavement and bridge management software tools in the next several years, as outlined in chapter 8, *Planned Enhancements*.

Life Cycle Plan Analysis

Using the investment spreadsheet tool, IDOT analyzed the long-term impact of several different life cycle plan strategies on network conditions. Two of the strategies considered are documented here. Both strategies used the same amount of funding, but the distribution of that money by treatment category varied. In the first strategy, $1 billion was considered, with 51 percent of the funding going to pavements and 49 percent to bridges.

STRATEGY 1 – WORST-FIRST STRATEGY

The first strategy represents an investment approach that is similar to the approach IDOT used historically, with an emphasis on Rehabilitation and Reconstruction activites to address the backlog of pavements and bridges. To represent this scenario, 50 percent of the funds available for pavements were allocated to Major Rehabilitation and the remaining 50 percent to Reconstruction, as shown in table 4-1. For bridges, most of the money was allocated to Major Rehabilitation since IDOT does not have sufficient funds to completely reconstruct many bridges each year; however, an exception was made for Interstate bridges in *Poor* condition, with 10 percent of the funding allocated for bridge Replacement. Because there is no planned investment in Preservation or Proactive Maintenance, this strategy is considered to be a Worst-First strategy in which the pavements and bridges in the worst condition are the highest priority for funding. The distribution of funding under this strategy is provided in table 4-2. This strategy is not applicable to the Illinois Tollway or

Skyway facilities, which have a user-based revenue stream to cover life cycle costs.

Table 4-1. Distribution of funding for pavements under a worst-first strategy.

Pavement Class Category	Pavement Class	Percent Class Budget by Pavement Condition Category					
		Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Preservation)	Fair (Minor Rehab)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	0%	0%	0%	0%	50%	50%
	Other NHS (Includes Local NHS)	0%	0%	0%	0%	50%	50%
Non-NHS	Marked Routes	0%	0%	0%	0%	50%	50%
	Unmarked Routes	0%	0%	0%	0%	50%	50%

Table 4-2. Distribution of funding for bridges under a worst-first strategy.

Bridge Class Category	Bridge Class	Percent Class Budget by Bridge Condition Category					
		Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Low Preservation)	Good (High Preservation)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	0%	0%	0%	0%	90%	10%
	Other NHS (Includes Local NHS)	0%	0%	0%	0%	100%	0%
Non-NHS	Marked Routes	0%	0%	0%	0%	100%	0%
	Unmarked Routes	0%	0%	0%	0%	100%	0%

The outputs from this strategy are presented in tables 4-3 (pavements) and 4-4 (bridges). As shown in the last three columns, over the 10-year period considered in the analysis, none of the targeted pavement conditions would be met and some significant deterioration of the system will take place between the initial year (year 0) and year 10. Overall, conditions under this scenario deteriorate from 70 percent of the network in Desired Acceptable Condition to only 34 percent at the end of the 10-year period.

The deterioration in system conditions for the bridges is less obvious, largely because bridges deteriorate at a slower rate than pavements. As a result, the cumulative impact of a worst-first strategy is not as obvious. However, under this strategy none of the systems meet the Desired Acceptable Condition targets. The condition of the bridges is projected to remain constant, with 88 percent of the bridge deck area in a Desired Acceptable Condition over the 10-year period.

Table 4-3. Pavement results for strategy 1 (worst-first).

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	1,892.3	1,601.3	1,114.8	85%	90%	59%
	Other NHS (Includes Local NHS)	5,737.9	4,302.7	2,280.8	75%	90%	40%
Non-NHS	Marked Routes	6,401.9	4,136.6	1,734.0	65%	75%	27%
	Unmarked Routes	2,347.5	1,492.2	481.0	64%	50%	20%
Statewide Totals		**16,379.6**	**11,532.9**	**5,610.6**	**70%**		**34%**

Table 4-4. Bridge results for strategy 1 (worst-first).

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	33,129,275	29,653,203	30,226,604	90%	93%	91%
	Other NHS (Includes Local NHS)	32,635,907	28,270,861	28,270,861	87%	93%	87%
Non-NHS	Marked Routes	11,663,027	10,283,700	10,283,700	88%	90%	88%
	Unmarked Routes	14,889,692	13,452,679	12,454,935	90%	90%	84%
Statewide Totals		**92,317,901**	**81,660,443**	**81,236,101**	**88%**		**88%**

STRATEGY 2 – INCREASED PRESERVATION PROGRAM

A second strategy was evaluated using the spreadsheet tool to compare the impact of using Proactive Maintenance and Preservation in combination with Rehabilitation and Reconstruction. Under this strategy, funds were distributed between each of the treatment categories as shown in tables 4-5 (pavements) and 4-6 (bridges). This strategy is considered to be much closer to the investment strategies that IDOT is moving towards with the investment strategies presented in this TAMP; however, it will take time for IDOT to transition to a program that increases the amount of preservation work substantially.

Table 4-5. Funding distribution for pavements under the increased preservation program.

Pavement Class Category	Pavement Class	Percent Class Budget by Pavement Condition Category					
		Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Preservation)	Fair (Minor Rehab)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	0%	5%	10%	20%	55%	10%
	Other NHS (Includes Local NHS)	0%	5%	10%	40%	40%	5%
Non-NHS	Marked Routes	0%	5%	10%	40%	40%	5%
	Unmarked Routes	0%	5%	10%	40%	40%	5%

Table 4-6. Funding distribution for bridges under the increased preservation program.

Bridge Class Category	Bridge Class	Percent Class Budget by Bridge Condition Category					
		Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Low Preservation)	Good (High Preservation)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	0%	2%	15%	15%	25%	43%
	Other NHS (Includes Local NHS)	0%	2%	10%	11%	32%	45%
Non-NHS	Marked Routes	0%	2%	10%	13%	30%	45%
	Unmarked Routes	0%	2%	10%	11%	32%	45%

The results of the analysis are presented in tables 4-7 (pavements) and 4-8 (bridges). For pavements, the overall percentage of pavements in Desired Acceptable Condition decreases from 70 percent to 61 percent for the same level of funding used in strategy 1. Although this strategy still shows a decrease in overall conditions, it is less severe than in the previous strategy and the NHS pavements are able to achieve Desired Acceptable Conditions.

The bridge results increase the overall percentage of bridge square footage in Desired Acceptable Conditoin from 88 percent to 93 percent. Under this scenario, all bridge systems achieve the Desired Acceptable Condition targets.

Table 4-7. Pavement results for strategy 2 (increased preservation program).

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	1,892.3	1,601.3	1,703.4	85%	90%	90%
	Other NHS (Includes Local NHS)	5,737.9	4,302.7	5,147.2	75%	90%	90%
Non-NHS	Marked Routes	6,401.9	4,136.6	2,221.6	65%	75%	35%
	Unmarked Routes	2,347.5	1,492.2	873.2	64%	50%	37%
Statewide Totals		**16,379.6**	**11,534.9**	**9,945.4**	**70%**		**61%**

Table 4-8. Bridge results for strategy 2 (increased preservation program).

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	33,129,275	29,653,203	30,913,795	90%	93%	93%
	Other NHS (Includes Local NHS)	32,635,907	28,270,861	30,771,601	87%	93%	94%
Non-NHS	Marked Routes	11,663,027	10,283,700	10,519,845	88%	90%	90%
	Unmarked Routes	14,889,692	13,452,679	13,468,479	90%	90%	90%
Statewide Totals		**92,317,901**	**81,660,443**	**85,673,721**	**88%**		**93%**

Recommended Life Cycle Planning Strategies

The results of the life cycle planning analysis were useful to IDOT as they considered changes to the historical consideration of Backlog as the primary performance metric to trigger pavement and bridge improvements. As demonstrated by the two strategies considered in this chapter, IDOT can improve or preserve system conditions by implementing a more proactive preservation program than if they continued focusing primarily on pavements and bridges in need of more major repairs, even if the risk of decreased funding should occur. Therefore, the increased use of preservation was recommended for consideration in developing the planned 10-year investments in chapter 6, *Financial Plan and 10-Year Investment Strategies*, where other considerations (such as projected revenue, industry capacity, risks, and other system needs) were taken into account. However, it will take time to shift the way IDOT currently does business since it requires new analytical tools, District guidance on project selection, and training.

To support the implementation of the recommended strategies, IDOT initiated the development of pavement selection criteria to guide the choice of treatments by the Districts. These selection criteria are aligned with the condition ranges used in the spreadsheet investment tool described in this chapter, but provide additional detail regarding unacceptable distress, rut depth, traffic levels, and amount of existing patching. Criteria have also been established for bridges, to help with programming work activities. The bridge criteria are also aligned with the assumptions built into the investment tool, but provide additional guidance regarding element conditions that make each treatment category viable.

Going forward, IDOT intends to improve the analysis tools available for conducting life cycle planning and to work with the Districts to ensure the implementation of the investment strategies presented in chapter 6, *Financial Plan and 10-Year Investment Strategies*. These plans are presented in more detail in chapter 8, *Planned Enhancements*.

Chapter 5: Risk Management

Overview

IDOT faces many uncertainties in managing its transportation system, including fluctuations in available funding, unanticipated weather events, changes in travel demand and patterns, and variability in asset performance due to material properties or traffic loadings. These uncertainties are considered to be risks that can have either a positive or negative impact on IDOT's ability to achieve its asset management objectives. Using a formal risk management process, IDOT identified and evaluated significant risks that could impact pavement and bridge performance. As a result, IDOT has a better understanding of the uncertainties associated with its TAMP objectives and the likely outcomes of actions that will be taken to mitigate these risks.

This chapter describes the risk management process that IDOT followed to identify and analyze risks that could impact the Department's ability to achieve its performance objectives. The chapter also presents the results of the risk analysis and the mitigation steps that IDOT has incorporated into the 10-year investment strategies outlined in this TAMP. Finally, this chapter lays out a process for addressing federal requirements for monitoring assets on the NHS that are frequently damaged during federally- or State-declared emergencies.

Risk Management Process

To identify and evaluate risks, IDOT followed the risk management framework developed by the International Organization for Standardization (ISO). This framework, which is presented in figure 5-1 has also been included in risk management guidance developed by both FHWA and the American Association of State Highway and Transportation Officials (AASHTO). A brief explanation of the activities involved in each part of the process is provided.

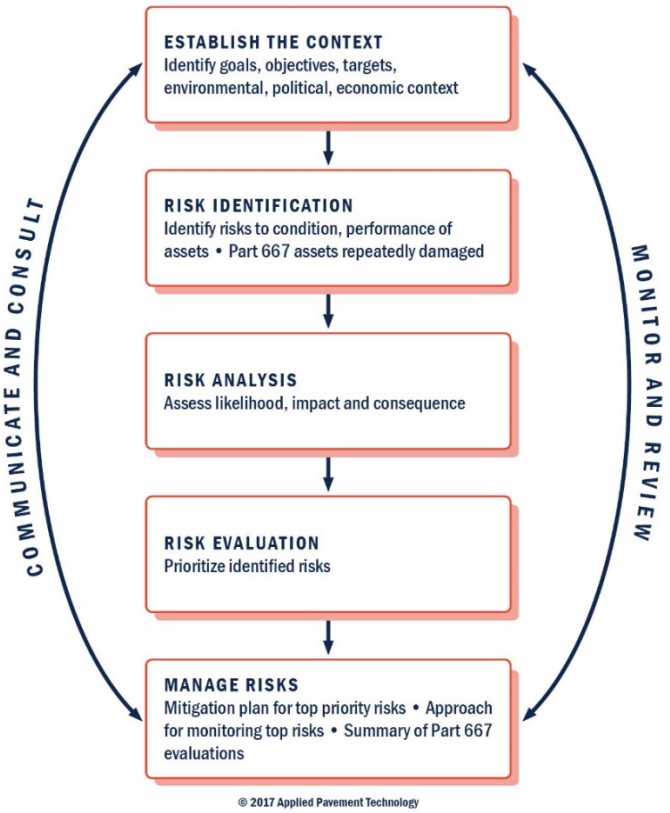


Figure 5-1. The risk management process.

Establish the Context

Prior to the development of the TAMP, IDOT had considered risks informally as part of the project development process. At the project level, the risk assessment was focused on each individual construction project, taking into account localized characteristics unique to that situation. The focus on one construction project at a time enabled IDOT to consider uncertainties such as climate, traffic patterns, and asset deterioration patterns in the selection and design of the appropriate fix. Additional risks that occur during the construction of the selected treatment could also be managed, such as weather delays that impact the construction schedule or unexpected soil properties that could lead to design revisions and cost overruns.

As part of the TAMP development, IDOT initiated a more formal risk management process that laid the framework for considering risks at a system and/or program level. This involved identifying a diverse and representative team to be involved in the process. A Risk Technical Working Group (TWG) was established, with the following offices represented:

- Planning
- Programming

- Operations
- Design and Environment
- Bridges and Structures
- Local Roads and Streets
- Finance and Administration

The Risk TWG reported to the Project Management Team and their recommendations were reviewed and approved by the Steering Committee.

Once the team was established, IDOT conducted a risk workshop in which participants were briefed on the risk management requirements and introduced to the activities involved in identifying, evaluating, and managing risks. Following the workshop, the Risk TWG developed the rating scales that would be used to evaluate the likelihood and consequence of various risks. The resulting ratings are presented in table 5-1, shown in order from a low rating to a high rating.

Table 5-1. Risk likelihood and consequence ratings.

Likelihood Ratings		Consequence Ratings	
Rating	Description	Rating	Description
Rare	< 5 % chance	Negligible	Won't impact objectives
Unlikely	5% to 20% chance	Minor	Will meet objectives with slight difficulty
Possible	> 20% to 80% chance	Major	Will barely meet objectives with significant difficulty
Likely	> 80% to 95% chance	Critical	Will not adequately meet objectives
Almost Certain	> 95% chance	Catastrophic	Will completely prevent IDOT from coming close to objectives

Identify Risks

At a separate workshop, the Risk TWG conducted a brainstorming session in which participants identified risks that had the potential to impact IDOT's ability to achieve its pavement and bridge performance objectives. Both short and long term risks were identified during this process. For each of the risks

identified, primary impacts were identified and the information was put into a risk matrix. The impacts provided the team with an assessment of who would be affected by the event and how the program objectives would be impacted. This additional information was used during a later step when the TWG identified and prioritized possible mitigation strategies.

The risks identified during this step were organized into the following groups:

- **Agency risks,** such as the possibility of reduced federal or State funding, unplanned changes in regulatory requirements, and loss of institutional knowledge due to retirements or other forms of staff reductions.
- **Program risks,** such as the potential decline in non-NHS pavement and bridge conditions due to the federal focus on the NHS, the ability to reliably forecast asset conditions and funding needs, and unexpected damage due to extreme weather events.
- **Asset risks,** such as unexpected increases in oversized vehicles, the use of non-compliant materials or poor construction practices, and the inability to assess small culvert needs due to a lack of inventory and condition information.

Analyze and Evaluate Risks

At a separate workshop, the Risk TWG assigned ratings to both the likelihood and potential consequence of each risk using the criteria presented in table 5-1. The results were incorporated into a risk register and an overall risk rating was assigned using the heat map presented in figure 5-2. The overall risk rating was assigned based on the combination of likelihood and consequence for each risk. As shown in the figure, the overall risk rating increases as both the likelihood that the risk will occur and the resulting consequence increase. In figure 5-2, cells shaded in green represent low risk and minimal consequences while the darkest red cells indicate the highest risk and the most significant consequences.

Likelihood	Consequence				
	Negligible	Minor	Major	Critical	Catastrophic
Rare	Low	Low	Low	Low	Low
Unlikely	Low	Low	Low	Medium	Medium
Possible	Low	Low	Medium	High	High
Likely	Low	Medium	High	High	Critical
Almost Certain	Medium	Medium	High	Critical	Critical

Figure 5-2. IDOT risk heat map.

To determine the ratings for both likelihood and consequence, the Risk TWG used an online polling tool that allowed each individual to assign ratings using a 1 to represent a "rare" likelihood or a "negligible" consequence and a 5 to represent an "almost certain" likelihood or "catastrophic" consequence. The scores from each member of the Risk TWG were averaged in real time and an overall score was assigned. If the results indicated that there was significant variability in the scores, the TWG members discussed the risk in more detail and re-rated the likelihood and consequence scores based on the discussions.

The average scores were then used to assign the risk rating from the heat map. For instance, a risk with a likelihood rating of "likely" and a consequence score of "critical" would be classified as a "high" risk. The overall rating provided IDOT with a method of ranking the risks so the agency could focus on developing mitigation strategies for the highest-ranking risks.

Manage Risks

During the final workshop, the Risk TWG assigned mitigation strategies to each of the risks that received a "critical," "high," or "medium" rating. The group considered five different mitigation strategies for each risk, including treat, tolerate, terminate, transfer, or take advantage of. In addition to identifying mitigation strategies, each mitigation strategy that required action was assigned to an office to oversee its implementation.

Monitor and Review

Going forward, the Office of Planning and Programming will retain responsibility for reviewing the risk register at least annually, as part of the MYP development process. As part of the review process, asset managers or other stakeholders will be consulted to determine changes that have taken place in the prior year to help determine whether risk priorities have changed, whether there are new risks that need to be added to the risk register, or whether the overall risk rating has lessened in severity due to changes in conditions and/or actions taken by IDOT. A more formal risk review, which involves repeating the process outlined in this section of the TAMP, will be undertaken every four years as part of the TAMP update process.

Risk Analysis Results

The results of the risk assessment were documented in a comprehensive risk register that is managed by the Office of Planning and Programming. The portion of the risk register related to high risks is presented in tables 5-2, 5-3, and 5-4, which reflect the results for agency, program, and asset risks, respectively. There were no risks that received an overall rating of "critical."

Table 5-2. Risk register for high agency risks.

Risk Event	Primary Impacts	Likelihood	Impact	Risk Rating	Mitigation Strategies
Agency Risks					
Reduced levels of federal funding	• Reduces the asset Level of Service (LOS) • Increases the amount of competitiveness between programs	Possible	Critical	High	Tolerate
Decrease in the level of state revenue available	• Reduces the asset LOS and the program size • Reduces stakeholder confidence in IDOT • Reduces quality of service • Difficulty in meeting federal match	Likely	Critical	High	Tolerate
Shifts in modes of transportation from cars to transit and bicycles	• Reduced funding from the gas tax reduces the amount of state revenue available for asset preservation • Reduces the asset LOS	Possible	Critical	High	Take Advantage/Treat – With mode shifts, capacity enhancements are needed less so funds previously used on capacity enhancements can be used on maintaining existing assets
Unplanned changes in regulatory laws by FHWA or other government agencies	• Shifts how funds are distributed, which can potentially impact funding • Adds additional requirements without associated funding, resulting in decrease in the LOS for assets • May require additional reporting resulting in additional work without additional staff	Almost Certain	Major	High	Tolerate
Ineffective or missing internal communication	• Results in inefficient use of manpower, which may lead to duplicating efforts • Inconsistent evaluation of needs • Increased cost due to a lack of understanding regarding the impact of decisions • Reduced program due to inefficiencies	Almost Certain	Major	High	Treat – IT enhancements, Intra-agency communication enhancements; change management; data coordination; data warehouse development; breaking down the silos; better documentation of data sources; data governance
Decreased staffing due to impending retirements or staffing losses	• The agency loses institutional knowledge that can decrease the efficiency in which assets are managed • Staffing levels are not adequate to move projects forward so projects fall behind and impact asset LOS	Almost Certain	Major	High	Treat –Cross train; work on personnel policies allowing for cross training; increase head count; incentivize staying within section/bureau; Make non-union positions attractive to union members
Opportunities provided by emerging technologies (and materials) are not utilized and current technologies are not maintained	• Productivity and organizational advancement are limited because work is labor intensive • IDOT is less appealing as a workplace for talented hires • IDOT falls behind other peer agencies • IDOT personnel will be limited in their ability to analyze, determine, and implement best practices	Almost Certain	Major	High	Treat – Educate management on ability to accomplish new technologies; Act timely on new products; enhance and streamline IT processes to allow for innovative development/purchases; Include training in any emerging technology training and/or support
Employee salaries and benefits do not keep pace with industry	• IDOT loses the ability to retain and attract the best hires • Employees lose motivation and may not have a vested interest in their work • Productivity and quality suffer, errors increase • Operational costs could increase due to increases in sick leave used or health issues among staff • These factors could lead to a decrease in the asset LOS being provided • People will not move up in the organization to non-union positions because of salary	Almost Certain	Major	High	Treat – Conduct and complete compensation study and implement. Consider cost to the agency if not implemented. Make non-union positions attractive to union members.

Table 5-3. Risk register for high program risks.

Risk Event	Primary Impacts	Likeli-hood	Impact	Risk Rating	Mitigation Strategies
Program Risks					
The federal focus on the NHS will impact IDOT's flexibility in using federal funds	• The LOS for non-NHS assets could deteriorate further • There could be a decrease in reputation among the traveling public • Political pressure for project selection could increase	Almost Certain	Major	High	Tolerate/Take advantage – Use the opportunity to prioritize maintenance to external partners. Enhance freight movement.
Data accuracy and consistency issues	• The wrong treatments could be recommended • Windows of opportunity for treatment strategies could be missed • Programs cannot be developed with a high degree of confidence	Likely	Critical	High	Treat – Data governance; data management; write a data quality management plan; enhance trainings and add quality control
Costs and benefits associated with new policies and specifications are not considered	• Individual project costs may increase, which leads to a smaller program • May result in a poor rate of return or the inefficient use of limited funds	Likely	Major	High	Treat – Identify new materials/ products/treatments/ strategies that cost less with higher benefits; complete cost/ benefit analysis to prioritize projects; consider true cost – consider productivity, material, and other existential costs
Inability to meet TAMP requirements	• Federal reimbursement level will be reduced, resulting in a smaller program and lower LOS	Possible	Critical	High	Treat – Prioritize meeting TAMP requirements and allocate the required resources
The size of the system continues to expand without corresponding increases in funding to address needs	• Planned preservation strategies may not be implemented because funding is being stretched over a larger network • Asset LOS will decrease	Likely	Major	High	Treat – Make strategic expansion; use cost/benefit analysis and complete extensive planning
IDOT is not prepared to respond if unexpected funding is made available because not enough projects are ready to be constructed	• On-going fluctuations in the funding make it difficult to develop a planned program • IDOT will miss opportunities for additional funding • As IDOT outsources more of the work, the agency has less control over its ability to get projects ready for construction	Likely	Critical	High	Treat – Educate policy makers on time needed for project development; streamline project development process; strategically prioritize projects to complete pre-construction activities without having construction funding identified
Extreme natural events disrupt system mobility	• System mobility suffers, resulting in public dissatisfaction • Emergency events disrupt or change program priorities, which will impact IDOT's ability to meet performance targets • Emergency events often drive changes to policy and design standards that can increase project costs and eventually lower the LOS due to the reduction in projects	Possible	Critical	High	Tolerate/Treat – Implement disaster recovery plans; increase the number of disaster/asset specific recovery plans for highly critical assets

Table 5-4. Risk register for high asset risks.

Risk Event	Primary Impacts	Likeli-hood	Impact	Risk Rating	Mitigation Strategies
Asset Risks					
Preservation activities are ineffective or are not performed on a timely basis	• The expected service life of an asset is not achieved • Repair costs increase due to a lack of maintenance • The overall LOS decreases	Almost Certain	Major	High	Treat – Review and enhance guidance on preservation; increase investment in preservation
Increases in illegal or oversized heavy vehicles	• The rate of pavement deterioration increases, leading to the need for more frequent treatments • The expected life of an asset is not achieved • The overall cost of preserving the system increases	Likely	Major	High	Transfer – increase enforcement; Treat – identify priority corridors for oversize heavy vehicles; increasing permit fees

Consideration of Risks in the Development of Investment Strategies

The mitigation strategies that resulted from the risk analysis focus primarily on improving guidance, conducting training, streamlining existing processes, and enhancing IT capabilities. The specific activities that will be undertaken to improve data, processes, and analysis capabilities related to the investment strategies identified in the TAMP are described in chapter 8, *Planned Enhancements*.

Special Requirements for Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events

One of the requirements under 23 CFR Part 667, *Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events*, imposes the conduct of a periodic statewide evaluation of the State's existing roads, highways, and bridges on the NHS that have repeatedly required repair or reconstruction on two or more occasions from emergency events declared by the Governor or the President of the United States. The requirements instruct State DOTs to complete an evaluation of any repair and reconstruction events to pavements and bridges on the NHS that have occurred due to emergency events since January 1, 1997. In addition, the rules require that a process be established to continue the periodic reviews into the future.

Existing Process

IDOT may respond to natural disaster emergency events (including tornados, floods, and storms) with technical and highway maintenance personnel from

any designated location from across the State of Illinois. If it is determined that the response requires resources from District highway personnel, and could potentially result in Federal Emergency Management Agency (FEMA) reimbursement dollars for resources, then special considerations are given to capturing this information.

A special project number for the emergency event is created by the Central Bureau of Operations and those geographical locations (i.e. District, Team Section) affected are required to track allocated resources (including labor, equipment and materials) by work activity code in response to the event using this special project number. This data is entered into IDOT's legacy Maintenance Management Information System (MMIS). This is the system of record for all statewide highway maintenance activities and for producing costing reports for labor, equipment, and material allocated to these special events or projects.

IDOT may also be asked to provide resources for special events across the State of Illinois. For example, IDOT, partnered with numerous other Illinois agencies, and was heavily involved in the planning and response to the 2017 eclipse. This event brought thousands of people to the southern part of Illinois, one of the locations where a total eclipse of the sun occurred. IDOT was asked to respond with dynamic message signs to assist with signing and traffic control along with people and trucks for roadway cleanup and to assist roadway motorists, if needed.

Assessment of Prior Emergency Events

IDOT conducted an evaluation of the data available in its MMIS to assess its responses to emergency events declared by either the U.S. President or the Governor of Illinois. The study found that records maintained by Operations track labor and material costs for the affected areas, but did not specify any information regarding which assets were repaired or what work was done. Therefore, it is virtually impossible for IDOT to identify, with any certainty, NHS pavements or bridges that have historically received repair or reconstruction two or more times due to declared emergencies. As described in the next section, IDOT is taking steps to modify its record-keeping going forward to satisfy the 23 CFR Part 667 requirements.

Future Assessment of NHS Repair or Reconstruction Due to Emergency Events

Moving forward, District Operations staff will be responsible for reporting on NHS pavements and bridges that repeatedly require repairs or reconstruction due to emergency events. To facilitate this assessment, Operations staff will develop a process to record the required information on impacted assets,

including the type of work performed and the associated costs. Guidance will be provided to Operations staff on these requirements. The stored information will be displayed graphically in a GIS application.

During the MYP development, District Programming staff will use this information to review potential projects to identify when alternate designs are needed due to pavements or bridges that are repeatedly damaged during emergency events. The information and review results will be documented in the Phase I Report. This process ensures that the issue is addressed either when work is planned for a particular pavement or bridge, or a design exception is required for approval by the Bureau of Design and Environment.

Chapter 6: Financial Plan and 10-Year Investment Strategies

Overview

Most of the revenue available to IDOT for addressing system needs is derived from Motor Vehicle Registration (MVR) Fees, Motor Fuel Tax (MFT), reimbursements from the Federal Highway Trust Fund, and reimbursements from local governments. These funds are first used to address general and administrative expenses (such as debt service and IDOT operations) as well as ongoing construction projects from prior years' programs. The remainder of the funds are used to develop a MYP to sustain the condition of the existing infrastructure through investments in safety, roads, bridges, and other projects that improve the economic competitiveness and the overall quality of life for Illinoisans. This chapter summarizes the amount and sources of revenue anticipated over the next 10 years and presents IDOT's planned investments in its pavements and bridges during that time. IDOT used the best information available at the time this document was written to prepare this information, but recognizes that both anticipated revenue and funding needs could vary considerably over the next several years. The first six years of the planned investments presented in the TAMP are based on information in the current MYP and the last four years are estimated based on predicted conditions. Actual fluctuations in either revenue or funding needs will be reflected in updated versions of the TAMP.

Revenue Sources

IDOT

In FY 2018, IDOT received a total of $3.552 billion in revenue from two primary sources: reimbursements from the Federal Highway Trust Fund and State Revenue (comprised primarily of Motor Vehicle Registrations and Motor Fuel Taxes). The balance of IDOT's revenue came from local government reimbursements. The distribution of these revenue sources is shown in figure 6-1.

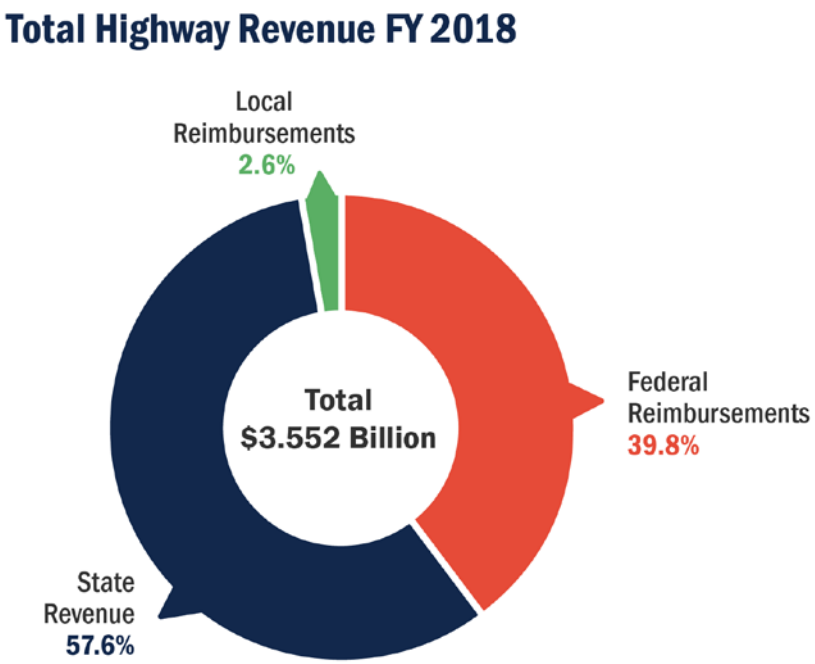


Figure 6-1. FY 2018 Total highway revenue sources and amount.

Each of the major funding sources is described in more detail in the following sections.

FEDERAL HIGHWAY TRUST FUND

Federal programs provide funding for transportation projects through the Highway Trust Fund (HTF), which is supported by the revenue collected from federal fuel taxes and a variety of tire and truck sales taxes. The taxes credited to the HTF are to be used for transportation spending and are split between the Highway Account and the Transit Account. Federal funding has been expanded to encompass not only highway projects, but also transit and environmental projects. In recent years, the HTF has required large and growing transfers from the US Treasury general funds to keep payments flowing to States under the various multi-year highway programs (such as the FAST Act). HTF support is available to all States. The amount of various apportionments (the purposes for which federal funds can be spent) are dependent on a number of factors, including the revenue contributions attributable to each individual State, while the amount of obligation limitation (the authority to draw cash from the HTF) that is awarded to each State is based on annual federal appropriations.

A “fair share” of federal funds for local governments is determined by the federal funds authorized in the federal bill and the amounts that have been determined to be an equitable allocation among State and local programs.

The allocation is based on a percentage that was developed many years ago in previous federal highway bills, and it is currently approximately 19 percent.

MOTOR VEHICLE REGISTRATIONS (MVR)

Vehicle registrations and related fees are administered by the Secretary of State under the provisions of the Illinois Vehicle Code (625 ILCS). The Vehicle Code covers registration requirements that include everything from motorcycles, mopeds, and motorized bicycles to 80,000-pound tractor trailer rigs and everything in-between. The State participates in the international compact governing the registration of trucks operating in Interstate commerce through the International Registration Program (IRP). Unlike Motor Fuel Tax (MFT), MVRs and related fees are not deposited into a single fund. Rather, the money is distributed into various funds as they are received in accordance with State law.

A significant portion of the revenue received from this source is used to support road and bridge projects. MVRs are the single largest source of State revenue for the State of Illinois' highway program. However, in recent years, there has been a growing trend to use motor vehicle-related fees to support other, non-transportation purposes, such as the State's main operating fund, the State Police Vehicle Fund, and the Department of Natural Resources.

MOTOR FUEL TAXES (MFT)

The Illinois MFT is derived from a tax on the privilege of operating motor vehicles on public highways and recreational watercraft on the waters in the State of Illinois. The tax is a flat rate based on the amount of motor fuel purchased. The rates for Illinois MFT that are deposited in the MFT Fund are:

- 19.0 cents per gallon on all fuel (including gasoline, gasohol, and diesel)
- 2.5 cents per gallon on diesel fuel in addition to the tax above

The State's MFT is administered by the Department of Revenue. The tax is passed along to consumers through the pump price but is actually collected from wholesalers and distributors whenever fuel is delivered as a way to encourage compliance and minimize collection costs. The State's share of MFT on Interstate truckers is collected according to the International Fuel Tax Agreement (IFTA). Motor Fuel is also subject to the State sales tax, but that revenue is used to support general State operating expenses and not the highway program. Tax collections are deposited into the MFT Fund by the Department of Revenue. The Department of Transportation allocates these monies monthly according to the provisions outlined in the MFT distribution statute (35 ILCS 505/8) and initiates the process for distribution of motor fuel tax revenue to the counties, townships, and municipalities. Net revenue

from the MFT (after various deductions such as the cost of collection and IFTA payments to other States) is split between the State and local governments, with the State receiving 45.6 percent of the net proceeds and local agencies receiving 54.4 percent. This is the only source of State revenue sharing with local governments specifically for transportation-related purposes.

Each month, the net proceeds designated for local governments are apportioned on the basis of statutory formulas. Most counties receive a share of the revenue based on the level of motor vehicle registration activity recorded in those counties, while municipal apportionments are based on relative levels of municipal population, and townships/road district apportionments are based on a combination of miles under their jurisdiction plus tax effort. Monthly apportionments are posted on the Department's website and are paid out subject to appropriation by the General Assembly.

LOCAL MATCH/LOCAL REIMBURSEMENTS

Local funds are appropriated when the project is paid for in conjunction with federal and/or State funds. In Illinois, most local projects are awarded through State lettings, and the local share of the project is initially paid with State funds. Afterwards, local agencies reimburse their share of project costs back to the State, where by law they are deposited in the Road Fund.

State grants to local governments are based on need, growth, population, MFT collections, and other factors. The budget for the combination of all of these programs is approximately $50.8 million annually and is comprised of grants from the Road Fund, as shown to the left.

Annual Road Fund Grants to Local Agencies

Consolidated counties: **$21.8M**
Needy townships: **$10.0M**
High-growth cities: **$4.0M**
Township bridges: **$15.0M**

Total: **$50.8M**

Illinois Tollway

The primary source of operating revenue for the Illinois Tollway is toll revenue from both commercial and passenger vehicle traffic. In 2016, toll revenue generated approximately $1,303.3 million. Revenue bonds are also issued to fund the capital program.

Revenue Projections

IDOT

Estimating revenues involves estimating all federal project reimbursements (for both existing projects and future funding assumptions), State tax sources (including both MVR and MFT), and local project reimbursements. Over the 10-year period from FY 2018 to FY 2027, IDOT's revenue from the previously described sources is expected to remain relatively constant, as shown in table 6-1.

Table 6-1. IDOT's FY 2018-FY 2027 revenue estimate (in millions).

Revenue	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Federal Reimbursements	1,413	1,712	1,691	1,679	1,640	1,605	1,623	1,621	1,622	1,629
State Revenue	2,046	2,064	2,077	2,072	2,065	2,061	2,057	2,063	2,062	2,056
Local Reimbursements	93	102	113	100	99	101	98	97	96	95
Total	3,552	3,877	3,880	3,850	3,804	3,766	3,778	3,781	3,779	3,780

A "transportation lockbox" passed overwhelmingly by public vote in November 2016 is intended to ensure that the taxes and fees paid at the fuel pump, on licenses, on vehicle registration, and for other transportation-related purchases go toward improving Illinois' infrastructure. Exactly how the lockbox will impact the funding available for transportation will be determined over time. As for the lockbox impact today, IDOT cannot currently assume a significant inflow of capital. In passing the lockbox amendment, the people of Illinois voted clearly in favor of transportation investment and the importance of funds raised for transportation to be invested in transportation.

Transportation funds may also be expended for the State or local share of highway funds to match federal aid highway funds, and expenses of grade separation of highways and railroad crossings, including protection of at-grade highways and railroad crossings, and, with respect to local governments, other transportation purposes as authorized by law. In other words, the ability to divert revenue generated from sources traditionally associated with transportation to non-transportation uses, such as the general fund, has been severely curtailed.

Illinois Tollway

Since the Illinois Tollway revenue is primarily generated by tolls, forecasted revenue is largely based on changes in toll rates and projections in traffic levels. In 2017, the Illinois Tollway projected an increase of slightly more than 5.9 percent over 2016 revenue, resulting in $1.38 billion in estimated total revenue. Beginning in 2018, an annual Consumer Price Index adjustment will be applied to commercial vehicles, which is expected to result in additional revenue in future years.

The Illinois Tollway provides an estimate of expected toll revenue in October of each year for the budget process. The estimate is based on actual data for the first eight months and estimates for the last four months of the year. A month-by-month estimate of toll revenues for the following year is also provided. The short-term forecasts are based on several key variables,

including recent trends, construction activities, weather-related events, land-use developments, and so on.

A summary of the Illinois Tollway's Capital Program is shown in table 6-2. Due to the Illinois Tollway's planning horizon timeline of its operations, the Illinois Tollway's current documentation could only project revenue through 2026.

Table 6-2. Illinois Tollway 2018-2026 projected cashflow (in millions).

Revenues	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total Revenues	1,450	1,487	1,545	1,589	1,635	1,678	1,712	1,751	1,873
Operating Expenses	353	366	382	396	411	428	444	463	485
Net Operating Revenues	1,097	1,120	1,163	1,193	1,224	1,250	1,269	1,289	1,389
Debt Service*	424	423	423	423	423	423	423	436	481
Net Operating Revenue less Debt Service	674	698	740	770	801	828	846	852	908
Capital Expenditures	**1,184**	**1,312**	**1,093**	**836**	**926**	**728**	**1,565**	**1,434**	**611**

*Debt Service is debt service on all outstanding Tollway bonds including its most recent issuance, Series 2017A, on Dec 6, 2017. It does not include debt service on projected future bond issuance. The Authority's projected future bond issuance to finance a portion of its current capital program, the *Move Illinois* Program, is $2.9 billion.

Anticipated Expenditures

IDOT

Projected expenditures for FY 2018 to FY 2027 are summarized in table 6-3, which details the General and Administration Expenses expected over that period. General and administrative costs, which may include debt service transfers, IDOT Operations, and other agency expenditures, represent the Total Expenditures in the table. In addition, IDOT must address multi-year payouts for projects with available cash balances at the end of each Fiscal Year. IDOT determines its program size each year by maximizing the available balances during that period. Therefore, in years where expenditures are greater than revenues, IDOT spends down a higher cash balance, maximizing its resources while maintaining a fiscally-constrained program. The New Program Appropriation at the bottom of table 6-3 is the annual element, or the program size available, for new programs or appropriations.

The financially-feasible six-year program element size is then provided to the Office of Planning and Programming once these adjustments have been made. The distribution of the expenditures in FY 2018 is provided in figure 6-2.

Table 6-3. Projected FY 2018 to FY 2027 highway and bridge expenditures (in millions).

Expenditures	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Highway Construction	2,078	2,184	2,169	2,061	1,922	1,844	1,813	1,738	1,714	1,738
Highway Maintenance and Management	755	716	822	839	865	891	918	946	974	1,004
Grants and Highway Safety	123	135	138	142	146	150	155	160	165	171
Debt Service	355	364	368	369	366	348	323	310	280	278
IDOT Administration	104	96	111	113	116	120	123	127	131	135
Other State Agencies	160	171	183	195	208	222	238	254	272	291
Transfers to GRF/Other	337	348	353	358	363	359	355	360	365	370
Total Expenditures	**3,932**	**4,014**	**4,143**	**4,077**	**3,987**	**3,935**	**3,925**	**3,895**	**3,903**	**3,986**
Available Balance	**1,307**	**1,190**	**927**	**700**	**517**	**349**	**201**	**86**	**-37**	**-243**
New Program Appr.	**1,900**	**2,200**	**1,900**	**1,800**	**1,750**	**1,700**	**1,700**	**1,625**	**1,700**	**1,725**

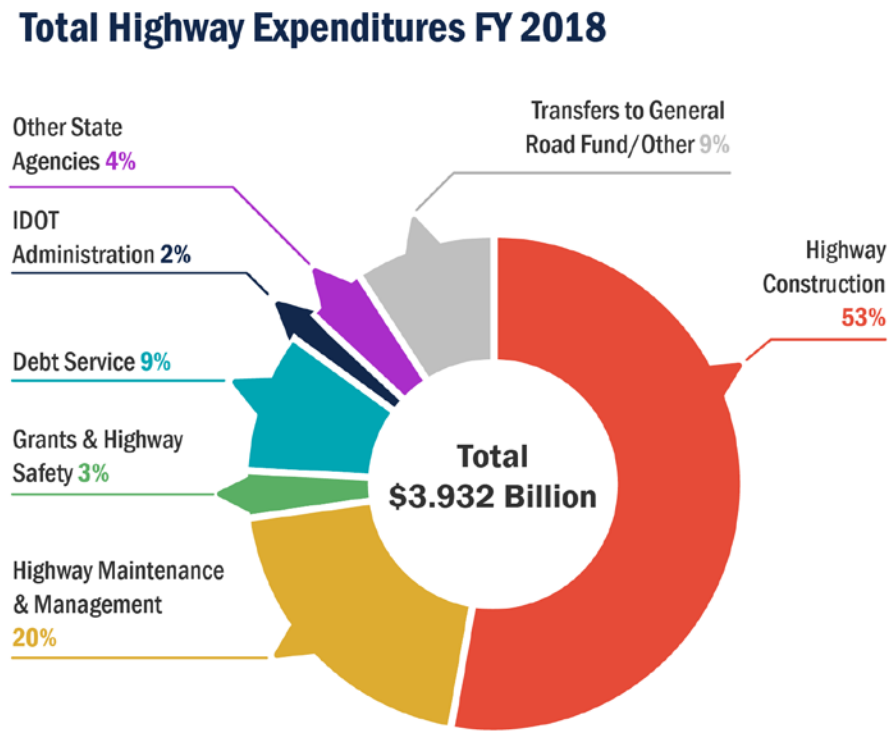


Figure 6-2. FY 2018 distribution of highway expenditures.

The anticipated distribution of funds available for the maintenance, repair, rehabilitation, and reconstruction of IDOT's pavements and bridges is provided in table 6-4. The numbers provided in the last row represent the funding levels used in developing the 10-year investment strategies outlined later in this chapter.

Table 6-4. Funding available for pavement and bridge asset management activities in FY 2018-FY 2027 (in millions).

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Highway Program Amount	1,900	2,200	1,900	1,800	1,750	1,700	1,700	1,625	1,700	1,725
Minus Safety/ Other, ROW, Local Roads "Off System" State Force Maintenance	(1,022)	(988)	(898)	(841)	(868)	(857)	(843)	(620)	(620)	(620)
Add Local Roads "On System" and Statewide Preservation	37.5	47.5	42.15	42.15	52.15	42.15	42.15	42.15	42.15	42.15
Funds Available for Pavement and Bridge Investment Strategies	915.5	1,259.5	1,044.15	1,001.15	924.15	885.15	899.15	1,047.15	1,122.15	1,147.15

Illinois Tollway

The Illinois Tollway's 2018 budget allocates $1,184 million for capital expenditures. This represents approximately 82 percent of Total Revenue for the year.

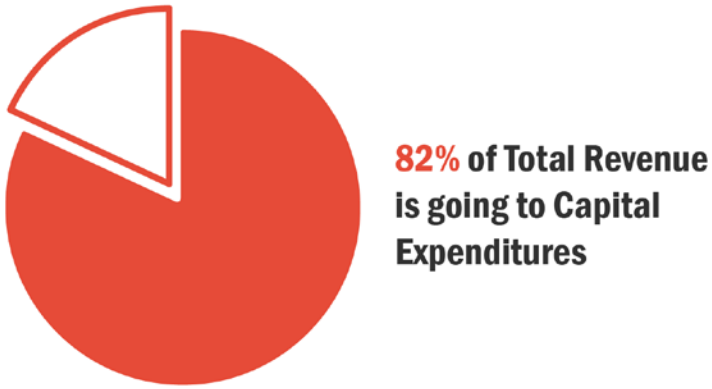


Figure 6-3. 2018 capital program expenditures for the Illinois Tollway.

Planned Investment Strategies

Using the spreadsheet tool discussed in chapter 4, IDOT analyzed different investment strategies using the expected funding levels presented in table 6-4. Based on past spending patterns, IDOT analyzed investment scenarios in which 50 to 55 percent of available funding was allocated to address pavement needs and the balance was allocated to address bridge needs.

IDOT

PLANNED PAVEMENT INVESTMENT STRATEGY

For pavements, an investment strategy was developed that recognized existing project commitments, but would gradually transition to the strategy recommended based on life cycle planning. This strategy first allocated funds based on pavement class (using current condition distributions) and then allocated funding within each class to different pavement condition categories representing categories of repair. The amount of the budget allocated to each pavement class and condition category was varied to reflect current project commitments and satisfy the Desired Acceptable Conditions established for the network (as shown in table 6-5) as much as possible. An iterative process was used to maximize the percent of the network that met the Desired Acceptable Conditions, with the higher-volume facilities established as the highest priority. The first objective was to meet the Interstate targets and then allocate funds to the Other NHS routes, Marked and Unmarked Routes, where funding was inadequate to achieve the Desired Acceptable Conditions.

Table 6-5. Desired Acceptable Conditions for pavements.

Pavement Class Category	Pavement Class	Acceptable Condition Level	
		Acceptable CRS Value	Target % Miles > Acceptable
NHS	Interstates	5.5	90%
	Other NHS	5.0	90%
Non-NHS	Marked Routes	5.0	75%
	Unmarked Routes	5.0	50%

The final recommended pavement strategy invests heavily in Minor and Major Rehabilitation with the remaining funding allocated to Preservation and Reconstruction activities. Over time, IDOT intends to shift more funding towards Preservation and Proactive Maintenance once the supporting business processes are in place.

A summary of the recommended distribution of pavement funding is presented in table 6-6. The projected pavement conditions in 2027 from following this allocation strategy are presented in table 6-7. As shown, the Desired Acceptable Conditions under this strategy are only achieved on Interstates. The remainder of the system does not meet the Desired Acceptable Conditions at this level of funding.

Table 6-6. Pavement funding allocation.

Pavement Class Category	Pavement Class	% Budget by Class	Percent Class Budget by Pavement Condition Category					
			Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Preservation)	Fair (Minor Rehab)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	49%	0%	0%	3%	20%	65%	12%
	Other NHS (Includes Local NHS)	27%	0%	0%	7%	40%	48%	5%
Non-NHS	Marked Routes	20%	0%	0%	7%	73%	15%	5%
	Unmarked Routes	4%	0%	0%	7%	78%	15%	0%

Table 6-7. Resulting pavement conditions in 2027 with the recommended investment strategy.

Pavement Class Category	Pavement Class	Total Pavement Miles	Number of Acceptable Miles		% Acceptable Miles		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	1,892.3	1,601.3	1,892.3	85%	90%	100%
	Other NHS (Includes Local NHS)	5,737.9	4,302.7	2,668.2	75%	90%	47%
Non-NHS	Marked Routes	6,401.9	4,136.6	1,870.6	65%	75%	29%
	Unmarked Routes	2,347.5	1,492.2	715.8	64%	50%	30%
Statewide Totals		**16,379.6**	**11,532.9**	**7,146.9**	**70%**		**44%**

PLANNED BRIDGE INVESTMENT STRATEGY

A similar approach was used to determine the optimal allocation of available funding to maximize the percent of bridge deck area that met the desired acceptable condition targets presented in table 6-8. As with pavements, Interstate and NHS bridges were the highest priority to achieve targets under a constrained funding scenario. The distribution of funding that resulted in the highest percentage of bridge deck area in Desired Acceptable Conditions is presented in table 6-9. The resulting conditions in 2027 under this scenario are presented in table 6-10. As shown in the table, all NHS bridges

achieve the Desired Acceptable Conditions, but funding is inadequate to achieve the Non-NHS targets.

Table 6-8. Desired acceptable bridge conditions.

Bridge Class Category	Bridge Class	Acceptable Condition Level	
		Acceptable NBI Value	Target % Sq Ft of Deck Area Acceptable
NHS	Interstates	5	93%
	Other NHS (Includes Local NHS)	5	93%
Non-NHS	Marked Routes	5	90%
	Unmarked Routes	5	90%

Table 6-9. Bridge funding allocation.

Bridge Class Category	Bridge Class	% Budget by Class	Percent Class Budget by Bridge Condition Category					
			Excellent (No Work)	Very Good (Proactive Maintenance)	Good (Low Preservation)	Good (High Preservation)	Fair (Major Rehab)	Poor (Reconstruction)
NHS	Interstates	47%	0%	0%	15%	17%	25%	43%
	Other NHS (Includes Local NHS)	41%	0%	0%	10%	13%	32%	45%
Non-NHS	Marked Routes	7%	0%	0%	10%	13%	32%	45%
	Unmarked Routes	5%	0%	0%	10%	13%	32%	45%

Table 6-10. Resulting bridge conditions in 2027 with the recommended investment strategy.

Bridge Class Category	Bridge Class	Total Bridge Square Feet	Number of Acceptable Square Feet		% Acceptable Square Feet		
			Initial (Year 0)	Final (End of Year 10)	Initial % Acceptable (Year 0)	Target % Acceptable (Year 10)	Actual % Acceptable (Year 10)
NHS	Interstates	33,129,275	29,653,203	31,188,353	90%	93%	94%
	Other NHS (Includes Local NHS)	32,635,907	28,270,861	30,771,428	87%	93%	94%
Non-NHS	Marked Routes	11,663,027	10,283,700	10,418,502	88%	90%	89%
	Unmarked Routes	14,889,692	13,452,679	13,178,844	90%	90%	89%
Statewide Totals		**92,317,901**	**81,660,443**	**85,557,127**	**88%**		**93%**

Illinois Tollway

The Illinois Tollway uses a comprehensive capital planning process that identifies opportunities to increase system efficiency and to analyze and evaluate the investments required to address needed improvements. Projects are evaluated through a rigorous prioritization process that is based on several criteria, including (Illinois State Toll Highway Authority 2017 Budget):

- The condition of the existing roadway network and facilities.
- Benefits in terms of congestion relief and improved operations.
- Accident reduction and improved traffic flow and response time.
- The timing of the project to minimize commuter disruption.
- Anticipated local and regional growth.
- Impact on revenue and future maintenance/operating costs.
- Estimated project cost and risk.
- Assessment of right-of-way needs and environmental resources.
- Consideration of external agency projects and initiatives.

The Illinois Tollway's Capital Budget is comprised of two major programs, including an on-going program called *Move Illinois: The Illinois Illinois Tollway Driving the Future*, and a recently-completed Congestion-Relief Program that began in 2005. The *Move Illinois* Program is targeted at completing the rebuilding of the Illinois Tollway system and improving mobility, relieving congestion, reducing pollution, and linking economies across northern Illinois.

The capital budget process is conducted each year, beginning in the summer. The budget division works with each department to compile a comprehensive list of capital needs, which is used to identify new projects recommended for funding. The proposed pavement and bridge projects are evaluated by the Illinois Tollway's Project Management Office and General Engineering Consultant using the inspection reports prepared by the inspection teams, which identify asset conditions and repair recommendations. The information is used to help the Illinois Tollway establish priorities and investment strategies. Then, a thorough cost-benefit analysis is performed to justify the proposed capital expenditures and impacts to the operating budget. The final proposed project list is reviewed with department chiefs, approved by the Executive Director, and presented to the Board of Directors in October for approval. Changes to the projects are made and public hearings are held in

November. Once final changes are made, a final budget is presented to the Board of Directors for adoption at its December meeting.

Future projects are evaluated through a transparent process that includes collaboration with IDOT, transit agencies, and local/regional transportation and planning agencies to help identify projects that will significantly reduce congestion, expand economic opportunities, improve the region's transportation infrastructure, and foster environmental responsibility and sustainability.

The planned Illinois Tollway 9-year investment levels are presented in table 6-11. This level of funding for pavements and bridges will enable the Illinois Tollway to achieve its Desired State of Good Repair, which consists of 100 percent of pavements and bridges in *Good* condition.

Table 6-11. Illinois Tollway's planned 2018-2026 investment levels (in millions).

Expected Funding for the NHS	2018	2019	2020	2021	2022	2023	2024	2025	2026	9-Year Total
Planned Investments	1,183.8	1,311.6	1,092.6	835.6	926.3	727.5	1,565.1	1,433.9	611.1	10,401
Percent Pavements at Desired State of Good Repair	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Percent Bridges in State of Good Repair	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Summary of IDOT's Planned 10-Year Investments

Using the information presented earlier, tables 6-12 and 6-13 show the planned investments for pavements and bridges for FY 2018 to FY 2027, respectively, in accordance with the federal requirements for reporting this information. These tables summarize the level of investment in five different work types: Maintenance, Preservation, Rehabilitation, Reconstruction, and New Construction. Since IDOT does not currently have mechanisms in place to separate out Proactive Maintenance and Preservation, they are combined into a single Preservation category for reporting purposes.

The information is presented for both the NHS and non-NHS pavements and bridges that IDOT maintains. Note that since the federal requirements specify that New Construction projects are included in the table, the amount allocated for new construction and/or system expansion (which was previously deducted from the revenue available for pavement and bridge asset management activities) has been added back in to the totals.

Table 6-12. IDOT's planned pavement investments by work type for FY 2018-FY 2027 (in millions).

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	10-Year Totals
Planned Investments — NHS Pavements											
Proactive Maintenance and Preservation	16.6	22.87	18.93	18.17	50.31	129.98	203.42	287.73	308.34	315.21	1371.56
Rehabilitation	287.66	335.74	401.93	385.33	375.45	226.75	159.0	134.34	143.98	147.15	2597.34
Reconstruction	71.25	158.49	7.59	7.31	6.75	6.47	6.53	7.62	8.15	8.37	288.54
New Construction (assumed 54% of available funds)	54	54	54	54	54	54	54	0	0	0	378
Subtotal	**429.51**	**571.4**	**482.45**	**464.81**	**486.51**	**417.2**	**422.95**	**429.69**	**460.47**	**470.73**	**4,635.42**
Planned Investments — Non-NHS Pavements											
Proactive Maintenance and Preservation	8.31	11.43	9.47	9.08	8.39	8.03	8.16	9.5	10.18	10.41	92.96
Rehabilitation	105.34	145.08	120.2	115.25	106.39	101.89	103.49	120.52	129.18	132.07	1179.42
Reconstruction	4.93	6.78	5.63	5.40	4.97	4.78	4.86	5.67	6.05	6.17	55.24
New Construction (Assumed 0% of available funds)	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**118.58**	**163.30**	**135.30**	**129.73**	**119.75**	**114.70**	**116.51**	**135.69**	**145.41**	**148.65**	**1327.62**
Total Planned Investments — Pavements											
Totals	**548.09**	**734.4**	**617.75**	**594.54**	**606.26**	**531.9**	**539.46**	**565.38**	**605.88**	**619.38**	**5,963.06**

Table 6-13. IDOT's Planned bridge investments by work type for FY 2018-FY 2027 (in millions).

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	10-Year Totals
Planned Investments – NHS Bridges											
Proactive Maintenance and Preservation	102.99	141.83	117.51	112.67	104.01	99.62	99.62	87.86	93.87	95.87	1,055.86
Rehabilitation	104.68	144.15	119.44	114.52	105.71	101.25	102.85	119.78	128.36	131.22	1,171.93
Reconstruction	162.72	224.07	185.66	178.01	164.32	157.38	161.44	216.19	231.96	237.21	1,918.98
New Construction (assumed 46% of available funds)	46	46	46	46	46	46	46	0	0	0	322
Subtotal	**416.39**	**556.05**	**468.61**	**451.2**	**420.04**	**404.25**	**409.91**	**423.83**	**454.19**	**464.3**	**4,468.77**
Planned Investments – Non-NHS Bridges											
Proactive Maintenance and Preservation	11.62	16.00	13.25	12.71	11.73	11.24	11.41	13.29	14.25	14.56	130.06
Rehabilitation	16.16	22.26	18.44	17.68	16.32	15.63	15.88	18.49	19.82	20.26	180.95
Reconstruction	22.73	31.30	25.93	24.86	22.95	21.98	22.33	26.01	27.87	28.49	254.46
New Construction (Assumed 0% of available funds)	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**50.51**	**69.55**	**57.63**	**55.26**	**51.00**	**48.85**	**49.62**	**57.79**	**61.93**	**63.31**	**565.47**
Total Planned Investments – Bridges											
Totals	**466.9**	**625.6**	**526.24**	**506.46**	**471.04**	**453.1**	**459.53**	**481.62**	**516.12**	**527.61**	**5,034.24**

Summary of Planned Illinois Tollway 9-Year Investments

A summary of the Illinois Tollway's planned 9-year investments by work type is provided in table 6-14. This table combines the planned investments for pavements and bridges on the NHS highways that are maintained by the Illinois Tollway. It also combines Proactive Maintenance and Preservation into a single work type.

Table 6-14. Illinois Tollway's planned pavement and bridge investments by work type for FY 2018-FY 2026 (in millions).

Planned Investments	2018	2019	2020	2021	2022	2023	2024	2025	2026	9-Year Totals
Maintenance & Preservation	325.51	311.71	235.05	193.54	173.94	211.88	302.54	238.04	305.53	1,020
Rehabilitation	234.51	236.42	64.81	7.04	1.67	13.70	8.13	15.62	148.70	731
Reconstruction	238.10	408.79	433.14	370.24	409.20	295.07	1,034.80	1,053.52	116.06	4,417
New Construction	385.65	354.70	359.63	264.79	341.53	206.84	219.63	126.72	40.82	2,300
Subtotal	**1,183.8**	**1,311.6**	**1,092.6**	**835.6**	**926.3**	**727.5**	**1,565.1**	**1,433.9**	**611.1**	**10,401**

IDOT's Implementation of the Recommended Investment Strategies

Once the amount of funding for pavement and bridges is determined, the Office of Planning and Programming works with the Districts to develop Annual and Multi-Year Programs that reflect the planned investments. Funding was allocated to the Districts based on 11 criteria, including truck percentages, backlog and accruing backlog miles, backlog bridges, congestion, and safety. Historically, the allocation formulas resulted in approximately 45 percent of the available funds being allocated to District 1.

To assist with the development of the Multi-Year Program, the nine highway districts were issued funding targets and technical guidance to use in developing, prioritizing, and submitting projects. For example, Districts were instructed by the Office of Planning and Programming to use at least 5 percent of their unrestricted funds on bridge and pavement preservation, although they still retained considerable flexibility in how those funds would actually be used. Districts were also provided with the number of pavement miles or square feet of bridges that needed to be addressed to meet the statewide targets in place at that time. In addition, the Districts were told which system to prioritize, based on systemwide conditions. However, the implementation of the guidance was not applied consistently among the Districts and the funding provided was generally inadequate to achieve the intended targets.

In the past year, the Office of Planning and Programming began modifying the process used to develop the Multi-Year Program by conducting a more focused review of the Districts' recommendations. Using spreadsheet tools, the Office of Planning and Programming ran analyses based on the recommendations and worked with the Districts to make necessary changes.

RAISING the BAR

The Office of Planning and Programming is **Raising the Bar** with its plan to use improved analysis tools to ensure investments focus on high-priority objectives

As the TAMP was being developed, further changes to the Multi-Year Program process were initiated that will further improve IDOT's asset management procedures. For instance, the spreadsheet tool that was described in the life cycle planning chapter and used to generate the recommended investment strategies, will be used by the Office of Planning and Programming during the development of the next Multi-Year Program to identify a more balanced approach to asset management that follows the investment strategies recommended on a statewide basis. This increased involvement by the Office of Planning and Programming in the program development process is expected to help IDOT focus investments on high-priority objectives, such as reducing agency risks. In addition, it will help to ensure that the Statewide Transportation Improvement Program (STIP) is consistent with the TAMP recommendations.

Under the new approach to system preservation, CRS and element level bridge data will be linked to improved guidance on treatment selection that has been developed for both pavements and bridges. This improved guidance shifts the emphasis from addressing mostly Backlog conditions to the use of planned maintenance and preservation strategies to keep pavements and bridges in serviceable condition for as long as possible. New pavement and bridge management programs are also being planned to further assist in project and treatment selection.

A summary of the steps that will be taken to develop the Multi-Year Program is shown in figure 6-4. It establishes the important link between available revenues, system needs, and performance targets that help to ensure that investment decisions are aligned on a statewide basis to achieve desired conditions. IDOT will continue to improve this process over the next several years to further strengthen these important links.

Figure 6-4. IDOT's process for developing its FY 2019-2024 MYP.

Chapter 7: Performance Gap Analysis

Overview

While construction and maintenance costs continue to rise, IDOT faces flat or declining revenues, in part due to the effects of the reduction in vehicle miles traveled and improved vehicle fuel efficiency on fuel taxes. Because revenue has not kept pace with system needs, Illinois has become reliant on a series of capital bills approximately every ten years to improve infrastructure.

Recognizing the reality of inadequate funding, the Office of Planning and Programming initiated changes to the project identification and selection process to control costs and extend the useful lives of existing transportation assets. The result will lead to a gradual shift in the way projects are programmed, moving away from the historical focus on Backlog and Accruing needs to a life cycle approach that includes strategic investments in preserving system conditions, delaying the need for rehabilitation, and extending the service life. As part of the shift in approaches, the Office of Planning and Programming worked with the Bureau of Research, the Bureau of Design and Environment, the Bureau of Bridges and Structures, and the Districts to develop improved guidance for project and treatment selection based on pavement survey and bridge inspection results that was piloted during the development of the FY 2019-2024 MYP.

Although the planned changes are expected to enable IDOT to achieve most of its pavement and bridge condition targets, the desired conditions on the Non-NHS Marked and Non-NHS Unmarked Routes are not projected to be met by the end of the analysis period in FY 2027. This chapter discusses the expected performance gap and the funding needed to eliminate the gap.

IDOT is ... RAISING the BAR

by setting Desired Acceptable Conditions at the level where preservation treatments are viable.

Desired Acceptable Conditions

As discussed in chapter 3, IDOT established new pavement performance metrics beginning in 2017 to shift the focus from Backlog needs to a more proactive approach that recognizes the importance of preservation activities before assets deteriorate to a Backlog condition. For pavements, the new approach uses CRS values to determine the percentage of the highway system in a Desired Acceptable Condition of 5.5 or higher for Interstate pavements and 5.0 for all other systems. These CRS values were selected because they represent the lowest condition at which preservation treatments are considered viable.

IDOT is ... RAISING the BAR

by establishing new Desired Acceptable Conditions for Pavements

- Interstates: 90 percent of the network with a CRS ≥ 5.5
- Other NHS routes: 90 percent of the network with a CRS ≥ 5.0
- Marked routes: 75 percent of the network with a CRS ≥ 5.0
- Unmarked routes: 50 percent of the network with a CRS > 5.0

IDOT is ... RAISING the BAR

by establishing new Desired Acceptable Conditions for Bridges

- Interstate and all other NHS bridges: 93 percent at or above an NBI rating of 5
- All other bridges: 90 percent at or above an NBI rating of 5

Using current and predicted CRS values in conjunction with anticipated funding levels, the initial targets listed on the previous page were established for pavements.

For bridges, the performance metric also changed and the definition for Desired Acceptable Conditions was set at an NBI element rating of 5 or better, representing a bridge element that could be preserved using proactive maintenance or preservation treatments. The initial targets established for bridge conditions are listed to the left.

Performance Gaps

As discussed in chapter 6, the planned investment strategies were developed to help IDOT achieve the Desired Acceptable Conditions for its pavement and bridge networks. Unfortunately, funding is not sufficient to achieve the desired conditions on all systems, so there are gaps between the desired and actual conditions in some instances. For pavements, funding is adequate to achieve the Desired Acceptable Conditions for both the Interstate and Illinois Tollways; however, a performance gap exists for the remainder of the pavement network. For bridges, all of the NHS bridges meet or exceed the Desired Acceptable Conditions, but the non-NHS bridges do not. Figure 7-1 illustrates the performance gap for pavements and figure 7-2 presents the performance gap for bridges.

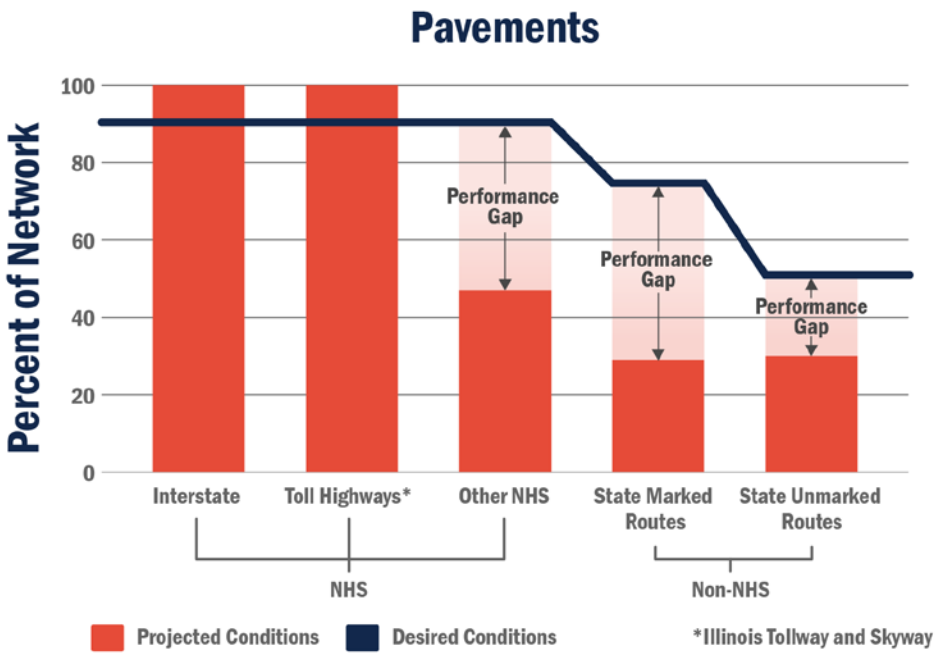


Figure 7-1. Pavement performance gap.

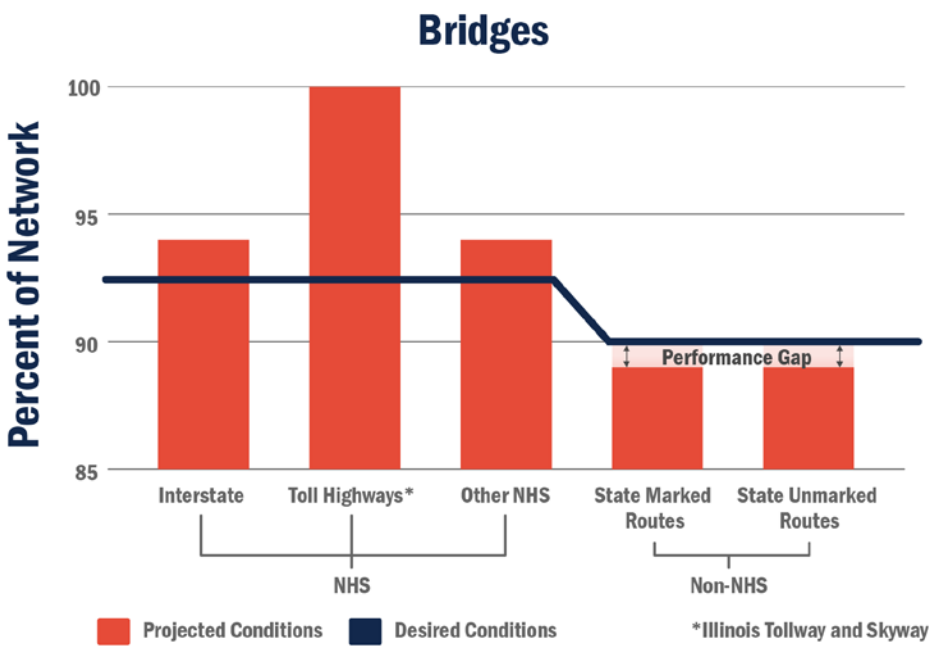


Figure 7-2. Bridge performance gap.

An analysis was conducted to determine the additional funding that would be needed to eliminate both the pavement and bridge performance gap by the year 2027. This analysis estimated that, for pavements, an additional 2,499 Other NHS miles, 2,931 miles of Marked Routes, and 458 miles of Unmarked Routes would have to be addressed over the 10-year period. Using the same preservation strategy recommended in this TAMP, that would require additional funding of $6.56 billion over the 10-year period. This includes $2.704 billion on the Other NHS pavements, $3.562 billion on the Marked Routes, and $0.293 billion on the Unmarked Routes.

The same type of analysis was conducted for bridges. The analysis found that an additional 78,222 square feet of bridges on Marked Routes and 221,879 square feet of bridges on Unmarked Routes would have to be addressed to meet the desired conditions. The cost of repairing these additional bridges, using the same preservation strategy recommended in the TAMP, is estimated to be $66 million over the 10-year period. This includes $17.4 million for Marked Route bridges and $48.9 million for Unmarked Route bridges. The $66 million performance gap for bridges is considered to be a conservative estimate of funding needs due to the following factors that may not have been adequately considered in the investment analysis:

- A large percentage of the bridge inventory is made up of major bridges, which are typically those 1,000 feet and longer. These bridges typically have much higher rehabilitation and reconstruction costs than the rest of the bridge inventory.

- As discussed in chapter 3, a large portion of IDOT's bridge inventory was built between the 1950s to 1970s. The lack of adequate investment in bridges over the past years is accelerating the rate at which these bridges deteriorate, which may require earlier intervention than assumed in the model.

For the development of its next TAMP, IDOT will refine its investment analysis tools to better consider thes factors in its asset management planning activities.

Federal Performance Targets and Minimum Condition Requirements for the NHS

In addition to the metrics that IDOT uses to manage its pavements and bridges, the FHWA has established performance measures for pavements and bridges. For pavements, IDOT is currently in the process of modifying its pavement condition survey reporting procedure for the NHS to be able to meet the requirements. The bridge inspection procedures already collect the information required for federal reporting. IDOT's next TAMP is expected to include two-year and four-year targets for the NHS that meet the federal requirements.

The legislation also introduced minimum condition requirements for Interstate and NHS bridge deck area. The legislation requires that no more than 5 percent of the Interstate miles be in Poor condition using definitions provided by FHWA (which differ from the CRS). For bridges, no more than 10 percent of the NHS bridge deck area can be classified as Structurally Deficient (SD) in accordance with the NBI definitions.

For pavements, the Department is confident that no more than 5 percent of the Interstate miles will be classified as being in *Poor* condition using the federal performance measures. Although IDOT uses different reporting methods to analyze the pavement condition, the Department has been collecting the necessary performance data for several years and is in the process of developing analysis methods based on the federal performance measure criteria. Furthermore, the investment analysis tool used to develop the 10-year investment strategies based on CRS indicates that none of the Interstate system will be in Poor condition by 2027.

For bridges, the investment analysis predicts that 5.7 percent of the NHS bridge deck area is projected to be in *Poor* condition at the end of the 10-year analysis period. This is within the minimum performance requirements established by the federal government. Therefore, IDOT does not expect to exceed the minimum condition requirement for bridges during the analysis period.

Strategies to Address the Gaps

Without additional funding, IDOT recognizes that it would be difficult to eliminate the pavement and bridge performance gaps discussed in this chapter. Therefore, it will be important for IDOT to be strategic in making sure that available funds are used as wisely as possible. The new project and treatment selection process that is described in this TAMP will help to ensure that pavement and bridge lives are extended as much as possible using preservation strategies, which will slow the overall rate of deterioration. This process, in conjunction with the availability of improved guidance for the Districts to ensure the right treatments are being used, is expected to go a long way towards improving pavement and bridge conditions in the State, even without new revenue sources. At the same time, IDOT will work with elected officials and other stakeholders to look for opportunities to increase the amount of funding available for pavement and bridge preservation so that desired conditions can be achieved.

Chapter 8: Planned Enhancements

Overview

As described in this TAMP, IDOT is committed to ensuring the success of its asset management initiatives as a way to improve system conditions while managing the network through strategic, cost-effective improvements. IDOT recognizes that asset management is not a static process; rather, it requires continual evaluation of the process in order to identify possible changes that could be made to agency policies and practices that will help improve efficiency, reduce risks, and address agency priorities. This chapter outlines the framework that IDOT has established to support asset management and the planned enhancements that will be implemented within the next several years to further enhance IDOT's asset management practices.

Asset Management Framework

IDOT's Asset Management program resides in the Bureau of Programming within the Office of Planning and Programming. It is championed by the Secretary of Transportation, directed by a Steering Committee, and supported by an Asset Management Project Management Team and Technical Work Groups.

The development of the TAMP and IDOT's implementation of asset management practices is guided by a Steering Committee made up of representatives at the executive management level. The Steering Committee is expected to remain active as IDOT transitions from its historical focus on Backlog conditions to the new life cycle strategy presented in this TAMP. IDOT considers the next few years to be critical in terms of adopting the new strategy and the support provided at the executive level is critically important to the agency's success at making this transition. The Asset Management Project Management Team will report to the Steering Committee on a regular basis and provide updates on actual versus planned progress towards the enhancements described later in this chapter.

The Project Management Team and the various Technical Working Groups that were created to support the development of the TAMP are expected to remain in place, although they may occasionally be dormant until they are needed to address activities identified by the Steering Committee. Membership in these groups is expected to change to account for job changes that may occur over the next few years.

Once this initial TAMP is certified by the FHWA, the Office of Planning and Programming intends to hire a permanent Asset Management Lead who will be

responsible for reporting to the Steering Committee on a regular basis, coordinating the efforts of the Project Management Team and the Technical Work Groups, and updating the TAMP at least every four years. The appointment is expected to be made during the 2018 calendar year so the individual in this position can lead the development of the fully-compliant TAMP in 2019.

Planned Enhancements

There are several specific enhancements that IDOT will make to existing business processes and analysis tools within the next several years to meet federal requirements and improve IDOT's ability to effectively manage its pavements and bridges. The most significant of these enhancements are detailed below.

Acquisition and Implementation of Improved Analysis Tools

IDOT recognizes that it currently does not have pavement and bridge management systems that meet the minimum requirements outlined by the federal requirements. Therefore, one of the most important enhancements that will occur is the acquisition and implementation of a new Enterprise Asset Management System (EAMS) that contains software that will give IDOT the ability to evaluate the long-term impacts and cost-effectiveness of different pavement and bridge treatment strategies. The Office of Planning and Programming is responsible for the EAMS implementation and has approved the following proposed timeline for its completion:

- Develop a draft Request for Proposals (RFP) for review by June 1, 2018.
- Submit the final RFP to Business Services by July 2, 2018.
- Advertise the RFP by September 29, 2018.
- Select the vendor and have a contract in place by April 30, 2019.

Once the contract is in place with the selected vendor, the Office of Planning and Programming will establish an implementation timeline that accelerates, as much as possible, the availability of the new analysis tools to support the development of future MYPs and TAMPs.

During the implementation of the software, the Bureau of Bridges and Structures will work with the selected vendor to identify critical data elements and develop bridge deterioration models that enable IDOT to predict changes in bridge element conditions over time. IDOT currently anticipates that its existing pavement deterioration models will be input directly into the pavement management software. Crucial pavement data elements for the EAMS will be coordinated between the Bureau of Programming and the Bureau of Research.

Development of Improved Project and Treatment Selection Guidance

IDOT has made significant progress towards the development of changes to the guidance available to Districts to help them select projects and treatments. General guidance for the category of repair associated with each CRS and NBI rating was established during the development of the investment spreadsheet described earlier in the TAMP. In addition, the Pavement Technical Working Group has been working with other stakeholders to provide more specific guidance for pavement treatment selection using characteristics such as traffic levels, distress types, amount of rutting, and percent of area patched. These selection criteria are being finalized and will be programmed into the pavement management software in 2019.

The Bridge Technical Working Group is also working to enhance the guidance provided to the Districts to select bridge improvements. The Bridge office will continue to review projects recommended by the Districts to ensure that statewide bridge targets are met. The final guidance will be input into the new EAMS in 2019 and used to evaluate future investment decisions.

In addition to finalizing the project and treatment selection guidance, the Office of Planning and Programming will work with the Districts to establish new accountability criteria that can be used to drive District investment decisions and to help ensure that IDOT's statewide strategies are being followed. The Office of Planning and Programming will also evaluate whether changes are needed to the current process for distributing funds to the Districts to better support the proposed investment strategies.

Finally, the Office of Planning and Programming will be responsible for evaluating the results of the new strategy on an annual basis so that the benefits, if realized, can then be used to further convince those who are affected to make the necessary changes.

District Training

The Districts have a significant role in the successful implementation of the planned investment strategies due to their responsibilities for identifying and recommending projects and appropriate treatments. The investment strategies presented in this TAMP represent a significant change in the approach IDOT uses for programming projects, which is being presented to the Districts through training that addresses the reasons for the changes and how the new guidance will be implemented. This training will continue over the next several years.

The initial use of the new guidelines is being tested by the Office of Planning and Programming during the development of the FY 2019-2024 MYP, and the lessons learned will be used to finalize the selection criteria and issue formal guidance documents to the Districts. At that time, the Office of Planning and Programming will coordinate with the Districts regularly to ensure that the guidelines are being followed.

Modifications to Pavement Performance Measures for Federal Reporting

As noted in the TAMP, specific pavement performance measures have been established by the FHWA for reporting pavement conditions on the NHS. These performance measures differ from the historical CRS condition surveys that IDOT has been conducting. Therefore, changes are needed to the way pavement condition information is processed to meet the federal reporting requirements.

IDOT initiated the necessary changes with its data collection vendor during the FY 2017 data collection process. The resulting data is currently under review. Once the data is considered acceptable, IDOT will report the information as required to the FHWA.

IDOT is also required to develop two-year and four-year pavement performance targets using the federal performance measures. IDOT will explore the feasibility of developing correlations between its CRS ratings and the federal metrics since the agency currently has no tools capable of predicting pavement conditions using the federal measures. IDOT will work with its FHWA Division Office to develop an acceptable approach to satisfy the federal requirements in this area.

Improved Coordination with Local and Regional Transportation Partners

IDOT currently complies with federal requirements to provide information on the NHS, regardless of whether the assets are managed by the State or by local partners. IDOT has been able to satisfy this requirement because of its decision to collect asset condition data for the entire NHS. However, IDOT recognizes the importance of working with its local and regional transportation partners to help ensure that all federal funds are used effectively to meet short- and long-term performance targets. The coordination efforts will be the responsibility of the Office of Planning and Programming.

IDOT is working with the Chicago Metropolitan Agency for Planning (CMAP) to conduct a pilot program where CMAP will provide technical assistance to MPO municipalities in collecting, storing, and analyzing asset conditions. This

will assist CMAP in planning for improvements, prioritizing funding, and setting targets.

Consideration of Repetitive Damage in Project Programming

As noted in chapter 5, State DOTs are required to establish processes to consider alternate treatment strategies on NHS assets that have been damaged two or more times due to emergency events declared by the Governor or the U.S. President. IDOT has established a process that will collect, compile, and track the required information and will incorporate a review of emergency repairs into Program Development's Programming and Planning processes beginning with the FY 2020-2025 MYP. The process requires the completion of the following activities:

- The Bureau of Operations will provide a process to collect, record, and store emergency event activities that is available during FY 2019.
- IDOT GIS staff will compile and store the data in a GIS application.
- The District Offices will add a repetitive damage assessment review during Phase I development and the review will be documented in the Phase I Study beginning with the FY 2020-2025 MYP.
- The Bureau of Operations will provide guidance to District personnel on the necessary changes to recording information related to emergency events on NHS pavements and bridges. The guidelines will be provided during FY 2019.

Moving Forward

As documented in this TAMP, IDOT has made a strong commitment to *Raising the Bar* through improved asset management practices that make use of new performance metrics to emphasize the importance of preservation treatments, enhanced analytical tools to predict funding needs, stronger guidance to support project and treatment selection, and improved coordination with regional transportation partners. These efforts will continue as IDOT prepares to meet the next TAMP deadline and moves forward with its new project and treatment selection procedures to enable the Department to achieve the goals set forth over the coming decade.

With On-Going Enhancements to Support Performance-Based Decisions:

- ☑ New project selection process to evaluate the benefits of expansion and congestion mitigation projects
- ☑ Acquisition of pavement and bridge analysis tools to evaluate investment options
- ☑ Increased investments in pavement and bridge preservation to extend service life

Illinois Department of Transportation

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