MOTT MACDONALD

Bridging the data gap

The enhancement and development of systems and processes to manage condition and treatments helped optimise transportation investment strategies for West Virginia's state pavement and bridge assets

Project
West Virginia Transportation Asset Management Plan (TAMP)

Location
West Virginia, USA

Client
West Virginia Division of Highways

Expertise
Asset management

The road to improvement

The West Virginia Division of Highways wanted to use data to manage its assets better

The West Virginia Division of Highways (WVDOH) is responsible for planning, engineering, right-of-ways acquisition, construction, reconstruction, traffic regulation and maintenance of more than 35,000 miles of state roads. As one of a handful of states that manages its secondary (county) roads as well as major highways, West Virginia has a large amount of road assets to maintain for a relatively small state, and must therefore spend its limited budgets wisely.

The Federal Highway Administration (FHWA) Moving Ahead for Progress in the 21st Century (MAP-21) and Fixing America's Surface Transportation (FAST) Act legislation requires all state transportation departments to develop,

implement and make public a risk-based Transportation Asset Management Plan (TAMP) which applies to all road surfaces and bridges on the National Highway System (NHS).
The plan must include a summary listing of all assets covered, with objectives, performance measures, the ability to forecast bridge and pavement conditions, a risk analysis, a 10-year financial plan and investment strategies. When it set out to publish its first-ever TAMP in 2019, West Virginia had a pavement management system (PMS) which analysed the condition of its roads, but no equivalent system for its bridges.

The state has 1294 bridges and 3451 miles of roads within the NHS, which account for

the majority of investment and would be the focus of its first TAMP, but there was also an expectation that more assets would be included in these plans in future years. The department wanted to put in place an integrated, risk-based system and processes that would use asset data to help calculate where investment is most needed, prioritise interventions, and maximise asset life and lifecycle cost for the taxpayer dollars it spends each year.

To help it deliver its TAMP to a high standard and develop leading-edge asset management practices for the future, WVDOH turned to Mott MacDonald, and its partners The Kercher Group and Deighton.

In the National Highway System in West Virginia there are...

1294

bridges and

3451

miles of roads

Intelligent analysis

Historical data was used to forecast asset condition and deterioration

The existing PMS, the Deighton Infrastructure Management System (dTIMS) which contained around 10 years of historical data of pavement conditions in the state, was enhanced to meet the updated requirements of the TAMP. Roads are classified as good, fair or poor based on a physical inspection, and are given an associated numerical score called a condition rating (CR), with lower scores given to those assets with increased evidence of damage or wear in categories of roughness, cracking and rutting. Two of the three categories must register a CR of 4 or below for the entire asset to be considered poor condition.

The project added a finer level of detail to this system, so that every 0.1-mile section of NHS road was given its own condition rating as required by FHWA. The project team also created a new bridge management system (BMS) which works on similar principles, leveraging inspections and calculating CRs based on three bridge categories: deck, superstructure and substructure. For bridges, only one category rated a CR of 4 or below triggers the bridge to be considered as poor/structurally deficient. Structurally deficient does not imply impending structural failure, but categorises the asset as one that should be prioritised for some type of treatment to improve its relative CR.

In both systems, software was built in that would use historical data to analyse the risk that any road surface or bridge would deteriorate and become 'poor'. Where individual assets have not been inspected recently, the scores will be updated to build in the assumed rate of deterioration, although this can be overridden when the next physical inspection does take place.

The risk analysis is then combined with information about the cost of possible treatments to improve the condition of the bridge or road surface, to allow a prioritised list of interventions to be produced showing which of them will have the greatest impact for the money spent. Where the department is already committed to a particular project, that can be preloaded into the analysis so that only potential interventions where flexibility exists are considered.

The department can use this prioritised list to model the effect of varying its maintenance budget. There are federal penalties associated with having more than 5% of NHS roads classified as 'poor' and with having more than 10% of NHS bridges classified as 'structurally deficient'. Using the output of the new asset management systems, WVDOH is able to compare the likely effect of extra spending with the likely penalties if money is not spent, and budget accordingly.

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Enhanced decision-making

The approach has given WVDOH the insight it needs to invest with confidence

Using the new systems and the analysis they provide, our team was able to develop investment strategies for WVDOH and make a recommendation for a $50M increase in annual bridge funding above baseline budget forecasts, which was approved by the West Virginia Department of Transportation.

This additional investment is needed to mitigate a negative trend line from the number of bridges expected to fall into poor condition beginning in 2024. The department expects the extra spending to reverse this negative trend and it will then set targets to continue to bring down the percentage over time to approach the FHWA's 10% figure.

The project will enhance decision-making, particularly by informing the contents of the State Transportation Improvement Program (STIP), and the systems and processes used are likely to be applied to more roads and assets in future.

The final TAMP, which included all the components required by federal regulations, was completed on budget, within a compressed time schedule, and received final approval from the FHWA in August 2019. Through this project, West Virginia is one of just a few states that currently has the ability to perform this level of detailed analysis required to accurately support the development of investment strategies. It will allow WVDOH to make data-driven decisions to better manage their bridges and pavements for years to come.
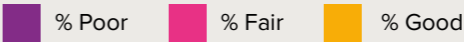
Key

■ % Poor   ■ % Fair   ■ % Good

Figure 1: Projected FHWA condition metrics for baseline funding on NHS bridges

Figure 2: Projected FHWA condition metrics for baseline with increased funding from 2024 on NHS bridges

Opening opportunities
with connected thinking.