

AASHTOWare Bridge Management Update



AASHTOWare Bridge Management

www.AASHTOWareBridge.com



User Group Priorities

User Group Concern/Priority Description	Alert Status	Priority Level	Response
Online help for version 5	High	1a	Refreshed manuals are being developed and are slated for release alongside BrM 5. Updated versions in 5.2.2.
Better documentation (User guide and Installation guide)	High	1b	Refreshed manuals are being developed and are slated for release alongside BrM 5. Updated versions in 5.2.2.
Implement Alabama customization as an option	High	2	Planned for the BrM 5.2.3 release.
Better QC/QA on contractor	High	3	Updated QA and code review practices. Ongoing process to always improve.
Better error handling	High	4	Ongoing, 5.2.3 will be a significant step forward with this.
We want to keep inspkey on Inspection screen	High	5	INSPKEY will remain on the screens in 5.2.
AASHTO to host TAG and TRT members at the User Group Meetings	Med	6	Complete. Inclusion of additional TAG and TRT members will be reviewed on a case by case basis.
64-bit rewrite	Med	6b	Complete. Workstation remains 32bit.
AASHTO BRIDGEWare website needs to be kept up to date	Med	7	Complete. On-going process
Need to include SHV Load Ratings now	Med	8	Complete as of 5.2.2
Better Oracle support	Med	9a	Ongoing. Bentley continues to focus on testing Oracle more aggressively. Oracle TA members report significantly better stability in 5.2.2
More stress testing	Med	9b	Ongoing. Bentley has implemented stress testing software(Visual Studios web performance and load testing framework) in its QA processes. Florida has helped test this with 5.2.2 and have seen significant improvements
Change log – connected to JIRA issues (log of resolved issues)	Med	10a	Complete, separate buckets being used to track all changes
Slow down on modeling and analysis project planning and focus on performance inspection	Med	10b	Ongoing. BrM 5.2.2 was heavily focused on increasing performance through inclusion of items such as an updated data layer and the switch to GUIDS.
Can we get Crystal Reports 2013 ASAP	Low	11	Complete.
SharePoint hosted site for TAG	Low	12	Complete.
Auto name files during uploading for media files	Low	13	Deferred for a later release.

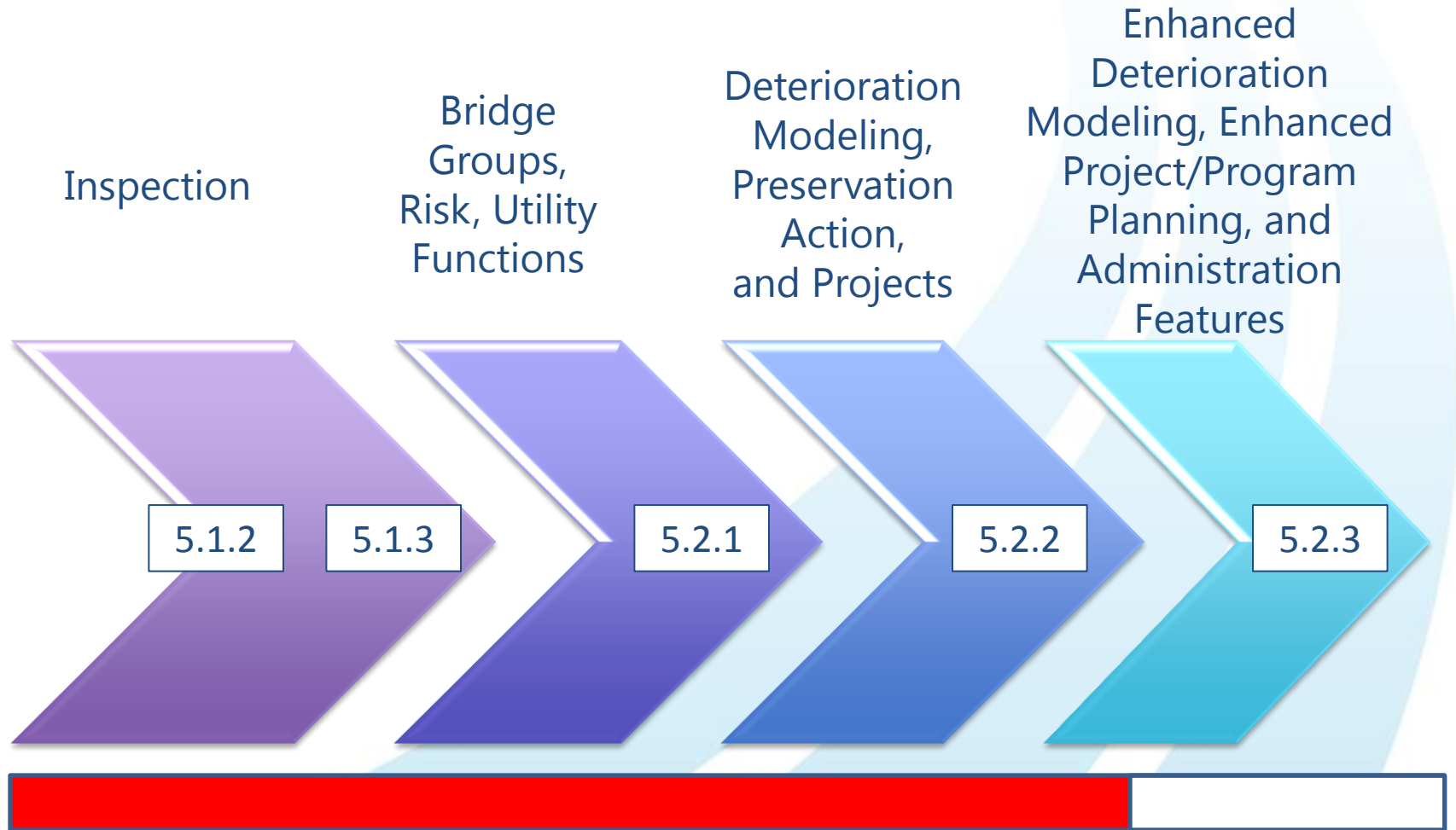


Bridge Management 5.2 Stages

- 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 (October 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



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.



MAP-21 (Cont'd)

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 October 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)

Work Candidates Existing for the Selected Bridge

Work Candidate	Utility	Utility Change	Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit	Action Year
Do Nothing	49.92					0
04 0759-NIMO-041614-27F109E126 - Approach Railing-Repair	50.5	0.58	\$2,000.00	.29	\$3	0

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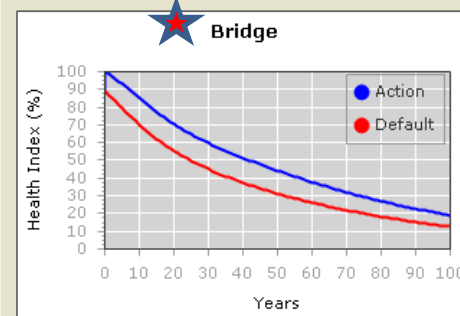
Effects on Each Utility Criterion

Category name	Before WC	After WC
Total Utility	49.92	50.5
Condition	58.32	59.73
Deck	5	5
Superstructure	81	81
Substructure	91	91
Scour	58	58
Element ratings	63.35	100
(12) Reinforced Concrete Deck	70.95	100
(331) Reinforced Concrete Bridge Railing	63.85	100
(510) Wearing Surfaces	55.26	100
Risk	53.81	53.81
Accident	53.81	53.81
Mobility	34.2	34.2
Percent of truck detoured.	34.2	34.2

Effects on Each Element

Element	Str. Unit	Env.	Condition	Effect
> (12) Re Concrete Deck	0	Low (2)		
<input checked="" type="checkbox"/> (331) Re Conc Bridge Railing	0	Low (2)		
(510) Wearing Surfaces	0			

Deterioration



Deterioration Modeling and Multi Objective Analysis (Example)

Work Candidates Existing for the Selected Bridge

Work Candidate	Utility	Utility Change	Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit	Action Year
Do Nothing	49.44					0
04 0759-NIMO-041614-27F109E126 - Approach Railing-Repair	50.5	1.06	\$2,000.00	.53	\$2	20

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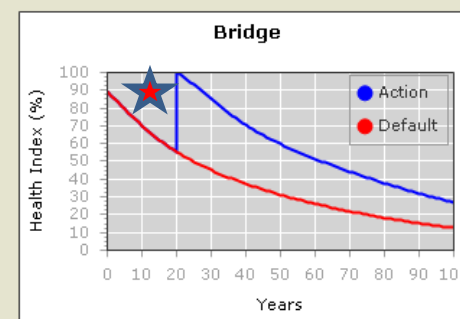
Effects on Each Utility Criterion

Category name	Before WC	After WC
Total Utility	49.44	50.5
Condition	57.16	59.73
Deck	5	5
Superstructure	81	81
Substructure	91	91
Scour	58	58
Element ratings	33.13	99.91
(12) Reinforced Concrete Deck	41.39	99.72
(331) Reinforced Concrete Bridge Railing	47.56	100
(510) Wearing Surfaces	10.44	100
Risk	53.81	53.81
Accident	53.81	53.81
Mobility	34.2	34.2
Percent of truck detoured.	34.2	34.2

Effects on Each Element

Element	Str. Unit	Env.	Condition	Effect
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Deterioration



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



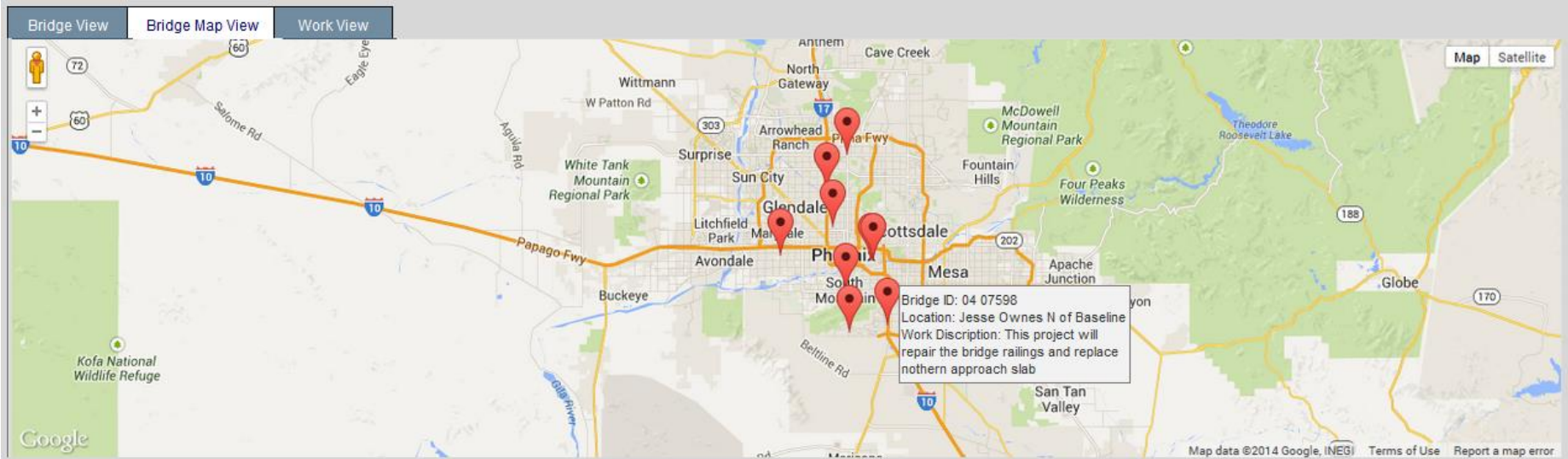
Project Details – Bridge View

Bridge View		Bridge Map View		Work View			
Bridge ID	Location	District	County	Facility	Precise Lon	Precise Lat	
04 07598	Jesse Owens N Of Baseline	02	013	JESSE OWENS PKWY	-112.0689604	33.3797993	
Action	Work Candidate	Base Utility	Utility	Utility Change	Estimated Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit
Misc-Paint ID	04 07896-NMIV-045678	50.34	52.42	2.08	\$9,842,148.00	0.0002	\$4,732
Joints-Rehabilitate	04 07896-NMIV-045678	50.34	52.39	2.05	\$3,002.00	0.6829	\$1
Bridge-Replacement	04 07896-NMIV-045678	50.34	50.95	0.61	\$91,914.00	0.0066	\$151
Paint-General	System Generated	50.34	51.48	1.14	\$196,200.00	0.0058	\$172
Bearings-Replace	04 07896-NMIV-045678	50.34	51.48	1.14	\$196,200.00	0.0058	\$172
Deck-Resurface	04 07896-NMIV-045678	50.34	51.48	1.14	\$16,800.00	0.0679	\$15
Deck-Seal	04 07896-NMIV-045678	50.34	51.48	1.14	\$96,300.00	0.0118	\$84
Approach Railing	System Generated	50.34	51.48	1.14	\$1,693,800.00	0.0007	\$1,486
Approach Slab-Repair	System Generated	50.34	51.48	1.14	\$139,500.00	0.0082	\$122
Channel-Repair Washouts/Erosion	04 07896-NMIV-045678	50.34	51.48	1.14	\$169,200.00	0.0067	\$148
> 04 07603	7TH ST S OF GREENWAY PKWY	02	013	7TH STREET	-112.0654944	33.637033	
> 04 07878	DESERT FOOT AT FRYE RD	02	013	DESERT FOOTHILLS	-112.0608444	33.2981246	
> 04 07935	INT ELIOT RD & 48TH ST	02	013	ELLIOT ROAD & 48TH	-111.973357844922	33.3123077041172	
> 04 08003	0.5 mi N of Buckeye Rd	02	013	75th Ave	-112.2210993	33.4456691	
> 04 08508	.4 MI N OF DUNLAP RD	02	013	25TH AVENUE	-112.1122222	33.5711104	
> 04 08511	1.5 MILE EAST OF 24TH ST	02	013	CENTER FLYOVER	-112.0108333	33.4366663	
> 04 08529	SKY HARBOR AIRPORT TERM 3	02	013	PARKING ENT&EXITS	-112.0069444	33.4361107	
> 04 08530	SKY HARBOR AIRPORT TERM 3	02	013	PARKING ENT&EXIT	-112.0069444	33.4349996	
> 04 09175	19th Av N Of Indian Sch	02	013	19TH AVE	-112.0999107	33.4995774	

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Project Details – Map View




Bridge Needs

Action	Work Candidate	Base Utility	Utility	Utility Change	Estimated Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit
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Main Project Screen



Welcome: Pontis User
 Database: BrM521 SQL Server
 Sample DB

[Help ?](#) [Account](#) [LogOut](#)

Menu

- View List
- Select All
- Unselect All
- Select Page
- Unselect Page
- Just Selected
- Apply Grid Settings
- Reset Grid Settings
- Printable View
- Manage Layouts
- Manage Filters
- Edit Project
- Create Project
- Upload Project
- Combine Projects
- Delete Project
- Manage Programs
- Manage Funding

[Bridges](#) [Reports](#) [Admin](#) [Inspection](#) [Gateway](#) [Analysis](#) [Projects](#)

Filter: BrM - None Layout: Default Jump to Project:

Project Name	Project ID	Category	Cost (\$k)	Utility Change	Benefit / Cost (\$k)	Cost (\$k)/Benefit	Funding	Year	Status	Description
<input type="checkbox"/> Rehab 1-25 Bridges	1234-2234 -21	Rehabilitation	150.5	60	.025	4.23	Federal	2014	Approved	Project Description
<input type="checkbox"/> County Bridge Painting	2235-5234 -19	Paint	15.0	55	.08	2.65		2016	Under Review	Project Description
<input type="checkbox"/> Clark St Bridge Replace	3234-2234 -55	Replacement	200.3	100	.10	5.22	State	2015	Proposed	Project Description
<input type="checkbox"/> District 12 Joints	7344-7234 -08	Joint Seals	20.2	48	.10	2.51		2018	Proposed	Project Description
<input checked="" type="checkbox"/> US 79 Deck Paving	5234-5234 -51	Deck Work	55.6	57	.10	3.22	Program X	2017	Approved	Project Description
<input type="checkbox"/> Cobb County Vegetation	3452-2234 -21	Crew Work	13.2	56	.08	2.64		2015	Under Review	Project Description
<input type="checkbox"/> Replace 12345	3234-3345 -55	Replacement	160.7	100	.025	3.56	Maintenance	2014	Proposed	Project Description
<input type="checkbox"/> Replace 12345	7344-7234 -08	Replacement	160.7	100	.025	3.56		2014	Proposed	Project Description
<input type="checkbox"/> Replace 12345	3234-2234 -55	Replacement	160.7	100	.025	3.56	State Budget	2014	Proposed	Project Description
<input type="checkbox"/> Replace 12345	7344-7234 -08	Replacement	160.7	100	.025	3.56		2014	Proposed	Project Description

11 Projects, 1 selected

Bridge View

Bridge Map View

Work View

Bridge ID	Location	District	County	Facility	Precise Lon	Precise Lat																																																																																								
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Project Details - Summary

Welcome: **POHIS US**
Database: **BrM521 SQL Server Sample D**
[Help](#) [Account](#) [LogOut](#)

Menu | Bridges | Reports | Admin | Inspection | Gateway | Analysis | Projects

View List | Manage Layouts | Manage Filters | Edit Project | Create Project | Bridge Query | Project Details | Upload Project | Combine Projects | Delete Project | Manage Programs | Manage Funding

Selected Project: **New Project**

Summary | Analysis | Management

Project Details

Project ID: 2235-5234-19 | Alternate ID: | Project Status: **Planning** | Project URL:
 Project Name: | Project Type: **Paint** | Year Start: | Year End: | Created by: John Smith | Date: 5/31/2014
 Project Description:

Project Notes

Project Cost and Benefits

Indirect Cost		Project Cost	
Calculated:	20.0%	Direct Cost:	\$5,000,000
Entered:	<input type="text"/> %	Other Costs:	<input type="text"/>
		Indirect Cost:	\$1,000,000
		Total Cost:	\$6,000,000

Performance Measure	Average Benefit	Median Benefit	Total Benefit
Health Index	20.31	21.71	321.32
Condition	15.21	16.02	214.64
Risk	4.56	4.5	40.42
Mobility	14.84	15.00	63.24
Life cycle Cost	23.54	23.50	267.43
TOTAL BENEFIT			1,483.43

Bridge and Work Summary

Bridge View | Map View

Bridge ID	Location	Base Utility	Utility	Utility Change	Estimated Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit	
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Paint-General	04 07896-NMIV-045678	50.34	51.48	1.14	\$196,200.00	0.0058	\$172	
Bearings-Replace	04 07896-NMIV-045678	50.34	51.48	1.14	\$196,200.00	0.0058	\$172	
Deck-Resurface	System Generated	50.34	51.48	1.14	\$16,800.00	0.0679	\$15	
Deck-Seal	04 07896-NMIV-045678	50.34	51.48	1.14	\$96,300.00	0.0118	\$84	
Approach Railing	System Generated	50.34	51.48	1.14	\$1,693,800.00	0.0007	\$1,486	
Approach Slab-Repair	04 07896-NMIV-045678	50.34	51.48	1.14	\$139,500.00	0.0082	\$122	
Channel-Repair Washouts/Erosion	04 07896-NMIV-045678	50.34	51.48	1.14	\$169,200.00	0.0067	\$148	
> 04 07603	7TH ST S OF GREENWAY PKWY							
> 04 07878	DESERT FOOT AT FRYE RD	50.34	60.44	10.04	\$12,345,000	.1245	\$2,136	
> 04 07935	INT ELIJOT RD & 48TH ST	62.34	75.44	13.04	\$3,874,000	.2134	\$1,428	
> 04 08003	0.5 MI N OF Buckeye Rd	50.34	60.44	10.04	\$12,345,000	.1245	\$2,136	
> 04 08508	.4 MI N OF DUNLAP RD	62.34	75.44	13.04	\$3,874,000	.2134	\$1,428	
> 04 08511	1.5 MILE EAST OF 24TH ST	50.34	60.44	10.04	\$12,345,000	.1245	\$2,136	
> 04 08529	SKY HARBOR AIRPORT TERM 3	62.34	75.44	13.04	\$3,874,000	.2134	\$1,428	
> 04 08530	SKY HARBOR AIRPORT TERM 3	50.34	60.44	10.04	\$12,345,000	.1245	\$2,136	
> 04 09175	19th Av N Of Indian Sch	62.34	75.44	13.04	\$3,874,000	.2134	\$1,428	

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Project Details – Analysis

Menu

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- Manage Layouts
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Bridges
Reports
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Gateway
Analysis
Projects

Save
Save & Close
Split
Cancel

Selected Project: New Project

Summary
Analysis
Management

Selected Bridge: 04 07603

Bridge Work Description:

Description

Route: 00000	Milepoint: mi
District: District 2	County: Maricopa
Owner: City/Municipal Hwy Agenc	Area: 02B - Paul Goldsmith
Material: 5 Prestressed Concrete	Resp: City/Municipal Hwy Agenc
Scour: 6 Calcs not made	Design: 05 Multiple Box Beam

Conditions

Deck: 4 Poor	Superstr: 6 Satisfactory
Substr: 7 Good	Culvert: N N/A (NBI)
Structure: 8 Protected	Deck Index: 50.07
Superstr Index: 45.89	Substr Index:
Culvert Index:	Structure Ht: 42.16

Current Scaled Performance

Condition: 59.32	Risk: 53.81
Lifecycle:	Mobility: 34.2

Sufficiency

Rating: 97.5	SD/FO: Not Deficient
--------------	----------------------

Recent Completed Work

Year	Cost (\$k)
No recently completed work found.	

Work Candidates Existing for the Selected Bridge Selected Work All Work

Work Candidate	Utility	Utility Change	Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit	Action Year
Do Nothing	50.34		\$45,000	.156	\$12	0
04 0759-JQX-031914-6ABA193714 - Approach Railing-Repair	52.5	2.16	\$125,000	.002	\$0	0
04 0759-NIMO-042114-E90D693A52 - Approach Railing-Repair	52.5	2.16	\$25,000	.141	\$0	0
04 0759-NIMO-091313-E2A8C9DA58 - Approach Slab-Repair	51.48	1.14	\$150,000	.114	\$9	0
A-DOT001-057F6A47-0000006A - Bridge Rail-Repair	50.34	0	\$75,000	.176	\$7	0
A-DOT001-057F6A47-0000006D - Deck-Rehab	50.34	0	\$100,000	.198	\$10	0

6 items in 1 pages

Effects on Each Utility Criterion

Category name	Before WC	After WC
Total Utility	50.34	52.5
Condition	59.32	61.88
Deck	42	98
Superstructure	81	81
Substructure	91	91
Scour	58	58
Element ratings	52.44	62.89
(12) Reinforced Concrete Deck	32.04	48.46
(38) Reinforced Concrete Deck	31.98	48.42
(65) Other Slab	100	100
(116) Reinforced Concrete Closed Web/Box Girder	100	100
(320) Prestress Concrete Approach Slab	10.66	10.66
(321) Reinforced Concrete Approach Slab	10.66	10.66
(331) Reinforced Concrete Bridge Railing	28.42	100
(520) Deck/Slab Protection Systems	100	100
(521) Concrete Protective Coating	10.66	10.66
(144) Reinforced Concrete Arch	100	100
Risk	53.81	57.58
Accident	53.81	57.58
Mobility	34.2	34.2
Percent of truck detained.	34.2	34.2

Effects on Each Element

Element	Str. Unit	Env.	Condition	Effect
(12) Re Concrete Deck	0	Low (2)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(12) Re Concrete Deck	0	Mod. (3)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(38) Re Concrete Slab	0	Low (2)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(65) Other Slab	0	Ben. (1)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(116) Re Conc Stringer	0	Ben. (1)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(144) Re Conc Arch	0	Ben. (1)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(320) Pre Conc Appr Slab	0	Low (2)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(321) Re Conc Approach Slab	0	Low (2)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(331) Re Conc Bridge Railing	0	Low (2)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>
(12) Re Concrete Deck	1	Mod. (3)	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>	<div style="width: 100%; height: 10px; background: linear-gradient(to right, green, yellow, red);"></div>

Deterioration Bridge

Deterioration Element



Cross Browser Compatibility

- Continuing to update BrM with latest support for all major browsers
 - IE 9, 10, 11+
 - Chrome
 - Firefox
 - Safari
- Allow for newer technologies to continue to be integrated in the future (e.g. HTML5)



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

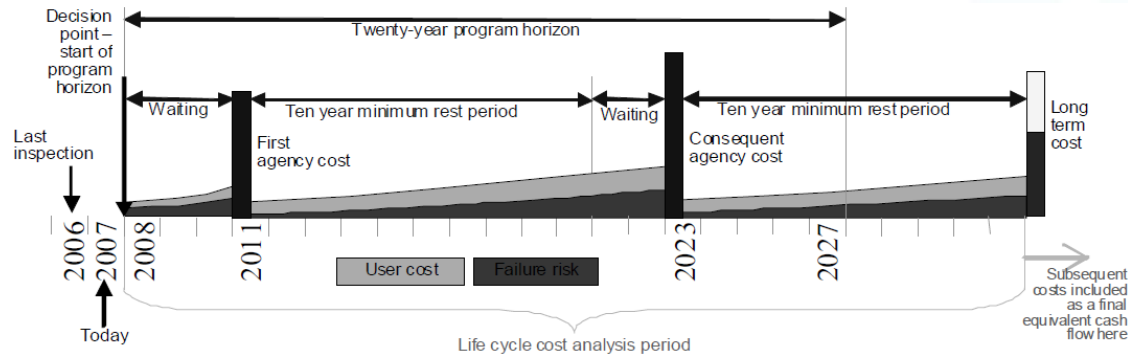


Bridge Management 5.2.3

- 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



Life-Cycle Cost Analysis



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 can be found at www.aashtowarebridge.com

AASHTOWare Bridge Management (BrM) Software
Life-Cycle Cost Analysis Prototype

Life-Cycle Cost Analysis (LCCA) Requirements Specification

The Life-Cycle Cost Analysis (LCCA) assists agencies in developing bridge maintenance programs. Agencies can evaluate the economic impact of several program alternatives through the LCCA. The length of programs depends on the agencies' policies. However, we'll assume that a typical program extends for a period of 10-20 years.

The diagram shows a timeline from 2006 to 2027. Key events include: 'Decision point (start of program selection)' at 2006, 'Last inspection' at 2006, 'First year program function' starting at 2007, 'First year minimum rest period' at 2007, 'First year agency cost' at 2007, 'First year minimum rest period' at 2008, 'Transition' at 2008, 'Transition agency cost' at 2008, 'Transition' at 2009, 'Transition' at 2010, 'Transition' at 2011, 'Transition' at 2012, 'Transition' at 2013, 'Transition' at 2014, 'Transition' at 2015, 'Transition' at 2016, 'Transition' at 2017, and 'Last inspection' at 2027. A shaded area represents 'User cost' from 2007 to 2027. A note at the bottom right says 'Additional information on a total program cost'.

AASHTOWare Bridge Management (BrM) Software
Tuning the Weibull shaping parameter and transition times in BrM 5.2.2

Introduction

Version 5.2.2 of the AASHTOWare Bridge Management (BrM) software will introduce the Weibull model as an enhancement to the pre-existing Markovian deterioration model. The introduction of the Weibull model aids in managing the known shortcomings of the Markovian model. The combination of the models provides a more realistic representation of the overall bridge deterioration process.

The accuracy of the model is largely dependent on properly configuring the modeling parameters. This document outlines:

- The effect that the parameter configurations have on the deterioration forecasted by the combined model
- How an agency can tune the parameters to best meet their needs

Weibull and Markovian Models

In BrM 5.2.2 the Weibull model is only used to model the onset of deterioration, or the transition of an element from the best condition state (CS1) to the next condition state (CS2). The rest of the transitions are modeled via the Markovian model. There are several parameters that need to be configured as part of the element deterioration model.

Transition times (T1, T2, T3)

A transition time T_i is defined as the median number of years a unit of the element stays in condition state i prior to transitioning to the next state.

Based on this definition, one can expect half of an element originally in condition state i to transition to the next state by the specified transition time.

Transition times are defined for both the Weibull and Markovian models.

Weibull Shaping Parameter (β)

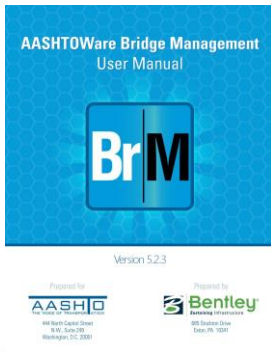
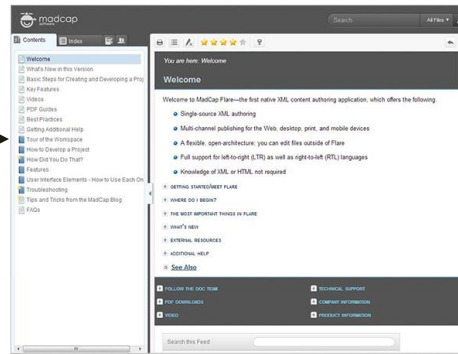
As its name implies, the shaping parameter is responsible for controlling the shape of the Weibull distribution. Figure 1 illustrates the effect of different shaping parameters on the Weibull model. A Weibull model with a shaping parameter value of "1" behaves identical to the Markovian model.

Figure 1 - Comparison of Weibull shaping parameter values *Values over 2 shown for illustration only

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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 released **July 2015**
- Spreadsheet is available to comply with inventory data submittal to FHWA by December 11, 2015
- The AASHTOWare BrM Task Force is actively pursuing potential methods of including new asset types (tunnels, culverts, signs, etc.) into the BrM Software.
- This will be a multi-phased approach
 - 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.



Questions?

