AASHTOWare Bridge Management Update

Todd Thompson, PE – SD DOT
Chair, AASHTOWare Bridge Task Force
Presented to the BTWG - SCOM
Des Moines, Iowa
July 22, 2015
AASHTOWare Basics

- Development started in the early 1990s under FHWA guidance
- Result of millions invested by States and FHWA
- Cooperative effort of over 40 state/local/federal transportation departments
- Licensed by US DOTs
- Software “owned” by members of AASHTO
- Supports AASHTO specifications, AASHTO element level inspection and management
AASHTOWare Bridge Management

- Utilized by 44 DOTs plus local and international agencies
- BrM/Pontis 5.2 is funded by a voluntary participation from more than 20 state DOTs, under DOT guidance and expertise
- Tools that are easier to use and understand:
  - Planning
  - Deterioration
  - Risk
  - Multi-objective analysis
  - Lifecycle costs
  - Project models
  - Dashboards
  - Corridor planning
FY2015 Licensees

<table>
<thead>
<tr>
<th>County/City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Co</td>
<td>CA</td>
</tr>
<tr>
<td>City of Phoenix</td>
<td>AZ</td>
</tr>
<tr>
<td>Penn. Turnpike</td>
<td>PA</td>
</tr>
<tr>
<td>Richmond Metro Auth</td>
<td>VA</td>
</tr>
</tbody>
</table>

41 State Departments of Transportation +
Manitoba, FHWA, District of Columbia
& Puerto Rico

Map Key

<table>
<thead>
<tr>
<th></th>
<th>Licensee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Licensee</td>
<td></td>
</tr>
</tbody>
</table>

AASHTOWare Bridge Management
www.AASHTOWareBridge.com
# AASHTOWare Bridge Task Force

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>Todd Thompson</td>
<td>South Dakota</td>
</tr>
<tr>
<td>Vice Chair</td>
<td>Eric Christie</td>
<td>Alabama</td>
</tr>
<tr>
<td>Member – BrM</td>
<td>Bruce Novakovich</td>
<td>Oregon</td>
</tr>
<tr>
<td>Member – BrM</td>
<td><em>Thomas Martin (new)</em></td>
<td>Minnesota</td>
</tr>
<tr>
<td>Member – BrM</td>
<td>Mark Faulhaber</td>
<td>Kentucky</td>
</tr>
<tr>
<td>Member – BrM</td>
<td><em>Beckie Curtis (new)</em></td>
<td>Michigan</td>
</tr>
<tr>
<td>FHWA Liaison – BrM</td>
<td><em>Derek Constable (new)</em></td>
<td>FHWA</td>
</tr>
<tr>
<td>Member – BrR</td>
<td><em>Joshua Dietsche (new)</em></td>
<td>Wisconsin</td>
</tr>
<tr>
<td>Member – BrD</td>
<td>Jeff Olsen</td>
<td>Montana</td>
</tr>
<tr>
<td>Member – BrD</td>
<td>Dean Teal</td>
<td>Kansas</td>
</tr>
<tr>
<td>Member – BrR</td>
<td>Amjad Waheed</td>
<td>Ohio</td>
</tr>
<tr>
<td>FHWA Liaison – BrDR</td>
<td>Tom Saad</td>
<td>FHWA</td>
</tr>
</tbody>
</table>
Bridge Management 5.2 Stages

• Development on 5.2 is rapidly moving forward with coordinated efforts between the Task Force, TRT, and Contractor
• Phased releases
  • Version 5.1.2/5.1.3 (Mar 2012 / May 2013)
    • New inspection and inventory functionality, integration with mapping
  • Version 5.2.1 (Feb 2014)
    • Core program framework, risk assessments, integrated utility functions, network corridors
  • Version 5.2.2 (Planned Summer-2015)
    • Implementation of new deterioration models and multi-objective analysis
  • Version 5.2.3 (Planned 2016)
    • Enhancements to Deterioration Modeling
    • Integrated project and program planning
    • All administrative features
Bridge Management 5.2 Stages

1. Inspection
2. Bridge Groups, Risk, Utility Functions
3. Deterioration Modeling, Preservation Action, and Projects
4. Enhanced Deterioration Modeling, Enhanced Project/Program Planning, and Administration Features

5.1.2  5.1.3  5.2.1  5.2.2  5.2.3
MAP-21

Upon final delivery of the AASHTOWare Bridge Management 5.x software, the software will fulfill all MAP-21 requirements:

1. Collecting, processing, storing, and updating inventory and condition data for all NHS bridge and pavement assets;  
   Currently supported for bridges.

2. Forecasting deterioration for all NHS bridge and pavement assets;  
   In BrM 5.2.3 we will have full implementation for all NHS bridges.

3. Determining the life-cycle benefit-cost analysis of alternative strategies (including a no action decision) for managing the condition of all NHS bridge and pavement assets;  
   Currently partially supported in BrM 5.2.2 for bridges, and will be fully supported in BrM 5.2.3.
4. Identifying short- and long-term budget needs for managing the condition of all NHS bridge and pavement assets;  
   Will be fully supported in BrM 5.2.3.

5. Determining the optimal strategies for identifying potential projects for managing pavements and bridges; and  
   Will be supported in BrM 5.2.3 for bridges.

6. Recommending programs and implementation schedules to manage the condition of all Interstate highway pavements, non-Interstate NHS highway pavements, and NHS bridge assets within policy and budget constraints.  
   Will be supported in BrM 5.2.3 for bridges.
Bridge Management 5.2.1

- Released in Spring 2014
- Key Features
  - Google Mapping Functions
  - Utility Functions
  - Needs Prioritization
  - Support For 2013 Element Inspection Manual
  - Cross-Browser Support
  - Key User Requests
Bridge Management 5.2.1 SP2

- Released in January 2015
- Key Features
  - FHWA Bridge Element submission and validation checks
  - Upgrade to the latest version of Crystal Reports (2013)
  - Enterprise version of SP2 has been upgraded to be 64 bit compatible
  - Specific TAG identified upgrades, enhancements, and stabilizations to the product
Bridge Management 5.2.1 SP3

- Released in April 2015
- Key Features
  - Addresses a page load issue encountered by users with a significant amount of element records tied to a single bridge.
  - Stores and displays ampersands ("&") as ampersands. This was not done previously in all prior versions of the software.
Bridge Management 5.2.2

- Currently in Beta
- Planned Release in Summer 2015
- Key Features
  - Deterioration Modeling including Weibull shaping parameters and protection factors for protective elements
  - Project Planning and Analysis Module
  - Conversion of the database from Metric to U.S. Customary units
  - New Inspection Process to better handle inspection dates and data for the NBI submittal
  - Application Programming Interface (API)
  - Database GUID conversion
Deterioration Modeling

- An agency is able to see the direct impact of performing work on an asset, and how it will impact the bridge currently, as well as years into the future.

- Also able to see the *direct impact of performing work at a later point in time*. This aids an agency in the decision to determine when the *optimized time would be to perform* the selected work.
Deterioration Modeling and Multi Objective Analysis (Example)
Deterioration Modeling and Multi Objective Analysis (Example)
Project Planning
Preservation Actions

- Ability to create and view projects
- Define projects by grouping together work items and bridges
- Determine cost and effectiveness of projects and the end result of performing the selected work on the selected bridges
- Dashboards to view higher level numbers and effects, while also being able to drill down to specific results and details
<table>
<thead>
<tr>
<th>Bridge ID</th>
<th>Location</th>
<th>District</th>
<th>County</th>
<th>Facility</th>
<th>Precise Lon</th>
<th>Precise Lat</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 07598</td>
<td>Jesse Owens N Of Baseline</td>
<td>02</td>
<td>013</td>
<td>JESSE OWENS PKWY</td>
<td>-112.0689604</td>
<td>33.379793</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Work Candidate</th>
<th>Base Utility</th>
<th>Utility</th>
<th>Utility Change</th>
<th>Estimated Cost</th>
<th>Benefit / Cost ($)</th>
<th>Cost (Sk) / Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misc-Paint ID</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>52.42</td>
<td>2.08</td>
<td>$9,642,148.00</td>
<td>0.0002</td>
<td>$4,732</td>
</tr>
<tr>
<td>Joints-Rehabilitate</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>52.39</td>
<td>2.05</td>
<td>$3,002.00</td>
<td>0.6829</td>
<td>$1</td>
</tr>
<tr>
<td>Bridge-Replacement</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>50.95</td>
<td>0.61</td>
<td>$93,914.00</td>
<td>0.0066</td>
<td>$151</td>
</tr>
<tr>
<td>Paint-General</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$195,200.00</td>
<td>0.0058</td>
<td>$172</td>
</tr>
<tr>
<td>Bearings-Replace</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$195,200.00</td>
<td>0.0038</td>
<td>$172</td>
</tr>
<tr>
<td>Deck-Resurface</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$16,800.00</td>
<td>0.0057</td>
<td>$15</td>
</tr>
<tr>
<td>Deck-Seal</td>
<td>04 07896-NM-045878</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$96,300.00</td>
<td>0.0118</td>
<td>$84</td>
</tr>
<tr>
<td>Approach Railing</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$1,693,800.00</td>
<td>0.0007</td>
<td>$1,486</td>
</tr>
<tr>
<td>Approach Slab-Repair</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$139,500.00</td>
<td>0.0082</td>
<td>$122</td>
</tr>
<tr>
<td>Channel-Repair Washouts/Erosion</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$169,200.00</td>
<td>0.0067</td>
<td>$148</td>
</tr>
<tr>
<td>04 07603</td>
<td>7TH ST S OF GREENWAY PKWY</td>
<td>02</td>
<td>013</td>
<td>7TH STREET</td>
<td>-112.0654944</td>
<td>33.637033</td>
<td></td>
</tr>
<tr>
<td>04 07878</td>
<td>DESERT FOOT AT FRYE RD</td>
<td>02</td>
<td>013</td>
<td>DESERT FOOTHILLS</td>
<td>-112.0608444</td>
<td>33.2981246</td>
<td></td>
</tr>
<tr>
<td>04 07935</td>
<td>INT ELLIOT RD &amp; 48TH ST</td>
<td>02</td>
<td>013</td>
<td>ELLIOT ROAD &amp; 48TH</td>
<td>-111.973357844922</td>
<td>33.312307041172</td>
<td></td>
</tr>
<tr>
<td>04 08003</td>
<td>0.5 mi N of Buckeye Rd</td>
<td>02</td>
<td>013</td>
<td>75th Ave</td>
<td>-112.2210993</td>
<td>33.4456691</td>
<td></td>
</tr>
<tr>
<td>04 08508</td>
<td>4 MI N OF DUNLAP RD</td>
<td>02</td>
<td>013</td>
<td>27TH AVENUE</td>
<td>-112.1112222</td>
<td>33.5711104</td>
<td></td>
</tr>
<tr>
<td>04 08511</td>
<td>1.5 MILE EAST OF 24TH ST</td>
<td>02</td>
<td>013</td>
<td>CENTER FLYOVER</td>
<td>-112.0108333</td>
<td>33.4366663</td>
<td></td>
</tr>
<tr>
<td>04 08520</td>
<td>SKY HARBOR AIRPORT TERM 3</td>
<td>02</td>
<td>013</td>
<td>PARKING ENT&amp;BATS</td>
<td>-112.0069444</td>
<td>33.486107</td>
<td></td>
</tr>
<tr>
<td>04 08530</td>
<td>SKY HARBOR AIRPORT TERM 3</td>
<td>02</td>
<td>013</td>
<td>PARKING ENT&amp;EXIT</td>
<td>-112.0069444</td>
<td>33.4349998</td>
<td></td>
</tr>
<tr>
<td>04 09175</td>
<td>19th Ave N Of Indian Sch</td>
<td>02</td>
<td>013</td>
<td>19TH AVE</td>
<td>-112.0999107</td>
<td>33.4995774</td>
<td></td>
</tr>
</tbody>
</table>
## Project Details – Map View

### Bridge Needs

<table>
<thead>
<tr>
<th>Action</th>
<th>Work Candidate</th>
<th>Base Utility</th>
<th>Utility</th>
<th>Utility Change</th>
<th>Estimated Cost</th>
<th>Benefit / Cost ($)</th>
<th>Cost ($K) / Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misc - Paint ID</td>
<td>04 07896-NMV-045670</td>
<td>50.34</td>
<td>52.42</td>
<td>2.08</td>
<td>$9,842,148.00</td>
<td>0.0002</td>
<td>$4,732</td>
</tr>
<tr>
<td>Joints - Rehabillate</td>
<td>04 07896-NMV-045670</td>
<td>50.34</td>
<td>52.39</td>
<td>2.05</td>
<td>$3,002.00</td>
<td>0.6829</td>
<td>$1</td>
</tr>
<tr>
<td>Bridge - Replacement</td>
<td>04 07896-NMV-049875</td>
<td>50.34</td>
<td>50.05</td>
<td>0.61</td>
<td>$91,914.00</td>
<td>0.0056</td>
<td>$151</td>
</tr>
<tr>
<td>Paint - General</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$196,200.00</td>
<td>0.0058</td>
<td>$1172</td>
</tr>
<tr>
<td>Bearings - Replace</td>
<td>04 07896-NMV-049873</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$196,200.00</td>
<td>0.0058</td>
<td>$172</td>
</tr>
<tr>
<td>Deck - Resurface</td>
<td>04 07896-NMV-049873</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$16,800.00</td>
<td>0.0679</td>
<td>$15</td>
</tr>
<tr>
<td>Deck - Seal</td>
<td>04 07896-NMV-049870</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$96,300.00</td>
<td>0.0118</td>
<td>$84</td>
</tr>
<tr>
<td>Approach Railing</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$1,693,800.00</td>
<td>0.0007</td>
<td>$1,486</td>
</tr>
<tr>
<td>Approach Slab - Repair</td>
<td>System Generated</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$139,500.00</td>
<td>0.0082</td>
<td>$122</td>
</tr>
<tr>
<td>Channel - Repair Washouts Erosion</td>
<td>04 07896-NMV-045670</td>
<td>50.34</td>
<td>51.48</td>
<td>1.14</td>
<td>$189,200.00</td>
<td>0.0057</td>
<td>$148</td>
</tr>
</tbody>
</table>

---

**AASHTOWare Bridge Management**

[www.AASHTOWareBridge.com](http://www.AASHTOWareBridge.com)
Main Project Screen
**Project Details - Summary**

![Project Details - Summary Image]

### Project Details

- **Project ID**: 2235-5234-19
- **Alternate ID**: 
- **Project Status**: Planning
- **Project Title**: 
- **Project Type**: Paint
- **Year Start**: 
- **Year End**: 
- **Created by**: John Smith
- **Date**: 5/10/2014

### Project Notes

- 

### Project Cost and Benefits

<table>
<thead>
<tr>
<th>Indirect Cost</th>
<th>Direct Cost: $5,000,000</th>
<th>Other Costs: $1,000,000</th>
<th>Total Cost: $6,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated: 20%</td>
<td>Indirect Cost: $1,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entered:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Bridge and Work Summary

<table>
<thead>
<tr>
<th>Bridge ID</th>
<th>Location</th>
<th>Base Utility</th>
<th>Utility</th>
<th>Utility Change</th>
<th>Estimated Cost</th>
<th>Benefit / Cost (Sk)</th>
<th>Cost (Sk) / Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 07550</td>
<td>Jesse Owens N Of Baseline</td>
<td>60.34</td>
<td>60.44</td>
<td>10.04</td>
<td>$12,345,000</td>
<td>1,245</td>
<td>$2,136</td>
</tr>
<tr>
<td>04 07550</td>
<td>Jesse Owens N Of Baseline</td>
<td>60.34</td>
<td>60.44</td>
<td>10.04</td>
<td>$12,345,000</td>
<td>1,245</td>
<td>$2,136</td>
</tr>
<tr>
<td>04 08000</td>
<td>0.5-m N Of Buckeye Rd</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
<tr>
<td>04 08500</td>
<td>4.4 N Of Dunlap Rd</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
<tr>
<td>04 08511</td>
<td>1.5 MILE EAST OF 24TH ST</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
<tr>
<td>04 08530</td>
<td>SKY HARBOR AIRPORT TERM 3</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
<tr>
<td>04 08530</td>
<td>SKY HARBOR AIRPORT TERM 3</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
<tr>
<td>04 08615</td>
<td>12th Av N Of Indian Sch</td>
<td>62.34</td>
<td>75.44</td>
<td>13.04</td>
<td>$3,074,800</td>
<td>2,136</td>
<td>$1,428</td>
</tr>
</tbody>
</table>
Project Details – Analysis
Metric Assessment Report

- Working with FHWA to include logic used for NBIS Metric Assessment Reports
- Ability to use current data to check NBIS Metric compliance
- Allow state and FWHA to better track interim deadlines for their Corrective Action Plans
Bridge Management 5.2.3

- Planned Release in 2016
- Fully supporting the FHWA Identified Rule Making
- Key Features
  - Capability to perform life cycle cost analysis
  - Capability to perform network level analysis
  - Dashboards for easy data visualization and tracking performance measures.
  - Enhanced User Help System
**Short-Term LCCA**
All costs incurred on a bridge within the program horizon and runs in the context of a set of work candidates specified by users, generated by BrM, or a combination of the two. The short-term LCCA sums the *direct* and *indirect* costs of all actions planned within the program. To accurately evaluate future actions, LCCA will utilize the newly developed deterioration modeling framework.

**Long-Term LCCA**
Estimates the total life-cycle cost of a bridge incurred once the program is completed. Long-term LCCA allows for reasonable comparisons of bridges in differing condition states. The long-term LCCA disregards indirect costs of actions. BrM forecasts the approximate sequence of interventions that will be performed on the bridge over an extended, user defined period of time (ex. 200+ years).
White Papers

White papers providing additional details regarding the Life-Cycle Cost Analysis and Deterioration Modeling enhancements will be found at www.aashtowarebridge.com
Enhanced User Help System

- Complete rewrite of the User Manual using MadCap Flare software
- Multi-channel publishing for the web-based Help system and, printed documentation
- Clicking the ‘Help’ icon within the software will take the user to the specific section of the Help System
- Detailed page-by-page explanation
Tunnel Inspection Elements

- NTIS final rule issued **July 14, 2015**
- The AASHTOWare BrM Task Force is actively pursuing potential methods of including new asset types (tunnels, culverts, signs, etc.) into the BrM Software.
Tunnel Inspection Elements

• This will be a multi-phased approach:
  – Phase 0 – Create Excel spreadsheet to collect initial inventory and export XML file to send to FHWA (underway)
  – Phase 1 – Defining new asset types and implementation of a framework
  – Phase 2 – Fully develop the functionality required to integrate new asset types into the software
  – Further phases will be planned out as needed.
Feel free to contact us or visit our website for more information:

Support line: 1-877-913-1550

Support email: pontis@bentley.com

Website: http://aashtowarebridge.com
Contact Information

• Todd Thompson
• 605-773-3285
• todd.thompson@state.sd.us