ILLINOIS
EXPLORING BRIDGE BUNDLING

BRIDGE BUNDLING
WHITE PAPER

The safety, reliability and efficiency of a state's transportation system is of critical importance to its economy and resident's quality of life. These multimodal systems are vast and made up of roadways, rail-lines, airports, waterways, and transit networks. These modes are interconnected and often rely on each other at some point; likewise each has its own advantages and disadvantages. Roadway networks are one of the most widely used networks within a state's transportation system, residents uses it daily whether they think about it or not. A state's roadway network enables it to grow its economy and provides individuals the freedom of movement to access services that enhance their quality of life.

Bridges are a key component of a roadway network, allowing roadways to continue where an obstacle such as a railroad or river would end its path. However, bridges require continued maintenance and preservation to be safe, reliable, and efficient. This white paper will outline the importance of bridges within a state's transportation network and show how states have used the bridge bundling project delivery concept, or simply "bridge bundling", to repair and replace a greater number of bridges.

This white paper is being developed by WSP USA (WSP) as part of the Illinois' Exploring Bridge Bundling initiative which is being brought forward by the Illinois Soybean Association (ISA). Since February of 2020, WSP and ISA have been working together on exploring the bridge bundling project delivery concept and how it could be realized to improve Illinois' bridge infrastructure. A group of several dozen dedicated statewide stakeholders have regularly met for educational webinars to discuss the concept. The webinars have included DOT officials from other states who have implemented, or are in the process of implementing, bridge bundling programs within their states. Likewise, members of USDA and USDOT's Build America Bureau have presented on alternative financing options. Additionally, WSP has held numerous one-on-one interviews with state peer DOT officials, as well as with contractors who participated in those programs. This white paper outlines the information gathered over the course of the year.

IMPORTANCE OF ROADWAY NETWORK

The nation's roadway network is the backbone of the economy. Freight movement on the network moves the grain that feeds our families, the construction materials to build cities, and the packages ordered online. According to the United States Department of Transportation's Freight Analysis Framework Version 4 (FAF4), in 2018, 18.6 million KTons was moved to, from, or within the nation valued at $18.9 trillion. The majority of this freight movement happened on the nation's roadway network, 11.9 million KTons or 64% of the total freight moved, valued at 12.9 trillion dollars or 69% of the total value of freight moved happened on the roadway network.[1] The roadway network enables this great amount of commerce throughout the nation.

The vast amount of freight moved on the roadways puts enormous stress on the network, which require continued maintenance and preservation. Bridges are a key component of the roadway network which if not maintained properly put the entire network at risk, specifically at a regional and local level.. According to the Federal Highway Administration's National Bridge Inventory, in 2019, there were a total of 614,735 bridges within the United States and the District of Columbia, of which 279,155 or 45% are in good condition, 289,709 or 47% are in fair condition and 45,871 or 7% are in poor condition.[2] The maintenance and preservation of these bridges is critical to keeping the roadway network safe, reliable and efficient.

The states and the local jurisdictions are responsible for the upkeep of bridges they own. If a bridge is deemed unsafe or nearing being unsafe there are several steps that may be undertaken to ensure the safety of motorists including but not limited to a weight restriction being added to a bridge or the complete closure of a bridge. If these actions were to happen freight may have to detour many miles increasing the cost of shipping. Likewise, if a bridge were to be closed, residents could be required

1 Total Flows 2018, FAF 4: https://faf.ornl.gov/fafweb/Extraction1.aspx
2 https://www.fhwa.dot.gov/bridge/britab.cfm

to make a detour which adds many miles to a routine trip, and could even be life threatening when the detour affects first responders. These are just a few of the reasons why maintaining bridges is of critical importance. States and local jurisdictions should look at every avenue as they fund and finance the maintenance or replacement of bridges. One tool available to assist states and local jurisdictions is bridge bundling.

WHAT IS BRIDGE BUNDLING?

Bridge bundling is the project delivery concept used by many states and local jurisdictions throughout the nation which takes advantage of an "economy of scale" by issuing a single contract for the replacement, rehabilitation, or repair of multiple bridges. While bridge bundling doesn't mean that every bridge is repaired or replaced, it does allow for a significant number of bridges to be fixed quicker and less expensively than through traditional methods. Likewise, it is important to note there is no one-size-fits-all solution as it pertains to bridge bundling. Each state and jurisdiction approaches the concept differently depending on the characteristics of its state/community and its end goal.

BRIDGE BUNDLING PROGRAMS IN PRACTICE

As previously stated, there is no one-size-fits-all solution as it pertains to bridge bundling. During the exploration of bridge bundling project delivery concept, WSP interviewed DOT officials from several states that have administered a statewide bridge bundling program, including Ohio, Kentucky, and Missouri. There were many similarities and differences on how each state approached developing and administering its bridge bundling program. Below are the highlights of each state's bridge bundling program.

OHIO

In 2013, the Ohio Department of Transportation (ODOT) implemented the Ohio Bridge Partnership Program (OBPP), a bridge bundling program which assisted in expediting the repair or replacement of bridges within the state. The roadway network is vitally important to Ohio's economy, in 2018, 74% of total freight (tonnage) movement to, from, or within Ohio was attributed to being moved by truck.[3] Ohio is substantially more reliant on its roadway network for freight movement as compared to the nation of which 64% of the total freight movement was by truck. Additionally, in 2013 when the OBPP was implemented the state had over 27 thousand bridges of which 52% were in good condition and 47% were in either fair or poor condition.[4]

The OBPP invested $120 million to repair or replace more than 200 county and city owned bridges over three years. The goals of the program were to address immediate needs, identify quick and effective solutions, and to keep the program simple in nature. By the end of the program, ODOT was able to fund the repair or replacement of 228 bridges throughout the state. The program was comprehensive and was developed with the input of many stakeholders across the state.

$120 Million
in funding

In the onset of developing the program, ODOT held many consultations with peer states and statewide stakeholders to gain their input, knowledge, and expertise. One of the first steps ODOT took was reaching out to Pennsylvania DOT (PennDOT). PennDOT had just implemented its own bridge bundling program in the prior years. The consultations with PennDOT helped ODOT learn from the flaws and successes of PennDOT's program. Likewise, ODOT sought input from statewide stakeholders including but not limited to the Ohio General Assembly, Ohio municipalities, the County Engineer's Association of Ohio, Ohio Contractors Association, American Council of Engineering Companies of Ohio and Ohio's metropolitan planning organizations. Due in part to these consultations the OBPP was developed with the needs of state stakeholders in mind.

Through the program development process, ODOT composed a list of 900 locally owned bridges that needed repair or replacement and ranked them in order from worst to least bad. The ranking was done by the creation of an equation which strongly focused on condition. During this process ODOT selected the 228 bridges that would be addressed. The selection process did not take any consideration of "spreading the wealth" which would have meant each county receiving a certain amount of bridges. This did cause some pushback, especially among elected officials who felt as though counties who did not take care of their bridges were being rewarded. The Ohio County Engineers Association agreed with ODOT on their approach from an engineering standpoint, but did say in retrospect they would have advocated for a limit on how many bridges each county could receive to alleviate some of the pushback.

228 bridges

3 Ohio Total Flows 2018, FAF 4: https://faf.ornl.gov/fafweb/Extraction1.aspx
4 FHWA National Bridge Inventory: https://www.fhwa.dot.gov/bridge/britab.cfm

ODOT took advantage of innovative financing techniques to fund the program. The original program with the 228 bridges was completely financed by ODOT; however, following the initial 228 bridges, ODOT continued the OBPP, with a required local match. ODOT financed the program using Federal GARVEE Bonds which are slated to be repaid within 10 years, and for the local match ODOT utilized toll credits.

The key aspect of the program was the means by which ODOT bundled the bridges. The bundled bridge projects were small in nature so as to not exclude any contractors from the bidding process. The smallest bundle consisted of just one bridge, while the largest bundle was six bridges. The average cost of a bridge project within the bundle in phase 1 of the program was $2.1 million. It is important to note that all the bridges within the program were design-build. When selecting the bridges in the bundle, ODOT took the following approach: keep bridges in bundles in close-proximity and with similar repair and construction needs. By bundling bridges in this manner benefits were realized by both the state and contractors, ultimately reducing costs for both parties.

KENTUCKY

In early 2018, the Kentucky Transportation Cabinet (KYTC) announced the Bridging Kentucky Program, a statewide bridge program that assisted in expediting the repair or replacement of bridges throughout the Commonwealth. The roadway network is vitally important to the Commonwealth of Kentucky's economy — in 2018, 58% of total freight (tonnage) movements to, from, or within Kentucky was attributed to truck movement.[5] In 2018, the Federal Highway Administration (FHWA) noted that 9,127 bridges, or 64% of the Commonwealth's total number of bridges, were in either fair or poor condition.[6]

The Bridging Kentucky Program was a priority initiative of KYTC, which committed to addressing bridges throughout the Commonwealth that were in poor condition according to FHWA inspection standards or had posted weight limits. KYTC had a relatively simple approach to developing a list of bridges that could be included in the program. The assessment of bridges which were in poor condition or had posted weight limits resulted in a list of more than 1,100 of Kentucky's more than 14,000 inventoried bridges. The list excluded major structures such as interstate bridges and large river crossings as well as bridges that were part of significant roadway projects.

For Kentucky's 2019-2020 biennium, the Kentucky General Assembly provided funding to address deficiencies of approximately 340 bridges. Those bridges were made priority projects for the program. Additionally, KYTC's utilized cost savings during the first biennium to advance 120 more bridge restoration projects from among the list of deficient bridges. To date, more than 400 projects have been awarded for construction and 250 projects have been substantially completed, as of the January 2021.

This bridge asset-management program is an enormous undertaking to address and remains a priority for KYTC. To meet the aggressive schedule, the KYTC brought on board a general engineering consultant (GEC) to assist in the program. The GEC was made up of 21 total firms and was tasked to assist the KYTC with a wide variety of tasks, including but not limited to bridge design, right-of-way acquisition, environmental issues, and public and stakeholder communications. The GEC worked in partnership with KYTC staff to conduct these tasks, it is important to note that the program for the most part is led by KYTC's central office and delivered by the GEC. Additionally, KYTC created design standards which could be applied and adjusted to a majority of the bridges within the program. Likewise, the KYTC did not rule out the design-build approach and did utilize it for some bridge bundles.

The program was funded by KYTC through the General Transportation Fund and did not require local match. This was an important factor because in Kentucky, while the Commonwealth is responsible for inspecting all bridges, the counties are responsible for the repair or replacement of their bridges. Approximately 60% of the bridges within the program were owned by counties or municipal governments. By not requiring a local match, many of the bridges included in the program likely would not have been delivered if a local match were required, due to revenue constraints at the local level.

Prior to letting any bridge bundles, KYTC held five meetings across the Commonwealth with contractors to inform KYTC about the program and gain their input. This allowed KYTC to understand the volume of bridges industry could handle. It was also an opportunity to go over the types of bundles which would be within the program. KYTC's goal was not

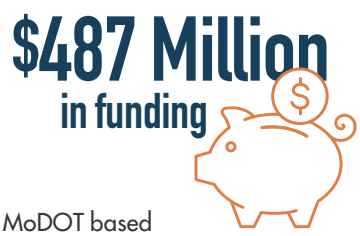
5 Ohio Total Flows 2018, FAF 4: https://faf.ornl.gov/fafweb/Extraction1.aspx
6 FHWA National Bridge Inventory: https://www.fhwa.dot.gov/bridge/britab.cfm

to exclude any contractors from the program due to the size of bridge bundles. Due to that fact, KYTC made available several bundle sizes, with the smaller bundles consisting of two to three bridges, while the largest bundle included more than 100 bridges. The 100+ bridge bundle was also let as a design-build project. Overall, when developing bundles KYTC tried to keep bridges within the bundles close in proximity and design. For example, multiple bridge replacements in the same region of the state with similar scopes were bundled together to create efficiencies for contractors. KYTC also bundled or batched preconstruction activities such as utility and railroad coordination and environmental permitting. These were some of the means by which KYTC was able to allow for greater efficiencies when delivering a large number of bridges.

MISSOURI

In 2009, the Missouri Department of Transportation (MoDOT) implemented the Missouri Safe and Sound Bridge Improvement Program which assisted the repair or replacement of bridges within the state in three years. The roadway network within Missouri is important to the state with 76% of all freight (tonnage) movement to, from, or within in the state being done via truck (2018).[7] Missouri has a large inventory of bridges, in 2009 when the program began there were over 24,000bridges across the state with 12,538, or 54% being in either fair or poor condition according to FHWA inspection standards.[8]

The Safe and Sound Bridge Improvement Program was initiated in 2009 and repaired or replaced 802 MoDOT-owned bridges across the state within three years (with at least one bridge being repaired or replaced per county) at a total cost of $685 million. The goal of the program was not necessarily to save money, but to show the state legislature that MoDOT could repair or replace many bridges within three years, a relatively short timeframe.



The majority of the bridges in the program were part of one large bridge bundle which utilized design-build. This bundle included 554 bridges. The original intent of the bundle was for the consultant/contractor team to deliver the project. However, due to the large number of bridges and the short timeframe, the team realized it could not accomplish such an undertaking in the timeframe allotted. To still meet the three-year goal, the team conducted its own "mini-letting" hiring many local contractors to assist in the project. The remaining 248 bridges of the original 802 were bundled separately in smaller amounts by MoDOT based on bridge proximity and type of work.

Due in large part to the success of the Missouri Safe and Sound Bridge Improvement Program, MoDOT to this day utilizes the bridge bundling concept as appropriate. Today these bundles are much smaller than of the original program. Bridge bundles vary in size from two bridges to 20 bridges and the practice has been used throughout the state.

Over the more than decade MoDOT has been utilizing the concept its has learned along the way and has made improvements to its bridge bundling process. When developing bridge bundles today, MoDOT tries to keep bridges in a bundle within a small radius, roughly 30-miles. MoDOT also keep bridges within a bundle similar in type by avoiding including unique bridges in a bundle, even if they are close in proximity. This is because one unique bridge in the bundle can slow down the entire bundle. Additionally, MoDOT tries not to place multiple bundles on a letting that are in one geographical region, because they found it drives the prices up due to lack of competition.

CONTRACTOR EXPERIENCE

It was important for WSP to not only interview state DOTs that have implemented bridge bundling programs, but also the contractors who partook in those programs. Several one-on-one interviews were held with contractors to receive feedback on their experiences within the program. For the most part, most of the contracts echoed similar experiences and recommendations.

Contractors found it beneficial for bridges in bundles to be geographically located close to each other, due to the logistical benefits of having workers and equipment not having to travel long distances between bridge sites. It also helped with only having one foreman who could travel between bridges sites being worked on simultaneously. The contractors also stressed the importance of having similar types of bridges within a bundle, allowing for relatively seamless transition and efficiencies when working on multiple bridges.

7 Missouri Total Flows 2018, FAF 4: https://faf.ornl.gov/fafweb/Extraction1.aspx
8 FHWA National Bridge Inventory: https://www.fhwa.dot.gov/bridge/britab.cfm

While the contractors preferred smaller bridge bundles this was not a requirement. For example, one small contractor initially did not bid on bundles of 2-5 due to their unfamiliarity with the bridge bundling concept. However, after a couple of years the same contractor was bidding on bridge bundles of 20. Lastly, specifically for bundles being delivered via design-build, contractors stressed it was important to let those bundles in the winter as to allow for appropriate time for the prior to the spring and summer construction seasons. If design-build bundles were let in the spring the contractors felt like they did not have enough time to complete the bundle in that construction season.

CONCLUSION

The nation's transportation system is the lifeblood of the country. The driving force behind this system is the roadway network, which includes over 600,000 bridges nationwide, of which nearly 336,000 or 55% are in either fair or poor condition. The safety, reliability and efficiency of these bridges is critical to the network's success. Understanding this fact, many state DOTs stress the maintenance and preservation of bridges as much as they are able, while at the same time being constrained by limited funding. The bridge bundling project delivery concept can assist DOTs in fixing bridges quicker and less expensively as compared to one-off bridge projects. There is no one-size-fits-all solution when it comes to bridge bundling. This white paper outlined three examples of bridge bundling programs across the nation. However, each state must tailor their bridge bundling program to fit the constrains and needs of their own state.