IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of September 25, 2020

Regular Board Members Present

J. DeVries
T. Nicholson
R. Koester
A. Bradley
D. Sanders
W. Weiss
P. Geilenfeldt III
J. Fantz
B. Wilkinson
A. McGuire
T. Kenney
R. Knoche
W. Dotzler

Members with Representation

A. Abu-Hawash
W. Rabenberg
M. Rydl

Members with No Representation

Executive Secretary – V. Goetz

The meeting was held online via Microsoft Teams on September 25, 2020 at 9:00 a.m. by Chair Ron Knoche with an initial number of 14 voting members/alternates.

1. **Agenda review/modification**

2. **Minutes Approval form the June 26, 2020 meeting**

   Motion to Approve by R. Koester; J. DeVries
   Motion carried with 14 Aye, 0 Nay, 0 Abstaining

3. **Final Report: TR-715, *"Beam End Repair for Prestressed Concrete Beams"***, Behrouz Shafei, Iowa State University, $49,994 (15 min).

   http://publications.iowa.gov/id/eprint/33246

   Motion to Approve by A. Abu-Hawash; 2nd R. Koester
   Motion carried with 14 Aye, 0 Nay, 0 Abstaining

4. **Final Report: TR-754, *"Corn Based Deicers"*,** Ravi Yellavajjala, North Dakota State University, $49,991 (15 min).

   http://publications.iowa.gov/33802/

   Motion to Approve by R. Koester; 2nd P. Geilenfeldt III
   Motion carried with 14 Aye, 0 Nay, 0 Abstaining

Discussion
Q. Can you tell me the cost implications for doing this type of augmentation?
A. Cost depends on the purpose of what you are using. For corrosion you need to add one to three percentage, for deicing you need to add twenty-seven percentage and Ice melting you add thirteen percentage. You are looking at $200 to $300 per ton.

5. **Final Report: TR-756**, ***"Feasibility Study of 3D Printing of Concrete for Transportation Infrastructure"***, Kejin Wang, $49,991 (15 min).

   http://publications.iowa.gov/33802/

   Motion to Approve by T. Nicholson; 2nd T. Kinney
   Motion carried with 15 Aye, 0 Nay, 0 Abstaining

Member Left

6. **Final Report: TR-760**, ***"Reducing Uncertainties in Snow Fence Design: Development of Methods for Estimation of Snow Drifting and the Snow Relocation Coefficient"***, Corey Markfort, University of Iowa, $223,205 (15 min).

   http://publications.iowa.gov/33824/

   Motion to Approve by W. Dotzler; 2nd A. Bradley
   Motion carried with 14 Aye, 0 Nay, 0 Abstaining

Discussion
Q. How do you think this will affect the snow fence design for the Iowa DOT?
A. Before it was an assumption but now, we have evidence that this value is in the range, we now have confidence in these values.

7. **TR-790, Proposal: IHRB-181, *"Alternative Funding Approaches for Iowa Roads",*** Eric Rouse, HDR Engineering, $174,872.

   Background
   As a starting point, the literature review will build off the National Cooperative Highway Research Program (NCHRP) study "Transportation Governance and Finance: A 50-State Review of State Legislatures and Departments of Transportation".1 This report, completed in November 2016, provides a comprehensive, overview of how all 50 states and the District of Columbia govern and pay for their

transportation systems. Specifically, relevant to Alternative Funding Approaches for Iowa Roads, the report:

• Summarizes the institutional context for state-level transportation decision making;
• Explores how state legislatures and executive departments of transportation work together, and balance one another, in the development of transportation programs and policies;
• Examines the roles states play in local transportation funding;
• Provides extensive information about transportation funding and financing, including how transportation budgets and plans are developed, what revenue sources and finance mechanisms are currently in use; and
• Provides a nationwide comparative analysis of the different efforts to serve the public good, despite challenging circumstances and within complex intergovernmental arrangements.

In addition to this study, we will inventory existing and on-going funding studies from other states and industry organizations as well as transportation funding bills that have been implemented that either increased state-wide funding or increased funding for specific elements of the transportation system (such as Colorado's Bridge Enterprise Fund). Further, the research will provide a summary of the different fees and the justifications for those fees that states, regions and communities are considering for emerging vehicle technologies.

These research findings will help to inform Iowa of the most current approaches to public funding and allocating revenues to cities and counties. Another consideration will be available data from the Iowa DOT pavement management and bridge inventory systems that will be used in evaluating different fee concepts and defining the nexus between the potential fees and the issues that would be addressed.

Objective

The Alternative Funding Approaches for Iowa Roads project objectives include the following:

1. Evaluate the appropriateness of current funding processes and address how Iowa roads being funded.

a. Iowa's existing funding process will be evaluated and compared to best practices and novel concepts employed by other states based on the results of the literature review and interviews with Iowa stakeholders and agency staff. This will include a review of the allocation approaches used for the different programs: formula, including the variables used, or discretionary. The review will also include an evaluation of the results of the current funding process relative to achieving state and local goals.

2. Identify potential new sources of funding. Future revenue streams need to maintainpace with the ever-increasing costs of transportation construction and maintenance activities in Iowa. The evaluation should consider how new revenues would supplement the current fuel tax initially and transition to reliance on new and/or alternate sources in the future. Anticipated technology advancements should be considered and recommendations of potential benefits and liabilities.

a. A long list of potential funding sources will be developed based on a review of sources used by other states. Further, this list will be compared against transportation revenues currently collected in Iowa. The objective of this review is to identify funding sources that have been successfully implemented in other states that would represent a new or alternative revenue stream for Iowa. Potential opportunities could include implementation or expansion of heavy vehicle and equipment fees, including on-road operation of agricultural equipment; emerging technology fees; vehicle miles traveled (VMT) fees; use of express lanes or congestion pricing; and/or the role of value capture.

b. We will work with Iowa DOT staff and the Technical Advisory Committee to define the criteria to shorten the long list of potential sources into three categories:

• Realistic sources to carry forward for more detailed analysis;

• Secondary sources that have known political or public challenges but should have more detailed analysis;
• Sources that should not be carried forward, including documentation for why they were not advanced for further considerations.

3. Investigate revenue potentials and projections of various sources compared to anticipated construction costs with estimated effective timelines and review cycles for any recommended system revisions. Part of the evaluation should consider applying the state excise fuel tax or
a special partial tax on dyed fuels used in agricultural vehicles and equipment. With the agricultural industry changing, these vehicles and equipment are traveling on roads more and with the large size they are having a disproportionate impact. New potential funding systems should be structured in a way that would provide built-in indexing of revenues to the cost of the road system.
a. Near-term and long-range revenue estimates will be developed for the two categories of potential sources carried forward. These estimates will be developed relative to existing and available historical revenue reports and existing demographic, agricultural industry and statewide economic forecasts to reflect any potential trends that could impact future revenue potential.
b. Concurrent with the development of revenue forecasts, we will obtain construction and maintenance costs forecasts for Iowa DOT, cities, and counties from existing planning reports and studies, including data from the pavement management system and the National Bridge Inventory System.
c. The resulting revenue and cost forecasts will be incorporated into an econometric prioritization and financial model to evaluate potential funding needs and scenarios.
HDR developed this Microsoft Excel-based tool, called EconMOVES, for exactly this type of scenario development and evaluation.

4. Explore the use of fees and surcharges for certain facilities and operations that have a disproportionately negative impact on roads and bridges such as large confinement operations, hydraulic fracturing projects, and biofuel production facilities, and other facilities or operations that have a significant amount of heavy traffic in and out, or heavy loads, that can necessitate additional road maintenance and repair and shorten the lifespan of roads and bridges.
a. A subsection of the potential revenue source analysis will be evaluating the role of fees and surcharges related to agriculture and biofuel heavy vehicles and equipment, shown in Image 1 below. In additional to providing the technical analysis required to develop a nexus between the increased costs associated with these vehicles and potential fees, we will also consider the policy and legislative implications of proposing this type of user fee. The solutions proposed in this part of the project will be carefully screened to avoid potential legal pitfalls. For example, implementing a weight-based registration fee for agricultural vehicles that are operated on-road is likely to be more straightforward than imposing special charges based on the characteristics of an agricultural or industrial operation. Such a system might be modeled on the British “Special Concessionary” registration for agricultural equipment used on-road.
c. Administrative simplicity will also be evaluated. For example, a registration fee for agricultural vehicles that are used on-road is relatively simple to implement.
In comparison, taxes on dyed diesel are sometimes accompanied by complicated rebate systems for uses that do not affect the highway system, such as standby generators, industrial equipment, barges and locomotives.
d. Energy development projects such as wind farms present a separate set of challenges. These projects are characterized by temporary surges in heavy vehicle volumes during site development, followed by ongoing (often smaller) levels of heavy vehicle traffic during day-to-day operation. A number of research needs related to the traffic impacts of energy development were identified as part of the recent NCHRP

20-122 Rural Research Roadmap, but the roadmap is so new that very little of the suggested research has been completed. Comments received through the NCHRP 20-122 stakeholder outreach indicate that some jurisdictions have addressed roadway impacts through the land development review process. For example, Pennsylvania legislation authorizes local governments to require energy developers to mitigate the pavement and bridge impacts attributable to petroleum and natural gas extraction projects.

Benefits
The following potential benefits are expected from the research conducted and tools developed during this project:
- Outside review of the existing process for funding Iowa's roads
- Improved understanding of transportation funding sources used across the country
- Detailed evaluation of the funding challenges and opportunities for five cities and counties
- Working copy of EconMOVES to continue evaluation of funding scenarios after the study.

Motion to Approve by W. Weiss; 2nd P. Geilenfeldt III
Motion carried with 14 Aye, 0 Nay, 1 Abstaining

Discussion
V. Goetz stated the Project Development group requested that task 1A be taken off of the proposal, this is not something that they are interested in pursuing at this point.

Proposal:

- **IHRB-275, *"Bridges Designed for Minimum Maintenance",*** Brent Phares, Iowa State University, $350,000.

Background
With many of the nation's bridges approaching (or having already exceeded) their original design life, bridge replacement options/techniques/technologies continue to need to be advanced to meet the challenges faced by the bridge engineering community. Recent statistics reveal that there are approximately 600,000 bridges on the highway system and approximately 25%, by deck area, are in need of replacement. Although the situation has improved some in recent years, a significant problem still exists given the number of bridges needing regular replacement. It is vitally important that the original design be made such that it minimizes the complete life-cycle cost of bridge operation. Recently, as documented by several national publications, there has been an aggressive push to design bridges to last for 100 years (the so-called 100-year service life). The primary effort in developing guidance for 100-year service life design has been creating best practices for bridge detailing that ensures that each individual component can withstand environmental conditions for 100 years. As is widely known, bridge decks are the most susceptible to environmental attack and are frequently the first component needing major repair and/or replacement. Several common 100-year service life design ideas to address bridge deck deterioration include: using stainless steel reinforcement, increasing concrete cover, decreasing concrete impermeability, etc. All of these design concepts have merit and will certainly increase bridge service life.

Interestingly, however, a recent National Cooperative Highway Research Program (NCHRP) report indicated that most bridges are replaced after 53 years of service and generally for reasons other than deteriorated components. In fact, most bridge replacements occur for reasons such as vulnerability, need for additional lanes, and roadway widening, among others. This is not to say that designing for a 100-year service life is not warranted in some cases. Rather, there is merit to designing to minimize maintenance rather than for maximizing life. With such a targeted philosophy at the design stage, the State, Counties, and Cities have the potential to significantly reduce the life-cycle costs and risks associated with critical infrastructure while at the same time not "over designing" to achieve a performance beyond that actually needed.

It is important to note that the goal of this project is to design to a targeted service life that more closely matches the anticipated service life of most bridges (i.e., approximately 50 years) with a specified minimum level of needed maintenance or repair. This is not to be confused with the idea of Design Life which is the period of time on which the statistical derivation of transient loads is based (currently 75 years). This distinction is important as bridges will still be designed with the same level of confidence and safety. The only difference is that the various elements, components, and subsystems will be detailed by specifically designing for the target predicted service life.

Objective

The objective of this work is to identify high-value portions of a bridge where targeted design approaches can be applied to achieve minimal to no maintenance for the first 50 years of service life. Such a systematic approach to designing elements, components, and subsystems provides various options for bridge management that enhances the most common actual service life. In other words, this work will provide techniques for designing for needed durability and will equip users with the knowledge needed to develop optimal solutions for specific bridges in the following categories: Urban Interstate bridges, Rural Interstate bridges, State Highway bridges, Local Highway bridges, and Local roadway bridges. The Iowa State University team proposes that the developed concepts follow a design framework similar to other service life design methodologies as much as possible, following an easy-to-follow, multi-step framework.

Benefits

Meeting the goals of this project will help ensure that bridge construction and maintenance funds are utilized in a very effective manner by the integration of life target detailing.

- **TR-791, IHRB-275, *"Bridges Designed for Minimum Maintenance",*** Mohamed ElBatanouny, Wiss,Janney,Elstner Associates, $350,000.

Background

An important mission of state departments of transportation (DOTs) is to maintain the bridge network in a state of good repair (SOGR) such that the system can reliably facilitate convenient travel for the public. The Iowa DOT target for a SOGR consists of maintaining a minimum of 46.8 percent of bridges (by deck area) in good condition and permitting no more than 6.5 percent of bridges (by deck area) to be in poor condition (IowaDOT TAMP 2019). In order to consistently meet these metrics, the Iowa DOT must distribute limited funding and resources across its large number of bridge assets efficiently, resulting in a continual need for the development, identification, and implementation of more cost-effective bridge designs and maintenance strategies. Traditionally, bridge management entailed permitting the bridge to deteriorate and conducting maintenance on an as-needed basis. Often bridge maintenance is only executed once distress of the structure or a component is evident or to maintain functionality of the bridge. Examples of these as-needed maintenance activities include replacement of deteriorated bearings or steel members, patching delamination's and spalls in reinforced concrete or prestressed concrete members, beam end repairs, and scour repairs. As bridges continue to age and deteriorate, these maintenance activities increase and can overwhelm maintenance departments that strive to keep the bridge and roadways open and safe. Maintenance, preservation, and rehabilitation activities are implemented by the DOTs to keep bridges in satisfactory condition.

Currently, there is general agreement that minimizing the frequency of bridge replacements is both cost effective for the agency and desirable to the public, and as a result, transportation agencies have been implementing preventive maintenance strategies in order to prolong bridge life. As shown in preventive maintenance activities that the Iowa DOT commonly implements include routine painting, washing of steel members, joint repair, epoxy injection, and deck overlays. Other preventive strategies include application of crack sealers, concrete sealers, jackets, and wraps as well as joint replacement and cathodic protection of reinforced concrete, prestressed concrete, or steel members (FHWA, 2018). Preventive maintenance may be classified as cyclical, in which the frequency is predetermined (e.g., sealing concrete surfaces every 5 years regardless of condition), or condition-based, in which action is triggered due to the presence of distress (e.g., spot or zone painting a deteriorated steel coating). Condition-based preventive maintenance and maintenance applied on an as-needed basis are similar. The key difference between the two is that condition-based preventive maintenance is applied when the bridge is still in relatively good condition and with the primary purpose of prolonging the bridge's life by slowing deterioration, whereas as-needed maintenance is applied when bridge distress is noted and for the purpose of correcting conditions that might compromise bridge serviceability or functionality. While the types of activities may be the same, the scope and purpose of the work differs.

Recently, state DOTs have been further reducing life cycle costs by requiring that bridges be designed for a prolonged service life with typical target service lives between 75 and 100 years or more, particularly when the bridge is a high-profile asset or signature structure for which replacement is expensive and disruptive. This has led to the implementation of robust, durable bridge designs and construction practices that either fully avoid, withstand, or at least slow deterioration such that minimal maintenance is required in the bridge's early age and rehabilitation is not to be expected within the targeted service life. In support of these objectives, a recent SHRP 2 research study by Azizinamini et al. (2013) categorized service life issues associated with bridges in nine categories as follows:

_ Concrete durability;
_ Bridge decks;
_ Substructure;
_ Bearings;
_ Expansion joints, joints, and jointless bridges;
_ Fatigue and fracture;
_ Structural steel corrosion protection;
_ Steel bridge systems; and
_ Concrete bridge systems.

Objective

The primary objective of this study is to implement cost-effective bridge designs and techniques applied that require minimal (or no) maintenance for at least 50 years. The study is intended to address principal maintenance activities for various bridge components and subsystems that are typically completed for different bridge types owned and maintained by Iowa DOT and local jurisdictions. A list of supportive subobjectives of the study are:

- To identify the types of bridge deterioration and maintenance activities most common within and costly to Iowa transportation agencies by analyzing the available bridge maintenance records;
- To reduce maintenance costs by developing designs and pre-planned maintenance activities suited to each of the different traffic conditions and exposures found within Iowa;

- To validate the performance and cost-effectiveness of the conceptual designs by service life analysis and life cycle cost analysis (LCCA); and
- To identify designs suitable for further research due to insufficient performance data and potential for large cost savings.

To implement the minimal-maintenance designs, the design practices recommended as a result of this study will be drafted for publication in the Iowa DOT Bridge Design Manual and Construction Manual for use by bridge designers and other contractors. In addition, recommended scopes of work for the validation of new and innovative designs that currently have insufficient data will be provided to the Iowa DOT for potential implementation on a research basis. These deliverables will help the Iowa DOT minimize the life cycle costs of the agency's bridge network and efficiently invest in innovative bridge designs with the potential to further reduce system costs.

Benefits

An immediate benefit of this research is that it will help the Iowa DOT determine whether investment in a more robust design or pre-planned preventive maintenance is more cost-effective based on the environmental exposure and bridge functionality classification. The study findings will also aid in identifying design concepts for bridge components that will achieve a 50-year service life with minimal (or no) maintenance with reasonable certainty, resulting in reduced maintenance costs of the bridge network in the long-term. Overall, this will help the Iowa DOT invest in new bridges and bridge replacements and meet the goals in the Iowa DOT TAMP more efficiently. In particular, this study will help Iowa DOT as it will:

- Create a comprehensive, up-to-date resource of potential design concepts to aid in minimizing or eliminating maintenance of bridge components that are costly for Iowa DOT in terms of actual cost and traffic disruption. This will include procedures for best practices for construction, which will help In developing special provisions or standard specifications for select design concepts;
- Improve the service life and durability of bridge components by helping Iowa DOT and bridge designers select appropriate design concepts with the most favorable benefit-cost ratios;
- Provide direct and indirect cost savings by selecting optimal design for bridge components to eliminate or reduce the need for extensive repairs in the future;
- Record the industry's current state-of-the-practice for design of bridges with minimal maintenance in a final report that will aid in long-term retention of this knowledge; and
- Identify new and innovative design concepts with substantial benefits and limited performance data for potential implementation and future research.

Discussion

IHRB voted for **TR-791, IHRB-275, *"Bridges Designed for Minimum Maintenance"***

Motion to Approve by A. Abu-Hawash; 2nd W. Weiss
Motion carried with 14 Aye, 0 Nay, 0 Abstaining

8. **TR-792, Proposal: IHRB-366, *"Assessing the Flood Reduction Benefits of On-Road Structures",*** Antonio Arenas Amado, The University of Iowa, $449,363.

Background

This section provides information on the magnitude and severity of the flooding problem in Iowa, mentions some examples of existing ORS and the application of process-based hydrologic modeling to evaluate different flood mitigation strategies as well as the use of web-based information systems in Iowa.

a. Flooding in Iowa

Flooding is one of the most pressing challenges facing Iowa. Records maintained by the Federal Emergency Management Agency (FEMA) show that out of the approximately 1,300 federally declared disasters in Iowa counties (1989- 2019), 80% of them were related to flooding.
Iowa's estimated losses from flooding are substantial. The SHELDUS database (1988-2015) reports $13.5 billion in direct property losses and $4.1 billion in direct crop losses (https://cemhs.asu.edu/SHELDUS/). In 2019 alone, the National Oceanic and Atmospheric Administration (NOAA) estimates that extreme weather generated losses of approximately $1.9 billion in Iowa with flooding being the main driver of the estimated losses. Improving Iowa's resilience to flooding is going to require a significant amount of investment, creative thinking, and innovation. ORS are an example of how infrastructure repair or replacement investments can be used towards lessening the future impacts of flooding. By temporarily retaining water runoff derived from high-intensity precipitation events, ORS can reduce damages to county roads, bridges, culverts, and protect downstream communities and farmland.

b. Examples of on-road structures in Iowa

Bear Creek HUC12 watershed is located in Allamakee and Winneshiek counties in Iowa, and Fillmore and Houston counties in Minnesota. This watershed has pioneered the installation of ORS in Iowa and Minnesota and its stakeholders identified 56 locations suitable for the construction of this type of structure. Of the 56 potential sites, 18 have been constructed and are currently attenuating flows in approximately 15% of the watershed area.
With funding provided by The U.S. Department of Housing and Urban Development, The Iowa Flood Center (IFC) led the Iowa Watersheds Project. The IWP focused on selected Iowa watersheds for which it developed comprehensive watershed plans and worked with local volunteers to design and build water management projects. The second phase of the IWP provided support for the construction five ORS as well as several ponds and WASCOBs in Otter Creek HUC12 in Fayette County. Analyses presented in IFC (2016) found that, of the constructed practices, ORS were the most effective practice in reducing peak discharges, providing an estimated 30% peak flow reduction for the 50-year recurrence flows in some of the tributaries.

c. Distributed Storage and Hydrologic Modeling Several studies have proven the efficacy of a system of distributed storage in alleviating flood impacts. The flood reduction benefit from a single detention structure is not likely to be significant at the watershed scale.
However, the combined flood attenuating effect of several structures can be important. In recent years, three projects in Iowa have developed extensive evaluation of hypothetical and constructed detention structures (mostly off-road structures) located in watershed's headwater catchments: IWP, the Iowa Watershed Approach (https://iowawatershedapproach.org/), and the Des Moines River Upstream Mitigation Study. IFC and IIHRHydroscience & Engineering have played an instrumental role in the hydrologic and hydraulic analyses in these three projects. Researchers at IIHR have developed a continuous, process-based, surface-subsurface coupled model known as GHOST that we will use for the hydrologic analyses of this project. GHOST is designed to perform multi-year simulations in small catchments as well as large basins using finite volume techniques. In GHOST,

surface flows are simulated using a 2D diffusive wave approximation of the Saint Venant equations. Water depth at canals and streams is computed using a 1D approximation. GHOST models the unsaturated region assuming that the dominant flow direction is vertical and groundwater flow is modeled using Darcy's law. Fluxes between regions represent infiltration, exfiltration, recharge, and lateral mass exchanges between the surface and groundwater domains. GHOST's predictive capabilities have been, or are being, tested in several watersheds in Iowa with a variety of soil types and topographic, land use, and geologic conditions.
The ability of the GHOST model to predict streamflow values at four different locations in the Des Moines River watershed. Continuous simulations were run for 17 years (2002-2018) with the model simulating components of the hydrograph, including baseflow, peak flow timing and magnitude and the hydrologic effects of frozen ground conditions and snowmelt. Five largest Iowa's landforms overlaid with watershed boundaries where IIHR/IFC has developed or is developing GHOST models.

d. Wed-based information systems IIHR and IFC at the University of Iowa have pioneered the creation of user-friendly, interactive, web-based information systems (WBIS) to communicate environmental and geospatial information in Iowa and the United States Some examples of this type of website include:
• The Iowa Dot Culvert Platform provides information on culverts throughout the state of Iowa. https://apps.iowadot.gov/culverts/
• The Iowa Flood Information System. A comprehensive web-platform to access community-based flood conditions, forecasts, visualizations, inundation maps, and flood related information. http://ifis.iowafloodcenter.org/ifis/
• The Iowa Water Quality Information System. This website integrates real-time water quality data collected by IIHR and the USGS, along with a variety of watershed-related Information such as precipitation, stream flow and stage, soil moisture, and land use. https://iwqis.iowawis.org/

Objective
The objectives of this project are to:
1. Complete a comprehensive evaluation of the flood reduction benefits of existing ORS. This work will be performed in five selected HUC12s in Iowa. To accomplish this objective we will use the process-based hydrologic model GHOST to run multiyear continuous simulations using both historic precipitation conditions as well as increased precipitation conditions that represent the projected changes in heavy precipitation by the mid- and late-21st century.
2. Conduct a statewide GIS-based identification of suitable locations for construction of new ORS as well as estimation of their flood storage.
3. Build upon and expand The Iowa Dot Culvert Platform to both communicate the results of the comprehensive hydrologic analysis and the GIS-based analysis on potential ORS.
In this project, the research team will work closely with DOT and a Technical Advisory Committee (TAC) to select the HUC12s for the hydrologic simulations, find ways to best communicate the results of the hydrologic and statewide GIS-based analyses and design the proposed website to disseminate project's results.

Benefits
The main benefit of the present research is a thorough and scientific evaluation of the flood reduction benefits of ORS at multiple spatial scales as well as providing the tools to guide,

facilitate, and enhance the adoption of ORS in Iowa. Having estimations of changes in peak flow (e.g. 10-yr. flood) at different spatial scales for a given ORS implementation scenario can be used in engineering design of downstream bridges and culverts. Furthermore, this type of information can be part of a comprehensive cost-benefit analysis that can support counties, cities, and WMAs applications for infrastructure improvements and preand post-disaster mitigation dollars. In 2014, Fayette County in NE Iowa passed the on-road structure policy encouraging consideration of ORS at locations where an existing drainage structure needs to be repaired or replaced. The results of this project provide scientific and practical information for local and state decision makers to assess the benefits of ORS. This project will generate information that will increase awareness of the benefits of ORS and can lead to increased adoption of this type of structure in Iowa. This has the potential to improve traffic safety, extend road lifetimes, as well as decrease road maintenance costs.

Motion to Approve by A. Abu-Hawash; 2nd W. Dotzler
Motion carried with 14 Aye, 0 Nay, 0 Abstaining

9. **New Business**
V. Goetz stated she promised the board that we would be voting on new projects but they just rolled out a new platform on July 1st and did not get the bureau review that we had hoped to receive by the original date so we decided to extend the review of projects for another month so people can get familiar with the platform and to make sure they are getting the feedback that they wanted to get to prioritize the projects. This will now happen in October.

10. **Meeting Adjourn**

The next regular meeting of the Iowa Highway Research Board is scheduled for Tuesday, December 1, 2020 at 1:00 pm Online via Microsoft Teams Meeting. Please contact Vanessa.Goetz@iowadot.us by 4 p.m. Thursday November 30, 2020 if you would like to attend the meeting online.

Vanessa Goetz, IHRB Executive Secretary